DESIGN FOR PERFORMANCE

UK Commitment Agreements:

Making measured energy in-use the objective for new office buildings

Feasibility Study Final Report

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EXECUTIVE SUMMARY

This is the final report of a feasibility study into the potential for UK implementation of a Design for Performance approach, similar to the NABERS Commitment Agreement used in Australia since 2002 to promise and then achieve high in-use energy efficiency levels in new prime office buildings. It sets out the justification, structure and forward actions for creating a UK Commitment Agreement whereby a developer of a new building or major refurbishment commits to achieving a specific, measured in-use energy target. Its findings result from extensive input by Australian and UK experts and widespread consultation with the many stakeholders from both property and construction industries who are involved in creating and then managing large, new office buildings.

BACKGROUND

The international agreement at the Paris COP21 talks has achieved a remarkable consolidation of international intent towards reducing greenhouse emissions, aiming for them to start falling as soon as possible, and to limit climate change to well under 2°C. As a result, the UK now intends to enshrine in law a long-term goal of reducing its carbon emissions to zero. Policies and programmes will be needed to achieve measurable emissions reduction in a practical and economic way.

The energy efficiency of new offices in the UK is subject to Building Regulations Part L and represented in market transactions by Energy Performance Certificates (EPCs). Both these mechanisms focus on design and technology that improves predicted building performance, not on those that achieve directly measureable improvements in performance in-use. The consequence has been a design-for-compliance culture, and a disconnect between the regulatory framework and the influence it has on the energy use and associated carbon emissions it is supposed to be limiting – the so-called Performance Gap. Voluntary schemes such as BREEAM and LEED reinforce this mentality, with only BREEAM Outstanding requiring performance in-use to be considered.

By contrast, even for new designs, Australia's NABERS (National Australian Built Environment Rating System) office energy rating scheme targets the actual in-use energy performance of the so-called Base Building (services typically under control of the landlord ie. the heating, hot water, ventilation and air-conditioning of the whole building, light and power in common areas, and the lifts). Its effect has been transformational, with typical new office Base Buildings using about half the energy they did when the system was introduced in 1999 and the very best one-fifth as much.

Meanwhile, the lack of focus on in-use performance in the UK means that new office Base Buildings here are little more efficient than in 2002. As pressure increases on the UK's greenhouse gas emissions, this failure of the regulatory framework to drive improvement creates a risk of further regulations, possibly adding to construction costs without necessarily improving outcomes. By contrast, NABERS has allowed the industry to develop cost-effective responses, by concentrating on what really works.

Today, developers of and investors in offices are aware that future property values may reflect in-use energy performance. While those with limited technical appreciation may believe that the EPC and BREEAM assessments produced prior to occupation of a new building cover this risk, others are asking why the UK does not have NABERS-like ratings, which in Australia have been able to align such investor sentiment with a measurable, technically robust metric, presented on a simple, user-friendly six-star scale. In Australia, office buildings with more NABERS stars are now associated with higher rents, reduced voids and longer retentions, while the positive financial impacts of a good rating have proved to be far greater than the associated energy cost savings.

Unfortunately, introducing a NABERS-like rating system to the UK is not as simple as one would like to think, as a large proportion of existing UK offices lack the arrangements of plant and metering to make it easy to produce a robust rating, for example with items of Base Building plant often connected to tenant meters[1]. Instead, an alternative approach to market transformation has been scrutinised by this feasibility study: the Commitment Agreement for new buildings and major refurbishments.

CREATING A DESIGN FOR PERFORMANCE CULTURE

This report sees Commitment Agreements as part of a strategy to enable in-use energy performance to be targeted, achieved and verified, to complement existing regulations and to help push skills and innovation within the construction and property sectors well beyond the regulatory minimum. A Commitment Agreement in Australia is a formal contract lodged with the NABERS Administrator, by which a developer commits to achieving a specific post-construction in-use energy rating. In return, the developer may advertise the rating in advance of its measurement in use. In Australia, this provides commercial benefit because many upper-tier tenants seek good NABERS ratings. Second tier landlords are now also starting to see higher NABERS ratings as a desirable differentiator for their buildings. Good ratings also attract green bond investors, who seek robust, measureable outcomes for the duration of their investment, not performance gaps.

Property companies and designers in the UK have confirmed that appropriate Base Building boundaries for engineering systems and metering could be incorporated at the design stage at no significant additional cost. So Commitment Agreements would be a low-cost opportunity to create precedents for designing for in-use performance, with potentially significant impacts on the UK market.

IMPLEMENTING COMMITMENT AGREEMENTS

The proposed process to implement and support UK Commitment Agreements in developments currently underway would include:

- a preliminary workshop to explain the performance requirements and potential risks to the design and building team
- including the performance target process in contractual documentation between the developer and the lead contractor
- advanced computer simulation to predict Base Building performance in-use

[1] See section 3.3

- independent energy efficiency design review by a member of a prequalified panel of reviewers with experience in both the design and post-construction operation of office buildings
- use of the Soft Landings process
- a monitoring and verification process (informed by the simulation results) from building occupancy through to achievement of the target
- third party review and validation of the achievement of the final target
- a requirement to advise affected parties (tenants, investors) of the achievement or otherwise of the proposed target within 18 months of the building reaching 75% occupancy.

The process would provide a framework to help the design and building team to identify and manage the risks associated with achieving their performance target. As demonstrated in Australia, its use also helps to improve the skills of project teams generally, to the benefit of all subsequent projects. To accelerate UK uptake, we recommend the development of training courses, and discussion groups for participants.

In the absence of a NABERS-like benchmarking and rating scheme in the UK, performance targets for energy use within a well-defined value and measurement boundary can be set with reference to either:

1. an external benchmark, for example the Landlord Energy Rating[2] developed for the Better Buildings Partnership in 2013
2. a computer simulation model conducted in accordance with published NABERS guidelines.

The brand that would be promoted would be the Commitment Agreement itself (perhaps called *Designed for Performance*), not any particular rating system. It would provide a basis for the market to recognise a project that was designed to achieve a specific target or outcome, which would itself be clearly published as part of the requirements.

Commitment Agreements will require some form of administrative body to perform or coordinate the following activities:

- selection and management of a panel of independent energy efficiency design reviewers
- development and maintenance of guidelines for computer simulation and independent design review
- registration and tracking of Commitment Agreements and their progress
- enforcement of the contractual provision of the Commitment Agreement
- management of certification and branding for the scheme.

NEXT STEPS FOR THE UK

The proposed next step is an 18-month pilot phase to consider each major element of the Commitment Agreement separately on one or more real projects. This will allow all the main ingredients of a Commitment Agreement approach to be tested without the need to go through the full construction cycle on a single project which could take up to 5-10 years from concept to completion and then waiting for measurement over a full year with at least 75% of full occupancy.

We expect the pilot programme to include up to 10 projects: a longlist of 20 has already been identified, with around half of these looking reasonably certain to proceed. Results from the various pilot projects will help make recommendations for the enhancement and future implementation of UK Commitment Agreements.

[2] http://www.betterbuildingspartnership.co.uk/our-priorities/measuring-reporting/landlord-energy-rating

1 BACKGROUND

1.1 THE BETTER BUILDINGS PARTNERSHIP

The Better Buildings Partnership (BBP), is a collaboration of the UK's leading commercial property owners and investors. It currently has twenty-seven member organisations, who work together to help enable market transformation through sustainability leadership and knowledge sharing across the property industry. More information can be found on its website http://www.betterbuildingspartnership.co.uk.

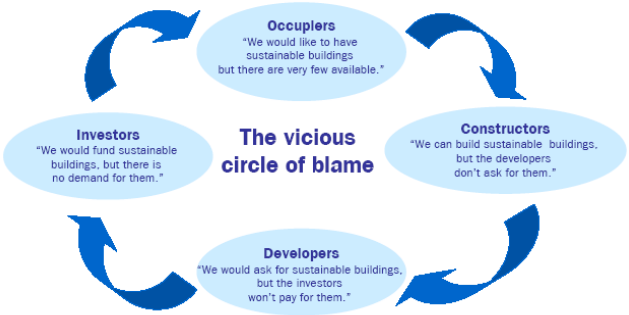
1.2 BENCHMARKING ENERGY USE OF OFFICE BUILDINGS

For many years, BBP has been interested in benchmarking the performance of office buildings in-use, not just to help improve environmental performance and reduce running costs, but seeking to translate this into increased rental and capital value, to stimulate interest by investors and drive improvement throughout the supply chain. Its work has included:

- discussing possible energy performance measurement and benchmarking systems and Green Leases in 2007-08
- producing a benchmarking toolkit in 2010
- advocating mandatory whole building Display Energy Certificates (DECs) for the commercial sector: these were included in the Energy Bill 2011, but removed from the Energy Act at the last minute
- commissioning the development of a Landlord Energy Rating prototype system in 2012-13 (see 1.5 below)
- from 2010 onwards, annual submission of Members portfolio data to create public domain Real Estate Environmental Benchmarks[3].

1.3 SPLIT RESPONSIBILITIES IN RENTED OFFICES

A major difficulty in benchmarking and improving the energy performance of rented office buildings - particularly multi-tenanted ones - is what economists call principal/agent problems: split responsibilities between investors, developers, landlords, tenants and their service providers[4]. The challenges were identified in the 1990s by the Property Environment Group (in some ways a predecessor of BBP) as the "vicious circle of blame", summarised in its diagram to the right.



1.4 VALUING THE PERFORMANCE OF "BASE BUILDINGS"

Australia is perhaps the only country to have overcome the problem of split responsibility in its multi-tenanted office buildings. The result has been a radical improvement in operational energy efficiency, for both existing and new buildings. In the UK, so-called "performance gaps" between design expectations and operational reality can still be enormous, as discussed later. Australia's success has built upon the NABERS[5] Energy benchmarking system (see APPENDIX F) for "Base Buildings", i.e. energy used in the common parts of a rented building and for shared HVAC services in the tenanted areas. Its uptake was aided because there was little else in the field. In addition, Australia had:

- A relatively homogenous market of air-conditioned buildings[6], particularly prime buildings.
- A culture of expectation amongst both landlords and tenants that it was the landlord's responsibility to provide occupiers with a comfortable working environment, and to maintain plant and controls in a tenant's demise.
- Routine provision of separate landlord's utility meters in New South Wales, ACT and Victoria (which together include most of the country's prime office stock), allowing measurement and benchmarking of Base Building energy performance. Metering boundaries in other states were similar, although not as consistent and usually defined using landlord owned meters.
- Good political support initially from the New South Wales State government and eventually the Federal government, to initiate the technical development of a rating system and obtaining buy-in from the property development and management industry.
- Requirements for Government tenants (State and Federal) introduced from 2004-08 that any office space they were planning to occupy should have at least a 4-Star Base Building energy rating (later raised to 4.5 Stars), which forced the supply side of the market to take notice.

1.5 THE LANDLORD ENERGY RATING – DEVELOPMENT AND DIFFICULTIES

After DECs for commercial buildings failed to be mandated in 2011, BBP sought an alternative. Impressed by the success of NABERS, it invited Verco and UBT to consider the opportunities for an investment-grade *Landlord Energy Rating* (LER) for UK office buildings and potentially European portfolios[2]. In a feasibility study in 2012-13, opportunities were investigated and a prototype rating system developed and tested. The tests revealed two major obstacles to rating existing UK office buildings:

- The absence of a clear metered boundary for landlord's services in most buildings. This introduced a need for estimation – which in turn undermined the concept of authoritative, investment-grade ratings.
- A lack of government buy-in and uncertainties about government's future intentions.

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[3] http://www.betterbuildingspartnership.co.uk/our-priorities/measuring-reporting/real-estate-environmental-benchmark

[4] See for example Mind the Gap: Quantifying Principal-Agent Problems in Energy Efficiency, International Energy Agency (2007).

