Response to GLA Consultation on London Environment Strategy
on behalf of the Design for Performance initiative.

This response is made on behalf of the ***Design for Performance Initiative*** in relation to Proposal 6.1.4b in the Draft London Environment Strategy: "Support the design of effective methods to ensure the energy and carbon performance of new developments meet their agreed designed standards.

The London Environment Strategy consultation document highlights the well documented gap between design intent and building performance in use and the need to ensure:

- That the energy and carbon performance of new developments meet their agreed design standards.
- The energy strategies that developers commit to are developed in practice.
- Accurate methods for measuring operational performance are required.
- Appropriate enforcement, but difficult once developers' interest/involvement has ceased.

In response, the consultation indicates that, the Mayor will:

- Review the potential for applying more effective methods of estimating building energy and carbon performance.
- Work with boroughs and developers to design more effective arrangements for monitoring the operational energy performance of new 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 support of BEIS, BCO, BPF and UK-GBC. 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.

1. High Level Summary & Recommendations

Design for Performance (DfP) is an industry led and backed initiative involving a wide range of key stakeholders. Based on the hugely transformational impact of the NABERS rating in the Australian office market, the initiative's objectives were to examine the feasibility of implementing the NABERS Commitment Agreement Protocol for new developments in the UK. A 3 year programme of work including a feasibility study and a pilot programme are coming to their conclusion and provide a sound evidence base from which to develop such a scheme in the U.K.

The DfP initiative strongly supports the GLA Proposal 6.1.4b. This consultation response aims to assure GLA that Proposal 6.1.4b can and should be adopted in the London Plan and has the potential to be transformational.

DfP also supports the underlying thrust of the Proposal - that the measurement of in-use performance, for comparison with the performance predicted at the design stage, must be accompanied by 'design for performance': it would be futile simply to measure outcomes if no effort had been made to target those outcomes during the preceding design, construction and early operation stages. Based on the DfP initiative's research, industry engagement and dialogue with the GLA, the DfP has made a number of recommendations below that will support the GLA in achieving its ambitions.

The DfP initiative recommends that the GLA:

1. **Requires all new offices over 2,000m^2 and all other new developments over 5,000m^2 to have a 'Commitment Agreement Protocol' in place.** A Commitment Agreement commits a developer and their main contractor from the outset to achieving a specific base building energy performance rating verified by measurement. These Commitment Agreements are proven to be a very effective tool for ensuring that the performance of new developments meets agreed design standards, including providing more effective methods of estimating building energy use and carbon emissions. Signing a Commitment Agreement could be used as an alternative route to satisfying any GLA specific requirements for new developments to demonstrate an energy/carbon performance that goes beyond compliance with building regulations.
2. **Requires all new developments of offices over 2,000m^2 and all other developments over 5,000m^2 to adopt a performance target.** The metric for target setting should be kWhe/m^2 and relate to the 'base building'. We would also recommend that the GLA encourages developments to achieve at least a 3.5 Stars target (using the LER rating scale for offices and for other developments based upon a linear scale tied to zero energy and derived from current data for specific sectors).
3. **Requires all new offices over 2,000m^2 and all other developments over 5,000m^2 to disclose their performance in use.** The reporting metric should be kWhe/m^2 and relate to the 'base building'. This could be implemented via Section 106 requirements. We also urge the GLA to find creative ways to reward public disclosure of a development's base building energy performance outcome.
4. **Demonstrates its own commitment** by:
    a. Requiring any <u>new</u> GLA office building over 2,000 m^2 NLA to achieve at least 4.5 stars base building (using the LER rating scale), which is the minimum acceptable new build standard in Australia for government tenants.
    b. Seeking to install the necessary sub-metering to enable base building energy performance to be measured and rated in all <u>existing</u> 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 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 the 2020 calendar year or fiscal year 2020/21 or whichever is the normal annual reporting period most aligned with 2020.

