

BUILDINGS

Why is Australia better than the UK at building energy efficiency?

The UK can learn a thing or two from down under when it comes to building energy use. Robert Cohen and Paul Bannister describe the findings of an ongoing UK initiative to replicate a successful energy efficiency scheme in Australia.

Reducing building energy demand is critical to achieving a secure, sustainable and competitive energy system. The EU requires all new non-residential buildings to be nearly zero energy from 2020. For this policy to fulfil its goals and be credible with all stakeholders, performance gaps between predicted and actual energy use must be eliminated. Buildings must be nearly zero energy in operation, not just in theory when designed and constructed.

Looking abroad to Australia's highly successful National Australian Built Environment Rating System (NABERS) for commercial office developments, the 'Design for Performance Project' is a UK industry initiative supported by the Better Buildings Partnership (BBP), which aims to make the design for new office developments more energy efficient and explore the suitability of developing and testing such a framework in the UK. In this article, the approach in Australia is compared and contrasted with typical UK practice.

Australia and 'NABERS'

Over the last 20 years, Australia has demonstrated that verified 'base building' NABERS energy ratings (see **box** opposite) are capable of motivating all the supply-side players and moving the market. For prime office buildings, a base building rating allows landlords, occupiers, investors and valuers to factor in-use energy performance into their decisions because unlike whole building performance, it is something they can 'own' and attribute to the building itself.

Now that base building ratings have become trusted, they

influence investment decisions for existing and new buildings, sales and purchases, and the management of major property portfolios in Australia.

Tenants in Australia have also become reluctant to occupy new space unless they can be sure of its in-use base building rating. This has forced developers and investors to demand a way to guarantee how much energy a new office base building would use once occupied. In 2002, the NABERS 'Commitment Agreement' was introduced, allowing a developer to enter into a firm commitment to deliver a specified level of in-use base building performance. Today, experience has amounted to Australian teams being able to design, build, commission, fine-tune and operate office buildings that routinely achieve measured base building performance in line with design predictions.

UK performance

Comparing the energy performance of new prime office base buildings in London with those in Melbourne – the city with the most similar climate – makes for sobering reading for British eyes. During 2016, Melbourne confirmed its first two 6-star NABERS new large office buildings (there are two other 6-star large office buildings across the country, one in Sydney and one in Canberra). A rating of six represents market-leading performance in the NABERS scale.

To put this in a UK perspective, Melbourne's best buildings are using three times less energy on a like-for-like basis than London's best performing new buildings and, quite conceivably, around six

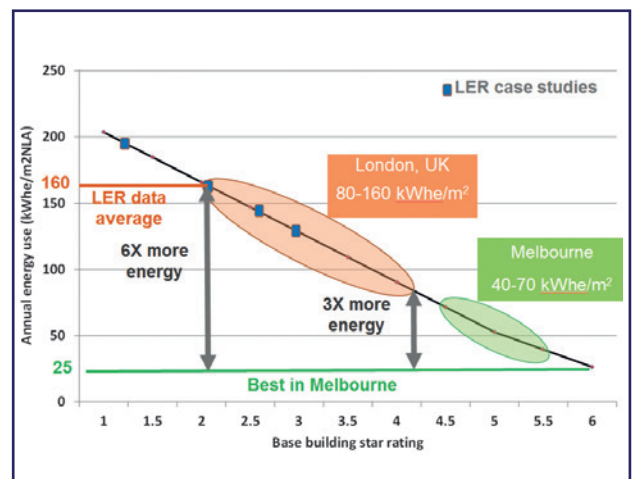


Figure 1. A comparison of base building annual energy performance of new prime offices in Melbourne and London. The data for London offices covers about 85 assets and was collected by Verco in 2013 as part of work to develop and test a Landlord Energy Rating scheme for the Better Buildings Partnership.

times less energy than more typical new buildings in London (see **Figure 1**).

Back in 2000, when NABERS began being implemented, the average building in Melbourne was 2.5 stars – similar to the London average today – and using about twice as much energy as the average now.

Why the difference?

Six key factors have been identified that may explain why Australia demonstrates higher energy efficiency performance than the UK:

1. A 'design for compliance' culture pervades the UK market

Regulatory mechanisms in the UK focus on the design and technology that improves predicted building performance – and not on achieving directly measureable improvements in performance in-use. Voluntary environmental design rating schemes such as the Building Research Establishment Environmental Assessment Method (BREEAM)

and the Leadership in Energy & Environmental Design (LEED) reinforce this mentality, with only a BREEAM 'outstanding' rating requiring performance in-use to be considered in the UK.

2. Energy performance analysis at the design stage in the UK ignores HVAC detail

In Australia it is common practice to undertake full simulation of HVAC systems and their controls at the design stage – this allows the control strategy to be corroborated and refined by the modelling process before it is implemented.

When the HVAC and controls are installed, they are commissioned and verified to be in line with the model. Furthermore, the model predicts the ideal energy performance of the as-built system, and the fine tuning during early operation can target these predicted outcomes by comparing them with the actual energy used by each sub-system (boilers, chillers, fans, pumps, lifts, etc) measured with sub-meters.

There's an expectation that the base building's real performance will turn out to be within 10% of that anticipated from the modelling. This computer-aided design template is the means by which much of the modern world has progressed so fast. Building construction is following this path through Building Information Modeling (BIM) but the energy performance of HVAC systems, at least in the UK, has been a blind spot. The design for compliance regime in the UK does not require scrutiny of HVAC system details and their controls.

3. A Monitoring and evaluation (M&E) skills gap in the UK

This manifests in multiple ways, but can be summarised in three categories: a) limited knowledge transfer from HVAC operational

energy performance back to design practice; b) inability, or at least inexperience, to undertake the detailed simulation of HVAC described in the second point above – the underlying problem may well be UK clients not asking designers to do detailed simulation; and c) a shortage of suitably trained operation and maintenance (O&M) engineers who can run large buildings at their optimal efficiency.

