

# DESIGN FOR PERFORMANCE TO DELIVER BETTER BUILDINGS

16<sup>TH</sup> OCTOBER 2018

# Agenda

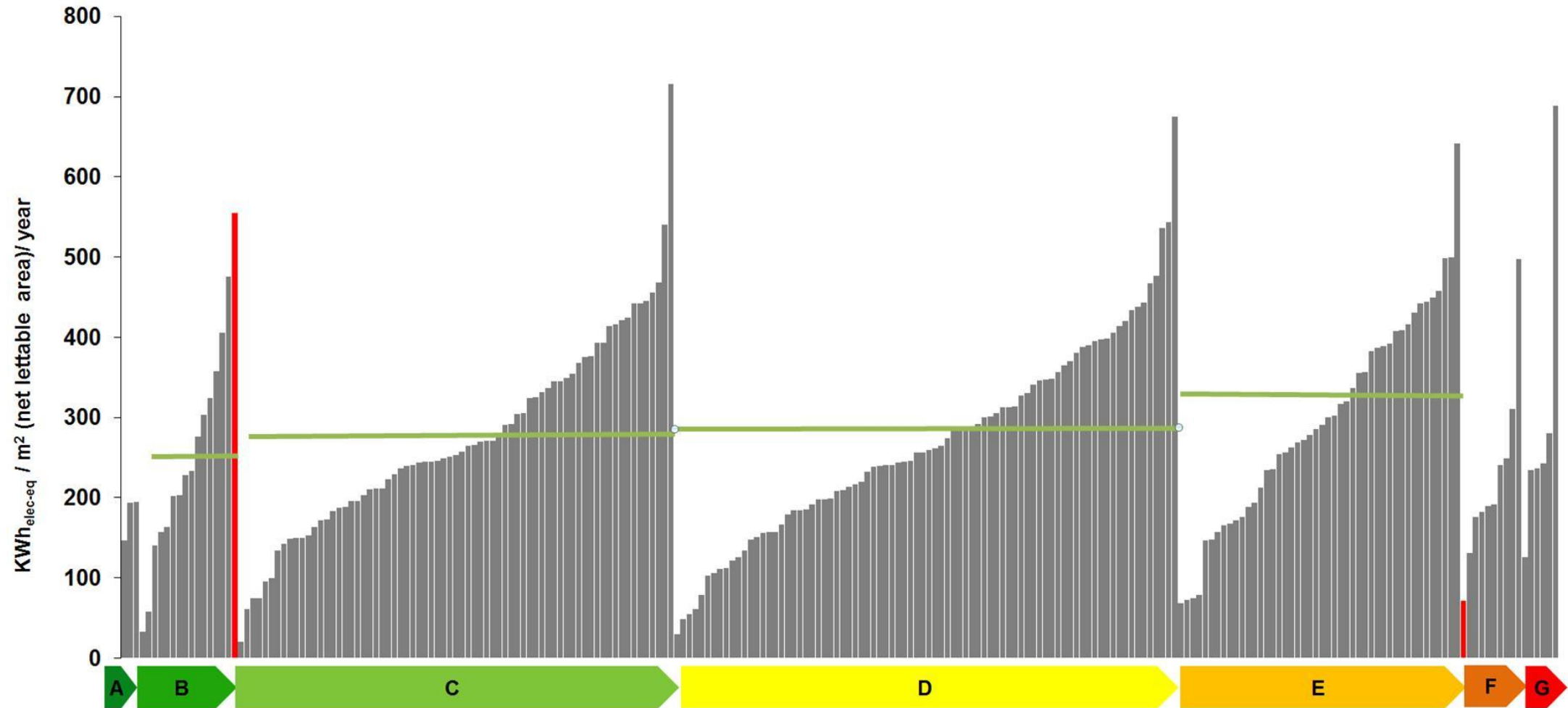
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1. Welcome
  - Ainslie McClennan, Fund Manager, TH Real Estate
2. Keynote
  - Victoria Quinlan, Managing Director, Lendlease IM (Europe)
3. An Introduction to Design-for-Performance
  - Sarah Ratcliffe, Chair of the DfP Executive Committee
4. Can we Design-for-Performance in the UK?
  - Robert Cohen, Verco
5. Modelling for Design-for-Performance
  - Darren Coppins, BuiltPhysics
6. What's next for Design-for-Performance?
  - Sarah Ratcliffe, Chair of the DfP Executive Committee
7. Panel Discussion and Q&A

# AN INTRODUCTION TO DESIGN FOR PERFORMANCE

SARAH RATCLIFFE, CHAIR, EXECUTIVE BOARD &  
PROGRAMME DIRECTOR, BBP

# A Dysfunctional Market



# Industry Backed & Led

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ARUP

**BBP** | BETTER  
BUILDINGS  
PARTNERSHIP

**BCO**

**BSRIA**

**BPF**

**British  
Land**

**CIBSE**

**THE CROWN  
ESTATE**

  
Department for  
Business, Energy  
& Industrial Strategy

**EDSL Tas**

**EnergyAction**

**LAING O'ROURKE**

  
**Legal &  
General**  
INVESTMENT MANAGEMENT

**NG Bailey**

  
**NSW**  
GOVERNMENT

**STANHOPE**

**TH Real Estate**  
a **nuveen** company

 **Transport  
for London**

 **UK  
GBC**  
Member

**UBT**  
Usable Buildings Trust

**Verco**

  
**WILLMOTT DIXON**  
SINCE 1852

**BBP** | BETTER  
BUILDINGS  
PARTNERSHIP

# Aims & Programme of Work

- An industry backed real-world research programme to learn from Australia's success and the market transforming NABERS scheme which aimed to:
  - Ascertain whether it is possible to replicate the Australian process for securing the performance of new office buildings in the UK.
  - Provide a sound evidence base from which to consider whether it is feasible and desirable to introduce such a scheme in the UK.

2015 - 16

Design for Performance Feasibility Study

Reviewed Australian & UK Markets to compare:

- Base building boundaries & performance
- Estimating energy use & setting targets
- Procurement processes
- Advanced simulation modelling approach & skills
- Drivers & tools for improving performance

2016 - 18

Design for Performance Pilot Projects:

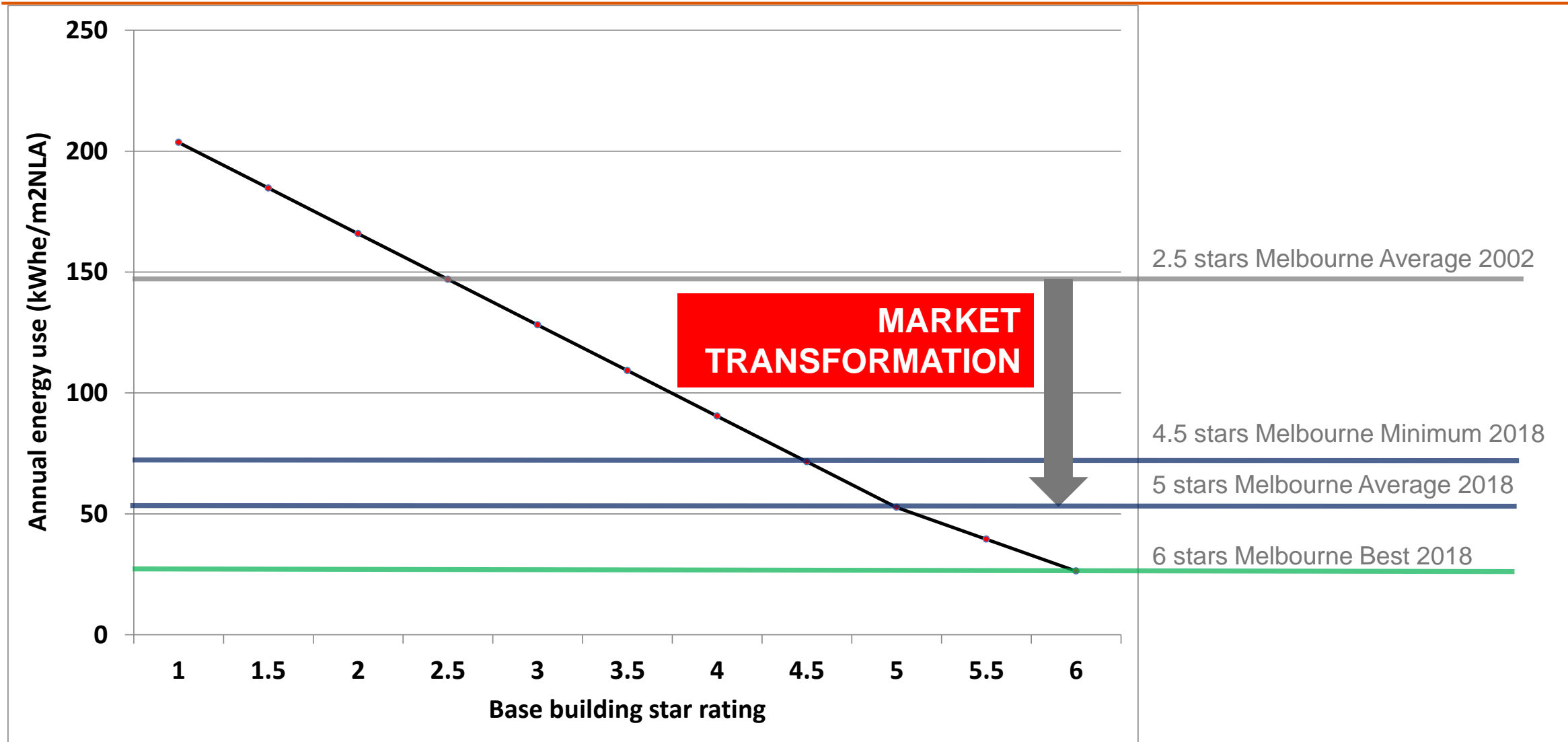
- 6 New Office Developments
- Different stages of the construction cycle
- Applying relevant Design for Performance approaches
- Reviewing outcomes

# Can we Design for Performance in the UK? DfP initiative key findings

Presenter's name: **Robert Cohen**  
Presented to: **DfP Launch at TH Real Estate**  
Date: **16 October 2018**