5. **Encourages voluntary disclosure of base building energy performance in use for existing commercial buildings**, using the LER rating scale for offices, and equivalent for other types of building, and an industry recognised platform to enable transparency. We also urge the GLA to find creative ways to reward public disclosure of an existing buildings' base building energy performance outcome.

By implementing these intentionally specific recommendations the GLA will have supported a process that more accurately predicts the performance of buildings, aligns stakeholders around a performance outcome, and provides greater transparency concerning actual performance in use. This is a critical opportunity for the GLA to demonstrate leadership in this area, support the commercial real estate sector in delivering better buildings and enable London to compete in an international market.

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

- **Proven success:** The NABERS scheme, of which the Commitment Agreement Protocol is part, has been proven to succeed in transforming the energy performance of 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 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 to which all stakeholders are contractually committed to achieving would enable the GLA to achieve its ambitions, but without being prescriptive concerning exactly how to do this.
- **Trajectory:** By using the LER rating scale there is a clear future trajectory towards (genuinely) zero carbon 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 M&E design effort and more intensive M&V 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 Commitment Agreement, 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 are already being developed and will be published early in 2018. These provide, not only a sound evidence base for these recommendations, but also scope out the next steps required to deliver this in the UK. This includes the regime required to support measurement and verification for (larger) new developments, a draft Commitment Agreement Protocol 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 GLA process.

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 the two key activities highlighted in the LES consultation:

- Effective methods for estimating building energy and carbon performance.
- Work with boroughs and developers to design more 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 Commitment Agreement commits 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.

A building that signs up to a Commitment Agreement Protocol can be marketed as a property whose measured energy performance will match what it says on the tin. This will not only position it as a sustainability exemplar, but also make 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 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[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[2]. 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, 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[3]. 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 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.

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[1] Base building ratings are determined by measuring over a year all energy used in the common parts of a rented building and for the shared HVAC and hot water services in tenanted areas. The ratings take account of the hours of occupancy and allow landlords to demonstrate how good and well-managed their buildings are. The energy efficiency of base building services for new buildings is controlled by energy performance Regulations. However, huge performance gaps are rife between design and reality in UK buildings. Base building services typically account for about half of all the energy used in an office building, the other half being used by the tenants (typically for their lighting, small power and servers, telecoms equipment, etc.)

[2] 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.

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

- 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 all Prime 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.

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.

