

Predicting and optimising HVAC performance Design for Performance for base-build and fit-out

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Agenda

1. Are large UK offices energy efficient?
2. Is performance based design possible for new buildings?
3. Placing advanced simulation at centre of design and operation
4. Proposals for a TM54 rewrite



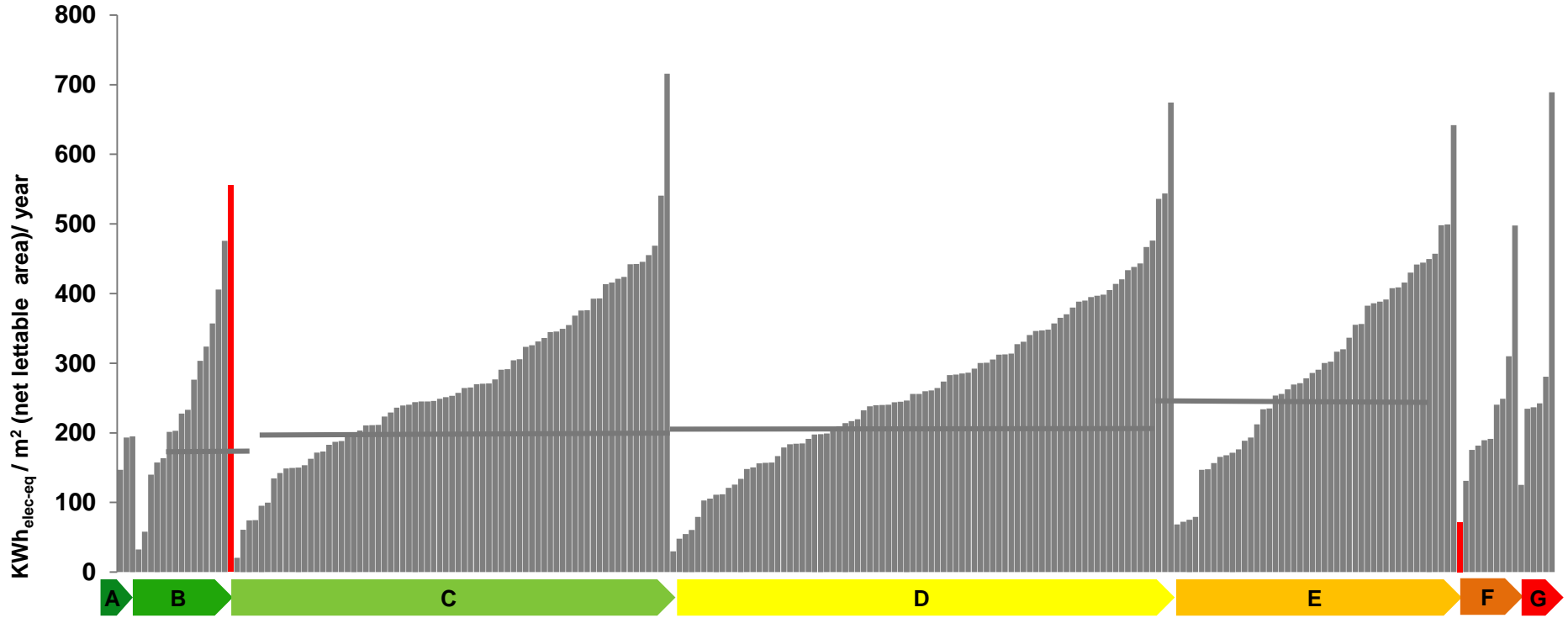


Are large UK office buildings energy efficient?

Do we have the right metrics to answer that question?



Are EPCs a good indicator of building energy efficiency?



