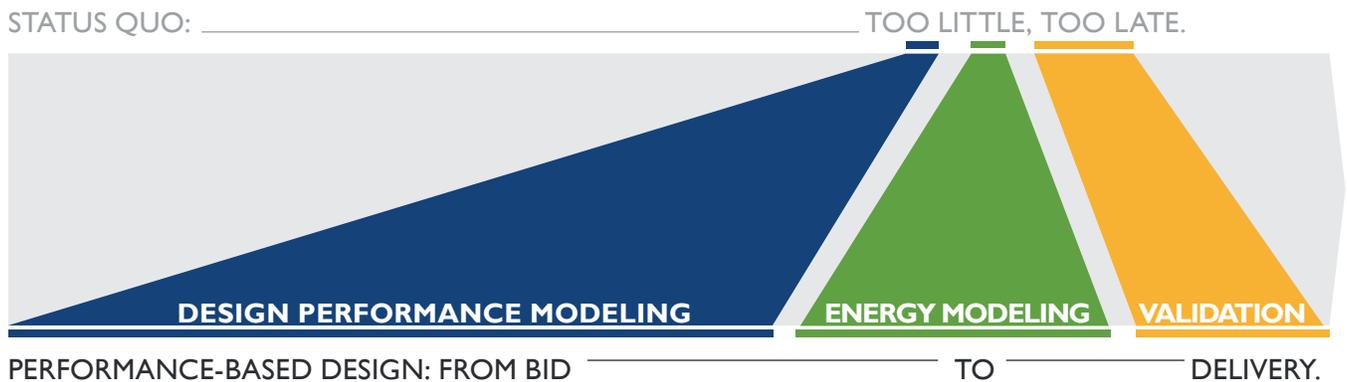


## Our Unique Approach: Performance-Based Design

“Performance” is not just about energy use or a carbon footprint; it’s about delivering the optimum occupant experience while maintaining competitive capital and operational costs.

Achieving performance requires a unique approach to design: whereas a typical approach is guided by assumptions and rules of thumb, our approach uses hard data and rigorous analysis to achieve targeted levels of performance.



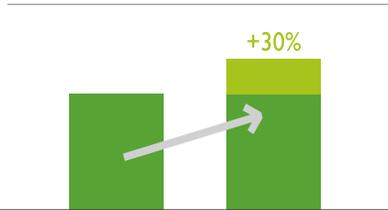
We use cutting edge tools that deliver performance analysis quickly and accurately in the early phases of design, where it matters most. We employ a nimble, iterative process that ensures building performance goals are tracked and maintained throughout the project.

This approach enables us to consistently provide the highest level of building performance possible, while avoiding bolt-on strategies and late-stage changes that can drive up project costs.

## Why Performance-Based Design?

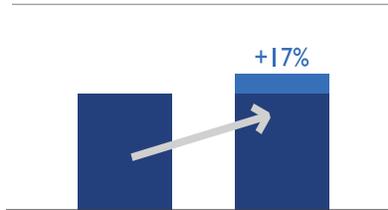
The best buildings - those with higher rental rates, higher occupancy, and less tenant turnover - are high-performing buildings:

### Higher asset value:



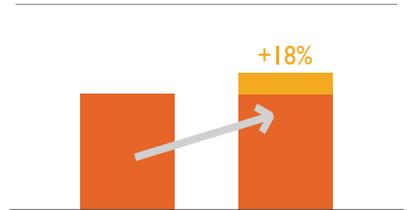
High performance buildings have shown price premiums of up to 30%, driven by higher rental rates & higher occupancy.

### Increased rental rates:



High performance buildings increase rental rates up to 17% and occupancy rates up to 23%. Owners also see lower operating costs, and lower replacement costs of smaller HVAC systems.

### Improved productivity:



Good daylight, views & thermal comfort leads to improved employee productivity (+18%), improved learning in schools, and improved recovery rates in hospitals.

Source: World Green Building Council, "The Business Case for Green Building," 2013

The industry is changing. Performance-based design is the best approach to meet both the increased demand for high-performance and tightening regulations.

