



# Carbon Trust “Low Carbon Buildings Accelerator”: Design and actual energy use for refurbishment projects



# Project 1: High Street Bank Branch

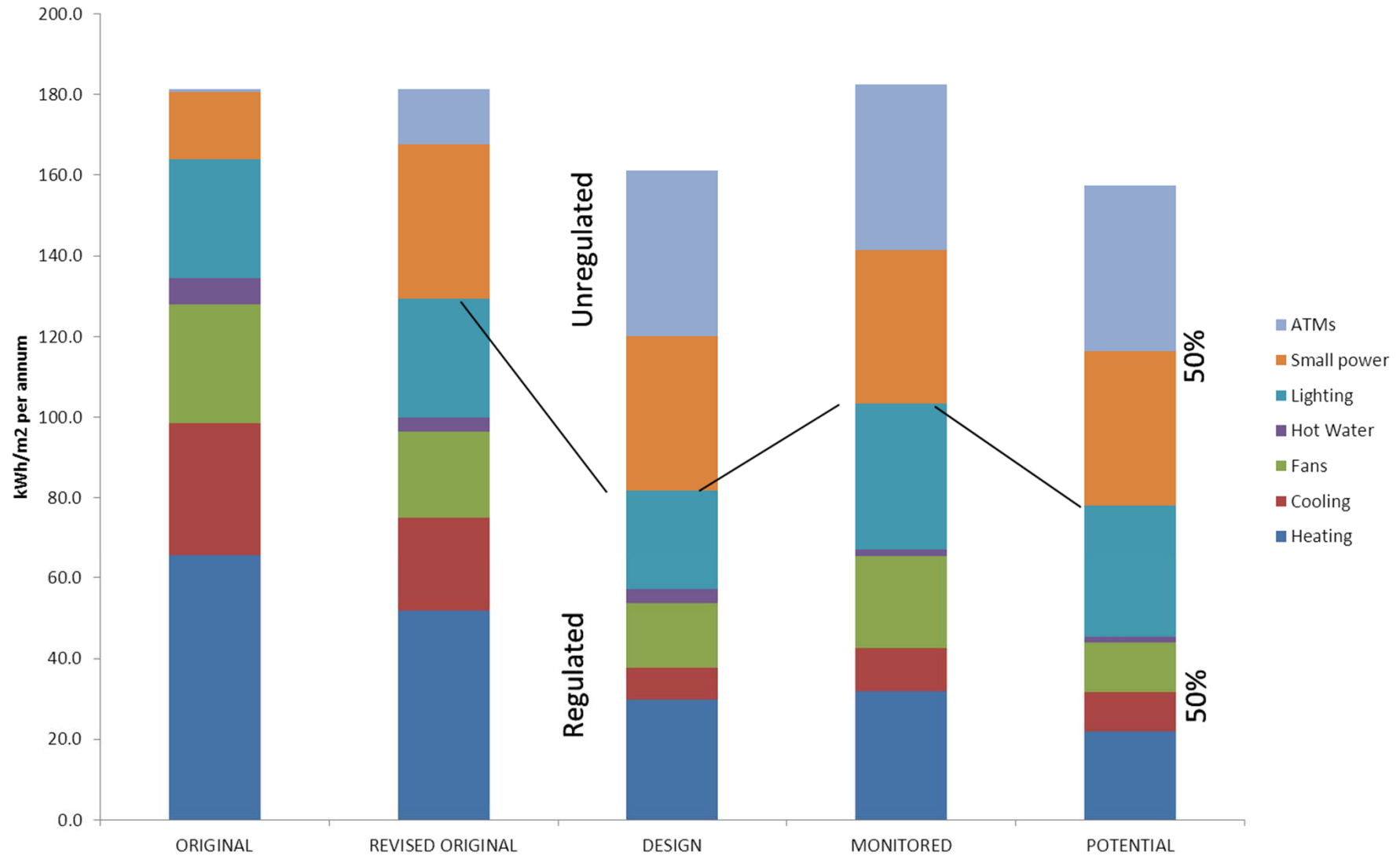


- “Light” refurbishment only
- A fast track refurbishment over a May bank holiday weekend.
- Complete upgrade of all services i.e.
  - Heating, cooling, ventilation, lighting but falling short of a full rewire
- Little opportunity to improve fabric due to security concerns, budget restraints and listing, but a small area of flat roof was improved