[5] NABERS stands for the *National Australian Built Environment Rating System.* Its energy benchmarking system began in 1999 in the State of New South Wales as ABGR – the Australian Building Greenhouse Rating system.

[6] The traditional and still dominant servicing approach for upper-tier office buildings in Australia is variable air volume (VAV) air-conditioning. Modern systems are being designed with separate air-handlers for each façade. Other cooling systems used in temperate regions for upper tier buildings include active chilled beams, passive chilled beams and various hybrids of these and VAV systems. A small number of displacement ventilation systems are also in use. Older system types include multi-zone and dual duct systems.

2 COMMITMENT AGREEMENT FEASIBILITY STUDY

2.1 A FRESH START

In spite of the drawbacks identified in implementing the LER, BBP members remained keen to develop a method to overcome the vicious circle of blame and promote investment in first creating and then operating landlord's services that were truly energy-efficient in practice. In new buildings and major refurbishments, it was believed it would be possible to overcome the problem of "Base Building" boundaries for landlord's services and their metering at the design stage. BBP also saw potential commercial benefits for those developers and building operators that were able to demonstrate their ability to eliminate the "performance gaps" between design intent and operational reality.

2.2 COMMITMENT AGREEMENTS

Again, NABERS in Australia provides an example of what might be done. NABERS Energy (formerly ABGR) began as a benchmarking system for buildings in-use. As it gained traction in the early 2000s, it created a chicken-and-egg situation, in which developers and investors became concerned that new buildings could not obtain a rating until they had been at least 75% occupied for 12 months, while an increasing number of tenants would not occupy space unless they knew its rating. The result was a NABERS "Commitment Agreement" (CA) in which a developer could enter into a firm commitment to deliver a specified level of in-use performance, defined in terms of a predicted Star rating once a building came into full use.

2.3 A COMMERCIALLY FUNDED FEASIBILITY STUDY

Over Spring and Summer 2015, with the support of BBP, a team led by Verco, with the Usable Buildings Trust (UBT), the Building Research & Information Association (BSRIA) and Arup, worked on a club-funding model for a feasibility study into introducing the Commitment Agreement concept into the UK, and follow-on pilots[7]. The funders include British Land, EDSL, Laing O'Rourke, Legal & General, N G Bailey, Stanhope and TH Real Estate. Three other organisations are considering whether to join. The feasibility study has run from October 2015 to April 2016. It is intended to be followed by pilot projects, see Section 7. Funding is in three equal tranches, for 2015 (covering the feasibility study), and for 2016 and 2017 (covering the pilot studies). All funds raised so far have been matched 1:1 by the Usable Buildings Trust charity, which in addition to providing advice is considering the wider possibilities for Commitment Agreements and obtaining extensive input from leading experts in Australia.

Each funder provides a member of the Executive Board that oversees the project. The Board is chaired by BBP's Programme Director and attended by team members and a representative of DECC, the Department of Energy and Climate Change. The project is also supported (but not funded) by BBP, BCO, BPF, CIBSE and UK-GBC. It is in close touch with the Office of Environment and Heritage (OEH), New South Wales, which manages NABERS on behalf of the Australian government, and is enthusiastic for the unique national success of NABERS to be replicated internationally.

2.4 ASPECTS CONSIDERED

The Feasibility Study (of which this report is the main output), included consideration of:

- Scope of Base Building energy and suitable UK boundaries, see APPENDIX B
- Scope for CAs for office Base Buildings, and more generally see APPENDICES C AND D
- Differences in Base Building performance between Australia and UK and how these are affected by the design of fabric, plant, controls and metering; the build quality, systems commissioning, fit-out, tuning and operational management
- Estimating energy use at design stage and setting targets, together with any tendencies to over-design
- Differences in procurement and investment practices and contractual relationships
- Differences in design, commissioning, handover, documentation and operator training
- Drivers and tools to improve in-use performance in the two countries
- Quality of building management, nature of FM contracts, and the priority given to energy management
- Potential for incorporating Commitment Agreements into Soft Landings
- UK capacity to undertake advanced simulations and improve the realism of design energy estimates
- UK capacity to staff and operate a Design Review panel
- What a CA would look like; how it might be overseen, operated and funded; and how it would relate to UK legislation, practices and guidance (some of which might need updating, for example CIBSE's publications TM39 (metering), TM54 (energy estimation) and AM11 (Building energy and environmental modelling)).

2.5 STAKEHOLDER CONSULTATIONS

The primary consultation event was an industry workshop[8] on 1 December 2015. Meetings have also been held with investors, leasing agents, developers, landlords and occupiers, contractors, software providers, managing agents and valuers, architects and engineers. A simulation workshop was run with dynamic software developers and modelling practitioners. A seminar was held at EcoBuild in March 2016 and two peer-reviewed papers have been published for presentation at conferences: IEECB'16 in Frankfurt, March 2016 (see Appendix G) and the CIBSE Technical Symposium in Edinburgh, April 2016. Meetings have also been held with the lead contractors for the revisions of the EPBD's CEN Standards (ISSO, NL) and the development of the European common Voluntary Certification Standard (CSTB, FR).

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[7] Verco and BSRIA members of this core team undertook a lecture/study tour of Australia and New Zealand in March 2015, promoting the Soft Landings Framework and learning about NABERS directly from practitioners in Perth, Melbourne, Auckland and Sydney. All the team members have had involvement with the development and/or management of one or more of the tools likely to be associated with Commitment Agreements: the LER, the Soft Landings Framework and the Building Use Studies occupant satisfaction survey.

[8] View all the presentations here: http://www.betterbuildingspartnership.co.uk/design-performance-workshop-1
And a workshop blog here: http://www.betterbuildingspartnership.co.uk/momentum-builds-behind-design-performance-0

3 IMPROVING BASE BUILDING PERFORMANCE IN AUSTRALIA

3.1 BACKGROUND

During the 1990s, case studies began to reveal major differences between design estimates and the in-use energy performance of UK commercial buildings. The results tended to be ignored, or dismissed as anecdotal. Today, the evidence is overwhelming and there is wide recognition that these "performance gaps" really do exist. In spite of this, the gaps remain: they are also thought to be wider in multi-tenanted offices than in ones with a single occupier, owing (amongst other things) to split responsibilities for their operation - though evidence is thin as good data are not collected routinely.

3.2 THE SITUATION IN AUSTRALIA

In the 1990s, a similar situation prevailed in Australia. However, in 1999, the Australian Building Greenhouse Rating system (ABGR) was introduced, providing a scale against which the energy performance in-operation of office buildings could be measured. When ABGR was introduced in 1999, the performance scale ran from 1 to 5 stars, in half-star increments. By statistical analysis of the utility meter data, the scale was calibrated as follows:

- about 15% of prime office buildings would not obtain a star
- a typical (median) energy performance level was estimated to be 2.5 Stars
- 4 stars was industry best practice and 4.5 stars a plausible stretch target
- 5 Stars was regarded as unattainable.

In 2010, a 6-Star rating was introduced, set to be half way from 5 Stars to true zero carbon.

In 2006, ABGR was incorporated in the National Australian Built Environment Rating System, as the NABERS Energy rating – which can be separately determined for Base Buildings (landlord services), tenancies, or whole buildings. Of these three types of rating, the Base Building rating has been most successful, both in terms of market penetration and of transformative outcomes.

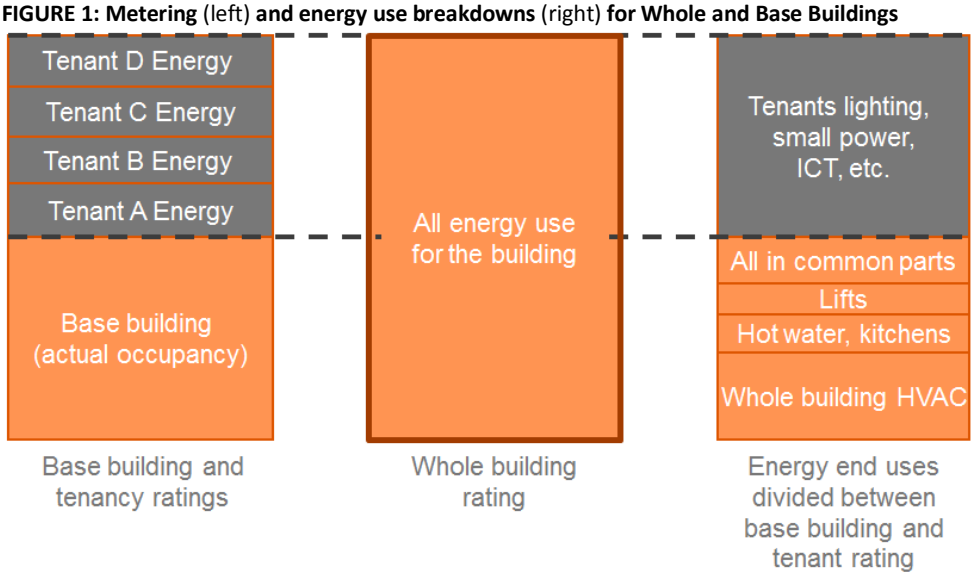
3.3 WHAT THE AUSTRALIAN BASE BUILDING INCLUDES

A consistent "Base Building" definition was critical to establishing a robust rating. In Australia, this drew upon common energy metering practice in New South Wales, ACT and Victoria, where there tended to be separate utility meters for the landlord and each tenant[9], see the left hand side of Figure 1. However, there was significant variation in the detail of what was actually connected to the landlord's meter, so a definition was firmed up for NABERS - its key components are listed below and summarised on the right hand side of Figure 1:

- all energy used by the general HVAC system provided to service the office areas and common parts (but not special HVAC systems added to suit specific tenant needs, e.g. for server rooms)
- light and power to non-lettable spaces, including the entrance foyer, most lift lobbies, back of house and base-building amenities
- lifts (excluding any lifts installed within a tenancy by the tenant)
- external lighting
- car park lighting and ventilation, where car parks are for the sole use of tenants
- all other services provided for general use by tenants (e.g. condenser water loops for supplementary air-conditioning)
- domestic hot water provided centrally or for Base Building amenities, but not local domestic hot water added by tenants in their spaces
- fuel use for standby generators.

Typically Base Building energy consumption averages about half the primary energy use or carbon footprint of an office building, though with wide variations depending on tenant usage and equipment.

FIGURE 1: Metering (left) **and energy use breakdowns** (right) **for Whole and Base Buildings**

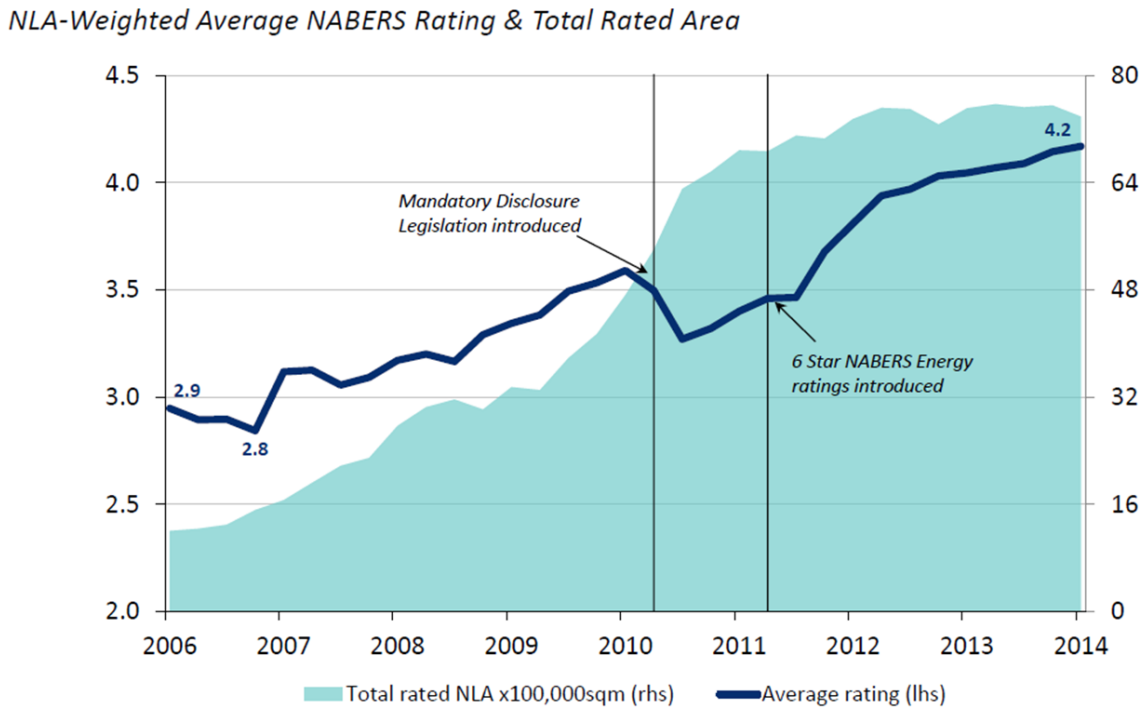


[9] In the UK, such metering arrangements were abandoned in the 1980s, in the run-up to electricity privatisation, with whole building metering being required where practicable. In hindsight, this was a mistake, as it separated the metering and billing from those responsible for the energy use.