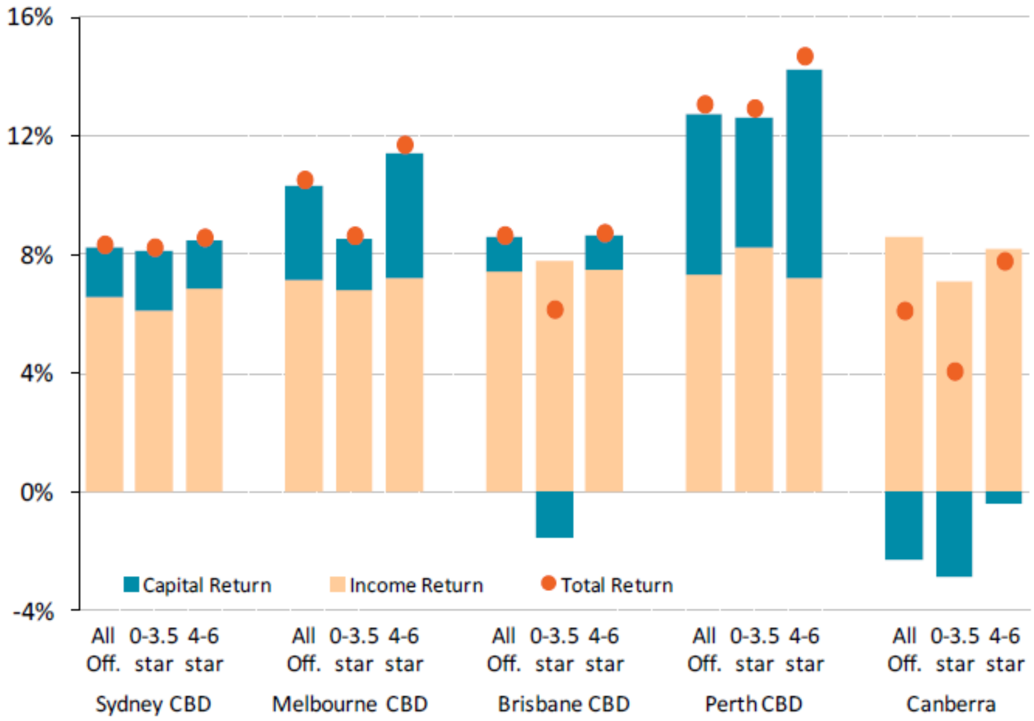

Figure 1 Across Australian CBD markets, offices with high NABERS Energy ratings deliver stronger returns and consistently outperform offices with low NABERS Energy ratings and the all office benchmark (Ref: IPD Australia Green Investment Property Index, June 2013)

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

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

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). Since a Green Construction Board report on the performance gap in 2013, 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.