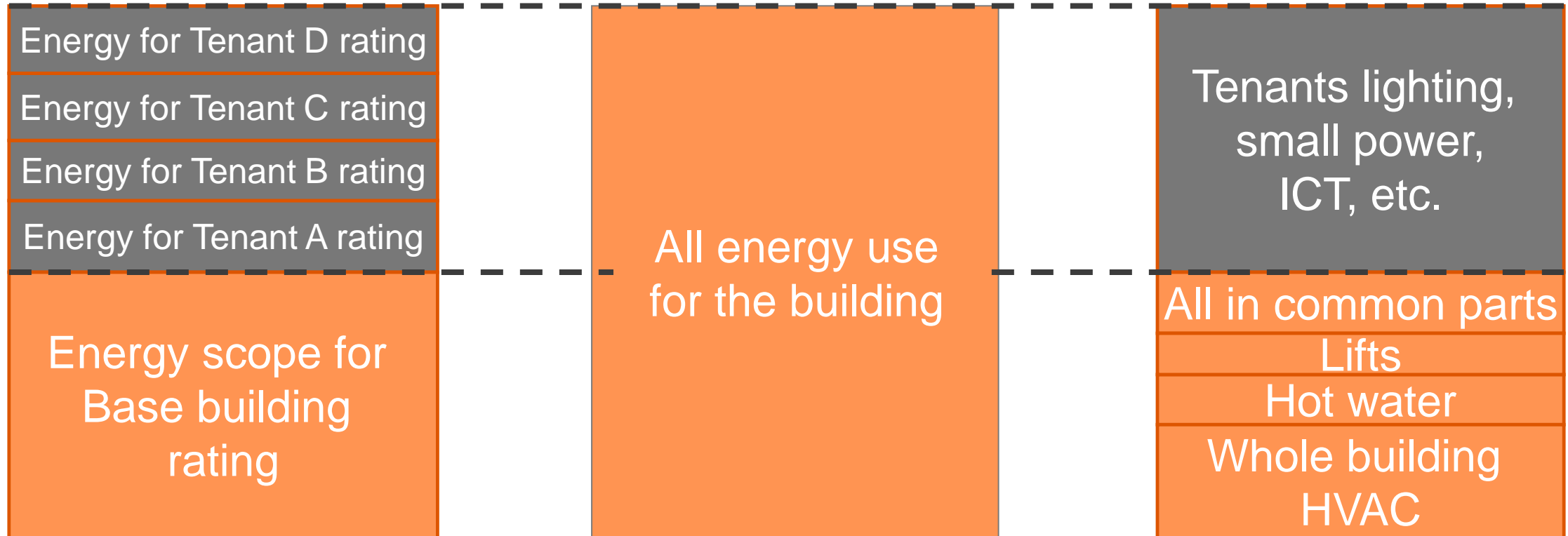


# What has been achieved in Australia

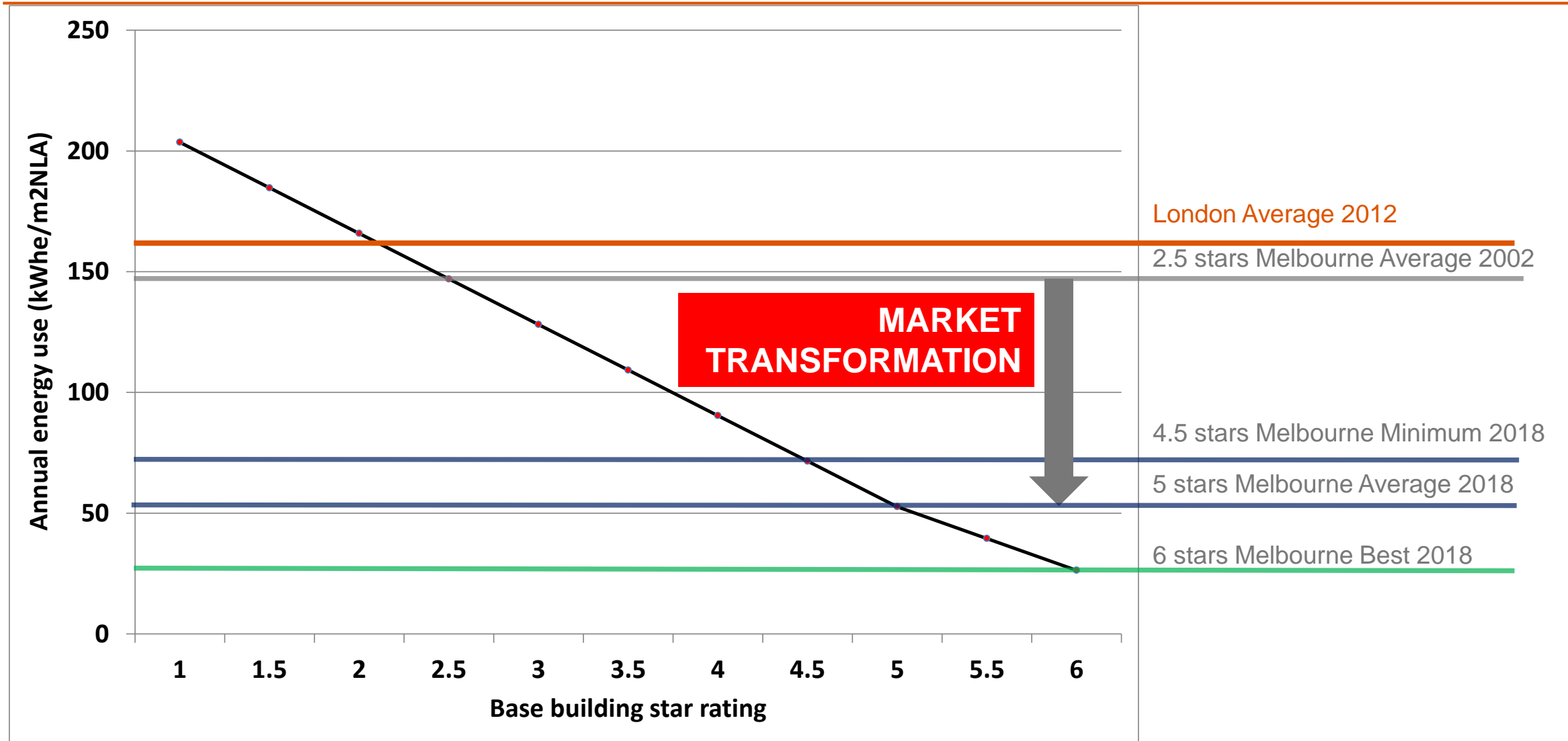




# Defining a measurable metric for a building's energy efficiency



# What has been achieved in Australia



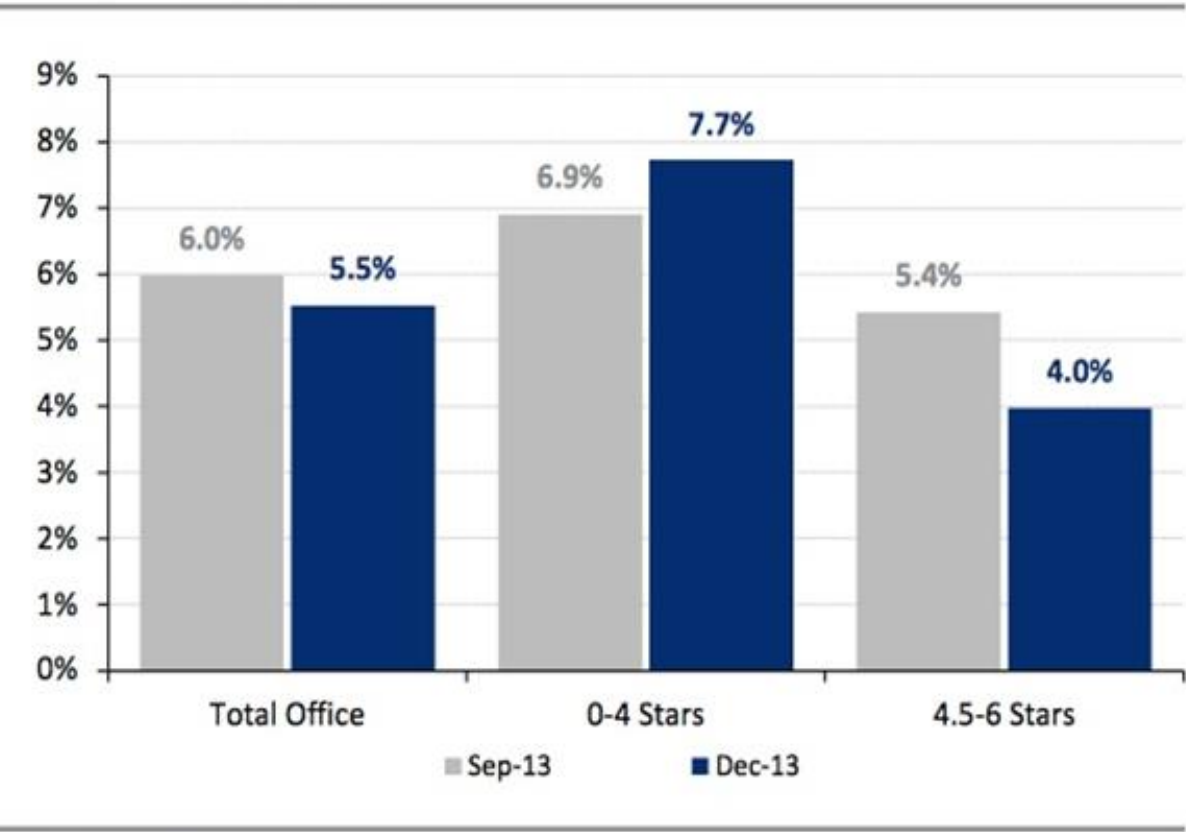
# Market must ask for and value performance

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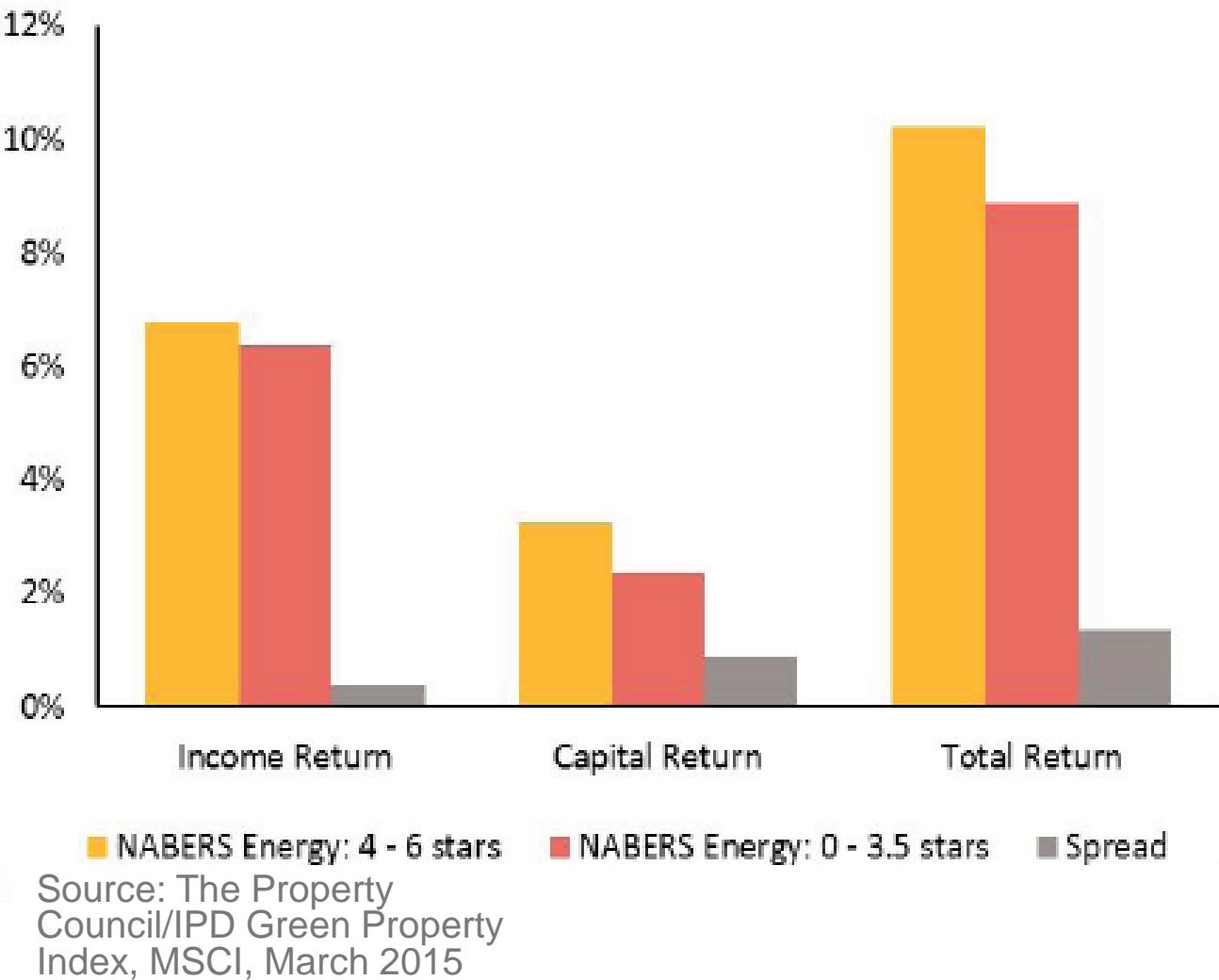