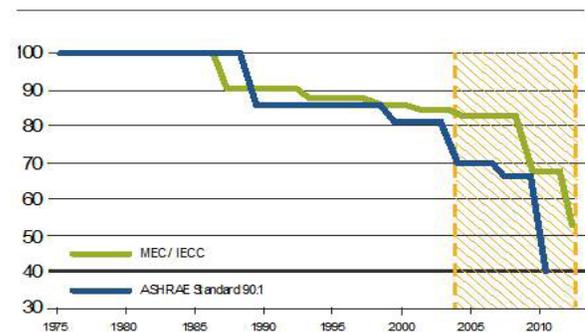
### Market demand is growing:



The market for new high-performance buildings has grown eight fold since 2005, and will be 55% of the market by 2016.\*

\* McGraw Hill Construction, 2012

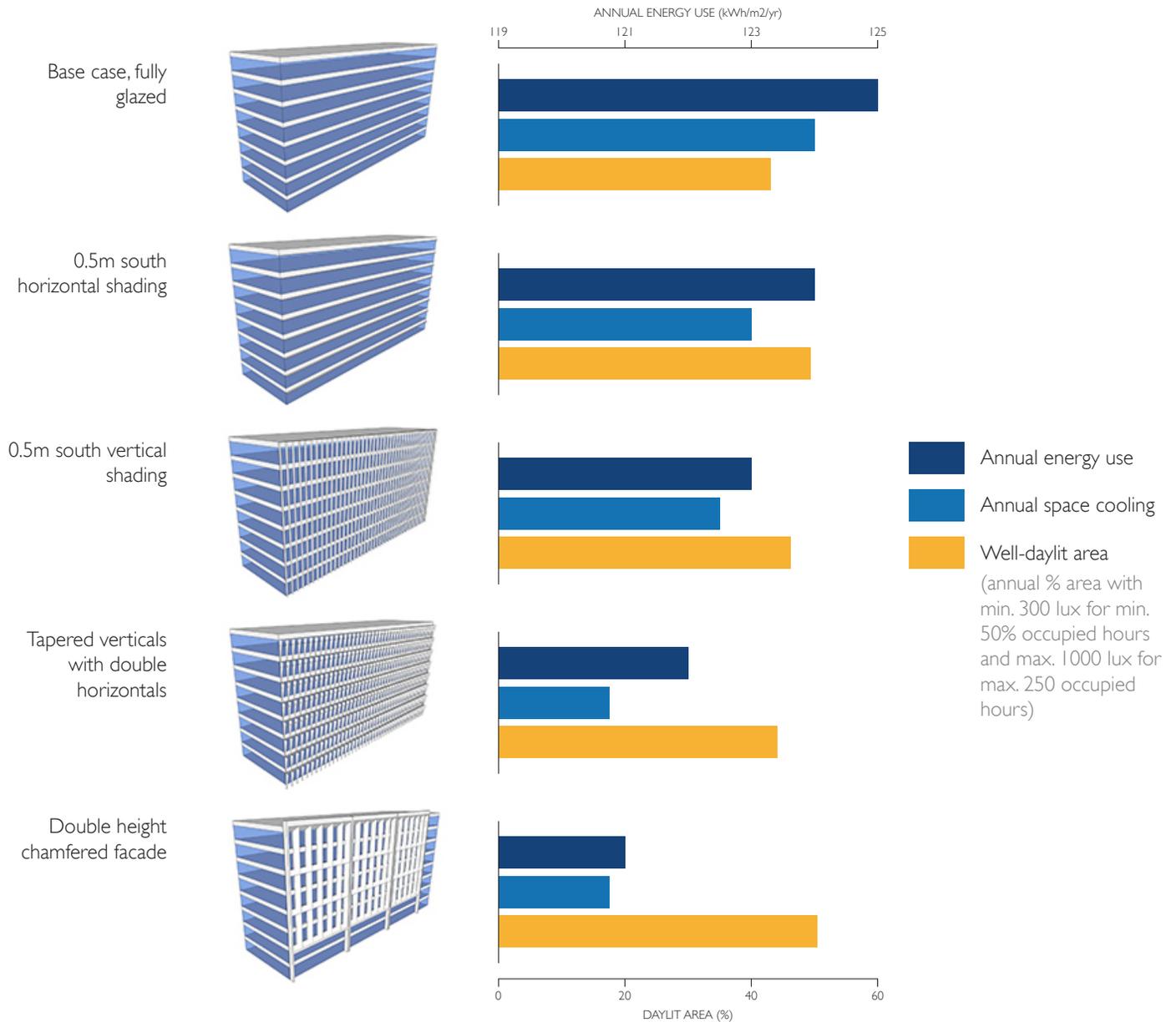
### Codes & standards are getting stricter:



A 30% improvement in ASHRAE 90.1 since 2004 will make standards like LEED harder to hit.\*\*

\*\* McGraw Hill Construction, 2013

## Performance-Based Design in Action

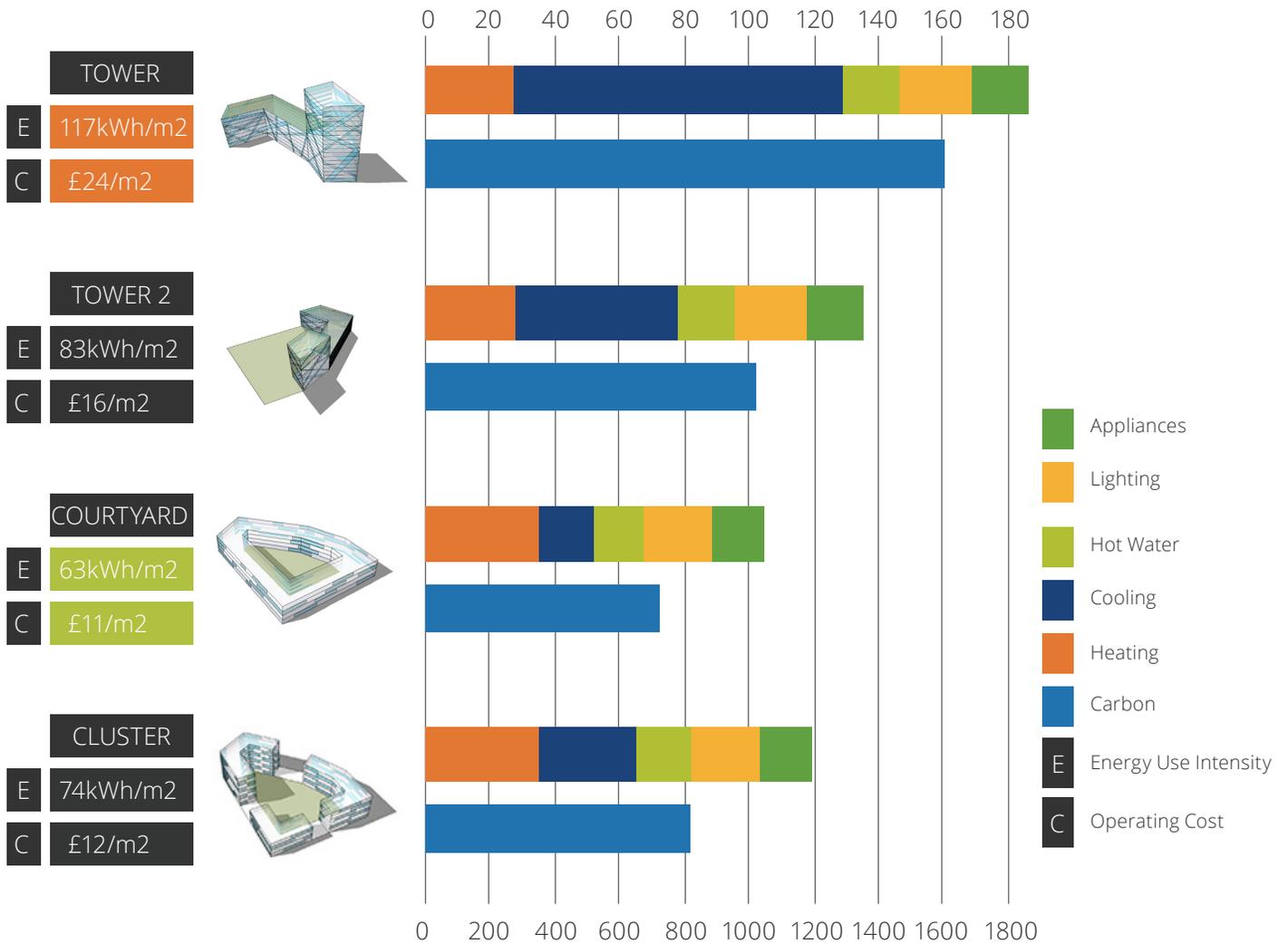


## Glazing and Shading Studies

Natural light is a key component of occupant comfort, but can also drive cooling loads and energy use, which in turn affect capital and operational cost.