4. HVAC performance in UK buildings is not measured and rated

The UK lacks a simple rating system for operational energy of base build, tenant demises and whole buildings as they have in Australia. Without a rating system which differentiates base building and tenant energy use, underperformance is invisible to both owners and occupiers. But if both parties were cognisant of the scale of the inefficiencies that exist, they might be expected to give the issue a higher priority.

5. A blurring of responsibilities for HVAC control between landlord and tenants

It is common in the UK, especially in prime London offices, for landlords to provide a central HVAC service to all the tenants in a building, but to outsource provision and fit-out of HVAC systems on tenant floors to the tenants themselves, with tenants often installing their own building management systems (BMS) and having their own facilities management (FM) team. The landlord's managing agent for the building and their – often third-party – FM team has little or no visibility of each tenant's system, creating the need for the central service to be provided 24/7 in case any tenant system calls for heat or coolth. This makes efficient base building operation virtually

impossible.

In Australia, the landlord retains control of on-floor HVAC. Tenants can still manage their own on-floor fit-out, but landlords require oversight and approval of the design from their own consultants to ensure the tenant system does not compromise the landlord's ability to provide an efficient service (and the promised base building rating). Tenant fit-out may include HVAC servicing for hot-spots such as on-floor server rooms, but this would use energy off the tenant's meter, not the landlord's HVAC.

6. The UK market does not value energy performance

M&E engineers note that their clients (developers) and the developers' clients (occupiers/investors) perceive energy efficiency as a second order issue equated with regulatory compliance, leaving energy efficiency measures as ripe fruit for the value engineering snip.

This means efficient HVAC design is not one of the key factors that must be balanced against others, such as architecture or net to gross floor area by the developers and their leasing agents. The contrast with Australia is stark, because there the building's energy efficiency star rating is taken as a proxy for building quality and influences how much rent the landlord can secure, with the higher values paying for better quality design and operation and maintenance, and leading to continuous improvement and upskilling of the market.

Why do UK landlords cede HVAC control to tenants?

One straightforward answer is that the management of on-floor HVAC is a burden that landlords are pleased to pass on. It avoids the

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NABERS

The National Australian Built Environment Rating System covers energy, water, the indoor environment and waste. The NABERS Energy rating scheme, introduced in Australia in 1999, has enjoyed particular success in driving improvement in energy performance of larger prime office base buildings in Australia, for which it is now mandated (on sale or let) by the Building Energy Efficiency Disclosure Act 2010.

NABERS energy ratings are based on measuring and benchmarking the carbon dioxide emissions arising from the energy use of buildings. They are also available, but less widely used, for office tenancies, whole office buildings, shopping centres, hotels and data centres.

Base building energy use in Australia applies to the energy required for a building to provide a comfortable environment for its occupants over a year and is largely determined by

design, construction, HVAC services, controls, commissioning and management. Base building energy uses (except for lifts) are normally covered by building regulations, and are all things that the developer, designers, contractors and operations and maintenance staff of managed buildings can be responsible for.

The remaining energy used in a building is needed for occupant activities, eg small power and ICT in offices whose energy efficiency is often beyond the influence of the building developer, owner and manager, while intensity of provision and use can be highly variable and difficult to benchmark. Responsibility for lighting energy use and efficiency straddles this base building or occupant split. In multi-let offices, lighting in common parts is the landlord's responsibility and included in the base building rating.

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need to gain access to a tenant's demise for maintenance, tenant facility management teams rather than the landlord get to field comfort complaints from occupants and, perhaps most significantly, some key tenants are more than willing to take charge. It essentially has become an accepted norm in the market.

But there is a highly successful alternative servicing model. The Australian approach:

- caters for the same demanding multi-national tenants and financial institutions;
- avoids duplication of effort and control ambiguities and so produces lower overall costs of occupancy (capital expenditure and operational expenditure) – the market accepts that landlords have single point responsibility for the full servicing of the building;
- encourages upskilling of all parties with key performance indicators based on measured performance (for example, managing agents in Australia – the same ones that predominate in the London market – now compete for new business in Australia on the basis of the base building NABERS ratings of their

portfolios); and

- fosters innovation in HVAC solutions, eg more efficient chillers, smarter controls and BMS, as stakeholders compete to achieve higher star ratings.

Success for Australia

The transformation of the base building energy performance of Australia's office stock demonstrates what can be achieved by energy efficiency when all planets are in alignment: meters, controls, indoor environment, building quality and financial drivers. The change has been one of radical performance improvement and breadth – over 70% of floor area has now been rated. The minimum threshold of a 2,000 m² area set in 2010 (for the mandatory Commercial Building Disclosure on sale or let scheme) is being halved from next July.

All stakeholders seem to benefit from pushing the system harder and this makes innovation flourish. A market-driven approach supported by the government-backed NABERS energy rating scheme is now producing leading edge new buildings at the 6-star performance level, a credible definition for 'nearly zero energy'.

In the UK, the realisation is dawning that, in a climate

change-constrained business world, the system for regulating the energy performance of large air-conditioned buildings is weak. The system approves 'products' that require three to six times more energy in operation on a like-for-like basis than an alternative system fully-proven in a comparable economy and climate.

The success of the NABERS scheme in driving transformation in the Australian office market is clear, so can the UK kick-start the virtuous circle achieved in Australia – where higher asset values fund better services and continuous improvement? This is something that the industry leading 'Design for Performance' project is exploring, with support from investors, developers, industry bodies and NGOs. Perhaps these pilot studies will reveal whether the UK can learn from and compete with its Australian peers. ●

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