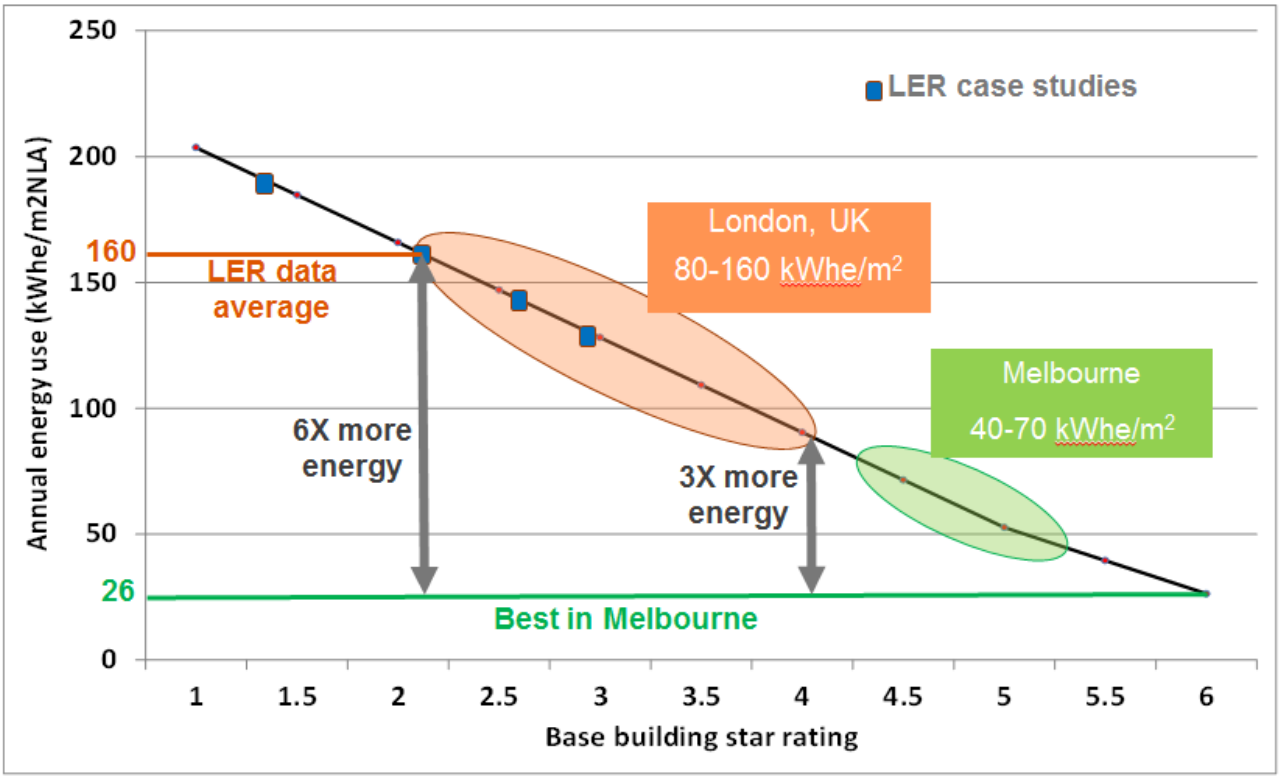

Figure 2 Base building annual energy performance of new prime offices in Melbourne and London compared. The data for London offices covers 85 assets and was collected by Verco in 2013 as part of work to develop and test a Landlord Energy Rating (LER) scheme for the Better Buildings Partnership[6]. Base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

2.4. The Commitment Agreement

What does a Commitment Agreement entail? The Commitment Agreement requires the developer to:

a) Design, construct and commission the premises to operate at the target energy performance level
b) Provide written notice of the Commitment Agreement to all consultants and contractors involved
c) Include in agreements to lease and in all leases a clause that discloses the Commitment 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 commitment rating for the duration of the lease
f) Provide tenants with annual updates of the performance rating, for the duration of their leases.

There are five key technical steps:

1. Advanced simulation of the design and its HVAC system and controls, to predict actual energy use
2. A verification plan which identifies monthly targets for individual sub-meters
3. Independent design review (IDR) by a member of a panel of approved independent experts
4. Extended commissioning and intensive post occupancy fine tuning against expected performance
5. Tracking the rating using a mix of actual and forecast energy use for the first 12 months of operation.

[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.

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

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 ten 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).

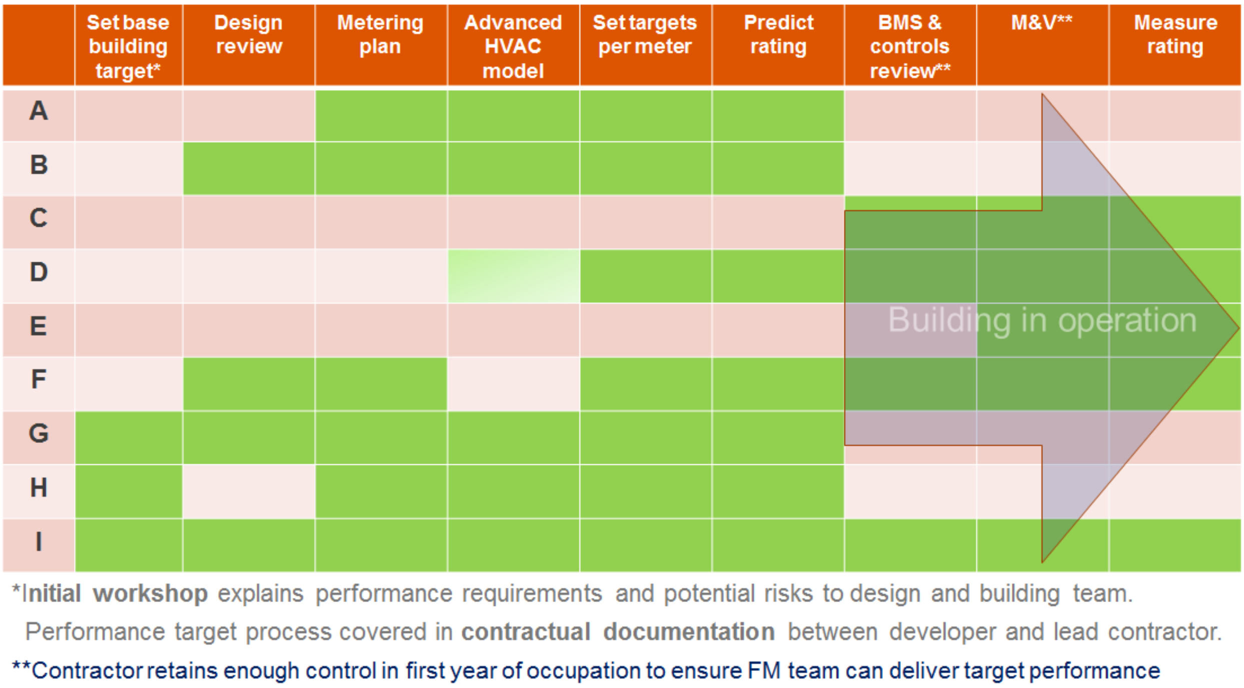

Figure 3 How the DfP pilot studies are testing the different steps of the Commitment Agreement Protocol

