Response to GLA on the London Plan draft for consultation
on behalf of the Design for Performance initiative.

Policy SI2 Minimising greenhouse gas emissions

New developments: non-residential buildings

Details of Respondents

This response has been written on behalf of the Design for Performance initiative which is funded by BBP members British Land, Legal & General Property, TH Real Estate and Transport for London and by other leading organisations in the UK construction industry: the energy simulation company EDSL, Laing O'Rourke, NG Bailey, Stanhope, Willmott Dixon and CIBSE. The core team is led by Verco and includes BSRIA, Arup and the Usable Buildings Trust (UBT). Other organisations directly involved in DfP pilots include The Crown Estate, Hoare Lea & Partners, Watkins Payne, Waterman Building Services and Built Physics Ltd. The initiative also has the backing of BEIS, BCO, BPF and UKGBC. The initiative is also supported by the New South Wales Office of Environment and Heritage (OEH), which is responsible for running the NABERS scheme on behalf of the Australian government.

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1. High Level Summary & Recommendations

Policies and industry efforts to reduce the energy use and carbon emissions arising from buildings, epitomised by targets seeking to exceed Part L requirements or achieve ambitious Energy Performance Certificate (EPC) ratings, have focused on regulating inputs and improving predicted building performance.

However, huge performance gaps are rife between design and reality in UK non-residential buildings. This is well documented in the commercial property sector and the current legislative and planning regime do not deliver new buildings that perform in use to the standard to which they were designed and to the performance level which the local authority consented. The performance gap is a systemic failure, with each part of the development process designing for compliance not performance.

Policy SI2 'Minimising greenhouse gas emissions' needs to address the performance gap challenge if it is to deliver its intended outcomes: lower and eventually net zero carbon emissions by 2050, in reality.

The 'Design for Performance' (DfP) industry led and backed initiative involving a wide range of key stakeholders aims to end the culture of satisfying theoretical efficiency metrics and instead target outcomes using the *Commitment Agreement* process that has transformed prime office development in Australia. A Commitment Agreement commits a developer and their main contractor from the outset to achieving a specific base building energy performance verified by measurement. DfP has conducted a 3 year programme of work including a feasibility study and a pilot programme which provide a sound evidence base from which to develop such a scheme in the UK. It is now embarking on a transition phase which aims to establish a fully-fledged DfP scheme in the UK in 2019.

The DfP approach can strongly underpin Policy SI2 and specifically:

- **Clause 9.2.4** which proposes a zero-carbon target is put in place for major non-residential developments on final publication of the London Plan (expected 2019).
- **Clause 9.2.9** which seeks to ensure that planning commitments supporting the move towards zero-carbon development actually lead to the targeted outcomes when the developments are in use. This clause therefore requires major new developments to monitor and report to the Mayor their actual annual energy demand and carbon emissions, for at least five years, to enable the GLA to identify good practice and report on the operational performance of new development in London.

This DfP initiative response to the London Plan consultation makes precise and targeted recommendations for how both these clauses could best be achieved. We propose the GLA capitalises on the new frameworks for setting targets and monitoring the energy performance of non-residential developments that are being introduced by BREEAM New Construction and the DfP initiative, both of which learn from and implement the successful approaches that have been proven to work strikingly well in Australia for over a decade. We additionally propose that where a new building has a single occupier, the GLA deploys the UK's standard methodology for reporting the operational performance of a whole building: the Display Energy Certificate.

A critical principle underlying this response is that the measurement of the in-use performance of a new development, for comparison with the performance predicted at the design stage, must be preceded by a 'design for performance' process: it would be futile simply to measure performance outcomes if no effort had been made to target those outcomes during the design, construction and early operation stages.

To underwrite the Mayor's goal to move towards a zero-carbon city by 2050, DfP urges the GLA to frame the energy and carbon policies in the new London Plan around three key attributes:

1. **performance outcomes**
2. **target setting** within the context of a transition to net zero emissions
3. **disclosure**: the power of transparency around performance outcomes to mobilise all involved.

These attributes are core features of the proven DfP process and lie at the heart of the recommendations we have made in this response to the London Plan draft for consultation. These recommendations are based on the DfP initiative's research, industry engagement and dialogue with the GLA, and will directly support the GLA in achieving its **Policy SI2** ambitions effectively; they are summarised in Table1.

		Annual energy reporting for 5 years after occupation		
All new major developments and refurbishments	Commit to BREEAM New Construction 2018 **Verification Stage**	Base building energy use broken down by energy end uses plus context for benchmarking	Project Agreement with 4* minimum Landlord Energy Rating target and public disclosure of actual outcome	Production of Display Energy Certificate (DEC)
with non-residential space NLA > 2,000 m^2	✓			
with non-residential space NLA > 5,000 m^2	✓	✓		
with office space NLA > 2,000 m^2	✓	✓	✓	
with non-residential space GIA > 1,000 m^2 and a single occupier				✓

Table 1 Summary of recommendations for an effective energy targeting and reporting regime

In more detail, the DfP initiative recommends that the London Plan:

1. **Requires all new major developments and refurbishments with non-residential space NLA > 2,000 m^2 to adopt BREEAM New Construction 2018 Verification Stage[1].** This requires a DfP-style approach from the outset of a new development, including setting an operational performance target, requirements for more robust performance predictions at the design stage, a validation plan supported by sub-metering and reporting actual performance after completion and occupation.

2. **Requires all new major developments and refurbishments with non-residential space NLA > 5,000 m^2 to incorporate the sub-metering necessary to report base building energy use broken down by energy end use, together with a limited set of contextual information to aid benchmarking.** The base building energy uses are subject to Building Regulations, and therefore what the local planning authority is delegated by government to control on behalf of our wider society. Responsibility for base building energy use can be directly laid at the door of the developer, their designers, and contractors. Once a building is in operation, it is the base building energy use that can be managed and improved by the building and facilities team, on behalf of the landlord (and tenants).