3.4 HOW MUCH HAS AUSTRALIAN BASE BUILDING ENERGY PERFORMANCE IMPROVED?

Since 1999 *(and particularly since 2004 when a good NABERS rating became a government and property industry requirement),* the average star rating of all buildings assessed in a year has improved progressively, see Figure 2, representing a 32% reduction in CO_2 emissions for the entire stock of office Base Buildings over the eight years of the graph. The pause in 2010-12 reflects the introduction of "mandatory disclosure", when the Australian government required all offices over 2000 m^2 Net Lettable Area (NLA) to prepare and disclose their NABERS energy ratings to inform a sale or let transaction. As a result, from 2010, more poorly performing offices started to be captured by the previously voluntary database. Market drivers have evidently ensured this reverse in reported ratings was temporary, as the data shows owners continued to tune-up their portfolios.

FIGURE 2: Average office Base Building star ratings 2006-2014, with total area rated



Source: IPD, NABERS.

3.5 WHAT ABOUT NEW AUSTRALIAN OFFICES?

When ABGR was introduced, new office buildings tended to be no more energy efficient than the existing stock. Following the introduction of Commitment Agreements (see Section 2.2), the situation began to improve. Today, most new office Base Buildings would achieve at least 4.5 Star performance, most reach 5 Stars or better, and a few are now beginning to achieve six-star performance. The key drivers of this transformation have been:

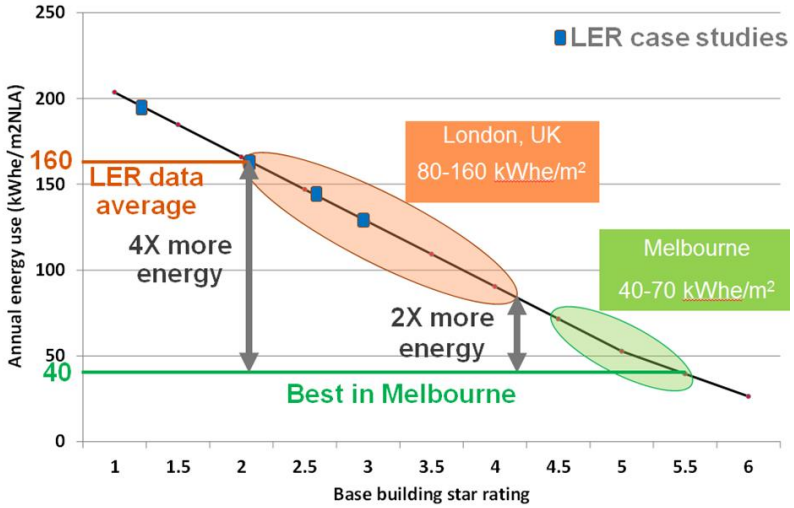
- the visibility of in-use Base Building operational performance *(through mandated disclosure of the NABERS energy rating)*
- improvements in that performance *(through better management, tune-ups and capital investment)*
- the ability of modellers to predict in-use performance (particularly for Base Buildings)
- the support of Commitment Agreements: not only helping the buildings concerned, but improving skills of design, modelling, engineering, commissioning, operation and management in the industry overall
- the design for performance approach helping to reduce capital costs as the plant and systems can be more confidently right-sized for the demands calculated to be placed upon them.

4 HOW DO UK OFFICES COMPARE?

4.1 COMPARING LONDON AND MELBOURNE

Figure 3 shows a comparison between Base Building energy use in London and Melbourne. London is typically cooler in summer and winter, so requires a little more heating and a little less cooling. The line shows the relationship between kWhe/m^{2}NLA/yr[10] and the NABERS star level for Victoria. At the poorer end of the scale, a 1 Star NABERS energy rating in Melbourne equates to over 200 kWhe/m^2. At the good end, 5 stars represents around 55 kWhe/m^2/yr. The ranges for these two cities indicate the spectrum of performance, from least to most energy efficient. Most new offices in Melbourne achieve 4.5 stars (70 kWhe/m^2/yr) or better, with the best at 5.5 stars (40 kWhe/m^2/yr), representing a twofold to fourfold reduction in the Base Building performance of new buildings since the NABERS system was introduced.

FIGURE 3: Base building energy use in London and Melbourne



4.2 BASE BUILDING ENERGY DATA FOR NEW UK OFFICES

As UK Base Building operational performance is not measured (by either a formal industry rating system or a more informal approach), it is not possible to make direct comparisons with Australia. However, testing in 2013 of the LER prototype on over 80 buildings in the portfolios of BBP members identified an average Base Building energy use of 160 kWhe/m^2/yr, comparable to the typical level in Melbourne in 1999 when the ABGR benchmarks were determined. Values for the four detailed LER case studies undertaken at the same time were scattered around that level, giving some confidence in its magnitude. From this and other evidence, it is likely that the range for new UK prime offices stretches up to at least 160 kWhe/m^2/yr, the average for existing buildings. Other non-publically available data disclosed for the purpose of this project suggest that the most efficient prime office Base Buildings in the UK currently reach 80 kWhe/m^2/yr, a little more than the 4.5 star minimum standard in Melbourne. So the best Base Building performance in new UK prime rented offices seems to require twice as much energy as the best in Melbourne, while the least efficient use perhaps four times as much energy. While these figures may appear startling, it is notable that the identified average energy use for London in the LER study is remarkably close to the average performance of buildings in Melbourne when the then ABGR rating scale was originally set.

4.3 WHY THE DIFFERENCES?

We have identified the following reasons for higher energy requirements of Base Buildings in UK prime offices:

- Base building performance is not measured and targeted, so it is hardly surprising that it is not optimised.
- Experience with NABERS suggests that, provided the building envelope is serviceable, ratings of up to 5.5 Stars can be achieved by attention to detail in the design, specification, plant selection, installation, control, commissioning, operation and management of what are fairly conventional building services installations. Unfortunately, all these items tend to be neglected in the UK, as we do not target Base Building in-use performance – in design or in operation.
- Instead, the UK's *design for compliance* culture creates a tendency to over-design and to add unnecessary complication to buildings and their engineering systems, which then makes it more difficult to achieve the intended performance – as many post-occupancy performance studies[11] have revealed.
- Relative to Australia, the UK focuses more on the building fabric and renewable energy systems, and less on the energy efficiency of services, and in particular their efficient control and management.

The UK tendency to waste energy is further exacerbated because the boundaries between landlord and tenant HVAC services can be blurred, particularly in large prime London office buildings. In particular:

- In shell-and core developments, a tenant may be responsible for installing, controlling and maintaining all the building services within their demises. The landlord then has no visibility of what their tenants' engineering services are doing, and can easily become a "dumb" provider of hot and chilled water and primary air, whether they are really needed or not. For example, does a demand in the middle of the night represent a real requirement, or is a valve stuck open?
- Even in "Category A" developments[12], where the landlord provides an interior with Base Building HVAC services, some of this may be on tenant meters; and the tenant may well be responsible for their maintenance under the lease.

[10] kWhe is the "electricity equivalent" of total energy use: kWh of electricity are added to kWh of any fuel multiplied by 0.4 and kWh of hot or chilled water multiplied by 0.5. The electricity to gas ratio is consistent with the UK Climate Change Levy's new rates. NLA is net lettable floor area.

[11] Including the office case studies in the late 1980s and early 1990s, the Probe studies (1995-2002), the Carbon Trust's Low Carbon Buildings programme in (2005-10), and most recently Innovate UK's Building Performance Evaluation programme (2010-2015).

5 CAN WE EMULATE THE AUSTRALIAN IMPROVEMENT IN THE UK?

5.1 THE TECHNICAL POTENTIAL

Since NABERS was introduced in 1999, the energy used by Base Building services in new prime offices in Australia has fallen by a factor of two (with average ratings improving from 2.5 to 4.5 stars) and a factor of five for the most efficient new buildings (2.5 to 6 stars), mainly by attention to detail in design, installation and commissioning; and particularly control, operation, management, fine tuning and continuous improvement. Could this success be replicated in the UK? Yes: the feasibility study has identified many sources of avoidable waste in existing UK practice. NABERS has demonstrated that this potential can be unlocked by making in-use performance visible, using an investment-grade rating that is both technically rigorous and can also be expressed in simple terms - probably in stars, as NABERS does[13].

5.2 THE TECHNICAL CHALLENGE

NABERS started by rating the energy efficiency of existing Base Buildings. Then, under pressure from the development industry, it added Commitment Agreements for new ones (see section 2.2). Unfortunately, the UK does not have routine utility metering of landlord's services, so most existing tenanted office buildings cannot be rated without making assumptions that undermine the credibility of the result from an investment perspective (see section 1.5), unless significant investment were to be made to introduce the required metering arrangements – which sometimes would also require modifications to the HVAC systems themselves. So we recommend the UK starts the other way round, with Commitment Agreements for new developments and major refurbishments, where - if the brief requires Base Building boundaries and the associated design of services and metering - developers and designers think that the appropriate engineering and metering systems could be incorporated at little or no additional cost.

5.3 THE CHALLENGE FOR EARLY ADOPTERS

Since the UK lacks an established rating system for existing office Base Buildings, those who take up Commitment Agreements are at risk of not having their efforts rewarded, because the meaning of the achieved in-use performance levels will not be widely understood. In spite of this weakening of the business case, the feasibility study has identified leading office developers, landlords and occupiers who are keen to try out Commitment Agreements in the proposed pilot projects, see Section 7. There are perhaps three main reasons why they are prepared to take this risk: seeing the success of NABERS; frustration that the UK (and Europe) has nothing similar; and pressure from "green" investors, who do not want to finance performance gaps, but seek an investment-grade guarantee of in-use performance which endures for the life of their investment.