2.6. Collaboration with existing voluntary standards and guidelines

The strategy of the DfP Executive Board is to avoid DfP becoming an additional new initiative which participants would need to be persuaded to add to their extensive list of other sustainability activities.

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. Participants in the DfP initiative support BRE's development of the Verification stage and in principle are keen to commit to using it when it is rolled out.

We believe the GLA and London Boroughs should be able to capitalise on the proposed introduction of a Verification stage to BREEAM New Construction in 2018. We hope BRE will make verification mandatory for BREEAM Outstanding. We would also like to see it become mandatory for BREEAM Excellent, which is more the current industry benchmark, if not in NC 2018 then signalled for the following update. GLA and London Boroughs, e.g. through Section 106 Agreements, may be able to insist on developments applying the Verification stage if they are aiming for Excellent under BREEAM New Construction 2018.

As well as seeking to align DfP with the GLA's proposals to close the gap between design and actual energy performance for larger new developments in London, and with the BREEAM New Construction 2018 update, the Executive Board is actively pursuing its objective for DfP to be integrated within other existing voluntary initiatives such as:

- BSRIA Soft Landings Framework 2018 update
- CIBSE Guides e.g. update of TM39 Energy Metering
- BCO Guide update (expected in 2019)
- Climate Bonds Initiative investment standard for new construction

3. Effective methods of estimating building energy and carbon performance

One of the key activities outlined in the London Environment Strategy is that the Mayor will 'review the potential for applying more effective methods of estimating building energy and carbon performance'.

3.1. Modelling Building Performance

In order for the GLA to understand whether buildings are meeting the agreed design standards, it is firstly important to accurately predict performance. There are essentially four levels of energy modelling available for non-domestic buildings:

1. 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.
2. 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.
3. CIBSE TM54[7] 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:
   - 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[8].
   - It 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.
4. "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 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).

Commitment Agreements require this advanced modelling of the HVAC system to be undertaken, and its routine application in Australia 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

[7] CIBSE Technical Memorandum 54: Evaluating operational energy performance of buildings at the design stage, 2013
[8] 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**.*"

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 routinely achieve in-use base building energy performance in line with the predictions of models[9].

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[10] 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 model equipment and associated control 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 GLA 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:

- 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 accredited 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 M&E 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 M&E design effort and more intensive M&V 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

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

[10] 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.

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 or 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[11] and would be happy to discuss this in further detail with the GLA, and other potentially interested parties like CIBSE and BSRIA.

DfP recommends that GLA documentation underlines the importance of the Independent Design Review process.

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. Most typically this includes:

- Establishment of building and subsystem targets based on the simulation
- Monthly monitoring reports comparing sub-metered performance to simulated predictions
- At least 4 tuning exercises during the course of the defects liability period, each including a detailed review of BMS operation
- Continued commissioning activity to identify and rectify commissioning defects
- Contractual retentions on the builder and mechanical contractor based on NABERS performance (i.e. NABERS performance failure is treated as a defect)
- End-of-period independent formal assessment of NABERS Rating prior to contractual release.

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 GLA documentation underlines the importance of effective commissioning and intensive fine tuning of the BMS and controls which bring metered monthly energy use in early operation into line with predicted targets.

[11] DfP is collating candidates for an Independent Design Review (IDR) UK Panel. A governance regime will be needed in order to establish the panel formally.

Monitoring Operational Performance

One of the key activities outlined in the London Environment Strategy is that the Mayor will 'work with boroughs and developers to design more effective arrangements for monitoring the operational energy performance of new buildings'.