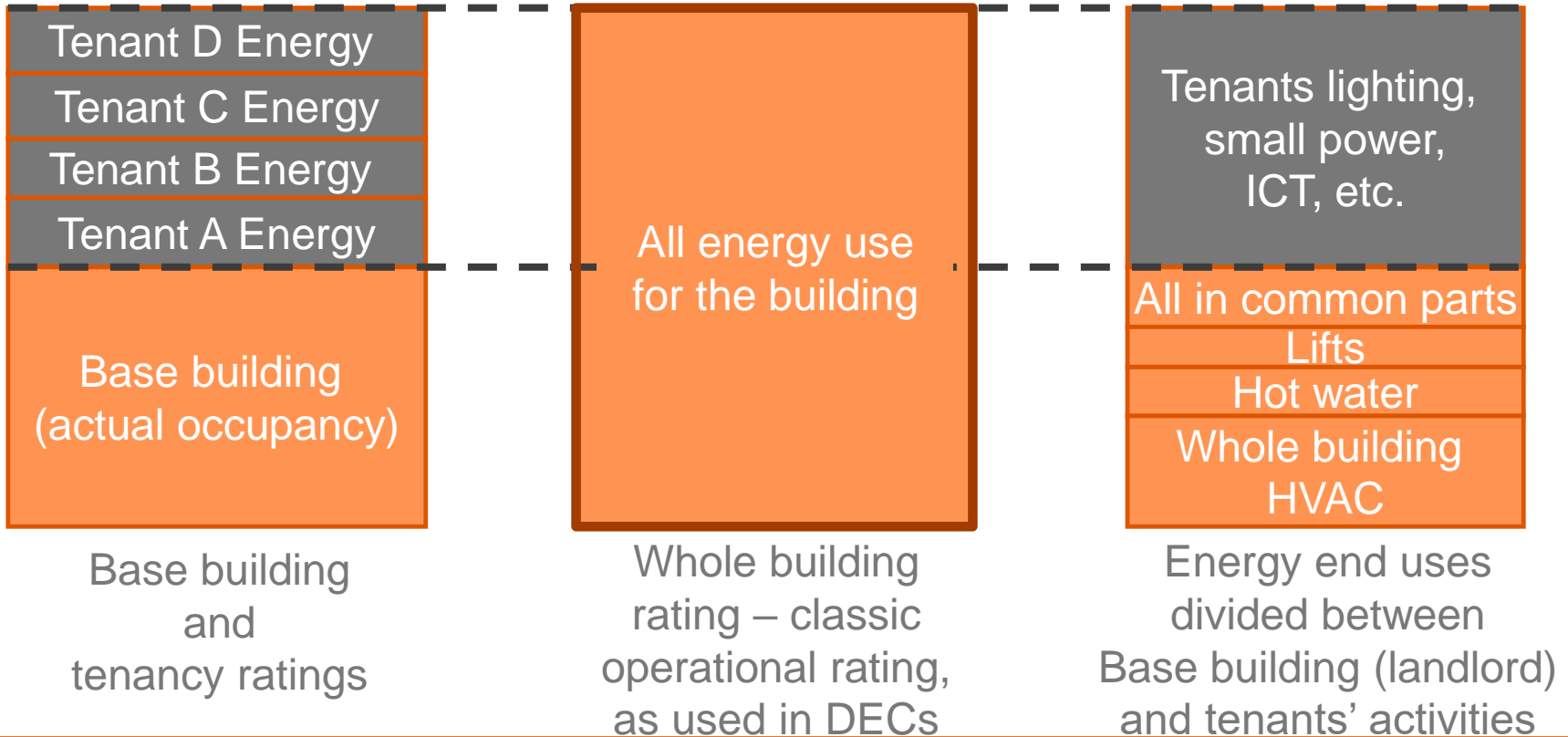
Source: Real Estate Environmental Benchmark Update, BBP, 2016



Let's instead define a measurable metric for a building's energy efficiency



giving each party the data they need to manage the environmental impacts they are able to control directly



If the aim is market transparency, which approach is better?