5.4 THE CULTURAL CHALLENGE

Improved Base Building performance offers huge prizes, not just in energy efficiency but its association with good design and management, occupant satisfaction, higher rents and capital values, not to mention the environmental benefits. However, in spite of its technical feasibility, we have identified endemic cultural barriers in UK practice, which threaten to be the largest stumbling blocks. They include:

- A deeply-embedded ***design for compliance*** culture: once theoretical calculations confirm that a design meets the Part L requirements (however unrealistic and incomplete those calculations may be), client and design team regard the result as a hurdle crossed and move on, never to revisit the design calculations, or for the most part to review performance in use.
- This culture is reinforced by ***the way computer models*** are used. The regulations do not require the absolute energy performance to be predicted, but a performance ratio in relation to a reference building, often with a radically simplified representation of the air-conditioning system. As a general rule, designers are also happy with this, as it absolves them from responsibility for the final results. Instead, they claim that models are used to compare options, not to predict outcomes. Ironically, in Australia, a significant proportion of those who do absolute predictions for NABERS Commitment Agreements are British-trained modellers, sometimes working for British firms (e.g. Arup who are part of this feasibility study team), often using British software (particularly TAS and IES). However, those who come back to the UK find themselves unable to do it, because there is no client demand.
- ***Reluctance of most players to take responsibility*** for Base Building performance - partly because it is difficult to grasp when there is no clear definition, or servicing and metering arrangements. Australian industry practice always had similar boundaries, now sharpened by the NABERS definition. Appendix B includes a provisional definition for the UK. This is a modified version of that used for the BBP prototype Landlord Energy Rating, and is very similar to NABERS.
- ***Fuzzy technical and metering boundaries*** between landlord and tenant services, particularly in larger Central London office buildings. Until the early 1980s, landlords often provided, operated and maintained all shared HVAC services throughout a building (air-conditioning was relatively rare) and everything in the common parts - these might also be on a landlord's utility meter. During the 1980s, deep plan, shell-and-core, and air-conditioning became much more common, while landlord's electricity meters disappeared from new buildings. With shell-and-core in particular, landlords started to pass responsibility to tenants for the installation, control, operation, maintenance and metering of part or all of what had formerly been landlord's HVAC services in the tenanted areas. In the early 1990s, the recently-

[12] Category B fit-out completes the fit-out to the occupier's / users' specific requirements.

[13] In 2003, in market research into the preferred format for the building energy certificates proposed by the Energy Performance of Buildings Directive, UK property industry stakeholders expressed a strong preference for the familiar A-to-G rating used in Europe since the 1990s for domestic appliances and later for lamps and cars. This form of display was subsequently incorporated in CEN Standard 15217 on methods of building energy certification. However, practical experience in rating in-use building performance shows that the star ratings used by NABERS and in the USA and India are far more market-friendly. *If your building had average performance, which would you prefer: 2.5 Stars (the average NABERS rating in 1999) or to be on the D-to-E boundary (as with EU Certificates)?* It is even rumoured that – in spite of strong support from the CBI and the property and construction industries – one reason for DECs for commercial buildings being dropped from the Energy Act 2011 at the last minute was representations from major retailers, who presumably didn't relish the prospect of selling A+ rated products from, say, D-rated buildings.

formed British Council for Offices developed its "Category A" fit-out definition, which included basic floors, ceiling, lighting and HVAC installations. Tenants then add partitions to suit. Any supplementary air-conditioning beyond the landlord's provision (e.g. beyond BCO standards) was connected to the tenant's meter, for example for server and dealer rooms. Most offices in Australia (and we understand anecdotally in other European countries) are fitted out this way, with the landlord remaining responsible for control, operation, maintenance and energy used by the Category A HVAC installation, which is regarded as part of the Base Building. In the UK, one frequently finds some of this installation (particularly fan coil motors and electric heating elements) connected to the tenant meters; and sometimes the tenant becomes responsible for installation and maintenance too, and controls the equipment with their own BMS. In Australia such subdivision of basic infrastructure between landlord and tenants is regarded as perverse - blurring Base Building boundaries and stopping a single party being responsible for the efficient operation of the landlord's services. With nobody properly in charge or receiving all the information, the opportunities for systems defaulting to ON and components fighting each other are legion, so Australians find it not unsurprising that average UK Base Buildings use twice as much energy as theirs, and see major difficulties in achieving the equivalent of 4.5 stars in the UK under these circumstances, let alone the higher levels that are now routine in Australia.

5.5 RESOLVING THE CUTURAL CHALLENGE

Passing on to tenants of prime offices responsibility for some elements of Base Building services has become the market norm for developers, who say this is what investors and tenants want[14] … while in Australia sometimes the very same investors and occupiers seem happy with landlord control. But split responsibilities for whole building HVAC services often causes systems to default to ON unnecessarily, and perhaps with heating fighting cooling too, wasting even more energy.

This nettle really does need to be grasped if rented UK offices are to become as energy-efficient as their Australian counterparts: no agency, no result! Until UK developers and landlords have a single-point responsibility for "owning" Base Building performance from inception through to continuous improvement in use, split responsibilities and incomplete information will always severely compromise the potential for landlord's services to perform efficiently. Fortunately, office buildings do exist – particularly smaller ones and those not in Central London - where landlords can (and sometimes do) take full control, allowing the energy-saving potential from better management to be demonstrated where the metering is appropriate.

In Australia, the office buildings that have more NABERS stars are now associated with higher rents, reduced voids and longer retentions. These positive financial impacts of a good rating have also proved to be far greater than the associated energy cost savings. Whether comparable financial benefits will become associated with more energy efficient Base Buildings in the UK will remain unproven until Base Building performance is defined, measured and rated. The prospect seems tantalisingly close as some investors in offices see sustainability as a driver of asset value and are anticipating that future property values are likely to reflect in-use energy performance[15].

5.6 ORANISATIONAL SUPPORT

Organisationally, the UK can benefit hugely from the experience built up by NABERS. The current feasibility study team includes Dr Paul Bannister of Energy Action Australia, who developed the original ABGR system, NABERS energy ratings and the NABERS commitment agreements, and is still the key technical expert in Australia. The team and BBP officials have also had discussions with OEH (the New South Wales Office of Environment and Heritage), which is responsible for running the NABERS scheme on behalf of the Australian government. OEH is keen to collaborate with us in developing and testing a system that will suit the UK (and ideally Europe[16]).

5.7 IMPLEMENTING UK COMMITMENT AGREEMENTS

The proposed process for new buildings is outlined in Section 6 and Appendix C: it would use **Commitment Agreement** protocols, **Advanced Simulation** methods that predict absolute performance; independent **Design Reviews** to cross-examine the design intent and simulation results; pay more serious attention to detail (particularly in plant selection, design and control) and undertake extended **Tune-ups** in operation.

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[14] Tenants may have been partly persuaded to take over control of the HVAC in their demises after experiencing poor service from their landlord or managing agent, and preferring to be masters of their own destiny. Landlords also had the perverse incentive that, if instead of improving their service, they could pass over to their tenants more responsibility for the installation, operation maintenance of what should have been landlord's services in tenant demises, they could lower their service charges, although the total (direct and indirect) cost to a tenant would actually go up. A landlord energy rating such as NABERS exposes the severe energy penalties of such practice and promotes good control by landlords, which leads to better ratings.

[15] Impax Asset Management: Quantifying "green alpha": measuring the excess returns generated through sustainability, September 2015. Can be downloaded at: http://www.impaxam.com/sites/default/files/Quantifying%20Green%20Alpha%20White%20Paper%20-%20FINAL_0.pdf

[16] The EU Energy Performance of Buildings Directive (2001) and its subsequent 2010 Recast talk about *"calculated or actual energy"*. Display Energy Certificates (DECs), and the associated Landlord's Energy Statements, were developed to support certification of actual measured energy. Unfortunately, in the transposition of the Directive by Member States, measured energy aspects were widely ignored, reinforcing the pre-existing compliance culture by having only calculated Energy Performance Certificates (EPCs) that are now known to bear little relationship to in-use performance. The performance gaps have been exacerbated by the encouragement of increased complexity of buildings and their engineering systems, in spite of evidence from post-occupancy studies in the UK (corroborated incidentally by the experience in Australia and evidence from NABERS) that unnecessary complication tends to be the enemy of good performance, while a lot more can be achieved by attention to detail, to get the simple things right. Worryingly, work towards the proposed second recast, planned for 2018, threatens to outlaw measured performance ratings as part of a quest for lowest-common-denominator trans-EU harmonisation around a solely theoretically-calculated EPC that takes into account heating, cooling and hot water only. The study team is currently advocating to the European Commission that a requirement for a Base Building rating at both design and in-use stages – with transparency between the two - would meet the harmonisation requirement, restore much-needed focus onto actual energy performance, and spur market transformation for rapid reductions in energy use and greenhouse gas emissions..

5.8 ACCELERATING THE UPTAKE

The problem is not so much a lack of UK capabilities but of market demand (see section 8.4). Given the availability to us of advice and experience from Australia, we think the transition from *design for compliance* to *design for performance* could be rapid; and could extend far beyond offices. It just needs the will to get on with it

5.9 SWOT ANALYSIS

A SWOT analysis was done on the plan to introduce Commitment Agreements to the UK for prime office Base Buildings. A summary analysis of the strengths, weaknesses opportunities and threats is shown in Figure 4. A more detailed analysis that has led to the conclusions summarised in the paragraphs above is given in Appendix A.

FIGURE 4: SWOT analysis summary

STRENGTHS	**WEAKNESSES**
Base Building performance is a good foundation for whole building energy efficiency because it can be "owned" and managed by the developer and then the landlord and their teams. The Base Building concept can be extended from offices to all managed buildings. Focuses on things that really work in operation, helping to get rid of unnecessary complication that does not add value in practice. Potentially reduces regulatory burdens. Helps to move the development, construction and property industries and their service providers away from a Design for Compliance culture to Design for Performance.	Major cultural change will be required for the supply side of the building industry and its clients to take proper account of in-use performance. The idea is new to the UK: there is no Base Building definition or metering of Base Building services - some of which can also be under tenant control, causing waste through split responsibilities. No proven in-use benchmarking system for base buildings is currently available in the UK, though the BBP's prototype Landlord Energy Rating may well be suitable.
OPPORTUNITIES	**THREATS**
First mover developers and landlords could gain advantage from having been involved in Commitment Agrement pilot projects. There is a latent demand from occupiers for energy efficient buildings, currently not being met in practice because base building energy use in the UK is invisible, with inefficiencies out of sight of the market, and beyond the reach of EPCs, which have lost credibility, owing to their poor relationship to in-use outcomes. Commitment Agreements can also be applied to whole buildings and to tenancies, though the greatest success in Australia has been with base buildings, owing to clear responsibilities for "ownership" of the problem.	Risks to reputations of participants if committed performance levels are not met in practice. Occupiers promised a target performance level as part of a pre-let negotiation may need compensating if it is not achieved. Some large occupier organisations may have group-wide policies to manage their own demises and may be reluctant to occupy a building where the landlord has control. The potential to improve base building energy performance of new buildings by a factor of 2 or more may affect the lettability of existing stock.

5.10 SUMMARY OF CRITICAL SUCCESS FACTORS IN AUSTRALIA

The following factors have been critical to the success of NABERS energy ratings. Most are unlikely to be directly available in the UK, which highlights the challenge of replicating the transformation achieved in the Australian office market.

- In Australia, utility metering generally follows the Base Building / tenant split.
- This allowed NABERS investment-grade, yet consumerised star ratings to be introduced for Base Buildings, and gain total market credibility.
- In 2002, Commitment Agreements were conceived for developers to ensure new offices could operate at their target energy performance levels and enable occupiers to sign up to pre-lets for space with the in-use energy performance they wanted. It took 5-10 years for the industry to become comfortable with the responsibilities this entailed.
- In 2004, State governments started to set minimum standards for space they occupied. New South Wales, where the ABGR began, took the lead in March 2004, when they decreed their existing owned buildings and tenancies had to be rated by the year end, should attain 3 star base building by July 2006 and new leases should require 3.5 stars from 2006[17]. They also required 4 stars for major upgrades and 4.5 stars for new buildings. Other States gradually introduced their own minimum standards and in 2006 the Federal Commonwealth (Australian) Government[18] mandated 4.5 star base buildings for new buildings, major refurbishments and new leases over 2,000m^2. Most States have since ratcheted up their requirements to the 4.5 star level for all their stock over 2,000m^2.
- Some large corporates followed suit.
- In 2006, the Property Council of Australia introduced NABERS base building energy ratings into their definitions of Prime, grade A and grade B offices: new buildings had to achieve at least 4.5 stars (4 stars for grade B) and existing buildings had to be rated . In 2012, the energy performance bar for all Prime offices was raised: to 5 stars for new buildings and at least 4 stars for existing buildings.
- In 2010, the federal government introduced the Building Energy Efficiency Disclosure Act, to mandate disclosure of Base Building ratings on sale or let of office premises over 2,000 m^2.
- The norm in Australia is for a developer and landlord to "own" the Base Building performance, which gives a single party full control over the HVAC for the whole building. This unfettered agency to deliver the targeted performance has been pivotal.