3.4. Operational Performance Metrics

The first step towards this is selecting the right metrics to drive change.

Offices

For the metric, for **offices** we recommend using the Landlord Energy Rating (LER) stars metric[12] 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[13], 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 > 2000m2 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 potentially interested parties such as CIBSE and UCL who manage the operational energy benchmarks for DECs.

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[12] 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 period for which the analysis is being undertaken.

[13] 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 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 Verification processes.

Base Building

The reporting boundary should be for the 'base building'. Whilst this might seem a to be a technicality, it is an important distinction and more likely to drive improvements led by the 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 the performance metric used is kWhe/m2 and that this metric is applied to the base building.

3.5. Minimum size threshold

We recognise that DfP will be more readily accepted by the industry on larger projects where it can benefit from economies of scale.

DfP recommends that the GLA considers a minimum floor area threshold for developments that would be subject to Proposal 6.1.4b.

We suggest this could be 2,000 m^2 NLA for offices, based on experience in Australia and where learning available from Australia is most readily available. We suggest placing the threshold at 5,000 m^2 GIA for other types of building.

3.6. Setting Performance Targets

DfP recommends that projects are encouraged to set an energy performance target that exceeds the level of the 3.5 stars performance standard at the middle of the LER scale.

To exceed 3.5 star performance requires a minimum of 4 stars, which translates to base building annual energy use < 90 kWhe/m^2. This should provide the incentive for projects not to set over-conservative targets i.e. < 4.0 stars.

We trust the market will be able to judge its ability to achieve more stretching targets than 4.0 stars, noting that achievement of the target is 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 hours and intensity of use scenarios. We note some M&E consultants in Australia insist on minimum tenant ratings (e.g. 1 star) being achieved 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.

3.7. Performance Verification

We recommend the verification process follows the principles shown in the diagram below (Figure 4):

- Use model to predict energy use at design stage with expected conditions (LH stack)
- Measure base building energy end uses under actual conditions (RH stack)
- 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.