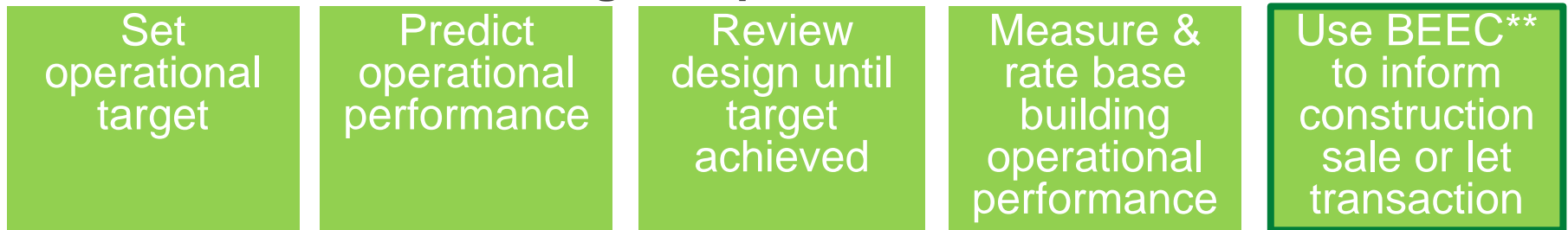
UK approach: design for compliance



*A DEC (whole building operational rating) is produced for public buildings

Building in operation →

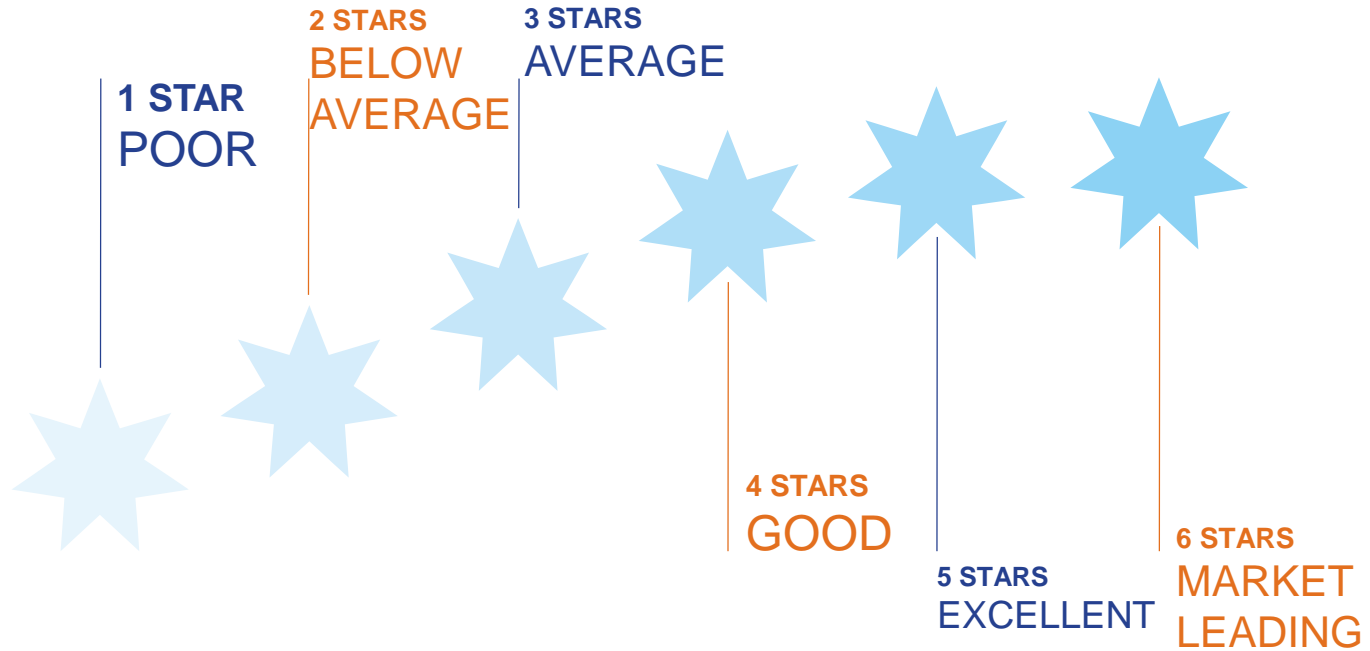
Australian approach: design for performance