3. **Requires all new major developments and refurbishments with office space NLA > 2,000 m^2 to have a 'Project Agreement[2]' in place, adopt a minimum 4* Landlord Energy Rating (LER) performance target for the office space and commit to public disclosure of the measured LER.** A Project Agreement is proven to be a very effective tool for ensuring that the performance of new office developments meets agreed design targets, including providing more effective methods of estimating building energy use and carbon emissions. The LER stars rating scale is a proven and appropriate metric for setting base building energy performance targets for offices and is calculated from the measured energy intensity of net energy imports in units of kWhe/m^2.

[1] Verification, to be published in Summer 2018, was developed with DfP as an addition to BREEAM New Construction
[2] "Project Agreement" is a working title to represent a DfP equivalent of the Commitment Agreement used in Australia

4. **Requires all new major developments and refurbishments with non-residential space GIA > 1,000 m^2 and with a single occupier to produce a Display Energy Certificate (DEC) for the non-residential portion of the development.** A DEC captures the total carbon footprint of a non-residential building, which is the development's overall ongoing impact on London's objective to become a zero carbon city. A DEC is recommended for buildings with a single occupier because they can take responsibility for all energy uses. In a multi-let building, the whole building performance does not lend itself to action by the separate parties (landlord and tenants). A DEC can be complemented by an LER to give insight into the different drivers of whole building energy performance.

Dialogue with the GLA encouraged us also to make suggestions for how the GLA itself could demonstrate leadership through actions relating to the buildings it owns or occupies. We would propose the GLA demonstrates its own commitment by:

a) Targeting at least 4.5 stars base building (using the LER rating scale) for any new GLA office building over 2,000 m^2 NLA, equivalent to the minimum acceptable new build standard in Australia for public sector occupiers or tenants.
b) Installing the necessary sub-metering to enable base building energy performance to be measured and rated in all existing GLA owned offices over 2,000 m^2 NLA and encouraging the landlords of GLA rented offices to do the same.
c) Setting an ambition trajectory for the base building energy performance of existing GLA owned offices over 2,000 m^2 NLA, by a programme of energy efficiency improvements.
d) Announcing an intention to set minimum base building energy performance ratings for all the offices over 2,000 m^2 NLA that GLA rents, starting with 3.5 stars for performance measured in 2020, rising to 4.5 stars by 2025.

Lastly, we recommend the London Plan also promotes the power of energy performance transparency to trigger efficiency improvements in existing non-domestic buildings. We urge the GLA to encourage the voluntary take up of LERs for existing commercial office buildings and the voluntary take up of DECs for all existing non-domestic buildings with a single occupier. We recommend the GLA to find creative ways to reward public disclosure of an existing building's energy performance.

By converging with other industry vectors (like BREEAM, the BCO Guide, BSRIA Soft Landings and CIBSE Guidance), DfP aims to become part of mainstream practice for major new developments. By implementing DfP's intentionally specific recommendations, the GLA will be supporting a process that aligns stakeholders around performance outcomes, and provides transparency concerning performance in use. This is a critical opportunity for the GLA to demonstrate leadership in this area and support the commercial real estate sector in delivering better buildings that will enable London to compete credibly in an international market that will be increasingly driven by the Paris Agreement on climate change.

Why are we recommending DfP as an effective way to achieve the GLA's Policy SI2 objectives?

- **Proven success:** The NABERS scheme, of which the Commitment Agreement is part, has been proven to succeed in transforming the energy performance of office buildings in Australia. Australia's experience suggests that with the right drivers, the energy use of base building services in typical new UK offices could be halved.
- **Viability:** The DfP Project feasibility study demonstrates that whilst there are some very specific differences between the Australian and the UK Markets that will need to be addressed, these are not considered to be a barrier to adoption of 'Project Agreements' in the UK.
- **Simplicity:** The Design for Performance Pilot projects demonstrate that a multitude of factors contribute to poor performance and therefore intervening with specific technical policies will not resolve this. However, introducing a commitment to a performance based outcome which all stakeholders are contractually committed to achieving would enable the GLA to fulfil its ambitions, but without being prescriptive about exactly how to do this.
- **Trajectory:** By using the LER rating scale there is a clear future trajectory towards (genuinely) zero carbon office buildings which aligns closely with the GLA's ambition to ensure all new non-domestic buildings are zero carbon by 2030. This also enables the GLA to set targets should it wish to do so.
- **Cost Effective:** Although DfP involves more mechanical and electrical engineering design effort and more intensive monitoring and verification activities, a key benefit should be that overall building cost should not be higher, with these extra costs offset by capex savings through right sizing plant capacity and opex savings. A further financial benefit should accrue by achieving a better quality building which could command a rent premium and an increased asset value.
- **Transparency:** Disclosure is proven as an effective route to driving improved performance and the Project Agreements, including the requirement to disclose performance, would enable the GLA to put in place effective arrangements for monitoring the operational energy performance of large new buildings.
- **Buy-in**: The DfP initiative has had substantive engagement with, and already influenced, key industry standards. The GLA would effectively be supporting the uptake of an industry led initiative which already has significant support.
- **Deliverability**: The Design for Performance initiative outputs will be published in early 2018. These provide not only a sound evidence base for these recommendations, but also scope out the next steps required to deliver a fully-fledged Scheme in the UK. This includes the regime required to support measurement and verification for (larger) new developments, a draft Project Agreement and outline cost proposals to get the scheme off the ground. Work is also currently being undertaken to look at how a UK NABERS platform can support the monitoring and reporting processes proposed in this consultation response on behalf of the GLA.

The remainder of this document provides firstly, a more detailed introduction to the Design for Performance initiative and secondly, more explanatory detail and evidence to support the Mayor in undertaking two key activities necessary to achieve the GLA's Policy SI2 objectives:

- effective methods for estimating building energy and carbon performance
- effective arrangements for monitoring the operational energy performance of new buildings.

Should the GLA be interested in adopting the above recommendations, the following sections provide greater detail and supplementary technical recommendations to support the high level recommendations above.