# Rating has become core business KPI

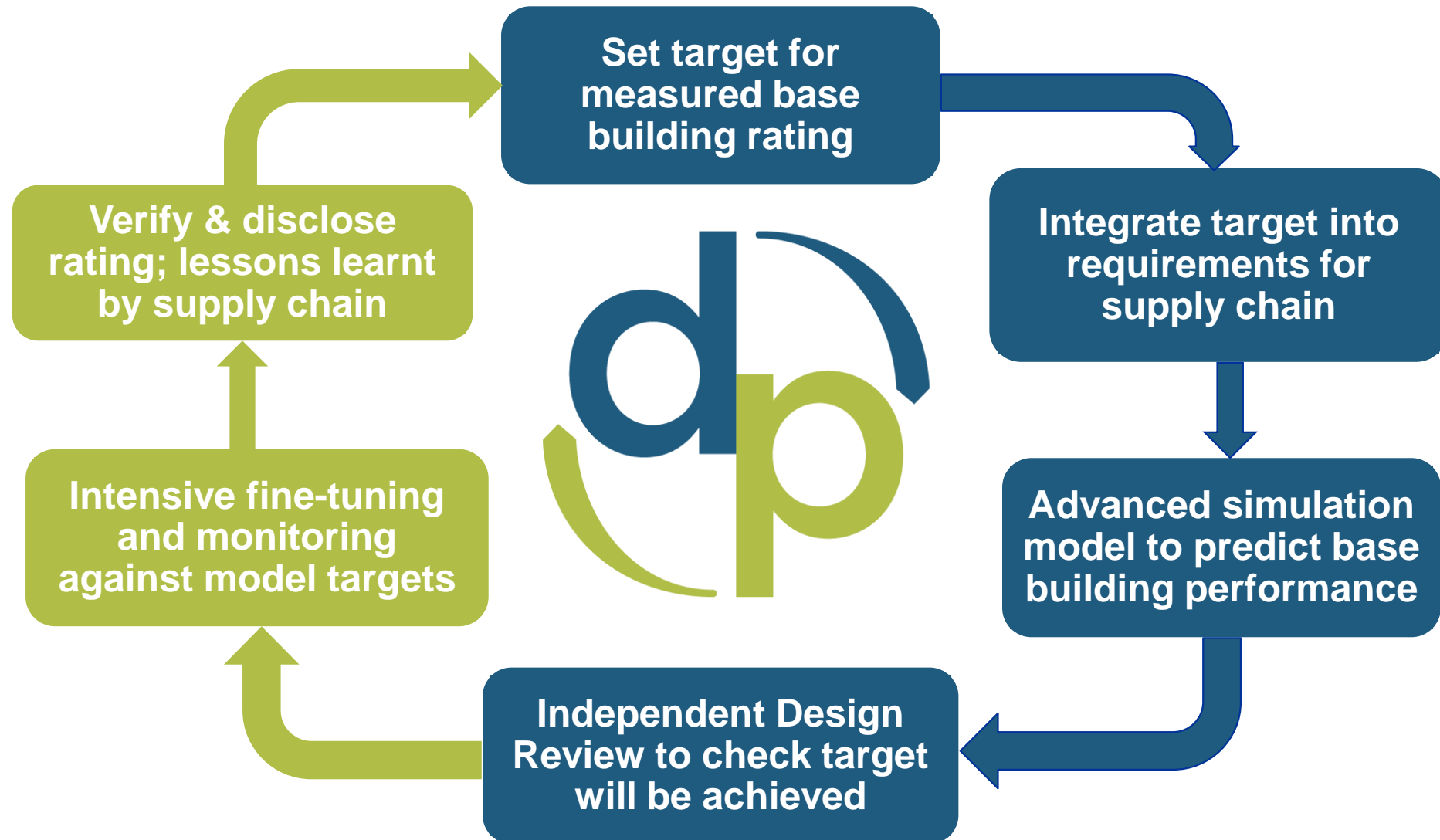
Figure 16. Market Vacancy Rate comparisons  
Percentage, Period End



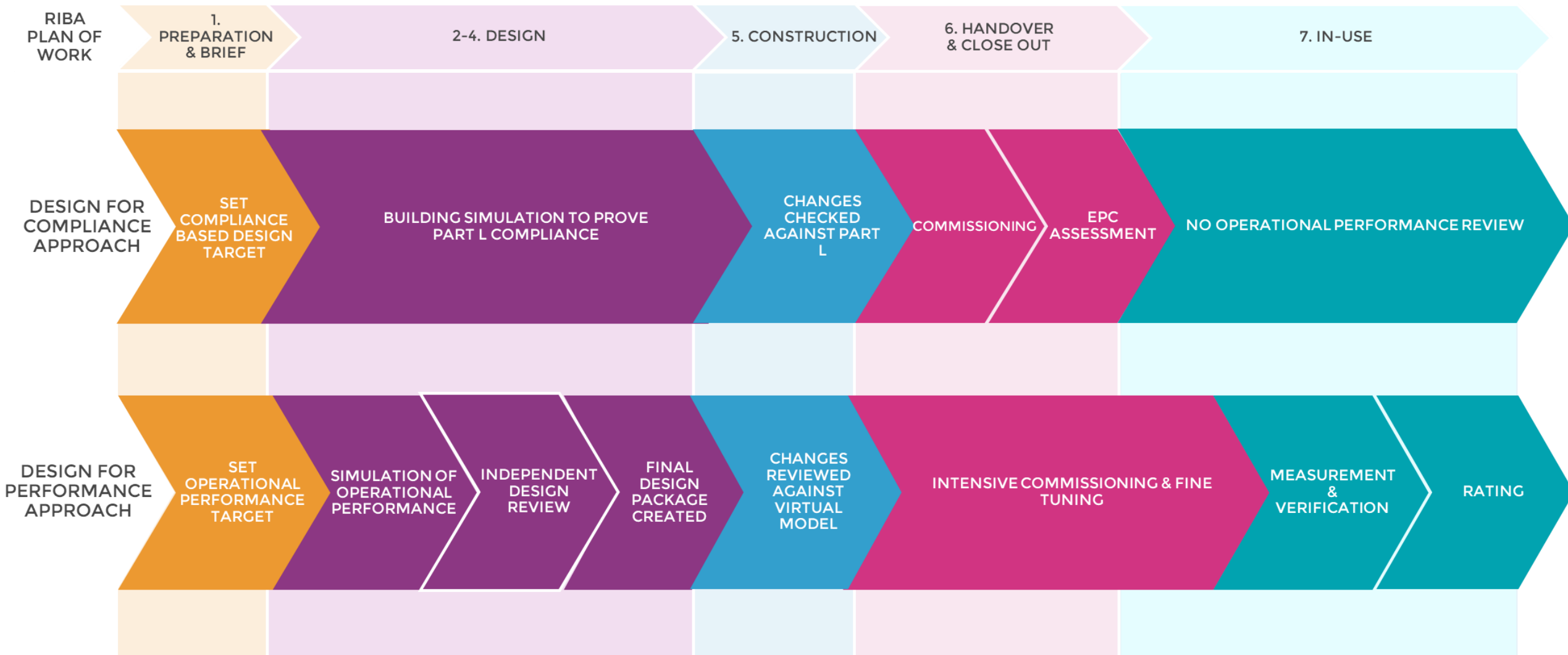
Source: NABERS, IPD



## Design for Performance – the key ingredients



# What is a DfP approach?



## Which DfP ingredients were applied by the pilot studies?

Pilot sponsor	Project type	Advanced Simulation	Design review	Commissioning & fine tuning	Monitoring & Verification	Rating
British Land	Refurb					
L&G	New					
Stanhope	New					
TfL	New					
TH Real Estate	Refurb					
Crown Estate	New					



## UK Building Design would benefit from an IDR process

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- **Systems not designed to respond to varying demand**
  - changing occupancy levels through a day
  - different operating hours in different tenancies
  - limited services needed for vacant spaces
- **Designs constrained by “normal industry practice” even if poor efficiency outcomes**
  - use of fan coils
  - constant volume outside air delivery
  - fixed chilled and hot water supply temperatures
- **Lack of attention to post-construction performance has de-skilled designers**
  - simulation not used to optimise HVAC design and control
  - model results not used to provide framework to assess post-construction performance
  - regulatory framework and EPCs diminish importance of HVAC detail and do not foster skills for enhancement of HVAC efficiency





## Commissioning and fine tuning needs to be improved

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- Commissioning checks of HVAC not driven by performance target or simulation outputs
- Seasonal commissioning poor imitation of quarterly detailed BMS reviews in Australia
- Weaknesses in specification and commissioning processes for LED lighting systems
- Controls interfaces not appropriate to skill set of building management/maintenance teams
- Clear, consistent and accurate documentation often absent
- Practical performance validation plan needed for building managers to implement
- Performance based maintenance contracts needed
- Best options need to be developed for metering base-building energy use



## Strategic findings of DfP pilots

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**If you want to improve performance..... target and measure performance:**

- Base building rating target crucial to drive DfP process
- Systemic failure of compliance process to improve energy performance
- Advanced simulation can drive efficient design and inform efficient operation