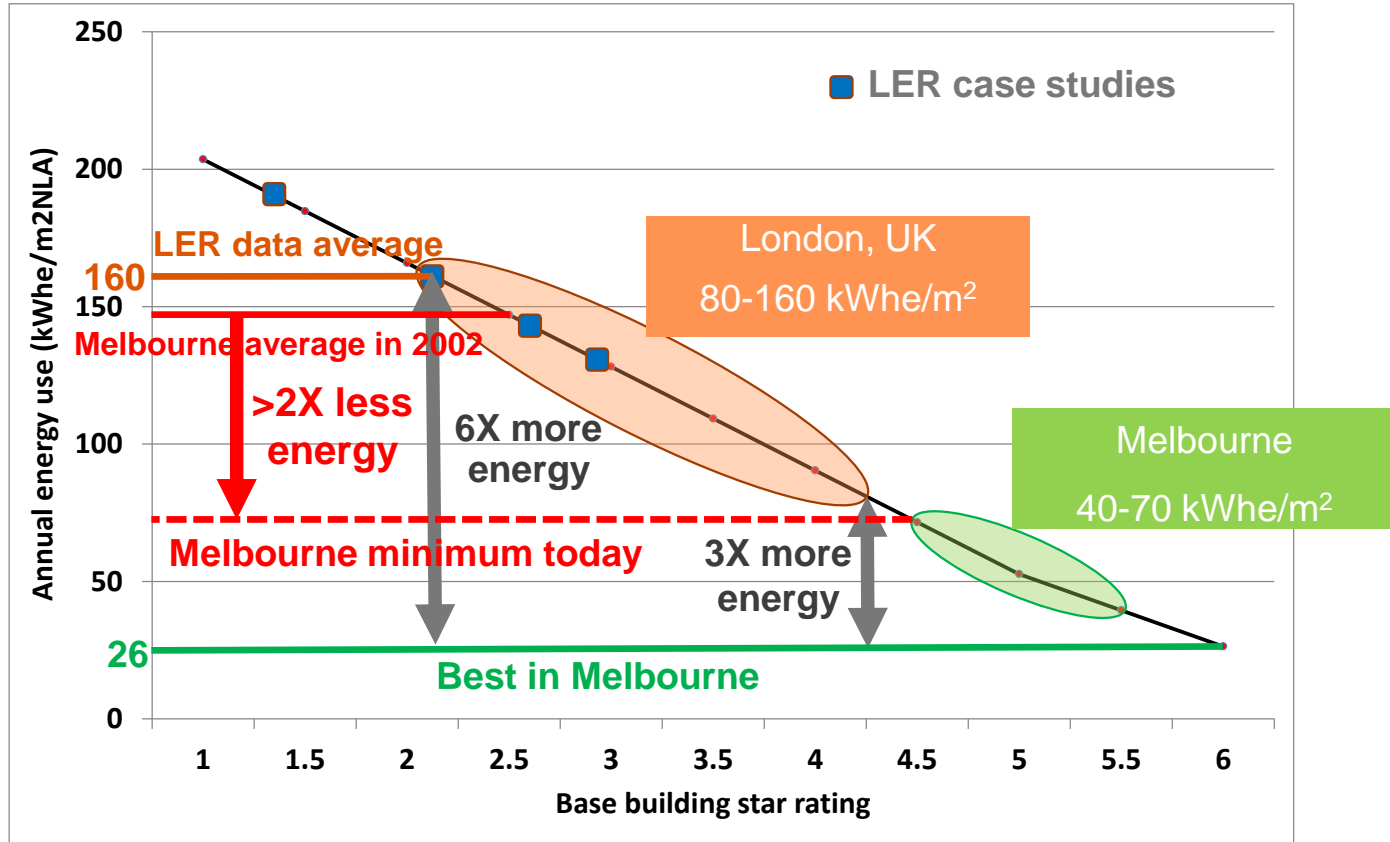
**A Building Energy Efficiency Certificate (BEEC) comprises a NABERS base building operational rating and Tenancy Lighting Assessment