2. Background to Design for Performance

2.1. Inspiration and aims

New buildings in the UK are supposed to be energy efficient. However, the regulations intended to achieve this outcome are failing: they secure efficiency in theory but not in practice. With performance rarely measured, this failure has been invisible. The problem is particularly acute for air-conditioned offices because the compliance regime does not require scrutiny of the details of HVAC systems and their controls. Research has confirmed that many new UK prime offices are using up to five times more energy than necessary. The 'Design for Performance' initiative aims to end this culture of satisfying theoretical efficiency metrics and instead target outcomes using the *Commitment Agreement* process that has transformed prime office development in Australia. A Project Agreement in the UK would commit a developer and their main contractor from the outset to achieving a specific base building energy performance rating verified by measurement. This lends certainty to occupiers signing a pre-let that the building will live up to its promises. It can serve the same purpose for the GLA.

A new development with a Project Agreement can be marketed as a property whose measured energy performance will match what it says on the tin. As well as positioning it as a sustainability exemplar, this also makes it more attractive to tenants seeking space in a building that is demonstrably better designed, better constructed, better commissioned and better operated and maintained. And adopting the DFP approach does not need to mean a more expensive building. Indeed it can lead to capital cost savings because plant and systems are correctly sized for demand, and less complicated.

2.2. What has been achieved in Australia?

Some 15 years ago in Australia, "base building" energy ratings [see Note 1] had started to influence investment decisions for existing and new buildings, sales and purchases. The scheme that measured and verified this base building performance was called the National Australian Built Environment Rating System or NABERS[3]. Some of the key steps since then have been:

- 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.
- 2004: State governments started to set minimum standards for space they occupied. New South Wales 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[4]. They also required 4 stars for major upgrades and 4.5 stars for new buildings. Other States gradually introduced their own minimum standards.
- 2006: the Federal Commonwealth (Australian) Government 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. In the same year, the Property Council of Australia introduced minimum NABERS base building energy ratings into their definitions of new offices: 4.5 stars for grade A, 4 stars for grade B.
- 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 NLA.
- 2012: the energy performance bar for grade A offices was raised: to 5 stars for new buildings and to at least 4 stars for existing buildings.
- 2017: the threshold for mandatory disclosure was reduced from 2,000 m^2 to 1,000 m^2 NLA.

[3] In 1999, New South Wales introduced a voluntary system (the Australian Building Greenhouse Rating, ABGR), to measure and benchmark the energy use of existing office buildings. This developed into the NABERS national scheme.

[4] http://arp.nsw.gov.au/m2004-04-greenhouse-performance-government-office-buildings-and-rental-properties

A feasibility study published by the Better Buildings Partnership in May 2016 confirmed that, in the commercial office property market in Australia, better base building operational energy performance has become aligned with investor, developer and occupier interests. This has driven a systemic change in design, construction and operation of office buildings, with innovation flourishing across the supply chain. As a result, base building services in today's *new* buildings in Australia use on average half the energy they did when measurements started in 1998, and the best one fifth. The nexus of financial and property industry interests has also driven a remarkable uplift in the base building energy performance of the majority of the *existing* stock in Australia: compared with the average in 1998, the average now uses 44% less energy.

In the context of tackling the energy trilemma[5], the scale of these improvements is striking. But the study found that the market transformation in Australia was driven by pure commercial interest: investors and developers get better yields from better rated buildings because occupiers associate them with better buildings and are prepared to pay higher rents for them (Figure 1). Government's role has been to develop and operate an online public disclosure platform, create infrastructure for independent and authoritative ratings to be produced and to lead by example by setting minimum ratings for the space it leases.

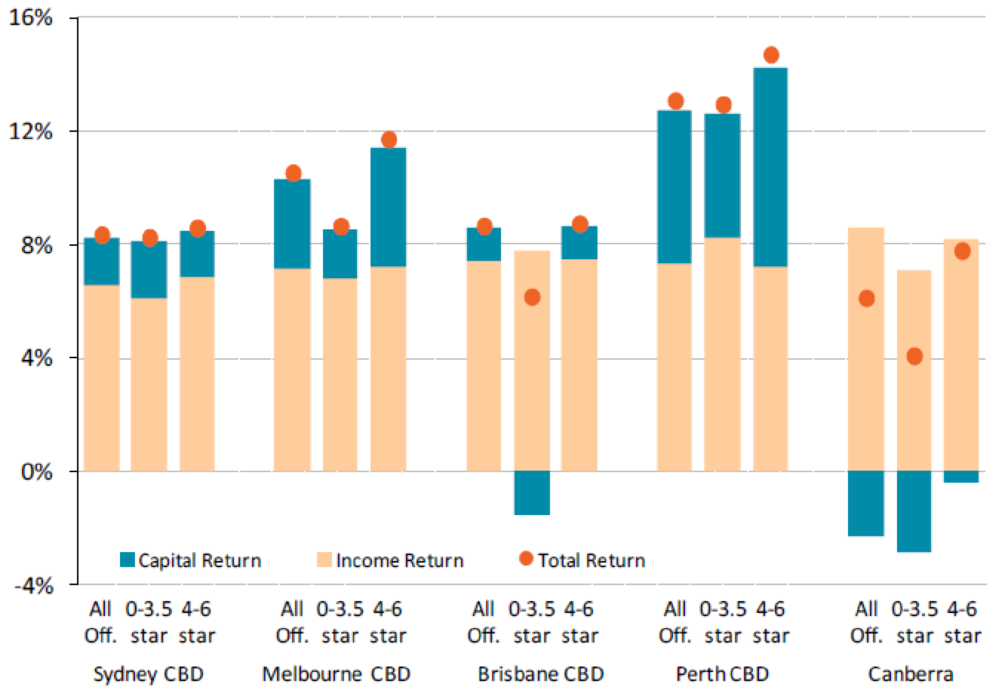

Figure 1 Offices with high NABERS Energy ratings deliver stronger returns and consistently outperform offices with low NABERS Energy ratings (Ref: IPD Australia Green Investment Property Index, June 2013)

2.3. How does the UK compare?

By contrast with Australia, sale and let transactions in the UK are informed by the EPC, a theoretical calculation which does not reflect real performance and so gives limited insight to decision makers. It is no coincidence that the base building energy performance of UK commercial offices today is similar to that in Australia in 1998 on a like-for-like basis. The EPC has not driven improvements in operational energy performance. However, Australia's experience suggests that with the right drivers, the energy use of base building services in new UK offices could typically be halved, and best practice four to five times lower (Figure 2). Following reports on the performance gap by the Green Construction Board in 2013 and UK Green Building Council in 2016, the UK property market has woken up to the potential of buildings which perform as intended and to the risks with those that don't.