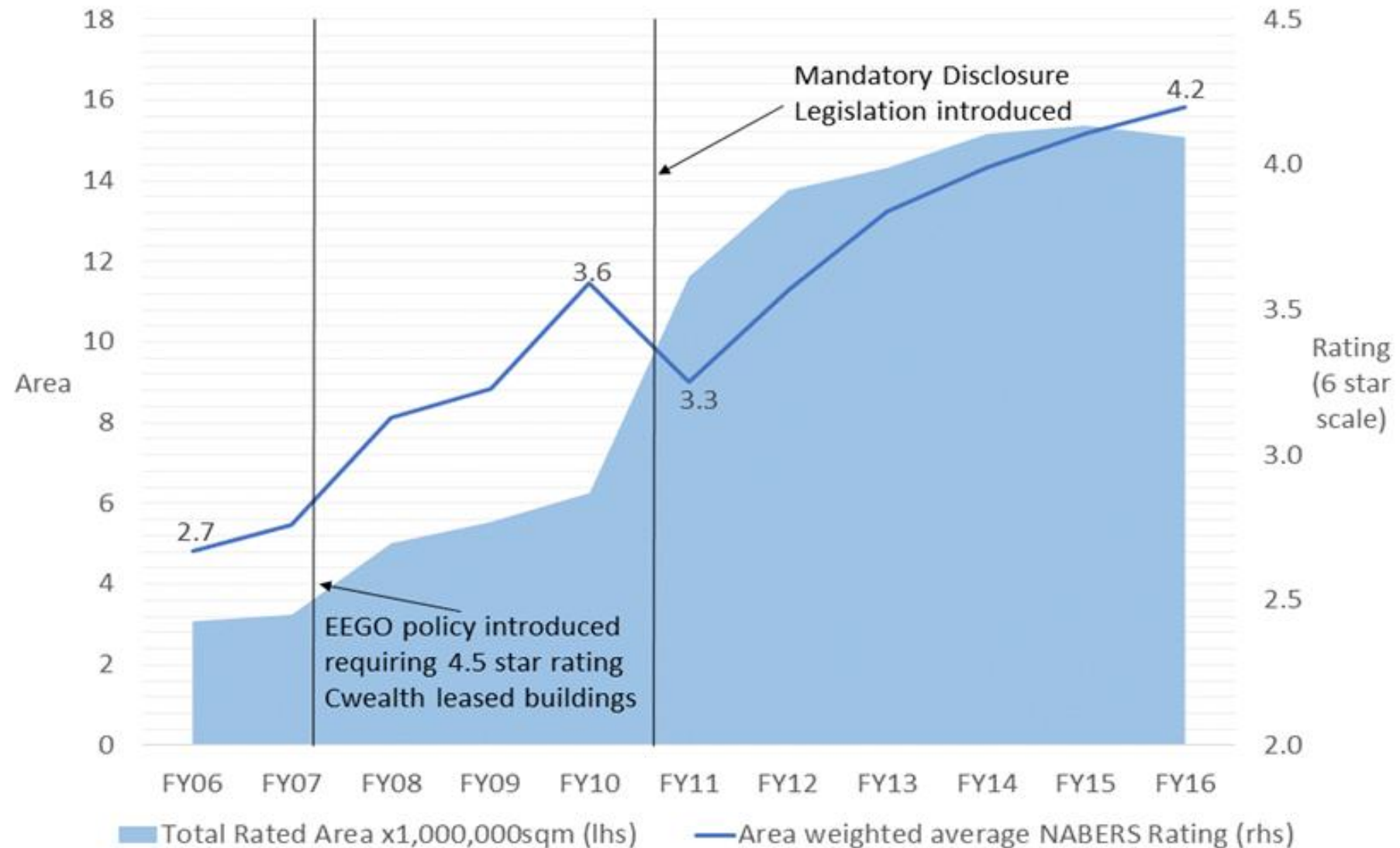
**Institutional challenges:**

- Divided landlord tenant responsibilities for control and maintenance of building HVAC:
  - likely increases overall costs of occupancy
  - militates against energy efficiency
- Developer/owner needs oversight of tenant fit-out to stop adverse impacts on base building
- Central point visibility of HVAC operation where tenant has their own BMS
- Performance-based maintenance contracts

**The pilot studies demonstrated potential for DfP in UK market, and urgent need for it**



## Market transformation when ratings taken as metric for building quality



# What are the outstanding benefits of Designing for Performance?

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Occupiers  
get better building  
for their staff and  
business

Financial return for  
developers,  
owners & investors

Supply chain job  
satisfaction: relish  
the challenge of  
achieving targets

Climate change  
mitigation and  
leadership

# Building Simulation for Design for Performance

by Darren Coppins

**Darren Coppins**

BEng CEng MCIBSE ASHRAE BEMP

Vice Chair CIBSE Building Simulation Group

Chair CIBSE BSG Certification working group

Independent Mechanical & Building Physics  
Engineer



**Built Physics Limited**

# Building Simulation in the UK



HM Government



## Current Modelling

Most simulation undertaken is for Compliance Modelling

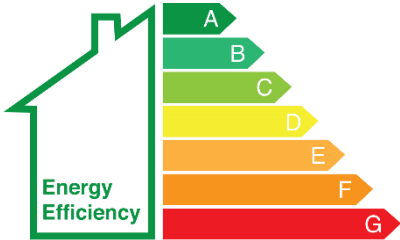
Bare minimum undertaken for Part L and EPC

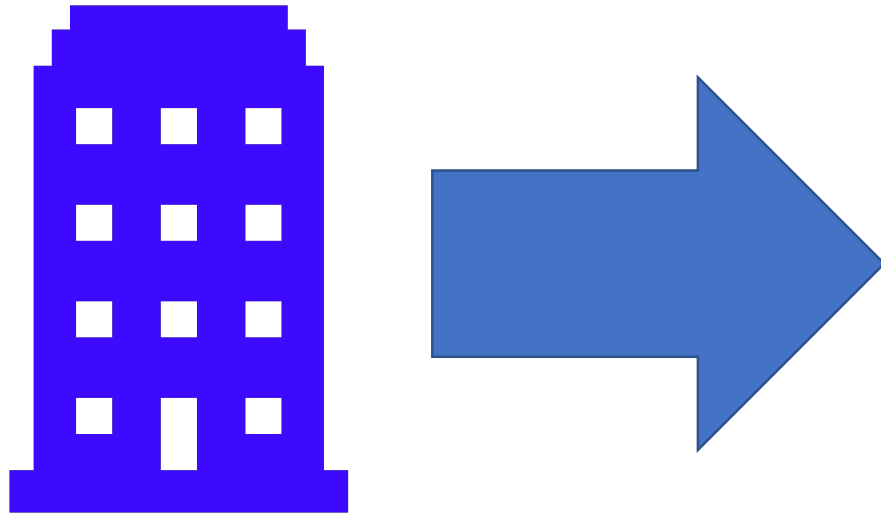
Planning compliance based on the same methodology

BRUKL Output Document  
Compliance with England Building Regulations Part L 2013

Project name	
Proposed	As designed
Date: Fri Aug 18 16:24:52 2017	
Administrative information	
Building Details	Owner Details

SBEM





## Current Modelling

Most simulation undertaken is for Compliance Modelling

Bare minimum undertaken for Part L and EPC

Planning compliance based on the same methodology

**Compares the proposed building with an identical building that meets regulatory standards for fabric and services efficiencies**