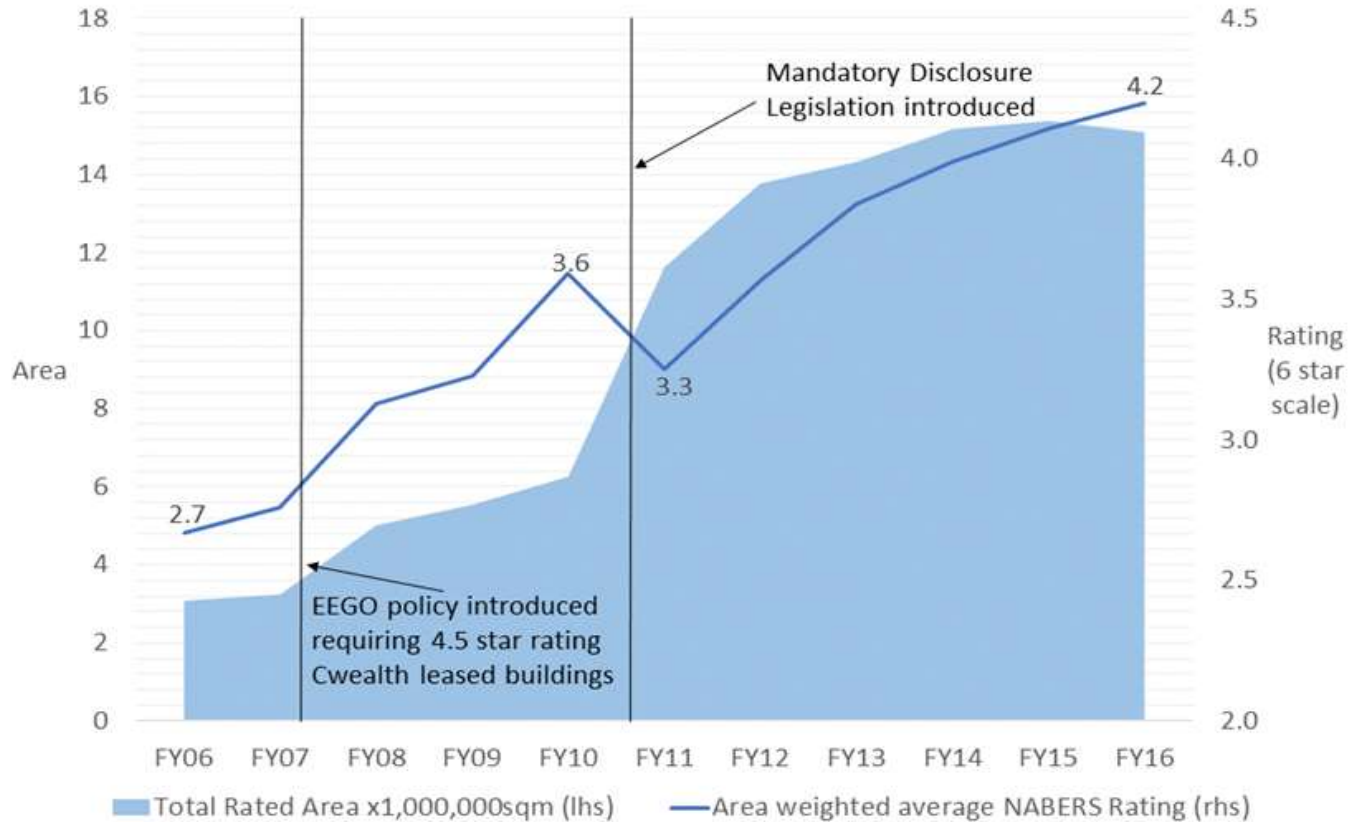
Consumer-friendly NABERS stars scale on trajectory to net zero energy