[5] Climate change, security of supply and affordability (minimising energy costs)

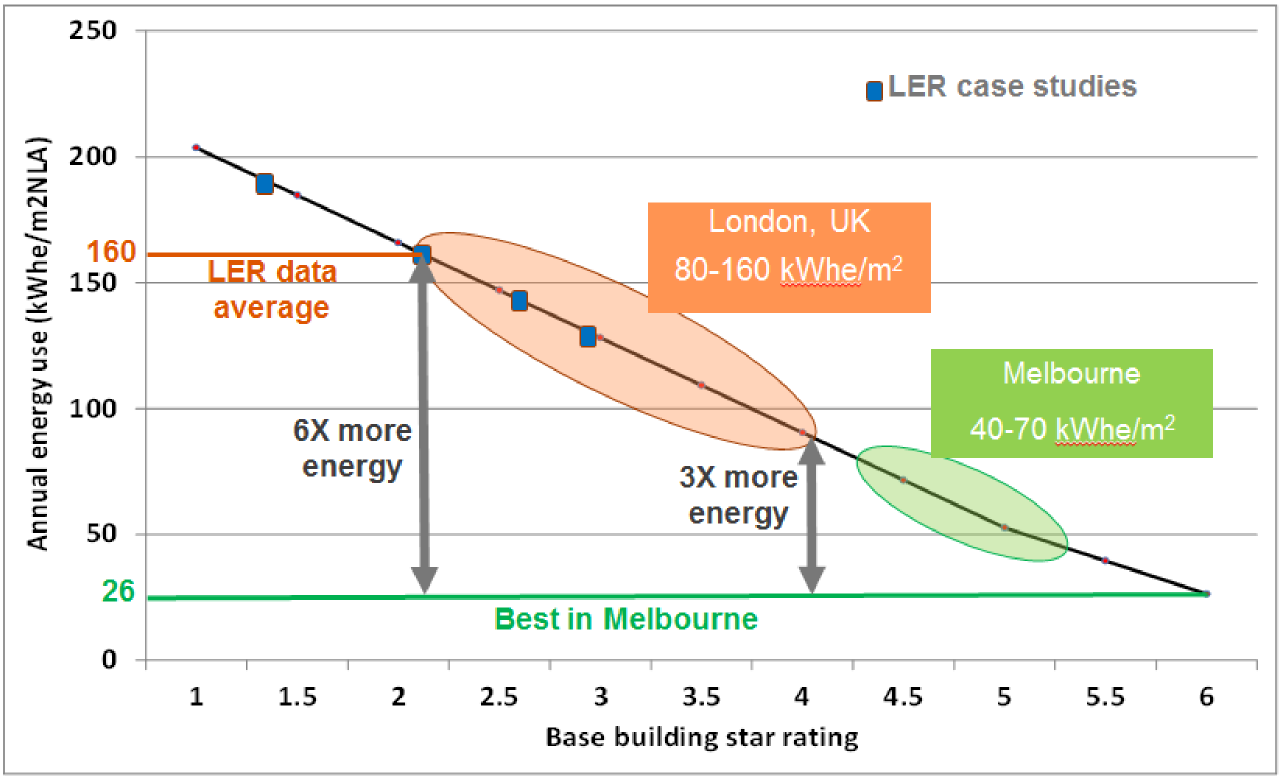

Figure 2 Base building annual energy performance of new prime offices in Melbourne and London compared. The data for London offices covers 85 assets and was collected by Verco in 2013 as part of work to develop and test a [Landlord Energy Rating (LER)](#) scheme for the Better Buildings Partnership[6]. Base building energy use averaged 160 kWhe/m²/yr. Data from four detailed case studies were scattered around that level, giving confidence in the value.

2.4. Project Agreement

A Project Agreement requires the developer to:

a) Set a target base building energy performance level, and design, construct and commission the premises to operate at the target level.

b) Provide written notice of the Project Agreement to all consultants and contractors involved.

c) Include in agreements to lease and in all leases a clause that discloses the Project Agreement.

d) Provide data to allow the operational performance to be verified after 12 months of full occupation.

e) Use best endeavours to achieve and maintain the target performance rating for the duration of the lease [see Note 2].

f) Provide tenants with annual updates of the actual performance rating, for the duration of their leases.

A Project Agreement for the UK is being drafted as one of the key outputs of the Design for Performance initiative.

[6] In 2012, BBP commissioned Verco and the UBT to develop the LER, a NABERS-style energy rating scheme for UK offices. Its application on about 85 buildings exposed challenges with the configuration and sub-metering of *existing* building services systems. This led BBP to focus on *new* buildings, where it was potentially possible to design out the obstacles of engineering services and sub-metering configurations encountered in the existing stock.

MEP consultant engineers would have responsibility for the following three key technical steps which are deemed essential for a Project Agreement to achieve its performance target:

1. advanced simulation of the design and its HVAC system and controls, to predict actual base building energy use and establish subsystem targets based on the simulation [see Note 3]. This modelling should output a verification plan which identifies monthly targets for individual sub-meters
2. responding to an independent design review by a member of a panel of approved independent experts [see Note 4]
3. extended commissioning, monitoring and intensive post occupancy fine tuning against expected performance. This process should include tracking the rating using a mix of actual and forecast energy use for the first 12 months of operation with > 75% occupancy and issuing monthly monitoring reports comparing sub-metered performance to simulated predictions [see Note 5].

2.5. The DfP Pilot Programme

The objective of the DfP initiative is to learn from and replicate Australia's success. Pilot studies currently being completed are introducing the key technical ingredients into UK practice. The 18-month programme involves nine pilot studies at different stages of the construction cycle, each applying the Australian best practice approaches relevant to the activities each has underway during this window (Figure 3).