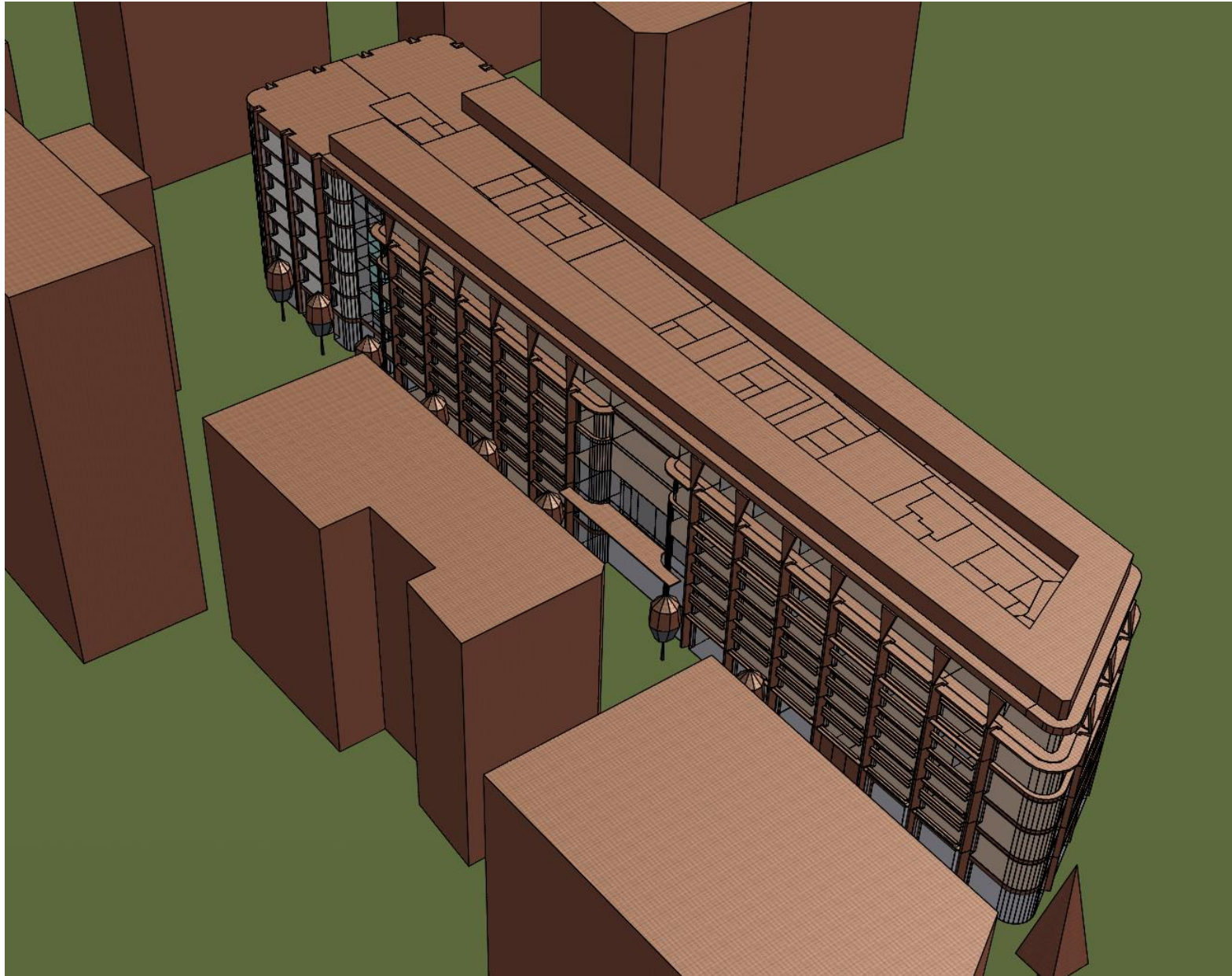




**MIND THE GAP**



# Pilot Study – York House



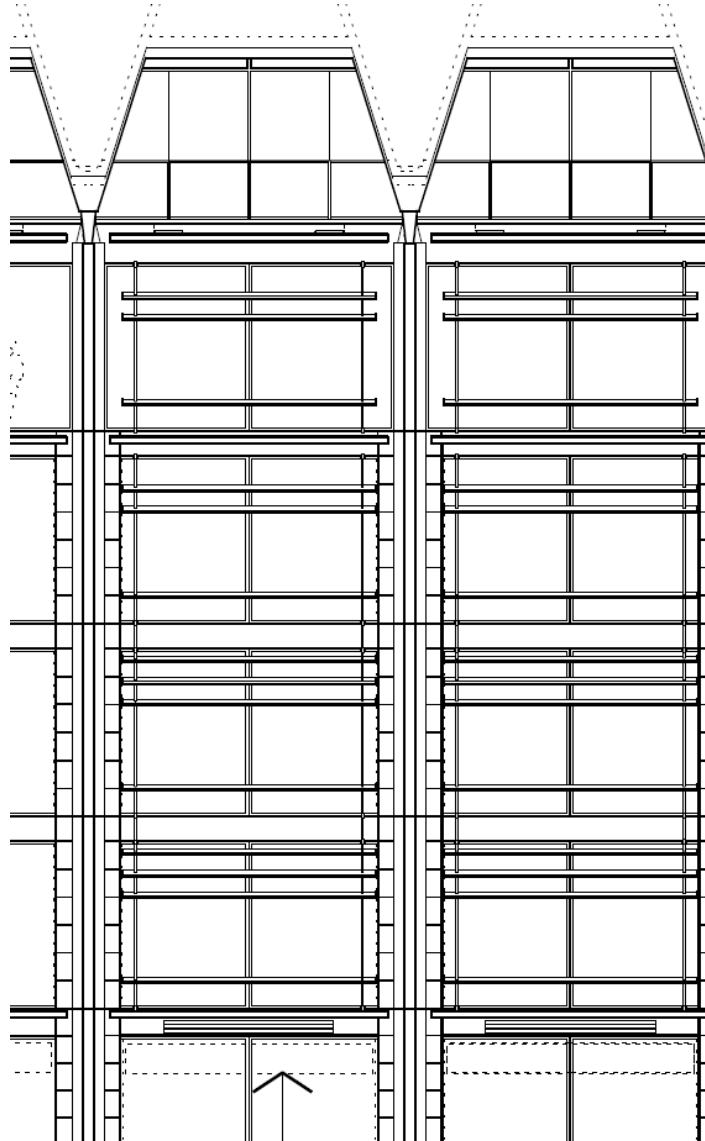
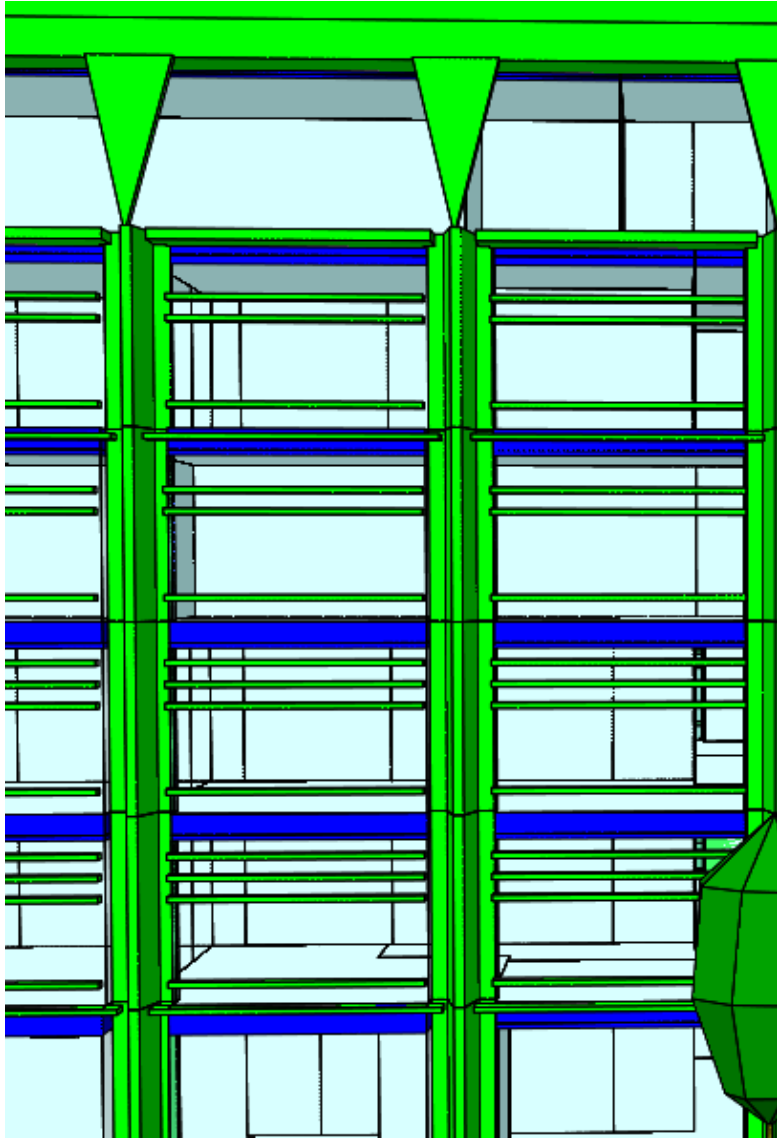
## **NABERS Methodology**

Model the building EXACTLY in as much detail as possible.



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# Pilot Study – York House



## NABERS Methodology

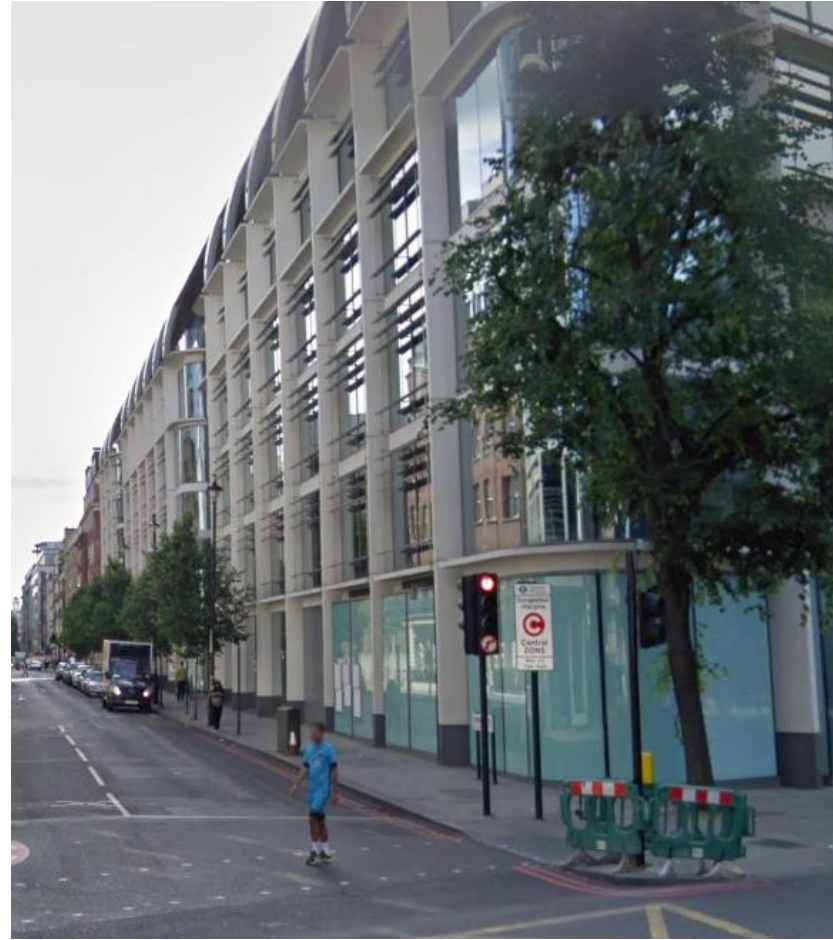
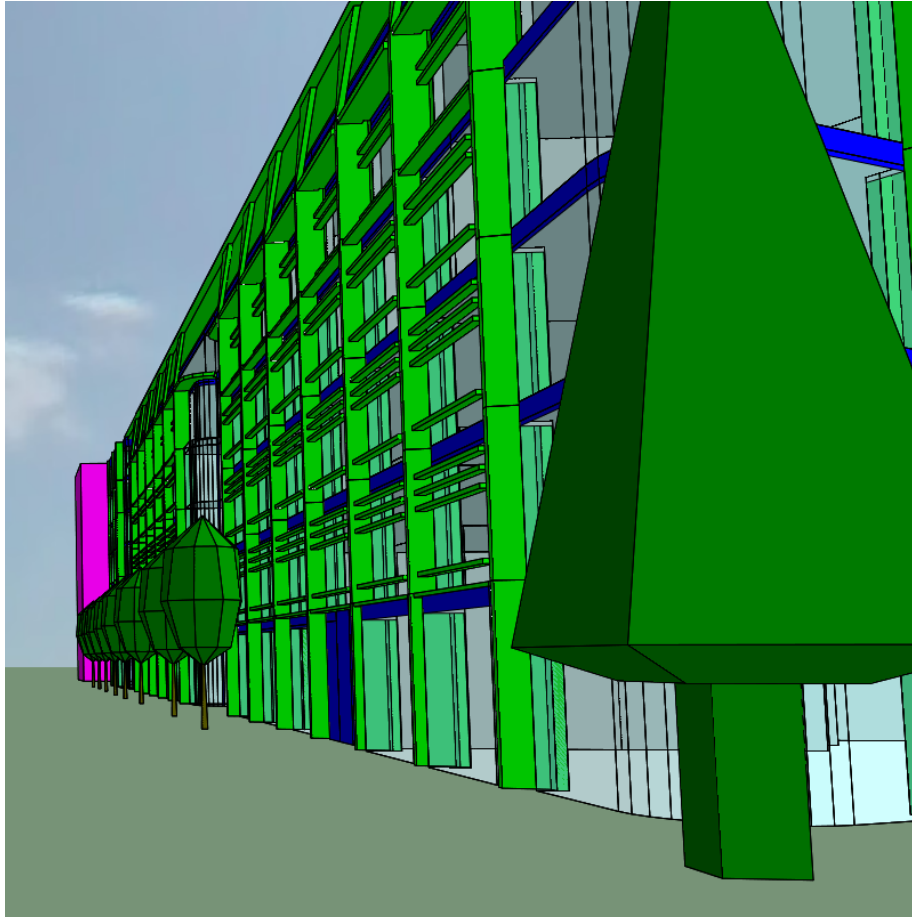
Model the building EXACTLY in as much detail as possible