London base building energy intensity 3 to 6 times higher than Melbourne



Existing buildings efficiency also transformed by performance outcome focus





How is a performance based approach possible for new buildings

Learning from experience in other markets



Energy Commitment Agreements in Australia - NABERS

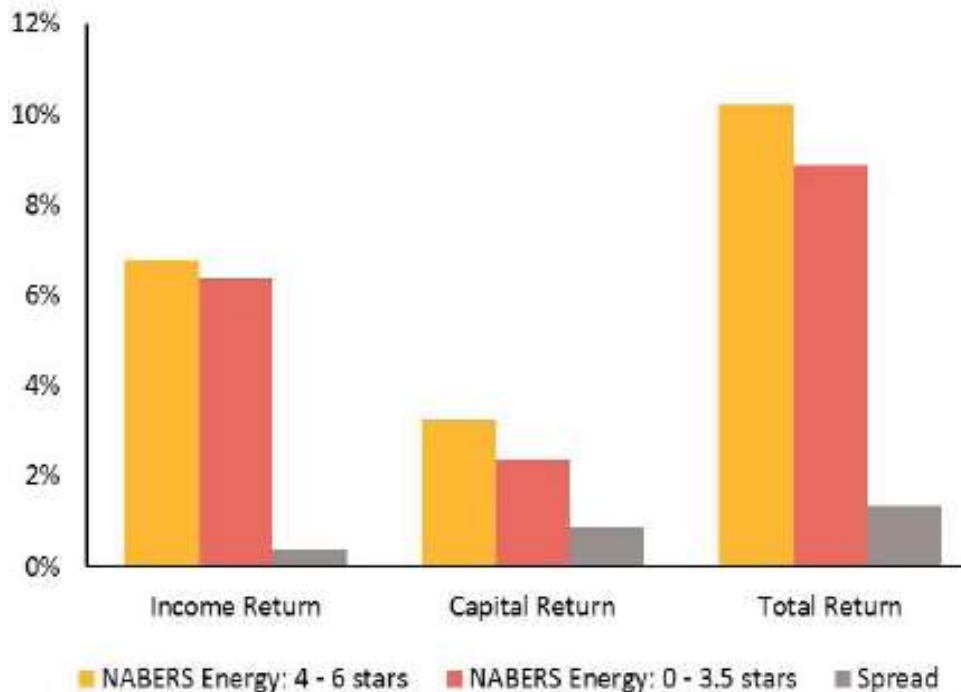


- Established to empower developers to design, construct and manage buildings to achieve an agreed *Base Building* rating measured in-use
- Effect on market has been transformational - typical new office Base Buildings use half the energy they did in 2002 and the best one-fifth
- Scheme is essentially market driven but infrastructure developed by government
- Mandatory performance disclosure law (on sale or let) informs market
- Office development in Australia has a design-for-performance culture and innovation across the whole supply chain is flourishing
- Better rating commands rent premium - Base building energy rating used by leaseholders as proxy for building quality: better designed, better constructed, better commissioned, better operated and maintained
- For developers and investors, office buildings with better energy ratings have higher asset values, reduced vacancy rates and increased yields