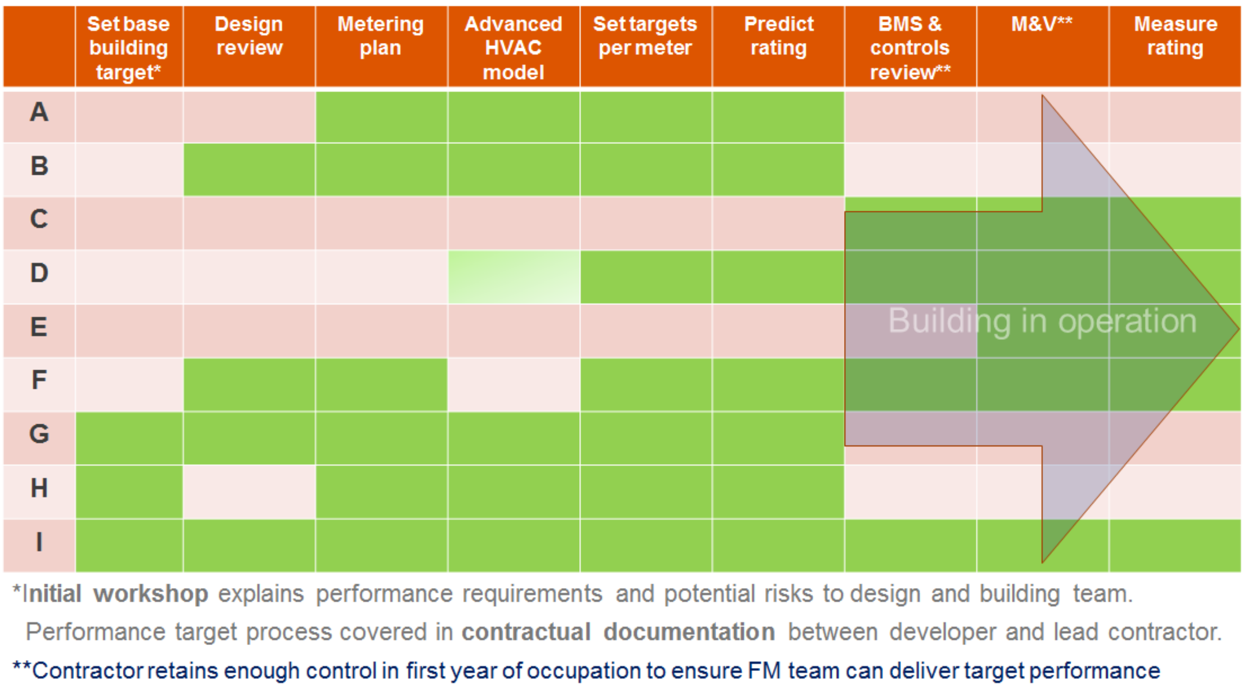

Figure 3 How the DfP pilot studies are testing the different steps of the Project Agreement

2.6. Collaboration with existing voluntary standards and guidelines

The Design for Performance (DfP) initiative has been working with BRE to incorporate the technical processes and commercial underpinnings into all three stages of the BREEAM New Construction (NC) 2018 Edition in order to address meaningfully the energy performance gap for regulated energy uses between design stage predictions and operational outcomes.

We believe the GLA and London Boroughs should be able to capitalise on the introduction of a Verification Stage to BREEAM New Construction in 2018, by insisting, e.g. through Section 106 Agreements, that major new developments apply the Verification stage.

As well as aligning DfP with the BREEAM New Construction 2018 update, the DfP Executive Board is actively pursuing its objective for DfP to be integrated within other existing voluntary initiatives such as:

- BCO Guide update (expected in 2019)
- BSRIA Soft Landings Framework 2018 update
- CIBSE Guides e.g. update of TM39 Energy Metering

3. Effective methods of estimating building energy and carbon performance

In order for the GLA to understand whether buildings are meeting the agreed design standards, it is firstly important to predict performance accurately.

3.1. Modelling Building Performance

The Project Agreement recommended for new offices over 2,000 m^2 NLA would require advanced modelling of building HVAC systems to be undertaken. In Australia, a routine application of such modelling appears to have had widespread beneficial ramifications, including upskilling of modelling practitioners (and mainstreaming of their role in the design process), improvements in HVAC system design, better specification and implementation of HVAC control systems, and ultimately hugely improved operational performance of base buildings. Because an advanced model can predict the ideal energy performance of the as-built system, fine tuning during early operation can target these predicted outcomes and compare them with the actual energy used by each sub-system (boilers, chillers, fans, pumps, 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 and the DfP feasibility study found that Australian teams can now confidently achieve in-use base building energy performance in line with the predictions of models[7].

DfP pilot studies have found that, as well as the important general advantages of deploying advanced modelling described above, there are also some more specific benefits to be realised:

- For new build, an approximate network can be built to quickly evaluate different systems and servicing methodologies which can then be developed. By incorporating the plant characteristics which affect efficiencies, a much more realistic estimation of actual energy use can be expected
- The approach gives insight into actual loads on heating and cooling plant on an hour to hour basis, allowing these loads to be quantified and understood. This should give confidence to reduce installed capacity compared with normal current practice and to size plant to enable operation within peak efficiency bands for most of the time
- For refurbishments, undertaking the modelling on the 'Before' existing building would enable a calibrated model to be built and used to optimise an upgrade[8] and provide a baseline for measuring the performance improvement produced by the refurbishment.

The DfP pilot studies make it apparent that a mechanical engineering background will be beneficial to represent equipment and associated controls in a model correctly. Closer ties between the designer and the modeller is likely to be required which may meet some resistance, particularly as it is often taken for granted that the regulatory model in the UK can sit entirely separately from any design process.

DfP recommends that the London Plan underlines the importance of 'advanced modelling' in achieving a design that can deliver the targeted operational performance: the modelling approach needs to go beyond that currently recommended by CIBSE TM54.

Specifically we advocate:

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[7] Experience in Australia has also shown that tenant activities have marginal influence on Base Building ratings, once occupancy hours are taken into account.

[8] NB This would require time spent on site to record usage characteristics, details of all items of plant and the areas they served and the controls methodology, to obtain a good understanding of the systems installed and their associated controls and to code them correctly.

- Modelling should be at the same level of detail required by NABERS Commitment Agreements (ASHRAE 90.1 may indicate an alternative acceptable standard).
- The quality of modelling should be verified by a person qualified to undertake advanced modelling.