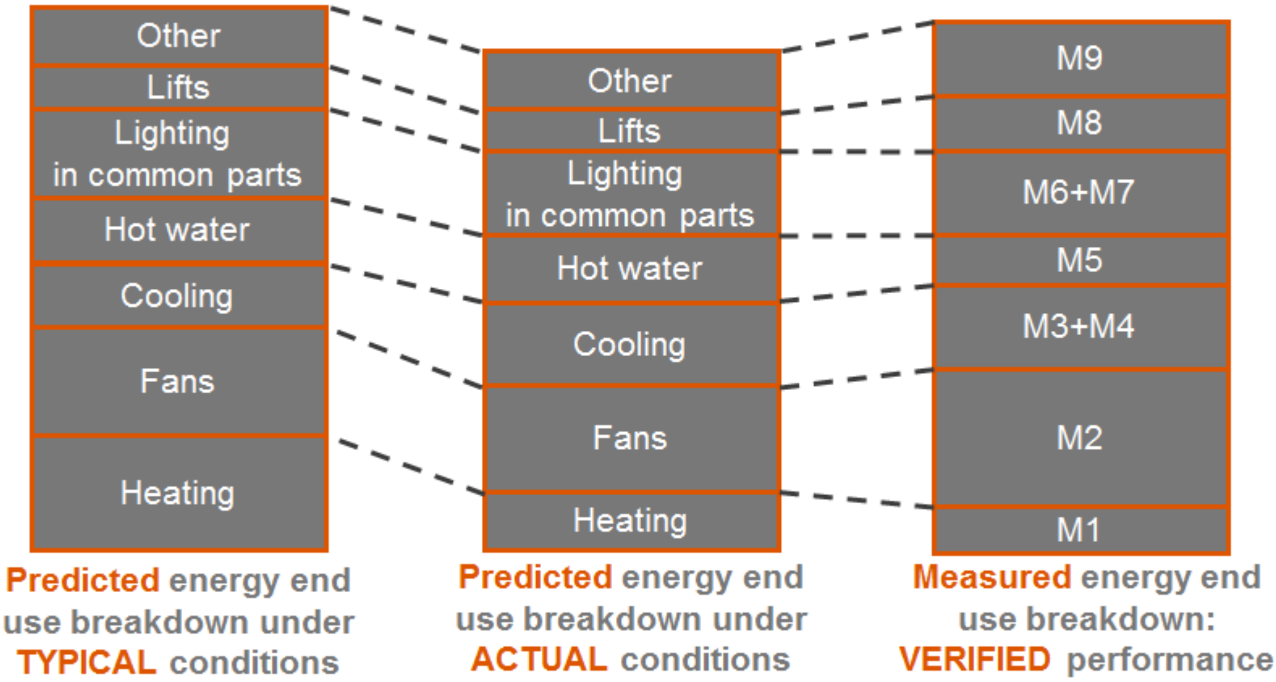

Figure 4 Illustrating how Verification Stage measurements can be compared with predictions by a calibrated model

DfP recommends that the GLA requires actual performance to be reported with this granularity and with suggestions for the potential causes of any significant discrepancies, the remedial actions which might mitigate them and their feasibility either on the current project or for future projects.

DfP recommends that energy performance is assessed at the Verification Stage using the same scale as for the Design Stage.

3.8. Disclosure of performance data

We recognise people will be reluctant to disclose initially. We therefore propose projects are rewarded for open-ness, until disclosure becomes the norm, rather than putting weight on achieved performance which risks putting the agenda in the 'too hard/awkward' category too often and too early. We would favour signalling that when disclosure becomes the norm, there could be a pre-defined ambition towards minimum standards for measured performance. We expect the introduction of a Verification stage for BREEAM new construction will act as a useful bridge to BREEAM In-Use for existing buildings[14].

We are looking at how a UK NABERS platform can support the GLA process ie making a public platform available where new developments can lodge their planned base building energy targets (LER star level for offices, energy predictions for other building types) and project progress is tracked in a high level way – essentially the project status in terms of completion/occupation and eventually the base building operational performance outcome is disclosed: actual LER star level or energy use by fuel type (kWh/m^2).

[14] In Australia, GreenStar energy performance credits for office buildings at the design stage are often based on the base building rating targeted in the NABERS Commitment Agreement, so on day 1 after completion it is both the GreenStar rating and the target NABERS energy rating which carry sway in the market. After the year of operation which allows a measured NABERS energy rating to be produced, the market's attention becomes focused on the NABERS energy rating that was achieved. The fundamental point is that once the building has been occupied and in operation for over a year, sustainability assessment becomes focused on the performance based metric.

The presence of the UK NABERS platform for tracking new development may interestingly open the door to enabling the GLA to encourage/incentivise existing buildings to lodge voluntary NABERS UK ratings (base build, tenancy or whole building) on the same platform.

4. Conclusions

The 'Performance Gap' is well documented in the commercial property sector and yet the current legislative and planning regime are still not delivering buildings that perform in use to the standard to which they were designed and to the standard 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 London Environment Strategy provides a simple solution to this dilemma by providing specific recommendations that would result in a focus on performance outcomes. This approach is proven to work in Australia for both new and existing commercial offices; and there is evidence emerging that it is also proving successful for 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. Furthermore, by converging with other industry vectors (like BREEAM, the BCO Guide, BSRIA Soft Landings and CIBSE Guidance) as well as with institutional standards used by investors (such as those set by the Climate Bonds Initiative), it becomes plausible to envisage performance measurement and verification 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 also provides a market differentiator which rewards those who adopt it, but is not such a big a lurch into the unknown that no one will sign up to follow it.

It is recognised that there are some 'unknowns' at the moment (especially with regard to costs). This response to GLA's consultation aims to set out possible ways forward to navigate these uncertainties through constructive engagement between the DfP initiative and GLA.