[17] http://arp.nsw.gov.au/m2004-04-greenhouse-performance-government-office-buildings-and-rental-properties
[18] http://industry.gov.au/Energy/EnergyEfficiency/Non-residentialBuildings/GovernmentBuildings/EnergyEfficiencyOperations/Pages/EEGORatings.aspx

6 PROPOSED SCOPE OF UK COMMITMENT AGREEMENTS

6.1 THE NEED TO MOVE TO DESIGN FOR PERFORMANCE (DfP)

In previous sections, we have made clear the shortcomings of the UK's current Design for Compliance culture, and the pressing need to move to *Design for Performance,* which addresses in-use outcomes. In Australia, Commitment Agreements have been shown to eliminate performance gaps - at least for Base Building performance in rented offices – by bringing together all parties involved and creating a chain of custody from client requirement, via design intent confirmed by advanced modelling, through construction and commissioning to operational reality.

6.2 IMPLEMENTING COMMITMENT AGREEMENTS FOR BASE BUILDINGS

Fortunately the experience gained in Australia, the support offered by the New South Wales Office of Environment and Heritage (OEH), and the advice and stakeholder comments we have received during the feasibility study suggest that it would be possible for the UK to proceed using much of the Australian model. This will allow us to undertake pilot projects over the next 18 months, as outlined in Section 7, and move rapidly into implementation after that.

6.3 PROMOTING THE IDEA OF DfP AND COMMITMENT AGREMENTS GENERALLY

Performance gaps in the UK – and indeed in other countries - exist across all sectors, and not just offices. As a result, although the pilot projects should necessarily be focused on office Base Buildings, the general idea is capable of being applied much more widely. This will be a particular priority for UBT, as summarised in Appendix D. In the course of the feasibility study, opportunities have also been identified for:

- Extending the Base Building concept to all managed buildings (e.g. university premises) in which a landlord provides the basic infrastructure while some of the activities are largely if not totally under occupier control.
- For the UK, requiring transparency between design calculations for so-called "regulated loads" (i.e. the energy end-uses and occupation schedules covered by Building Regulations Part L in England & Wales) and metering and reporting in-use performance of the same subset of loads – which are very close to Base Buildings, and could be made identical.
- In Europe, relating this proposed Base Building transparency requirement to the second recast (currently under development and due in 2018) of the Energy Performance of Buildings Directive and the associated common Voluntary Certification Standard (VCS).

6.4 INTEGRATION WITH OTHER GUIDANCE

While many UK tools and techniques have served to reinforce the UK's design for compliance culture, there are several that already begin to assist connections between design and in-use performance, in particular:

- CIBSE Technical Memorandum TM39 on metering. Recent experience, e.g. from Innovate UK's Building Performance Evaluation programme, shows that the sub-metering requirements in Part L (which reference TM39) are frequently not fit for purpose, for two main reasons – that they are not user-friendly and seldom properly commissioned. Fortunately, TM39 is currently being revised, giving the opportunity to correct these deficiencies. CIBSE has also offered to incorporate material on Base Building metering in the revisions.
- CIBSE Technical Memorandum TM54, on predicting operational energy use at the design stage, using a similar approach to TM22, which is used to support energy surveys. Although TM54 has been criticised for giving designers too much of a comfort blanket, designers and modellers do say that is has been a useful start. Potentially it could be tightened-up, and a version also produced to support the design, monitoring and verification of performance of Base Buildings.
- CIBSE Applications Manual AM11 on building performance modelling. This has recently been republished and should support the advanced modelling protocols necessary to predict in-use performance, particularly for Base Buildings. Meanwhile, a new guide for building simulation is under development in Australia (authored by Paul Bannister), and should also be very helpful for UK practitioners when it is published (expected by end of 2017), further highlighting the support for the introduction of Commitment Agreements the UK can benefit from through closer links with practice in Australia.
- BREEAM for new offices, although widely used, has largely been related to design intent in the UK – and more recently management procedures – but not to operational outcomes (apart from for BREEAM Outstanding). However, with all the attention being given to performance gaps, we understand that this shortcoming is about to be rectified.

In addition, the Soft Landings process is very much dedicated to maintaining the "golden thread" from design intent to reality, and focusing all team members on operational outcomes. It is already very much part of this project, with team members UBT (one of its initiators) and BSRIA (which runs an active user group and has produced many supporting publications). Soft Landings is not currently widely used in Australia, though there has been considerable interest in recent years. Interestingly, but not surprisingly, experience there with Commitment Agreements has led to similar findings, with the Agreement itself providing the outcome focus. Soft Landings is also being used to shape the proposed pilot projects.

6.5 POSSIBLE IMPLEMENTATION PROGRAMME

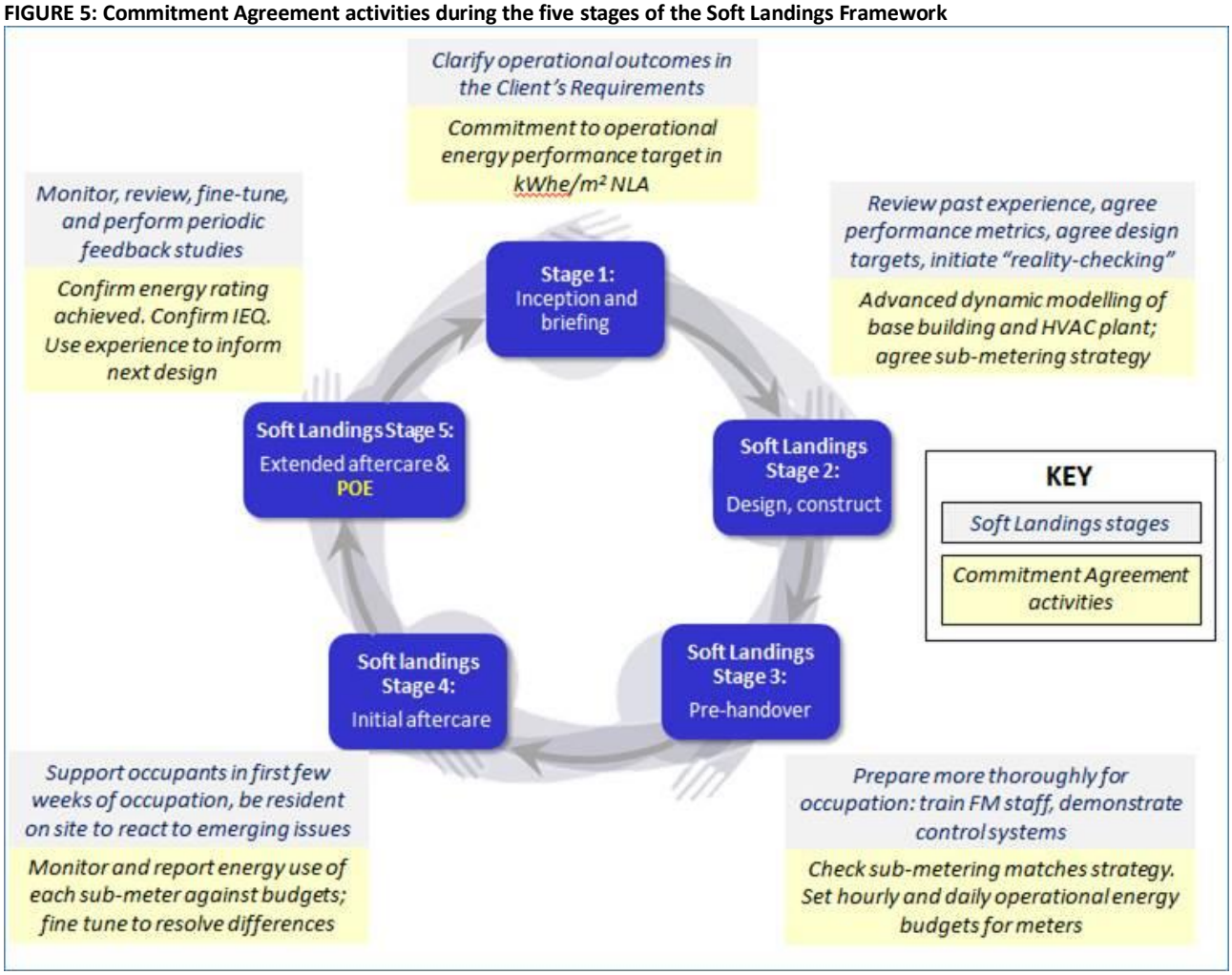
Stakeholder comments have revealed enthusiasm for Commitment Agreements, but also misgivings about how UK practice will adapt to them. Before proceeding to implementation, the team therefore suggests about ten pilot projects, as outlined in Section 7 below, ideally at least one in each of the five Soft Landings stages. Following this we would hope to proceed to larger-scale implementation, say in 2018. Fortunately, the support offered by OEH, which runs NABERS in Australia, means that in a transitional stage to full implementation (say in 2020), the UK would be able to make use of their technical and managerial infrastructure, avoiding the need to meet the costs of doing this before sufficient momentum had been achieved to support the business case. The sort of infrastructure needed is outlined in Section 8.

7 PROPOSED PILOT PROJECTS

7.1 PURPOSE OF PILOT PROJECTS

Pilot projects will test the key ingredients of the Commitment Agreement process through their application to live projects. The portfolio of proposed pilots will be divided between the five stages of the Soft Landings process shown in Figure 5, depending on which stage(s) of the project are applicable within the 18-month window (May 2016 - October 2017) currently planned for running the pilots. This will allow all the main ingredients of a Commitment Agreement approach to be tested without the need to go through the full construction cycle on a single project which could take up to 5-10 years from concept to completion and then measurement over a year with at least 75% of full occupancy.

FIGURE 5: Commitment Agreement activities during the five stages of the Soft Landings Framework



7.2 OUTLINE PROGRAMME

A detailed proposal for the pilot phase is being produced as a separate document. An outline programme is shown below. Detailed planning will proceed as soon as funders agree to go ahead with the pilot phase. For each pilot, outline plans for the work to be done, objectives and deliverables will be agreed with the core team and Executive Board. Quarterly short reports will be required from each pilot in advance of Executive Board meetings. It is suggested that there would be short presentations from the pilots to each quarterly Executive Board, with say 3 or 4 presentations (of different pilots) per meeting, so each pilot would report two or three times over the 18-month period.

	2016								2017									
Task	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O
Confirm plans and work programmes																		
Pilot study activities																		
Quarterly progress reports																		
Industry workshops																		

7.3 SUPPORT ARRANGEMENTS

The core team will co-ordinate, guide and observe the pilot projects, and revise the draft UK Commitment Agreement protocol to incorporate the knowledge and experience gained. The core team will also continue with dissemination, stakeholder consultation, and workshops; and also consider the longer-term implications for governance, operations and support – discussed in Section 8.

The pilot study team will collate the results of the various project pilots and make recommendations for the enhancement and future implementation of UK Commitment Agreements.

7.4 BENCHMARKING

Owing to the lack of an established UK operational rating system for Base Buildings, and a need also to promote Commitment Agreements generally, we recommend that the Commitment Agreement itself is branded (for example perhaps called *Designed for Performance)* and that the benchmarking system itself is subsidiary. For the pilot study buildings, the team proposes that predicted and/or in-use performance should be benchmarked in two ways:

- In relation to Melbourne buildings using NABERS Energy.
- Using the prototype Landlord Energy Rating (LER) developed for BBP by Verco and UBT in 2012-13.