With much of the industry still at the Part L modelling stage, there is concern that going beyond TM54 as a requirement may be challenging and the extra cost might be difficult for clients to accept. We believe that with increased demand for advanced modelling, costs will reduce rapidly as it becomes common practice across the industry. We also note that many larger MEP engineering practices in London have offices in Australia but seem to find it difficult to take advantage of the knowledge of advanced modelling held by their Australian counterparts – and changing that could really hasten UK practitioners up the learning curve. Furthermore, a key benefit of more detailed modelling should be that overall building cost should not be higher, with the extra cost of more MEP design effort and more intensive monitoring and targeting activities offset by capex savings through right sizing plant capacity and opex savings, even before conjecturing about a better building commanding a rent premium which rattles through to an increased asset value (once the concept is recognised in the market).

Some technical experts might question whether it is possible the benefits of modelling might be greater for VAV systems - the predominant system in Australia but almost absent here. It is true that VAV is the most control driven system in use, so the benefits in that respect would likely be more substantial than for fan coil systems. However, DfP perceives most UK buildings suffer gross inefficiencies, such as constant volume air and water systems which advanced modelling would very quickly call out and identify major savings.

Furthermore, the process of detailed modelling may also serve to open eyes and minds to the possibility of deploying systems other than fan coils. The perception from Australia is that the market in the UK is almost blind to alternatives and the consequences of the current norm. Advanced modelling can build the skills to start questioning this norm which may come under increasing scrutiny as the UK strives to achieve truly 'nearly zero energy' base buildings. Advanced modelling also leads to the critical process that matters above all, which is the process of tuning up the building to the simulation. This benefit is system independent.

In summary, advanced modelling has been a key factor in the hugely improved operational performance of base buildings in Australia. We believe its application and impacts would be different in the UK, but substantial nonetheless. Results emerging from the DfP pilots are starting to confirm the value of this more detailed HVAC modelling.

3.2. Independent design review

The independent design review (IDR) process developed in Australia enables the development team's design proposals to be scrutinised by an independent expert who will also look at the quality of the simulation modelling and the metering validation plan. DfP is developing plans to create the IDR infrastructure and is collating candidates for an IDR Panel. A governance regime will be needed to establish a panel. DfP would be happy to discuss this in further detail with the GLA.

DfP recommends that the London Plan underlines the importance of the Independent Design Review.

3.3. Commissioning and fine tuning

For successful delivery of NABERS outcomes, monitoring and tuning during the Defects Liability Period has been found to be essential. Buildings that have undergone this process adequately have been able to achieve their NABERS targets within 12-18 months of 75% occupancy.

DfP recommends that the London Plan underlines the importance of effective commissioning and intensive fine tuning of the BMS and controls.

4. Monitoring Operational Performance

The draft London Plan clause 9.2.9 requires major developments to monitor and report on the operational energy performance of new buildings for at least five years. This section details our recommendations for what should be done to secure the most effective outcomes from this policy.

4.1. Operational Performance Metrics

Offices
For offices**,** we recommend using the Landlord Energy Rating (LER) stars metric[9] because the LER has been developed and tested in the UK and the underlying methodology has been proven to work in Australia. It allows for deviations of weather, voids and hours of use from standard conditions of use by adjusting the benchmarks which are used to calculate a rating. The 1 to 6 stars LER scale (with half stars available between the integer values) is linear with a 30 kWhe/m^2 NLA bandwidth and the equivalent of 7 stars at zero. Base building energy must be < 180 kWhe/m^2 to get on the scale with a 1 star rating. 6 stars is half-way from 5 stars to net zero carbon (genuinely zero, not a zero carbon mirage with allowable solutions).

Buildings other than offices
Proven rating schemes equivalent to the LER are not available for buildings other than offices. We therefore recommend the metric for target setting should be kWhe/m^2. For those wishing to apply a rating scheme to their target, we recommend the kWhe/m^2 are placed on a linear scale tied to zero energy, with the equivalent of 7 stars at zero, as used for the LER, probably with different bandwidths for different sectors[10], aiming to set the 3.5 star level at the median performance for new buildings in that sector. With this approach, the same scale proposed for offices could be adopted for other building types.

The aim is to align the rating scale and DECs, as we have for the LER which has a scale aiming to ensure the median LER rating for all offices > 2000 m^2 should be around 3.5 stars and consistent with the median DEC rating of 100 (D/E boundary). DfP would be happy to discuss rating scales in further detail with the GLA, and other interested parties such as CIBSE who manage the operational energy benchmarks for DECs.

Base Building
The reporting boundary should be for the 'base building'. Whilst this might seem to be a technicality, it is an important distinction and more likely to drive improvements led by developers and valued by investors (whereby changes in occupier/occupier behaviour cannot be used to explain away poor performance and over which the landlord has very varying degrees of control). This also drives much more effective metering practice, a critical building block to better understanding and managing of building performance.

DfP recommends that performance is measured in units of kWhe/m^2 and applied to the base building.

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[9] The LER 1 to 6 star scale relates to the energy intensity of the base building measured in units of kWh of electricity equivalent (kWhe) per m^2 of net lettable area per year and is similar to the NABERS star rating scale although that is based on CO_2 intensity. To calculate the kWh of "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 delivered to the building multiplied by 0.5. The kWhe metric enables timeless, international comparisons of a building's energy performance and facilitates intrinsic building energy efficiency to be rated, independently from local, regional or national grid factors. Furthermore, with electricity often / usually the dominant energy carrier, kWhe avoids the need for a weighting or intensity factor for electricity – a unit of electricity retains the same value independent of the building's location around the globe or the timing of the period for which the analysis is being undertaken.

[10] The bandwidth could be adjusted to suit each sector: made smaller for less energy intensive building types like schools, say 20 kWhe/m^2 GIA) and wider for more energy intensive building types like hotels or supermarkets, say 40 kWhe/m^2 GIA). We believe it helps designers to use a round number for the bandwidth rather than trying to make it spuriously precise. A narrower bandwidth allows higher granularity, whilst a wider bandwidth allows more buildings onto the rating scale. The bandwidth could be adjusted in the future if justified by the data that is generated for each building sector by early adopters of the proposed GLA and/or BREEAM measurement and reporting processes.