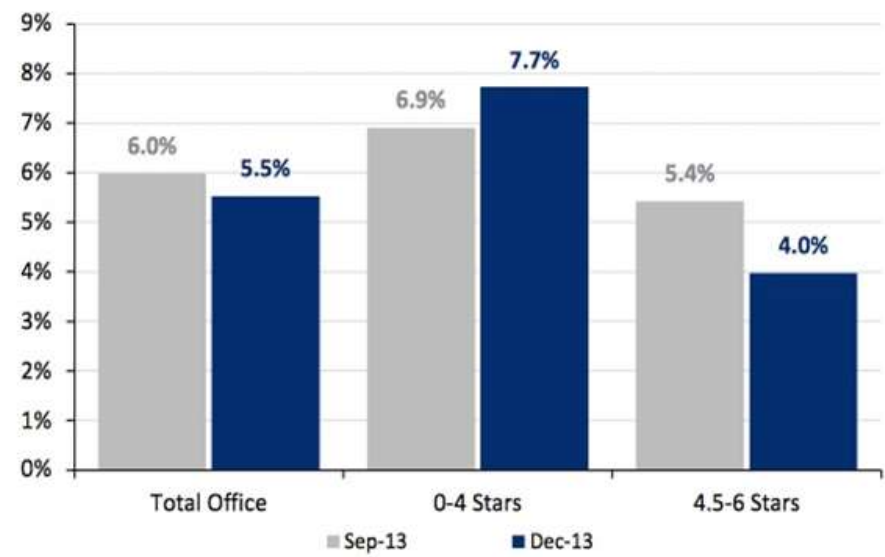


Investors see better energy ratings produce lower voids and higher returns



Source: The Property Council/IPD Green Property Index, MSCI, March 2015

Figure 16. Market Vacancy Rate comparisons
Percentage, Period End



Source: NABERS, IPD





What Energy Commitment Agreements entail

DESIGN AND CONSTRUCTION

1. **Set a target** base building energy performance level
2. Include performance target and process in **contractual documentation**
3. **Advanced computer simulation** to check target achievable & set budgets for each meter
4. **Independent design review** of design package and the simulation work

OPERATION

1. **Monthly monitoring reports** comparing performance vs targets and tracking rating
2. **Intensive fine-tuning** during first year, including 4 detailed BMS reviews
3. Provide data to allow the operational performance to be verified after 12 months of full occupation - third party **validation** of rating.
4. **Disclosure** to affected parties (tenants, investors) of the achievement or otherwise of target





Placing advanced simulation at centre of design and operation

Relish the challenge!





Objectives of detailed HVAC simulation

Create at design stage a virtual building to reflect accurately energy usage of proposed building under expected & plausible conditions of use over year

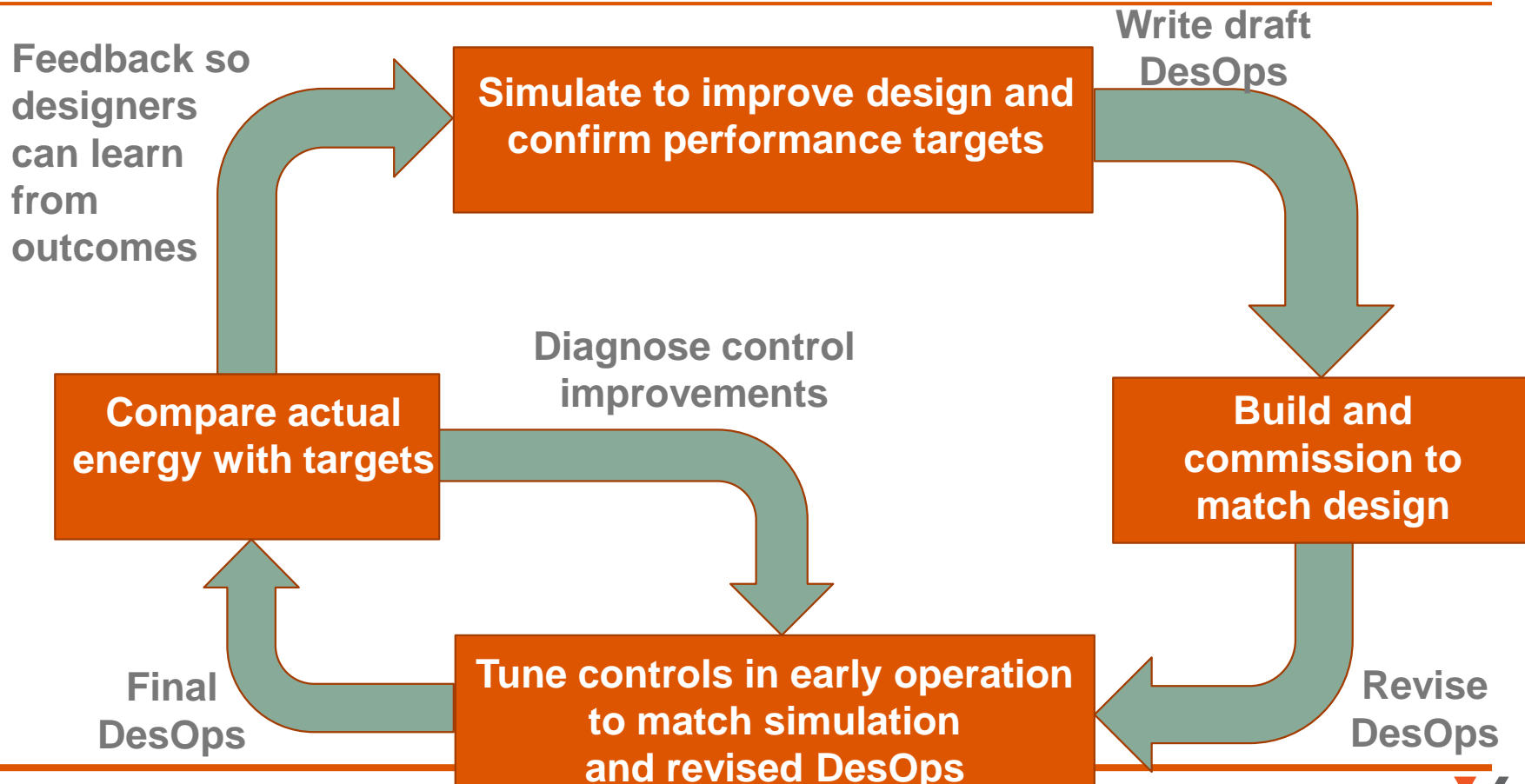
- understand plant capacity requirements
- confirm design is capable of meeting base building target energy rating
- check energy rating resilience to plausible tenant hours and intensity of use
- inform development of verification plan: sub-meters map to meters in model
- produce monthly targets for each sub-meter and sub-system
- inform optimisation of HVAC control