- Correctly represented shading



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# Pilot Study – York House



## NABERS Methodology

Model the building EXACTLY in as much detail as possible

- Correctly represented shading
- Including adjacent buildings and trees



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# Pilot Study – York House



## NABERS Methodology

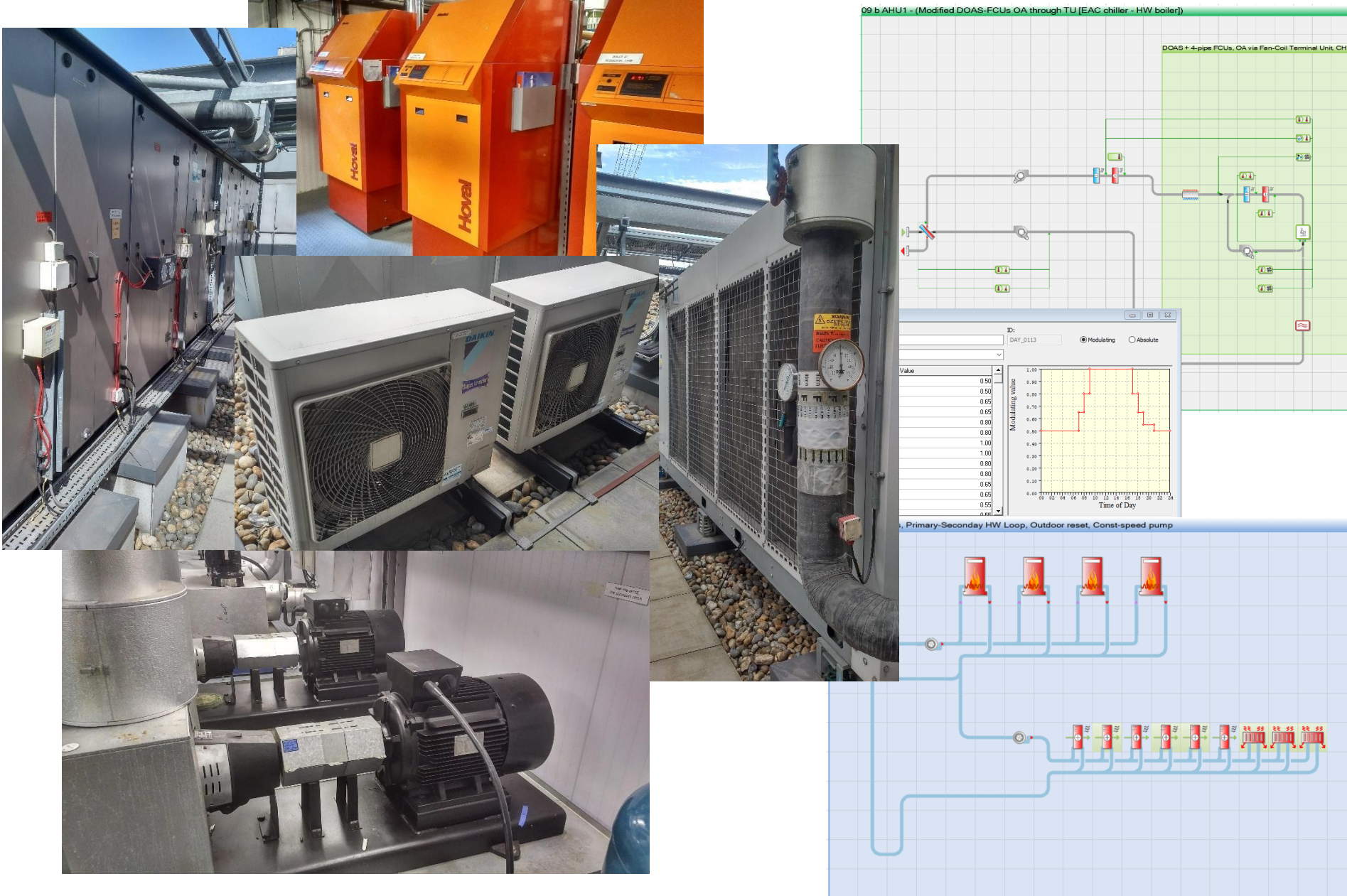
Model the building EXACTLY in as much detail as possible

- Correctly represented shading
- Including adjacent buildings and trees
- Internal gains & occupancy characteristics modelled as per the intended use with as much resolution as possible
- Where unknowns exist, use NABERS guidelines & update model as occupants become known



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# Pilot Study – York House



## Modelling for Performance

Model the building EXACTLY in as much detail as possible.

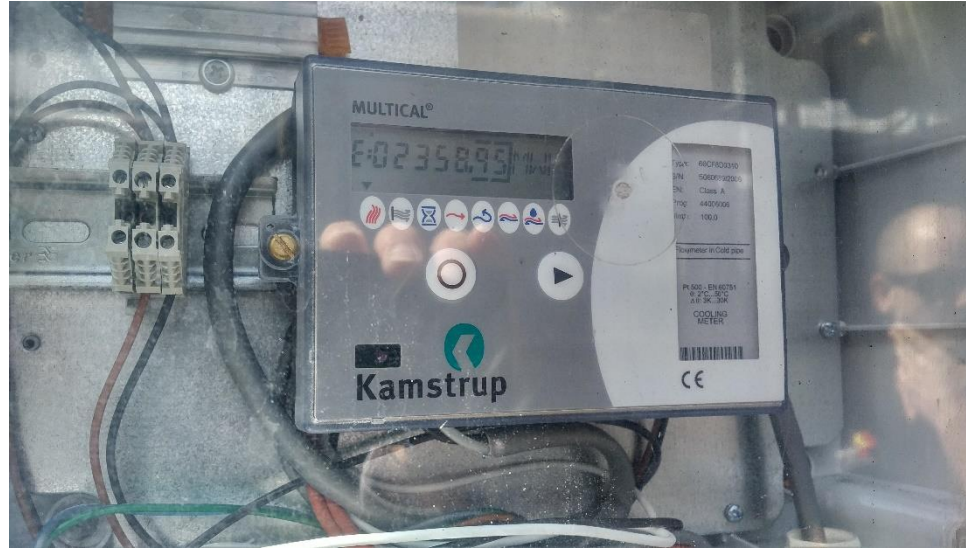
- Input plant data for detailed dynamic simulation



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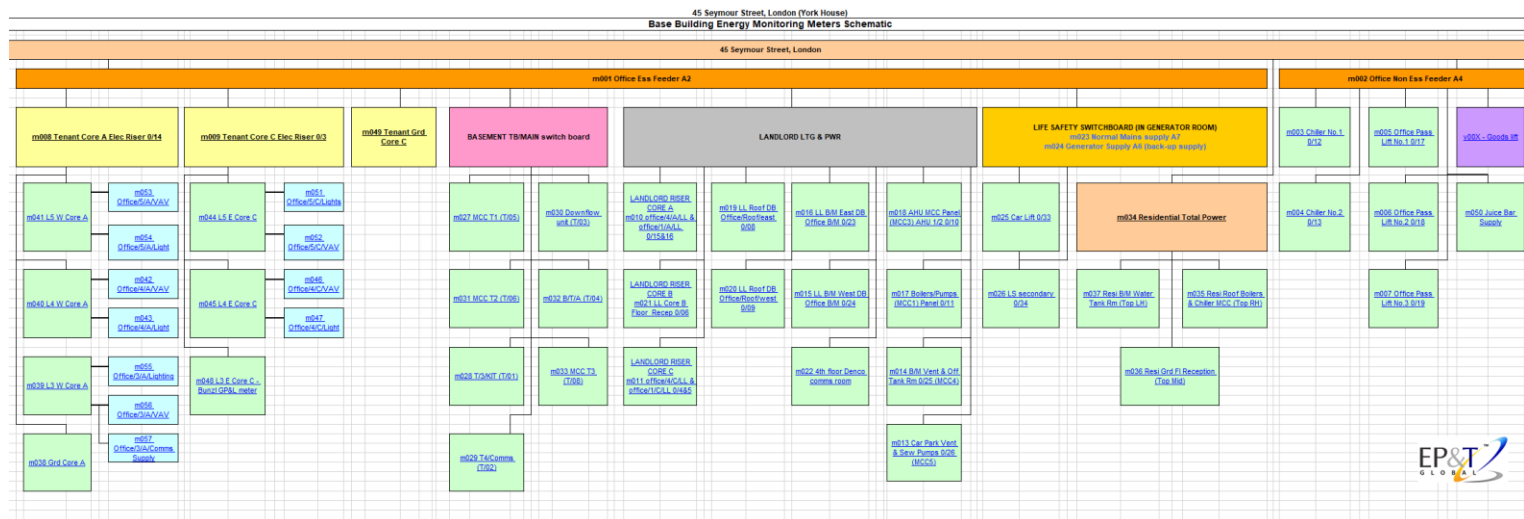
## Pilot Study – York House



## Modelling for Performance

Model the building EXACTLY in as much detail as possible.

- Input plant data for detailed dynamic simulation
- Set-up the metering in the model to be the same as the actual building (or set-up suitable reporting if metering doesn't feature in the software)



## Modelling for Performance

Model the building EXACTLY in as much detail as possible.

- Input plant data for detailed dynamic simulation
- Set-up the metering in the model to be the same as the actual building (or set-up suitable reporting)

Then run a number of scenario's to check how the building and its services react to:

- Normal use
- A 24hr tenant
- High / low loads
- Extreme weather



## Modelling for Performance

The building as modelled from design information achieved 4.5 Stars.





## **Modelling for Performance**

The building as modelled from design information achieved 4.5 Stars.

How does this compare to actual?





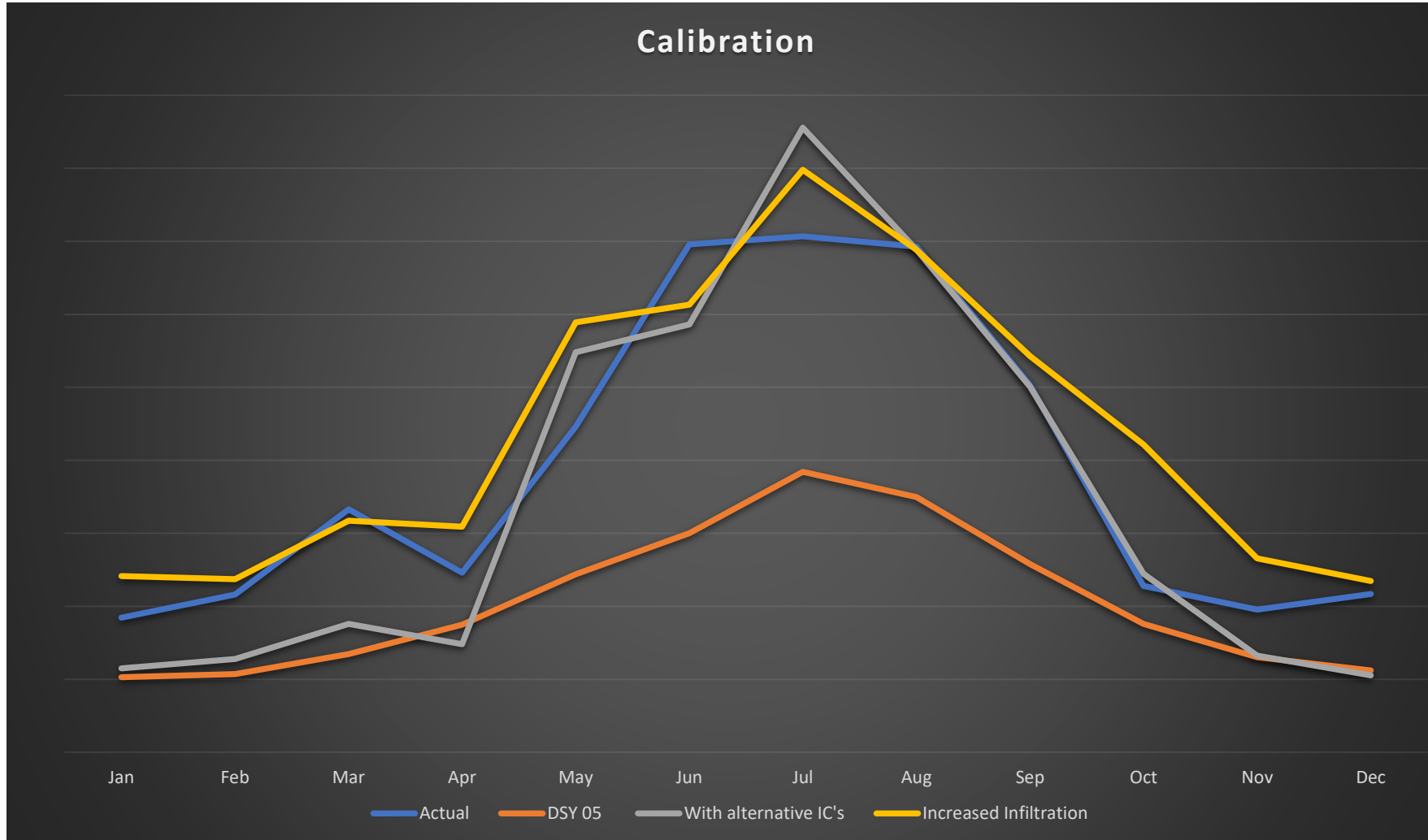
## Modelling for Performance

The building as modelled from design information achieved 4.5 Stars.