4.2. Minimum size threshold

We recognise that DfP and performance reporting will be more readily accepted by the industry on larger projects where the extra costs can benefit from economies of scale and be more easily absorbed.

DfP recommends that the GLA considers a minimum floor area threshold for developments that would initially be subject to detailed performance reporting.

Based on experience in Australia, we suggest this minimum floor area threshold for offices should be 2,000 m^2 NLA. For other non-domestic building types, we propose 5,000 m^2 NLA.

For single occupier new buildings required to produce a DEC, we suggest placing the threshold at 1,000 m^2 GIA, the same as the threshold applied for all existing public buildings when DECs were introduced in 2008.

4.3. Setting Performance Targets

DfP recommends that new office buildings required to set a base building energy performance target should aspire to exceed the level of the 3.5 stars performance standard at the middle of the LER scale. This means a minimum of 4 stars, which translates, under standard conditions of use, to base building annual energy use of up to 90 kWhe/m^2. This aims to avoid over-conservative targets i.e. lower than 4 stars.

We trust the market will be able to judge its ability to achieve more stretching targets than 4 stars, noting that achievement of the target is almost as important as greater ambition. The resilience of the design to variations in use should be tested by off-axis scenario modelling. In Australia, a developer would expect to achieve the target rating under all reasonable scenarios for hours and intensity of use. We note some MEP consultant engineers in Australia insist on minimum tenant ratings being achieved (e.g. 1 star) before signing up to stretching base building targets, to give themselves perceived added protection against excessive tenant energy intensity affecting the base building services efficiency. Modelling studies demonstrate this to be unnecessary (although truly agile working is sweating the system), but the ease of mind it affords is understandable. We feel this option can be left to the market to decide.

4.4. Performance Verification

We recommend the verification process follows the principles shown in Figure 4:

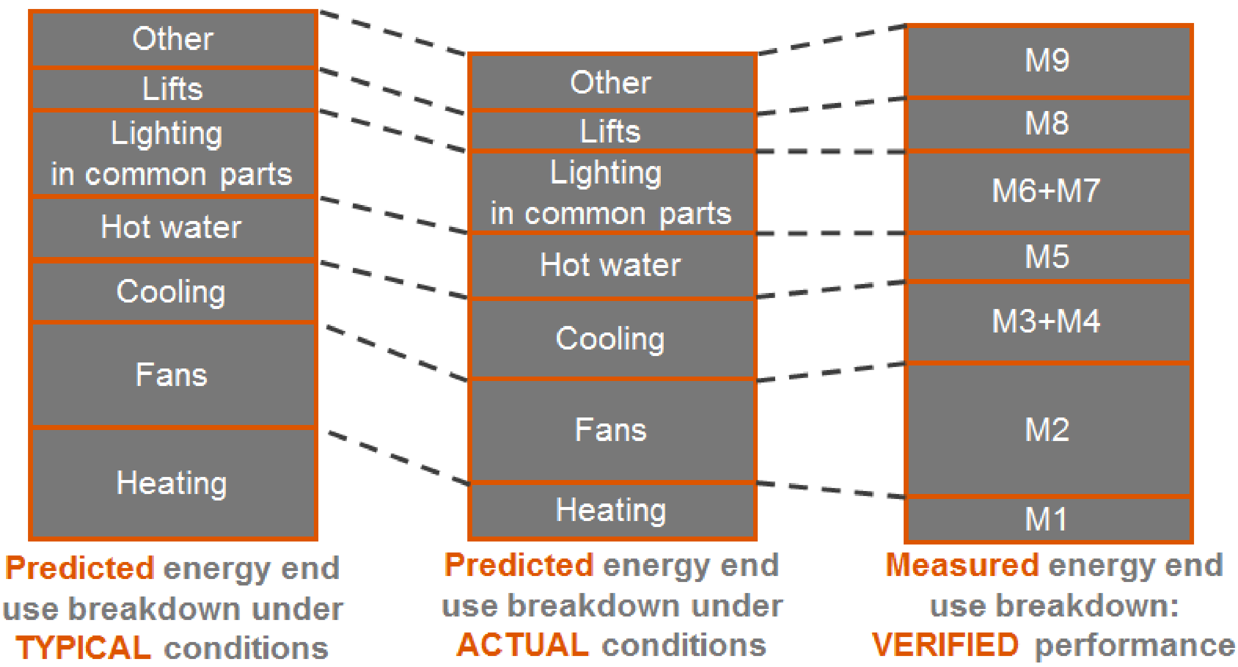

Figure 4 Illustrating how Verification Stage measurements can be compared with predictions by a calibrated model

The key steps are:

1. Use detailed model to predict energy use at design stage with expected conditions (LH stack)
2. Measure base building energy end uses under actual conditions (RH stack)
3. Join these up by re-running the design model under the actual conditions, to get a like-for-like comparison (middle stack vs RH stack)

This last step could be time intensive for collecting reliable data, but the effort expended can be moderated according to the enthusiasm of stakeholders to check the match between design and actual, and learn from the deviations.

DfP recommends that projects assess actual energy performance at the Verification Stage using the same scale as at the Design Stage and report with the granularity illustrated in Figure 4. It is also suggested that developments identify the potential causes of significant discrepancies between each design prediction and its corresponding metered value and propose the remedial actions which might mitigate them, and review their feasibility either on the current project or for future projects.

4.5. Disclosure of performance data

DfP recommends that an online platform is used to capture and disclose the performance targets set for new developments and eventually their actual performance once occupied, for at least 5 years of operation. DfP is looking at the potential for a UK-adapted NABERS platform, using the LER scale, to provide this functionality, and this may interestingly empower the GLA to encourage/incentivise existing buildings in London to lodge voluntary LER ratings (and NABERS-style tenancy ratings or whole building ratings) on the same platform. For buildings with multiple tenants, this would create a complementary performance disclosure option to DECs, which are more suitable for buildings with a single occupier. And the BREEAM Verification stage for new construction can act as a useful bridge to BREEAM In-Use for existing buildings.