NABERS base building rating defines energy efficiency using principle that a building should receive no benchmark 'allowance' from lettable space for any unlet period

Relish the challenge!



Place simulation at centre of design and operation





Proposing a TM54 rewrite

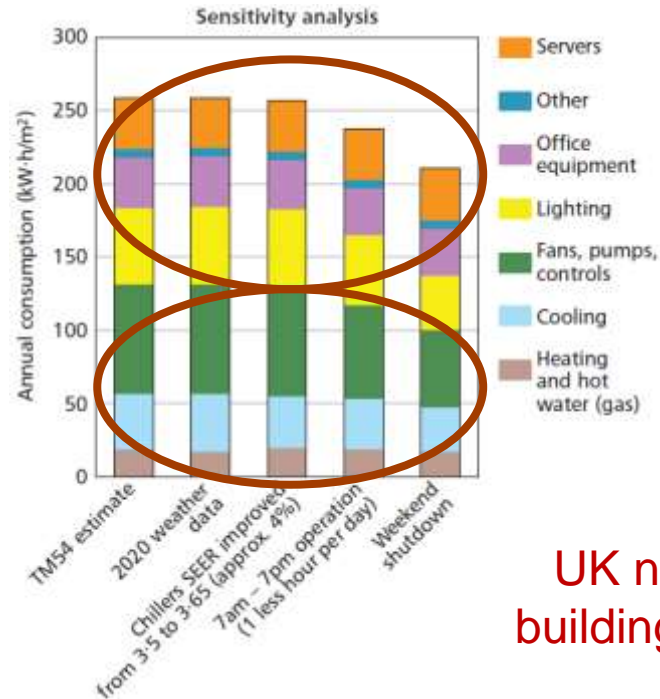
to ensure new buildings perform in line with design and at target energy efficiency



Rewrite TM54 to support measurability of outcomes and energy efficiency



- §7.11 should advocate simulation of HVAC
- Need to rate base building and tenants' energy use



How about the tenants' energy use?

Is base building energy use efficient?

UK needs a NABERS-style building energy rating scheme!





www.betterbuildingspartnership.co.uk