From metered data, the building achieves 4 Stars



# Pilot Study – York House



## Modelling for Performance

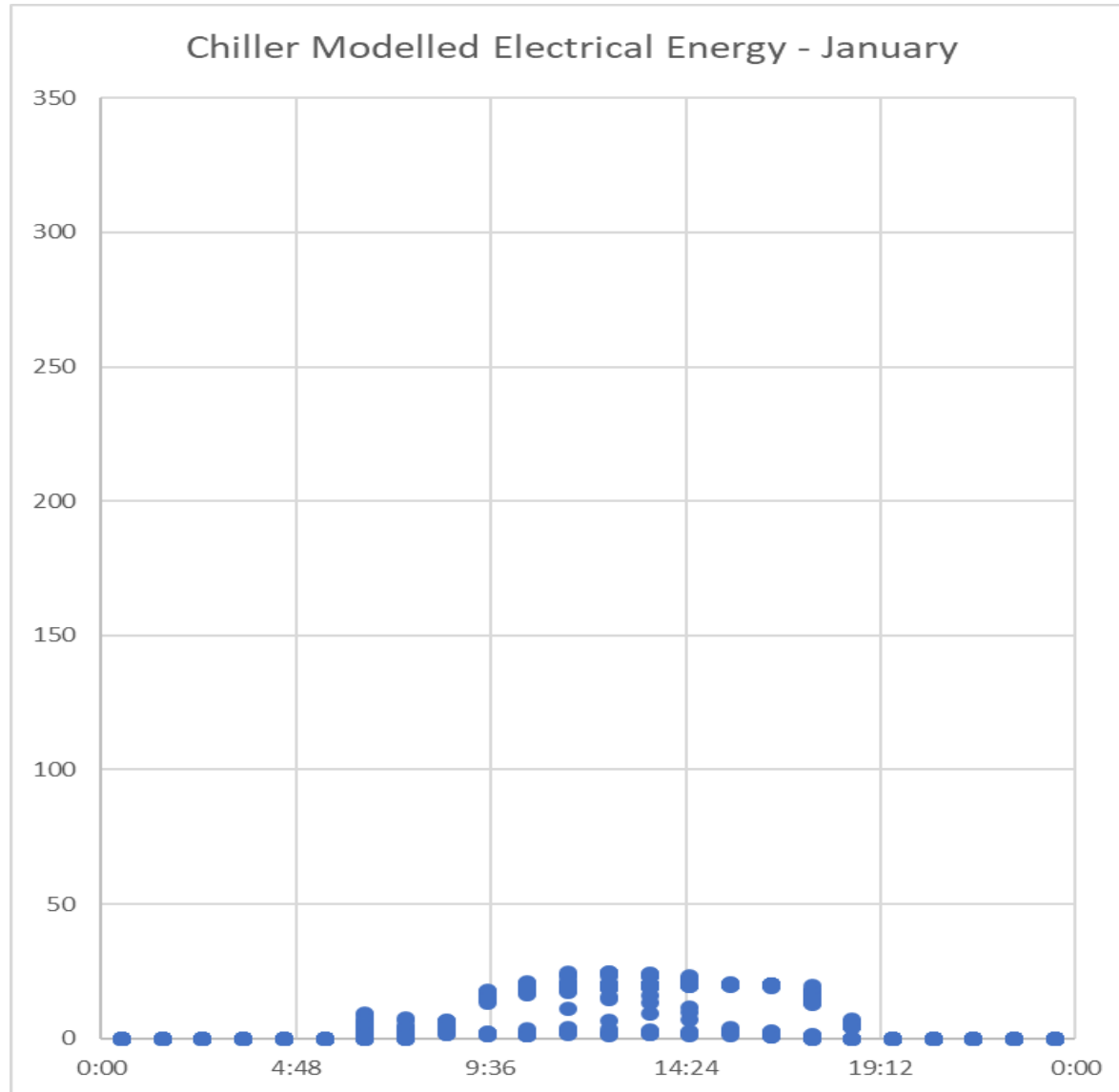
If the meters within the model correlate with the buildings actual metering strategy once completed, this allows for easy comparison of modelled and actual data.

For York House, Chiller Energy was significantly different. Some off-axis scenarios showed better correlation.



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# Pilot Study – York House



## Modelling for Performance

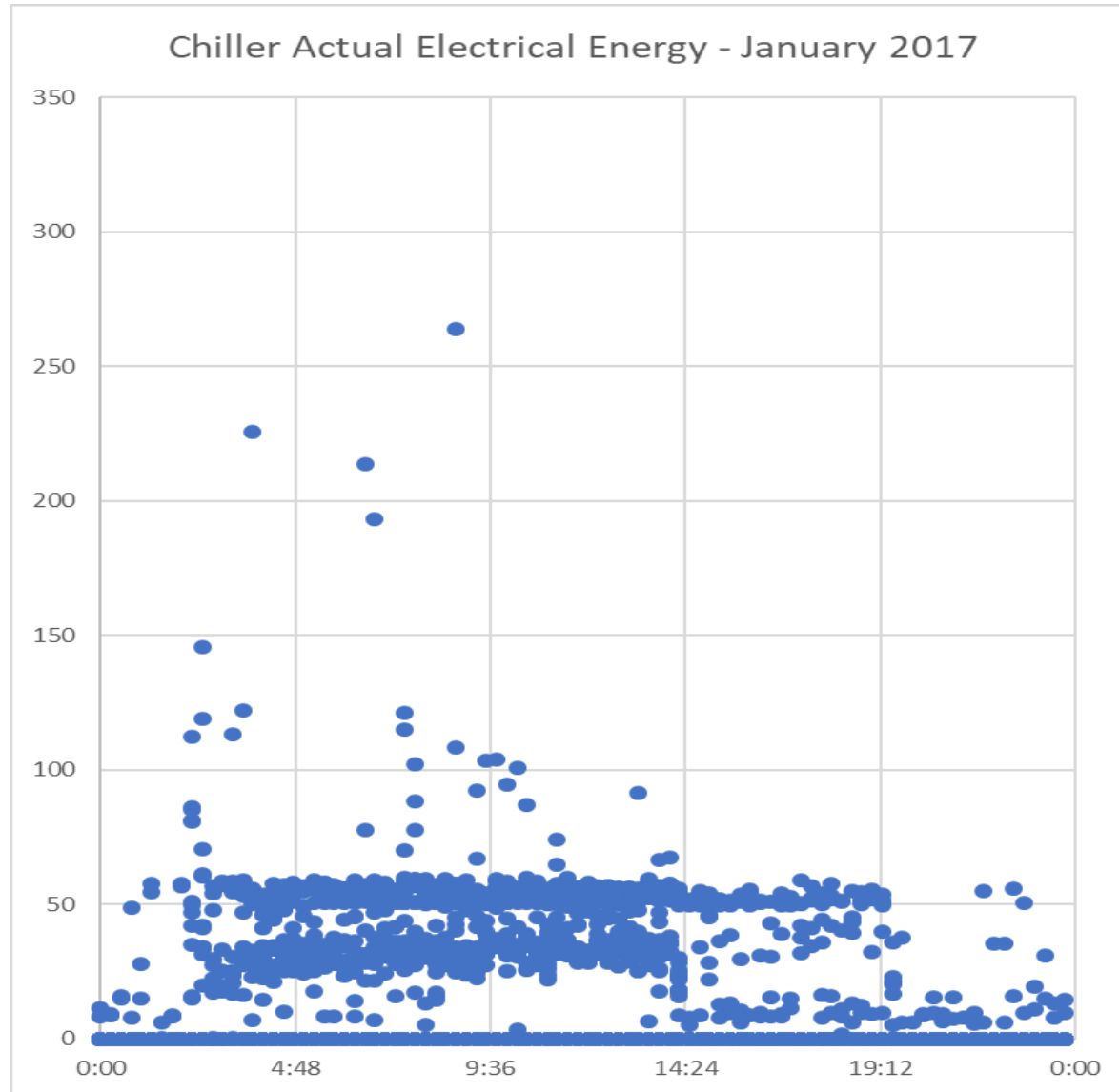
Meters within the model should correlate with the buildings actual metering strategy once completed

This allows for easy comparison of modelled and actual data. For York House, Chiller Energy was significantly different. Some off-axis scenarios showed better correlation.

Correct assignment of meters also permits more detailed analysis



# Pilot Study – York House



## Modelling for Performance

Meters within the model should correlate with the buildings actual metering strategy once completed

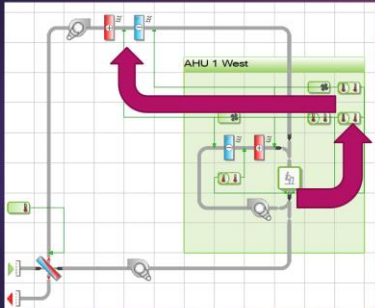
This allows for easy comparison of modelled and actual data. For York House, Chiller Energy was significantly different. Some off-axis scenarios showed better correlation.

Correct assignment of meters also permits more detailed analysis – Such as this example from January 2017 causing a mismatch in chiller energy due to operational issues (now resolved)

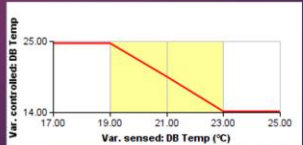
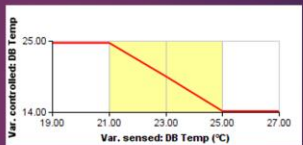


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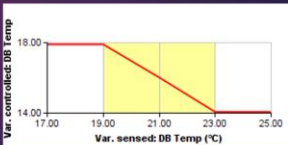
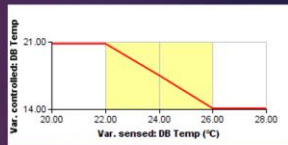
## a. Variable temperature air supply



► Tight control

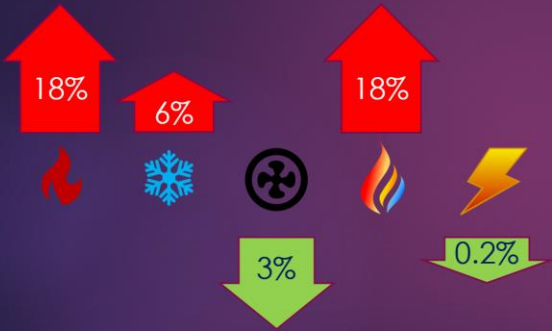


► Wide control

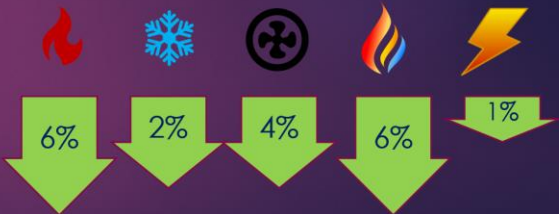


## a. Variable temperature

► Tight control



► Wide control



## Modelling for Performance

The model has since been used to evaluate different controls strategy and efficiency upgrades, some of which are now being implemented and monitored



## In Summary

- Modelling the real building to achieve design for performance:
  - Ensures the services are the correct fit for how the building will be used
  - Provides an insight into how the plant responds to off-axis scenarios such as a small percentage of the building having high loads or 24hr operation
  - Provides the most accurate building performance prediction
  - Brings certain important design elements like metering strategy to much earlier in the design process
  - Provides a model that can be used to help calibrate the building to the predicted performance once in operation



# Building Simulation for Design for Performance

**Thank you for listening**

**[darren.coppins@builtphysics.co.uk](mailto:darren.coppins@builtphysics.co.uk)**



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# WHAT NEXT FOR DESIGN FOR PERFORMANCE?