We use analysis to balance multiple interrelated factors that affect building performance: glazing ratio, glazing location, glazing material, and the potential impacts of various shading strategies.

## Performance-Based Design in Action

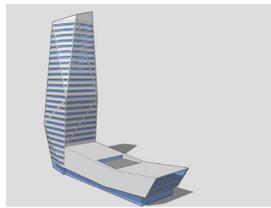


## Comparative Massing Studies

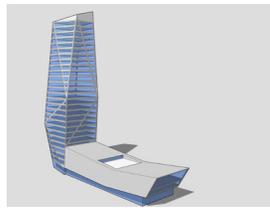
Energy and daylighting performance, as well as heating and cooling, are significantly affected by massing and orientation.

Producing analytical studies of potential design solutions early in the project is critical to delivering targeted built performance.

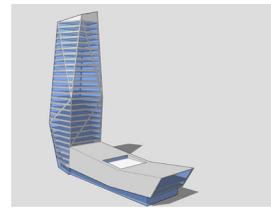
## Performance-Based Design in Action



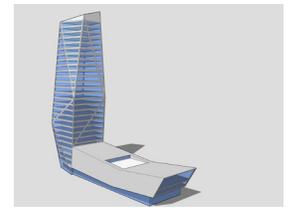
CODE BASELINE  
ASHRAE 90.1-2007



STRATEGY 1:  
Additional Glazing +  
Horizontal Louvers on  
South, East, and West  
Facades



STRATEGY 2:  
Additional Glazing + High  
Performance Envelope



STRATEGY 3:  
Additional Glazing +  
High Thermal Mass +  
Horizontal Shades on  
South and West

|                                |                                   |                                  |                                  |                                  |
|--------------------------------|-----------------------------------|----------------------------------|----------------------------------|----------------------------------|
| EUI                            | <b>107</b> kWh/m <sup>2</sup> /yr | <b>85</b> kWh/m <sup>2</sup> /yr | <b>82</b> kWh/m <sup>2</sup> /yr | <b>79</b> kWh/m <sup>2</sup> /yr |
| % ENERGY SAVINGS OVER BASELINE | 0%                                | <b>↓20%</b>                      | <b>↓24%</b>                      | <b>↓26%</b>                      |
| ANNUAL OPERATING COST          | <b>£260K</b>                      | <b>£228K</b>                     | <b>£222K</b>                     | <b>£213K</b>                     |
| % COST SAVINGS OVER BASELINE   | 0%                                | <b>↓12%</b>                      | <b>↓15%</b>                      | <b>↓16%</b>                      |
| PEAK COOLING LOAD              | <b>425</b> tons                   | <b>469</b> tons                  | <b>434</b> tons                  | <b>393</b> tons                  |
| DAYLIGHTING (sDA)              | <b>64%</b>                        | <b>80%</b>                       | <b>82%</b>                       | <b>80%</b>                       |

### Feasibility Analysis:

*Net Zero Energy / BREEAM / Architecture 2030 / LEED / Passivhaus / Part L*

The decision to pursue a building certification demands a comparison between the potential benefits and the required investment of time and resources.

Early feasibility analysis can help determine whether or not a certification is attainable and valuable within the scope and constraints of a project. Analysis like that shown above guides our clients in identifying opportunities and mitigating risk from the very beginning of a project, helping to optimize their return on investment.

## Performance-Based Design in Action



## Envelope Optimization

Rules of thumb can only take you so far. By analyzing the impact of material properties on performance, we can confidently and successfully direct the critical elements of early designs toward achieving performance targets.

## Performance-Based Design in Action



### Retrofit Performance Analysis

Bringing a retrofit project up to today's performance standards without breaking the bank is a distinct challenge.

Targeted analysis of peak heating and cooling loads, as well as envelope performance, enables us to avoid costly over-design while meeting performance targets.