This would allow the relative merits of the two systems to be compared and recommendations made for future benchmarking.

8 LONGER TERM IMPLICATIONS

8.1 GOVERNANCE

Although not necessary for the pilot projects – which can be supported informally – Commitment Agreements and the related benchmarking systems will need a system of governance to oversee the operations. In Australia this is provided by OEH, the successor to SEDA (the Sustainable Energy Development Agency) which initiated ABGR, the predecessor of NABERS. In the UK, stakeholders consulted during the feasibility study and in previous studies (including those for the Landlord Energy Rating in 2012-13, UBT's Technical Platform work in 2011-12, and the UK Green Building Council's review of DECs and the CRC in 2010-11), have expressed a strong preference for oversight and governance ideally by government, or failing that by an independent, authoritative not-for-profit organisation. In the present political climate, it seems unlikely that government would have an appetite to take this on. However, we have been encouraged by DECC's attendance at Executive Board meetings as an observer, and hope that Central Government would take a seat on the governing body.

8.2 ADMINISTRATION

Operation of a UK-CAP system will require an administrative body to, for example:

- publish protocols for UK Commitment Agreements
- be the counter-signatory when developers enter into Commitment Agreements
- seek, qualify, support and maintain a body of Design Reviewers
- operate, or at least endorse an appropriate benchmarking system or systems
- provide appropriate management support and record keeping.
- Monitor project progress and compliance
- Maintain process and training documentation

The actual work could either be done by the governing body (as at OEH in Australia) or outsourced. However, there are dangers with outsourcing that not sufficient institutional memory is retained within the governing body, which risks detachment of governance from technical grasp, amongst other things leading to technical difficulties when the outsourced service provider changes, for example after a tendering process.

8.3 FINANCIAL VIABILITY

The aim would be for a mature system to be supported by the fees for accreditation. However, financial viability will be delicate in the early days, when the business case will be unproven. Historically, the financial case for this type of work has also been difficult to make where there are uncertainties about the degree of government endorsement.[19] Fortunately, the pilot studies can be done with the support of the core team and the NABERS experience while – as discussed in Section 6 – OEH is prepared to help to provide infrastructure during the early stages of roll-out, which would limit the need for capital investment until it was known that Commitment Agreements were beginning to gather momentum.

8.4 UK SKILLS AND CAPACITY

At the beginning of this feasibility study, the team was concerned that another difficulty in implementing Commitment Agreements would be a lack of people in the UK with the experience, aptitude and capabilities to model actual in-use performance and undertake Design Reviews. However, stakeholder discussions have exposed a body of people who are keen to get involved and potentially do have the capabilities. They suggest that the main UK problem is not the technical skills (indeed, many people who work with NABERS Energy in Australia and Commitment Agreements are British-trained and use British models – and a few of them now live in the UK too), but a lack of market pull – "clients just don't ask for it".

8.5 TRAINING

With NABERS Commitment Agreements, everybody had to learn as they went along, so it took perhaps five years for designers and builders to find out the hard way that there were problems with achieving good in-use performance ("yes, we know it happens, but not on our projects" was a common retort); and another five years to learn what to do. But in doing so, they and the industry generally has considerably enhanced its skills, and learnt that better performance often results from greater attention to detail on what are relatively straightforward buildings and engineering systems; and not by adding "green bling" - which is what a design-for-compliance culture tends to do, as it rewards what works better in theory while ignoring what really needs to be done in practice.

If the UK takes advantage of this Australian experience, we do not need to learn everything the hard way. The team therefore recommends the development of training programmes, to help educate members of design, construction and management teams – and if possible a few clients – on what needs to be done. With support from those familiar with NABERS at the outset, such courses could probably be offered on a self-funding basis by existing providers, perhaps under some sort of licence to help assure quality and provide a funding stream to the governing body.

[19] For example: attempts to find commercial sector support for the development of a benchmarking system for Display Energy Certificates for commercial buildings in 2004-5, and for rolling-out the British Property Federation's Landlord's Energy Statement in 2008-09 (albeit not a propitious time for any investment).

9 CONCLUSIONS

1. **Base building energy intensity in London offices appears to be two to four times that of their counterparts in Melbourne**
The feasibility study found that "base building" landlord's services in all new office buildings in Australia using Commitment Agreements now use half as much energy as the average when Commitment Agreements started in 2002, and the best use only one-quarter, thereby achieving the "Factor 4" efficiency improvement hypothesised by Lovins et al in 1998[20]. The feasibility study also found that new office base buildings in London typically use as much energy as those in Melbourne did back in 2002[21], two to four times more energy than their best counterparts in Melbourne today.

2. **The prize for the UK prime office sector is huge but there's a lot that is routine in Australia to catch up with**
Closing the performance gaps in the UK is technically feasible with Commitment Agreements and a Design for Performance approach. The financial feasibility and chances of success of Commitment Agreements depends on energy performance in-use being valued by stakeholders eg reflected in rentals, voids, retentions and therefore asset values. A comprehensive programme of pilot studies examining all the key ingredients which help to deliver Commitment Agreements is recommended as the next step.

3. **Differentiating Base Building energy use from the energy used for occupiers' activities is absolutely key**
The study has highlighted the importance of metering separately the Base Building energy use and the energy used for tenants' activities. The routine provision of separate landlord's utility meters, allowing straightforward measurement and benchmarking of Base Building energy performance, has been a critical factor for success in Australia. Utility metering arrangements in the UK present a challenge in this respect, but guidance on using sub-metering as a solution is expected in an update of CIBSE TM39 due to be published this year. Australian experience emphasises also how dependent a good Base Building energy performance is on the landlord and their agents having single point responsibility for control and management. Providing robust metered energy data to the parties who can control and manage the energy being metered is a fundamental requirement for effective energy management and also provides evidence for investors.

4. **Base building performance in-use is pivotal for all stakeholders**
   - Base Building energy use (expressed in kWhe) is substantial, typically around half the whole building total, more in less densely occupied offices, less where there are areas of intensive computing eg trading floors.
   - Base building performance can be entirely under the control and influence of the developer and landlord via their designers, contractors and managing agents - it is determined by building design, construction, heating and cooling services, controls, commissioning and management in use.
   - Base building performance differentiates buildings for investors and tenants seeking energy efficient premises; it is not significantly muddied by the energy used by the occupants' activities, so long as the occupant hours of use are taken into account by the rating system.
   - The Base Building represents the portion of whole building energy use targeted by regulations, and therefore is an exposure risk for asset owners if regulators seek to address performance gaps through a policy of disclosure of actual energy use eg via the VCS (see conclusion 14).
   - Wherever Base Building performance is defined consistently and measured, there is scope to make international comparisons of performance, and friendly competition can spur further improvement.

5. **The UK will need to develop a Base Building Definition and an easy to understand (consumerised) 'brand'**
To enable Base Building energy performance to be recognised in valuations, it must be visible: defined, measured and rated. In the absence of an established Base Building rating scheme in the UK, the value brand can be communicated by '*Designed for Performance*' (or an equivalent) with the target performance set by advanced simulation and verified by measured performance in use.

6. **Advanced simulation modelling and independent design review are key technical drivers of good performance outcomes**
It is critical to recognise that advanced modelling is not only in itself a more insightful tool than conventional compliance modelling, but also that the simulation modelling process must be transposed from a back room, tick-box exercise, as is normal in the UK, to the prioritised status it enjoys in Australia, where its results are instead deployed as a core consideration for the construction, commissioning and fine tuning of the building. Importantly, more accurate design calculations, underpinned by a credibility arising from the monitoring feedback and learning from previous projects, help to reduce capital costs as the plant and systems are right-sized for the demands calculated to be placed upon them

7. **Australian teams can now achieve in-use performance in line with the predictions of models**
In effect, this means that Base Buildings with energy ratings beyond 5 stars are performing close to a theoretically ideal level. This should not be seen as 'rocket science', more the inevitable consequence of the property industry at last valuing construction industry products with good energy performance. This has empowered the construction industry and the managers of buildings in operation to produce buildings which perform as designed. Contractual retentions on the builder and mechanical contractor based on Base Building performance (i.e. performance failure is treated as a defect) ensure everyone is focused on the target. Although British software is often used by Australian teams to support Commitment Agreements there, the role of modellers in the UK is to support the compliance culture; so they are using the same software packages, but are not asked to deploy the 'advanced' modules available to model HVAC plant and controls. UK modellers will need to go up a learning curve to acquire the same expertise, but should be helped by Australia's experience.

[20] von Weizsacker, E., Lovins A.B., Lovins, L.H. Factor Four: Doubling Wealth, Halving Resource Use - Report to the Club of Rome, December 1998.
[21] The "Base Building" energy ratings (for landlord's services) of new prime offices in Melbourne today range from 4.5 to 5.5 NABERS stars, which equates to annual energy use in the range 40–70 kWhe per m^2 of Nett Lettable Area (NLA). In 2002, the average was 2.5 stars, equivalent to 150 kWhe/m^2 NLA. Data for buildings in London indicates new office Base Buildings here use 80–160 kWhe/m^2 NLA

8. **Even with a good design and high quality construction, intensive commissioning and fine tuning remain essential**
It is necessary to be methodical and rigorous in post-occupancy fine tuning to achieve target performance at 5 stars or higher. The simulation outputs are a key tool to inform monitoring and targeting for individual sub-meters. The target delivery team should expect to produce monthly reports comparing sub-metered performance to simulated predictions, and identifying whether the building is on track to achieve its target, and if not, what should be done. Several fine-tuning exercises on the BMS are essential over the first year or more of operation, ensuring different occupancy patterns and weather conditions across the different seasons are catered for effectively and efficiently. The process and culture changes required to make a Commitment Agreement work in the UK have many parallels with Soft Landings which is more widely used in the UK (than Australia) and provides a promising existing platform on which Commitment Agreements can sit.

9. **Mandating transparency for Base Building energy use has freed the market in Australia to drive improvement**
The improvements in Australia over the last 15 years were initially partly driven by government tenants demanding minimum Base Building energy ratings for space they occupied. Some large corporates then followed suit. And in 2006, the Property Council of Australia included being at least 4.5 stars in the definition of new Prime and Grade A offices (ratcheted to 5 stars in 2012 for the Prime grade). When in 2010 the government mandated disclosure of Base Building energy ratings on sale or let of office premises over 2,000 m^2 NLA, tenants were empowered to seek premises with higher ratings and landlords were able to charge more for them, creating a virtuous circle to drive improvement. The UK market seems unlikely to receive similar 'pump-priming' from its government in the current deregulatory environment. However, with devolution, there may be greater appetite at a city-level where sustainability is becoming an important differentiator for many city mayors.

10. **Tenants in Australia associate higher NABERS energy ratings with better buildings and pay more to rent them**
An important part of the explanation is that higher rated buildings will have had more care expended on them during design, construction and commissioning and are better looked after in operation, resulting in a higher quality working environment. Energy cost savings may well be a marginal benefit by comparison. For some tenants, enhancing their corporate reputation for environmental responsibility provides an additional driver, but the study revealed that the primary driver is more likely to be hard business benefit than altruistic concern about climate change. The willingness of tenants to value space in a building with a higher Base Building energy rating also gives the lie to those who speculate that energy efficient buildings might be associated with false economies in energy use, undermining productivity by creating poorer comfort conditions for occupiers. Such an outcome is theoretically possible, but truly efficient building services that are also well-managed can create comfortable working environments more simply and using less energy[22]. Driving pumps and fans less hard and avoiding simultaneous heating and cooling are underlying reasons to explain how less can provide more.