5. Conclusions

The 'Performance Gap' is well documented in the commercial property sector and yet the current legislative and planning regime are still not delivering new buildings that perform in use to the standard to which they were designed and to the performance level which the local authority consented. In summary, the performance gap is a systemic failure, with each part of the development process designing for compliance not performance. This response to the consultation on the draft London Plan provides a simple solution to this dilemma by providing specific recommendations that would result in a focus on performance outcomes.

The design for performance approach has been proven to work in Australia for both new commercial offices and major refurbishment of existing office buildings; and there is evidence emerging that it can be successful in other building types like shopping centres, hotels and multi-residential apartment blocks. The DfP feasibility study concluded that it would be possible to establish this approach in the UK for commercial offices and the pilot projects have already demonstrated that there is significant benefit to be gained by doing so. By converging with other industry vectors (like BREEAM, the BCO Guide, BSRIA Soft Landings and CIBSE Guidance), it becomes plausible to envisage design for performance, measurement, verification and reporting becoming mainstream far faster than might have been imagined.

The approach recommended in this consultation response is closely modelled on established principles and provides an opportunity for the GLA to demonstrate clear leadership. It complements the existing regulatory regime. It makes performance matter and promotes energy productivity. It provides a market differentiator and pushes market led innovation and lowest cost industry solutions. Its adoption would position London at the forefront of efforts by the major cities of the world to become zero carbon by 2050, reinforcing its attractions to organisations seeking to invest in verified green assets around the globe.

NOTES

1. Base building energy covers the following energy end uses; sub-meters should be provided to measure the energy consumed by fuel type in supplying each of these building central services:
   - heating, domestic hot water, cooling and ventilation e.g. to a British Council of Offices (BCO) specification*
   - common-area lighting and power (including lift lobbies, plant rooms and common-area toilets)
   - vertical transportation, e.g. lifts and escalators
   - exterior lighting
   - exterior signage provided by the building owner for the benefit of office occupiers
   - generator fuel where it serves central services
   - car park ventilation and lighting, where internal or external car parks within the legal boundaries of the site are provided for occupier use.

*supplementary HVAC services to a tenant's energy-intensive areas including server rooms, dealer rooms and laboratories should use energy off the tenant's meter, not the landlord's HVAC.

2. For successful delivery of Commitment Agreements in Australia, contractual retentions are commonly placed on the builder and mechanical contractor based on NABERS energy rating performance (i.e. base building rating performance failure is treated as a defect). This is not recommended for pioneering Project Agreements in the UK until experience of successful delivery of targets has been accumulated.

3. **Advanced modelling** definition, for avoidance of doubt. There are essentially four levels of energy modelling available for non-domestic buildings in the UK:
   i. Building Regulations Part L compliance using SBEM (a monthly calculation): predicts regulated energy use, assuming NCM standard occupancy and conditions of use. The Part L method is not intended to produce an absolute prediction - compliance is achieved by demonstrating sufficiently better theoretical energy efficiency relative to a notional reference building of the same geometry and given energy efficiency attributes.
   ii. Building Regulations Part L compliance using a dynamic simulation model, as above but mandated for larger and/or more complex buildings. This type of model has a more detailed representation of the building and uses a time step for the simulation of an hour or less.
   iii. CIBSE TM54[11] which sets out "*to evaluate operational energy use accurately at the design stage*". There are two significant differences between TM54 and the Part L compliance method:
      a) The predictions of the regulated energy uses (HVAC, hot water and lighting) deploy profiles for operating hours and intensity of plant and equipment which are bespoke to the individual building being designed, in contrast to the standard profiles that must be used for Part L calculations. However, the underlying model to predict HVAC loads is typically based on the same approach as the Part L compliance model, deeming simultaneous modelling of the HVAC system unnecessary[12].
      b) TM54 makes plausible estimates for the 'unregulated' energy uses in the building, such as lifts and escalators, small power loads, catering, server rooms and other plant and equipment.
   iv. "advanced simulation" following the process used in Australia and defined in the NABERS Energy Guide to Building Energy Estimation. As well as assuming realistic levels of occupancy and hours of use, as with TM54, this approach is based on dynamic simulation of the HVAC plant and controls simultaneously with the dynamic thermal modelling of the building which generates the heating, cooling and ventilation loads

[11] CIBSE Technical Memorandum 54: Evaluating operational energy performance of buildings at the design stage, 2013

[12] TM54 section 7.11 paragraph 2 states: "*A more detailed DSM, which includes the system design, can be built to calculate the energy use associated with heating, cooling, fans and pumps. This should provide a better representation of what would happen in reality. A detailed DSM requires considerably more time to build and has far more inputs. The cost and time associated with such an undertaking may well be prohibitive. Therefore,* ***the methodology set out in this document [TM54] proposes a simplified approach.***"

to be met by the building services plant. It also requires alternative HVAC system design, sizing and operating scenarios to be considered. Like Part L but unlike TM54, 'advanced simulation' focuses on regulated loads (aka the base building).

Project Agreements would require this level iv advanced modelling of the HVAC system to be undertaken.

4. The typical output from an **independent design review** would be a report in spreadsheet format that includes the following components:
   - a review of each building services package, including mechanical services, electrical services (including lighting), hydraulic services and vertical transport; this will include commentary on:
     - risks in design, construction and operation with consideration to the target energy performance level, environmental impact and maintenance
     - options, alternatives and avenues of enquiry that may assist the improvement of the design and effectiveness of controls
     - items within the design that may lead to shortcomings with regards to energy efficiency outcomes, environmental performance and/or maintenance requirements.
   - a review of the proposed energy metering in order to provide commentary regarding the suitability and/or adaptation of the metering to measure post-construction outcomes
   - a review of the architectural design, considering layout, orientation, materials selection, glazing and shading
   - issues and recommendations relating to the proposed commissioning process and ongoing management practices, to help ensure that the building performs to its potential
   - a peer review of any already completed simulation work.

   The detailed design review report will provide clear identification of issues along with specific recommendations for consideration and learning. It will also note issues that might be more appropriately considered for the next comparable design.

   A workshop would be expected to present the findings of the review to the design team and developer representatives.

5. **Fine tuning** typically includes at least 4 tuning exercises during the course of the defects liability period, each including a detailed review of BMS operation and continued commissioning activity to identify and rectify commissioning defects.