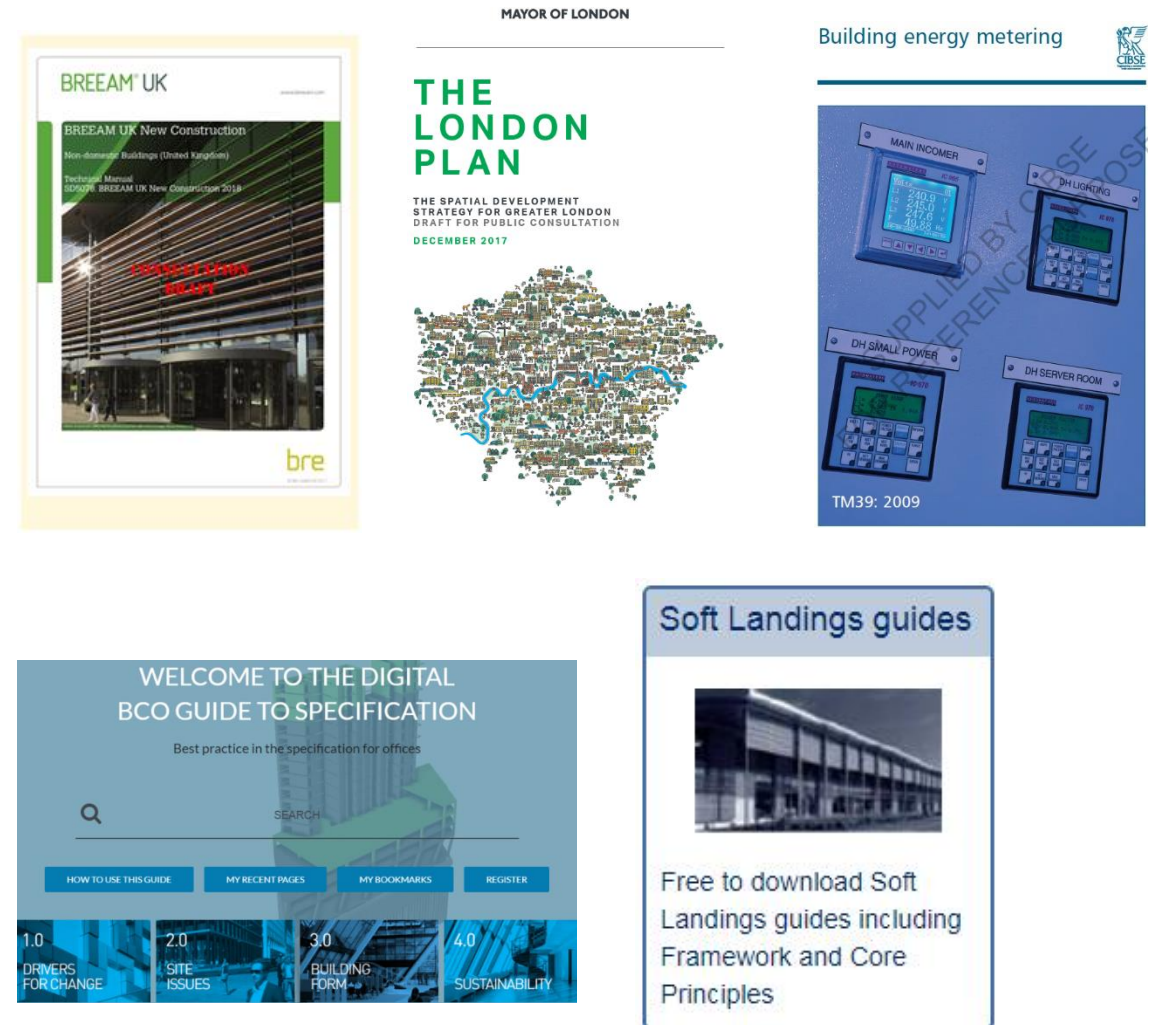
SARAH RATCLIFFE, CHAIR, DFP EXECUTIVE BOARD &  
PROGRAMME DIRECTOR, BBP

# Embedding DfP in the Industry

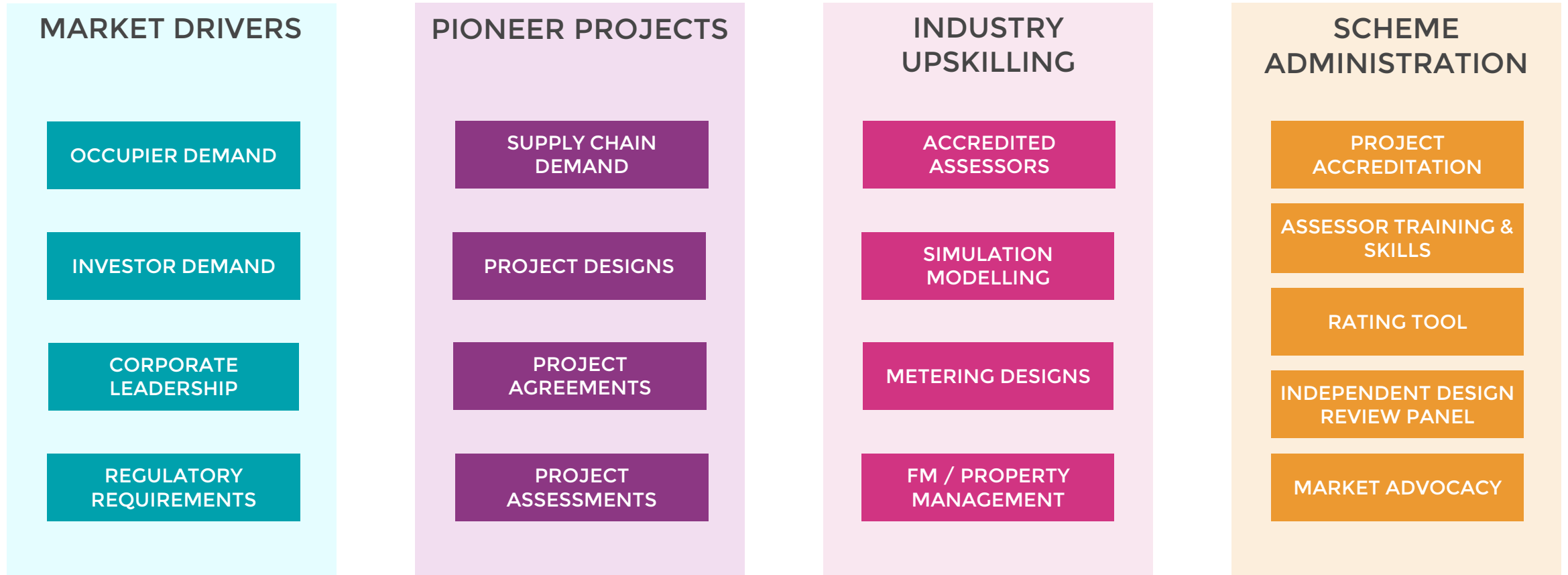
- ❑ [BREEAM New Construction 2018](#) with Verification Stage launched by BRE.
- ❑ [BCO Guide 2019](#) to include 'Design for Performance' with associated guidance and targets
- ❑ [BSRIA Soft Landings 2018](#) includes reference to DfP, guide to Soft Landings & DfP to be published
- ❑ [CIBSE TM39 \(Energy metering\) 2018](#): defines metering required for base building ratings

And ... policy/advocacy work is looking at DfP:

- ❑ [GLA's London Plan](#) to mandate performance reporting for all major new development
- ❑ [Aldersgate Group](#) advocates Commitment Agreements and performance based labelling
- ❑ [Committee on Climate Change](#) called for Government to support further work in this area (referencing DfP).
- ❑ [BEIS Call for Evidence](#) on Business Energy Efficiency references BBP, NABERS & DfP initiative
- ❑ [UKGBC "Advancing Net Zero"](#) synergies



# Developing a scheme for the UK...



# Design for Performance Pioneers

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## Funding Technical Specification:

- Supporting the development of a 'Design for Performance' scheme.

## Creating Market Demand:

- Pioneering the implementation of 'Design for Performance' on at least one new office in the development pipeline.

# Independent Governance & Administration

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# Upskilling the Industry

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## DfP Pioneer Delivery Partners:

- Embed DfP principles into the delivery of building services design on their projects.
- Advocate adoption of DfP with their clients.
- Train staff in skills relevant to the delivery of DfP.
- Commit resources to develop the DfP scheme infrastructure.

ARUP

CUNDALL

# Pioneering Activities 2018 - 2021

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- Rating Scheme Development
  - Rules and benchmarks
  - Submission, assessments and QA processes & documentation
- Pioneering Projects
  - Project Agreement development
  - Road testing
  - Consolidating business case
- Market Development
  - Brand development
  - Industry engagement
- Administration
  - Manage project applications & accreditation
  - Oversight of rating tool & project agreements
  - Procure UK Scheme Administrator
- Capacity Building
  - Establish Independent Design Review Panel
  - Develop professional competency frameworks
  - Training & skills development programmes

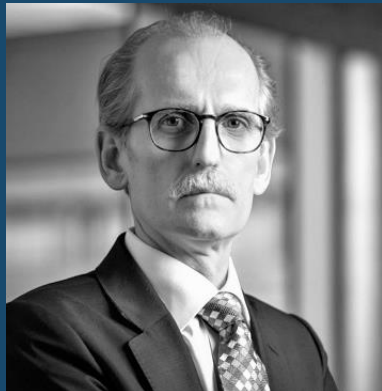


# PANEL DISCUSSION





**Jane Wakiwaka**  
Sustainability Manager  
**The Crown Estate**



**Geoff Harris**  
Head of Development  
**TH Real Estate**



**Sarah Ratcliffe**  
Programme Director  
**Better Building  
Partnership**



**Simon Leckie**  
Portfolio Director  
**Lendlease**



**Iain Trent**  
Engineering Director  
**Landsec**

THANK YOU