11. **Buildings with higher NABERS energy ratings produce higher yields and therefore receive higher valuations**
The association of higher asset value with better energy performance is the key to the market transformation across the prime offices sector in Australia. The financial impact of asset value appreciation more than justifies any extra effort incurred from achieving higher rated buildings. The benefits for asset owners are reinforced by the perspective that buildings with very good energy performance are de-risked from future increases in energy prices, more resilient to energy supply shortages and proofed against future draconian legislation for climate change mitigation.

12. **The impact of energy performance on asset value and yield makes the Base Building energy rating a core business KPI**
A fundamental consequence is that all players involved in delivering a new (or refurbished) office building are mindful of their responsibilities to contribute to the targeted performance outcome and motivated by the realisation that their reputation in the market will be undermined if performance failings were to be laid at their door. The contractual inferences of the Commitment Agreement and liability for satisfying pre-let tenants expecting the targeted performance to be achieved helps prevent value engineering from undermining energy efficiency design goals. Indeed, the conventional value engineering equation is turned on its head by the value attributable to better performance in use.

13. **'Design for Performance' is applicable to all managed non-domestic buildings but large offices are the best place to start**
The concept of 'Design for Performance' and targeting Base Building energy use (i.e. regulated loads, more or less) is applicable to all managed non-domestic buildings in the UK. The initial focus of the present initiative on larger new and refurbished multi-let prime office buildings is the obvious place to start, for two main reasons: 1) it offers a resolution of the notorious energy efficiency challenge set by the landlord-tenant split incentive in leased offices, and 2) in this sector, the concept has been definitively proven with spectacular success in Australia, enabling the UK to learn directly from Australia's experience. On larger and more complex buildings, the additional effort required is also likely to be seen as affordable, as it will be a smaller proportion of total costs.

14. **The EPBD allows measured Base Building performance to be used by regulations, but no Member State yet does this**
Annex 1 of the EPBD recast allows Member States to take the Australian approach of measuring Base Building performance to generate an EPC for the sale or let of an existing building, but none has chosen to do this. For new buildings, rather than EPCs calculating a Base Building performance relative to a reference building, the proposition would be to calculate the Base Building's absolute performance and then build, commission and operate the building with measured performance (when the building is occupied) in line with design intent. The common Voluntary Certification Standard (VCS) may create a vehicle to test this 'Verified Performance' concept across the EU and allow the VCS certificate to carry an additional accolade signifying a higher quality EPC, when the calculated asset rating is confirmed by measurement of energy in-use. This approach would be facilitated and reinforced if the CEN Standards for the EPBD recast define a methodology to do this. In time, Design for Performance could become the new normal: the basis for new building regulations and for EPCs.

[22] Examples of this are also found in the UK. An early reference is W Bordass, A Bromley and A Leaman: *Comfort, Control and Energy-Efficiency in Offices,* Building Research Establishment Information Paper 3/95 (February 1995).

APPENDIX A: SWOT Table

TABLE 1: UK Commitment Agreements - SWOT analysis						
	ITEM	**STRENGTHS**	**WEAKNESSES**	**OPPORTUNITIES**	**THREATS**	**COMMENTS**
1	GENERAL					
1.1	Offers guaranteed performance outcomes.	Improves security for investors and developers, and reputation of design & building teams, landlords & managers. Overcomes the notorious performance gap.	No proven in-use benchmarking system currently available in the UK, though the BBP Landlord Energy Rating may well suit base office buildings.	Commitment Agreements themselves could be the branded product, e.g. *Designed for Performance,* with benchmarks selected as appropriate.	Risks to reputations of participants if committed performance levels are not met in practice.	In Australia, Commitment Agreements are taken seriously by developers, landlords and building teams and can be used to differentiate their products and services.
1.2	Helps to move the development, construction and property industries and their service providers away from a *Design for Compliance* culture to *Design for Performance.*	Essential to meet the strategic objectives of energy and emissions legislation.	Major cultural barriers will need to be overcome, affecting all the players. For example, designers and modellers that have used NABERS in Australia say they find little client appetite for predicting in-use performance in UK.	In the Second Recast of the Energy Performance of Buildings Directive, energy certification could require verification of predicted base building energy performance by certification in use.	The Second Recast may require Energy Certificates to be based on design calculations only. If this is not changed, EU regulations will not be effective in stimulating the end goal - rapid improvement in performance outcomes.	Team members are in discussion with officials in the UK and EU, and with those providing them with technical support.
1.3	Improves the cost-effectiveness of building energy efficiency measures *(cost-optimality is also an EU requirement)*	Focuses on things that really work in operation, helping to get rid of unnecessary complication that does not add value in practice.	Major cultural change will be required for the supply side of the building industry to take proper account of in-use performance.	Australia demonstrates that Commitment Agreements do improve industry skills generally, and not just for the projects concerned.	There may be institutional resistance to the changes necessary to follow through, and concern about insurance risks etc..	Soft Landings and discussions about the need for professionals to engage with outcomes are already altering the UK landscape.
1.4	Potentially reduces regulatory burdens.	Chimes with the politics at the present time.	Beware throwing out the baby with the bathwater through deregulation.	Training can be provided to grow industry competences.	Will the UK government support the scheme?	State and (later) Central government support was helpful in Australia.

Note: colour filled cells are included in the SWOT analysis summary in Figure 4

Table continued on next page

APPENDIX A: SWOT Table (Continued)

Table continued from previous page

1.5	Base Building performance is a good place to start.	Because it can be "owned" and managed by the developer and then the landlord and their teams. The Base Building concept can be extended from offices to all managed buildings.	The idea is new to the UK: there is no Base Building definition or metering of Base Building services - some of which can also be under tenant control, causing waste through split responsibilities.	A draft definition has already been formulated for the BBP Landlord Energy Rating. It can be refined, applied and metered in new buildings and major refurbishments. Commitment Agreements can also be applied to whole buildings and to tenancies, though the greatest success in Australia has been with base buildings, owing to clear responsibilities for “ownership” of the problem.	The idea needs publicity, but this can be provided by the BBP and the market leaders who undertake the proposed pilot projects of a prototype Commitment Agreement	Office base buildings will spearhead UK Commitment Agreements. *Design for Performance* itself must also be seen to apply to whole buildings, tenancies, and other building types too.
1.6	Offers tenants genuinely better building performance.	Not just for energy: studies reveal that well-designed and well-managed buildings tend to provide higher levels of service generally, and better occupant satisfaction. This could provide "market pull" for energy efficiency.	Australian tenants have learnt to ask for good NABERS ratings. The UK does not have a comparable operational rating system in place	First mover developers and landlords could nevertheless be rewarded by their involvement in Commitment Agrement pilot projects. There is a latent demand from occupiers for energy efficient buildings, currently not being met in practice because base building energy use in the UK is invisible, with inefficiencies out of sight of the market, and beyond the reach of EPCs, which have lost credibility, owing to their poor relationship to in-use outcomes.	The potential to improve base building energy performance of new buildings by a factor of 2 or more may affect the lettability of existing stock. Occupiers promised a target performance level as part of a pre-let negotiation may also need compensating. Some large occupier organisations may have group-wide policies to manage their own demises and may be reluctant to occupy a building where the landlord has control.	The truth will out eventually, so those that grasp the nettle will be rewarded. NABERS does include an optional module to evaluate the internal environment, but this is rarely used.

Note: colour filled cells are included in the SWOT analysis summary in Figure 4

APPENDIX B: PROVISIONAL DEFINITION OF BASE BUILDING ENERGY

All energy consumed in supplying building central services to office lettable and common spaces during the Assessment Period should be included, such as:

- heating (including HWS), cooling and ventilation which ensure the whole premises are safe and comfortable for office work, typically to a BCO specification[23]
- common-area lighting and power (including the entrance foyer, back of house areas, lift lobbies, plant rooms and common-area toilets)
- vertical transportation eg lifts and escalators (excluding lifts provided by individual tenants for their own use only)
- exterior lighting
- exterior signage provided by the building owner for the benefit of office occupiers
- car park ventilation and lighting, where internal or external car parks within the legal boundaries of the site are provided for occupier use.
- generator fuel where it serves central services

Upon formal assessment, an assessor will seek evidence that all of the above uses have not been excluded.

Separable uses
Services provided in the building that are used by the general public (eg retail outlets, cafes, etc.) [or are an identified exceptional use] may be removed from the assessment if the landlord energy supplies are separately sub metered.
If a use is deemed a separable the landlord energy consumption and, where necessary, the relevant office NLA will be reduced.

Services with public access
Services used by the general public can be excluded from the Landlord Energy Rating. Where this is the case both the rated area and rated consumption should be adjusted. Example uses with public access are considered below.

Examples of public access separables

Example	Uses that can be separated	Uses that cannot be separated
Commercial cafés, retail stores, etc.	With public access (but can also be used by occupiers)	Exclusively for the use of office occupiers (and their visitors)
Gymnasiums, child minding centres, treatment rooms and similar	With public access (but can also be used by occupiers)	Exclusively for the use of office occupiers and their visitors)

Exceptional uses
There are a number of uses, which are outside of the scope of the Landlord Energy Rating. They relate to activities which do not fit a standard office use. These uses may be excluded from either rated area or rated consumption or both. Examples are set out below, along with the required adjustments:

Examples of exceptional use separables

Example	Rated Area	Rated Consumption
Telephone Masts	Unadjusted	Reduced if sub-metered
Laboratories or other process	Reduced	Reduced if sub-metered
Computer Server Rooms	Reduced	Reduced if sub-metered

[23] Supplementary HVAC services to a tenant's energy-intensive areas including server rooms, dealer rooms and laboratories would not normally be provided by the landlord and so are therefore excluded.

APPENDIX C: ELEMENTS OF PROPOSED UK COMMITMENT AGREEMENT FOR BASE BUILDINGS

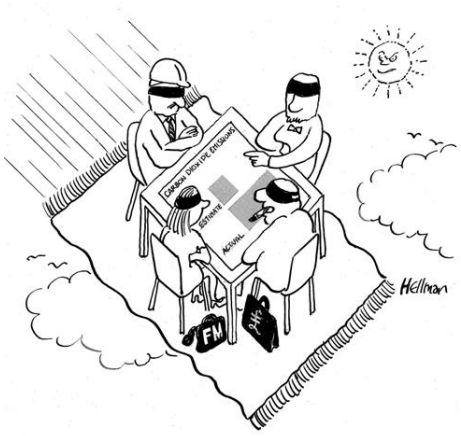
The proposed process to implement and support UK Commitment Agreements in developments currently underway would include:

- a preliminary workshop to explain the performance requirements and potential risks to the design and building team
- including the performance target process in contractual documentation between the developer and the lead contractor
- advanced computer simulation to predict Base Building performance in-use
- independent energy efficiency design review by a member of a prequalified panel of reviewers with experience in both the design and post-construction operation of office buildings
- use of the Soft Landings process
- a monitoring and verification process (informed by the simulation results) from building occupancy through to achievement of the target
- third party review and validation of the achievement of the final target
- a requirement to advise affected parties (tenants, investors) of the achievement or otherwise of the proposed target within 18 months of the building reaching 75% occupancy.

The process would provide a framework to help the design and building team to identify and manage the risks associated with achieving their performance target. As demonstrated in Australia, its use also helps to improve the skills of project teams generally, to the benefit of all subsequent projects. To accelerate UK uptake, we recommend the development of training courses, and discussion groups for participants.

APPENDIX D: WIDER APPLICATION OF COMMITMENT AGREEMENTS

– a discussion note *by Bill Bordass, Research and Policy Adviser, Usable Buildings Trust*



Introduction

The Usable Buildings Trust (UBT) is an educational charity, dedicated to improving the performance of buildings in use. We try to understand how buildings actually work in practice, and help to create a feedback loop to the people and organisations that can make a difference, including clients, designers, builders, managers, investors, government and postgraduate education.

In 2001, the author wrote a report, *Flying Blind,* published by the Association for the Conservation of Energy. This identified some reasons for the major discrepancies regularly observed between predicted and actual energy performance of commercial buildings. The cover, reproduced here, illustrated the problem - now known as the "performance gap"- which nobody wanted to admit to, including policymakers, as we later discovered. Better just to do the theoretical calculations and ignore the actual outcomes. Fifteen years later, while there is much wider recognition that performance gaps exist, few new UK buildings get anywhere near their design energy predictions.

What is a Commitment Agreement?

A Commitment Agreement (CA) is where a team responsible for developing, designing and managing a building agree that its predictions will be a good representation of the actual outcomes[24], and then strives to make this happen during construction and in use. The best proven example is the Australian NABERS CA for "Base Buildings", which has transformed the energy-efficiency of landlord's services in new rented offices, particularly at the top of the market. In addition to the change in attitude to converge onto outcomes (most projects instead diverge from design intent), implementing a CA requires three particular enhancements to business as usual:

1. *Energy prediction and reporting*
   Predictions must be realistic, count everything that is likely to use energy (and not just convenient subsets[25]), take account of likely patterns of use, and be reported transparently, in ways that permit ready comparison between predicted and actual levels, verified by effective sub-metering arrangements[26].
2. *The procurement process, including briefing, design, construction, commissioning and handover*
   All team members will need reminding that the project is outcome-focused. Care also needs to be devoted to usability and manageability of the proposed systems, engaging building operators to the extent possible.
3. *Monitoring and fine-tuning for a period after handover,* including feedback on any differences between the operational outcomes and the design targets and capturing the lessons learned, to inform future projects.

In multi-tenanted buildings, efficient operation of the landlord's services requires a single-point responsibility for their control, maintenance and management. The extent of these services also needs to be clearly and uniquely defined, to make definitive investment-grade benchmarking possible. This is common in Australia, but in the UK boundaries and responsibilities are often diffused, which greatly exacerbates the performance gaps as no single party has the authority and the information to procure and then operate the base building efficiently,

Parallels with Soft Landings

Items 2 and 3 above - the process changes required to make a CA work – have many parallels with Soft Landings (SLs): a general purpose method designed to help focus any project, using any procurement process, onto operational outcomes. The Framework[27] identifies five critical Stages during which procurement was found to be in need of reinforcement. These are noted below, together with findings from recent case study experience.

1. *Inception and Briefing.* It is vital to start a project as you intend to continue. Experience shows the importance of client commitment, and ensuring that everybody who joins the team knows it is a SLs project.
2. *Design and construction.* Case studies show that things can easily drift. In particular, client leadership may dwindle; design and building team members may lose sight of the strategic objectives as work continues, new people arrive, and the inevitable changes are made; energy predictions are not reviewed; and project managers concentrate on issues of cost and time, at the expense of quality. Antidotes include not just managing expectations with regular reality checks, but *Soft Landings Champions*[28] - individuals within the team whose role – in addition to their normal responsibilities – is to help maintain the focus on outcomes.
3. *Preparation for handover* to help ensure better operational readiness, not just of the building, its engineering systems and controls; but to allow the occupier, operators and managers to take control of their new facility. Experience shows that, under time pressures to finish, few building projects are able to complete this work properly before handover: the problem is that neither do they plan an effective follow-through afterwards.

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[24] While the subject of this particular note is energy, a CA could cover any number of aspects of performance. Indeed, energy performance itself may need to be combined with checks that internal environmental quality is satisfactory, e.g. by measurement, occupant survey, or signed-off confirmation by the building manager.

[25] In the UK, designers commonly report only so-called "regulated loads", i.e. energy end-uses subject to building regulations, using standard assumptions. Base building ratings cover similar energy end uses, but must account for all loads in the definition of a Base Building.

[26] Feedback from many sources confirms that the sub-metering systems required by Part L are seldom well configured or properly commissioned.

[27] BSRIA BG 54/5014, *The Soft Landings Framework,* Second Edition (BSRIA and UBT, 2014). BSRIA also hosts an industry group, see www.softlandings.org.uk

[28] A single champion can make a massive difference to project outcomes: either the client representative or a member of the design and building team. Ideally, however, a team will contain several champions, e.g. client, architect, services engineer and builder, who are able to provide rapid alerts as part of their routine activities.

4. *Initial aftercare,* including liaison with occupiers and their service providers, providing information and training, fine tuning, troubleshooting and seasonal commissioning. This period was first expected to require two or three months after handover: in practice, although the first few weeks tend to be the most intense, there are good arguments for it to coincide with the defects liability period (DLP), normally one year. Case studies reveal difficulties in changing the culture of many contractors, who during the DLP prefer to do as little as possible and to do it as late as possible, while in fact emerging problems are best nipped in the bud.
5. *Extended aftercare and post-occupancy evaluation,* including monitoring, further fine tuning, evaluation of outcomes (ideally including occupant satisfaction), feedback on any differences between the results and the design targets, and lessons learned to inform future projects. Case studies show that this Stage is difficult to fund within a building contract: it needs a separate budget. Although the evaluation can and should include members of the design and building team, it also needs to be undertaken in an independent manner, involving external advisers. There are several reasons for this: the team may be too close to the project to take an objective view; and they may wish to gloss over bad news. External advisers also bring a sense of perspective from their wider base of building evaluations: this can be reassuring, for example a shortcoming a team may worry about, may still represent better performance than many other buildings.

Implementing Commitment Agreements

The NABERS CA has stood the test of time (it started in 2002) and – together with the NABERS Energy benchmarking scheme (which started in New South Wales in 1999 as the ABGR) - has influenced the market and helped to improve the skill base, particularly of the Australian building services design and contracting industries. Its principal features include:

- A contract between the NABERS National Administrator and the client to design, build and commission a building to achieve a particular NABERS Energy star rating[29].
- A written notice of the CA by the client to all consultants and contractors involved in design, construction, commissioning and management, making clear the common goal: to achieve the agreed NABERS star rating.
- A suitably qualified consultant to undertake a computer energy simulation using the NABERS protocol.
- An Energy Efficiency Review of the design by a NABERS Certified Independent Design Reviewer.
- 12-months of data collection once the building has been fully commissioned and at least 75% occupied.
- After these 12 months of full operation, a NABERS Energy rating is prepared by a NABERS Accredited Assessor
- If the rating achieves the commitment level, the CA obligations are met and the rating can be promoted.
- If not, the rating is not reported, and the building enters a 12 month Review Period, to allow for further alteration and fine tuning, to bring the building within the CA. 12 months later, a NABERS Energy Rating is prepared and posted on the NABERS website.

While the CA itself has little legal force, the fact that a building has been marketed to investors and tenants as having a particular in-use performance level gives the developer and landlord strong incentives to achieve it.

Conclusions

In UBT's view, a CA could embody a range of levels of rigour and standardisation. For instance:

- The CA and the process used to fulfil it could be a standard procedure; or one agreed by the team: this would be a good match with Soft Landings, which allows teams to choose how best to implement the *Framework* to suit their particular circumstances.
- Performance levels could use published scales (e.g. NABERS stars) or be chosen and declared by the team.
- Independent reviewers could be used, or not. These reviewers might or might not be accredited.
- A training course might or might not be a requirement. These might start by introducing *Design for Performance* at a general level, and eventually include more specialised courses for particular participants, e.g. project managers, modellers, HVAC designers and property managers.

However, there is a strong case for promoting a rigorous process that could gain authority and be contractually binding.

UBT sees an opportunity for parallel development of:

- The concept of Commitment Agreements in general, combined with the Soft Landings process.
- Codified procedures for particular sectors and jurisdictions, starting of course with the ongoing Verco-BBP project for landlord's services ("base buildings" in Australian parlance), for which UK pilot projects are running from April 2016 to October 2017.
- Wider application of the base building concept to all managed buildings, e.g. university buildings
- Seeking a building regulations requirement for transparency between design and operational performance.

Commitment Agreements offer a rapid trajectory towards eliminating performance gaps in the UK (and indeed the EU), if we take account of the lessons learned in Australia and provide appropriate support and training

[29] CAs entered into today tend to be for 5 stars or better, with one building having achieved 6 stars. Periodic sale or let transactions mean that in many buildings the NABERS star rating is updated annually, which motivates continuous improvement, so it is not unusual for buildings to improve on their (deliberately conservative) CA target rating after a few years in operation.

APPENDIX E: LIST OF CONSULTATION MEETINGS

Date	Event/Meeting	Attendees
01 December 2015	Design for Performance Workshop	~80 stakeholders, see: http://www.betterbuildingspartnership.co.uk/design-performance-workshop-1
02 December 2015	Market delivery of prime office buildings under a Commitment Agreement	Robert Cohen (Verco), Paul Bannister (Energy Action Australia), Bill Bordass (UBT), Rob Watts (Stanhope), Emilija Emma (Verco), Debbie Hobbs (L&G), Chris Botten (BBP), Astrid Neve (BBP), Eddy Taylor (Laing O'Rourke)
02 December 2015	Policy/advocacy issues around Design for Performance	Robert Cohen (Verco), Paul Bannister (Energy Action Australia), Bill Bordass (UBT), Emilija Emma (Verco), Debbie Hobbs (L&G), Chris Botten (BBP), Astrid Neve (BBP), Antonia Jansz (ACE), Patrick Brown (BPF), Hywel Davies (CIBSE), Louise Sunderland (UK-GBC)
04 December 2015	Technical issues in delivery of prime office buildings under a Commitment Agreement	Robert Cohen (Verco), Paul Bannister (Energy Action Australia), Bill Bordass (UBT), Emilija Emma (Verco), Debbie Hobbs (L&G), Chris Botten (BBP), Ant Wilson (AECOM), Quinten Babcock (TfL), Chris Twin (Twinn Sustainability Innovation), Roderic Bunn (BSRIA)
04 December 2015	Value	Robert Cohen (Verco), Paul Bannister (Energy Action Australia), Bill Bordass (UBT), Emilija Emma (Verco), Chris Botten (BBP), Roderic Bunn (BSRIA), Sara Sayce (former Professor of Sustainable Real Estate), Ioannis Orfanos (DECC), Tim Mockett (Impax)
04 December 2015	Potential in London (GLA)	Robert Cohen (Verco), Paul Bannister (Energy Action Australia), Bill Bordass (UBT), Emilija Emma (Verco), Louise Clancy (GLA), Mark Roberts (GLA)
11 March 2016	Green Bonds (Climate Bonds Initiative)	Sarah Ratcliffe (BBP), Paul Bannister (Energy Action), Bill Bordass (UBT), Su-Ching Lee (Climate Bonds Initiative), Justine Leigh-Bell (Climate Bonds Initiative)
14 March 2016	Pilot studies (TH Real Estate and David Long & Partners)	Paul Bannister (Energy Action), Bill Bordass (UBT), Robert Cohen (Verco), Geoff Harris (THRE), David Long (D Long & Partners), Jenny Pidgeon (THRE).
15 March 2016	Advanced Simulation Workshop	Paul Bannister (Energy Action), Bill Bordass (Usable Buildings Trust), Robert Cohen (Verco), Claire Das Bhaumik (Inklings), Susie Diamond (Inklings), Chris Van Dronkelaar (Buro Happold), Sarah Graham (IES), Nancy Wood (Buro Happold)
15 March 2016	Role of Agents (Savills)	Robert Cohen (Verco), Barry Austin (Arup), Jarrod Griffiths (Savills), Lizzie Jones (Savills).
05 April 2016	Role of Architects (AHR)	Robert Cohen (Verco), Judit Kimpian (AHR) + 4 colleagues
10 May 2016	Liaison with BRE: potential for integration with BREEAM	Sarah Ratcliffe (BBP), Chris Botten (BBP), Robert Cohen (Verco), Gavin Dunn (BRE), Martin Townsend (BRE), Tom Taylor (BRE).