# Modelling

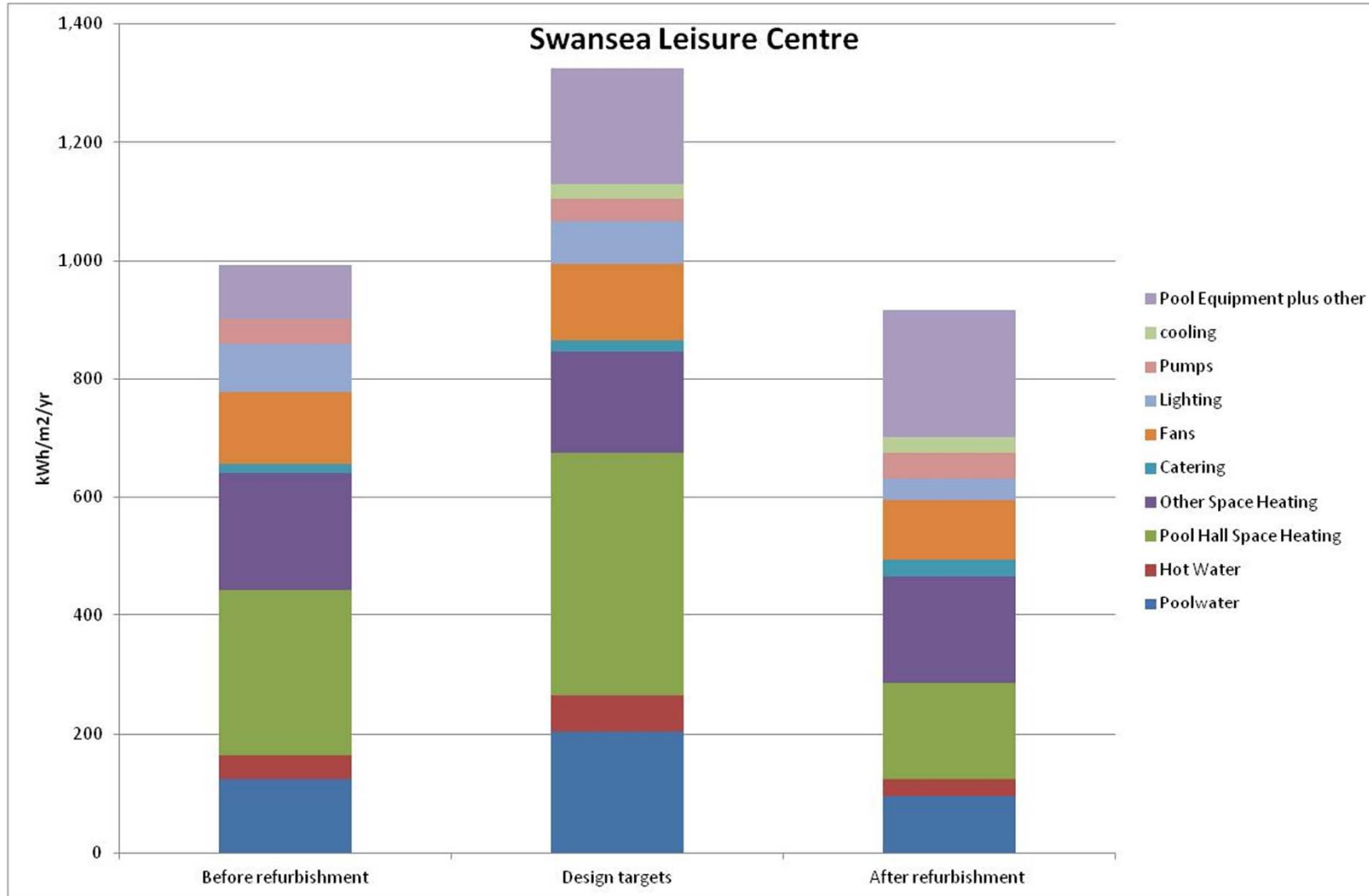
- Due to the small size and simple nature of the building a CIBSE TM22 modelling approach was used throughout
- This proved to be a very robust method of modelling the energy performance of the building throughout the various stages of the project
- As there is no variable flow or modulating control on site it was possible to accurately establish the energy consumption based on “on” and “off” time schedules and rated loads
- Activity logs were programmed into the BMS to record the operation of the presence detectors that control the lighting and heating in the intermittently occupied areas
- This information enable the TM22 model to accurately calculate the energy consumption of these areas

# TM22 Analysis of Energy Use



## Project 2: Leisure Centre

- Original leisure centre opened in 1977 as a 'state of the art' leisure centre with pool.
- Closed in 2003 due to lack of maintenance
- Decided to redevelop as a 'state of the art' waterpark and gym, spa, multipurpose hall & climbing wall.
- Deep refurbishment – the building stripped back to a concrete shell.
  - New building services,
  - building fabric improved through infill of the facade,
  - new roof.

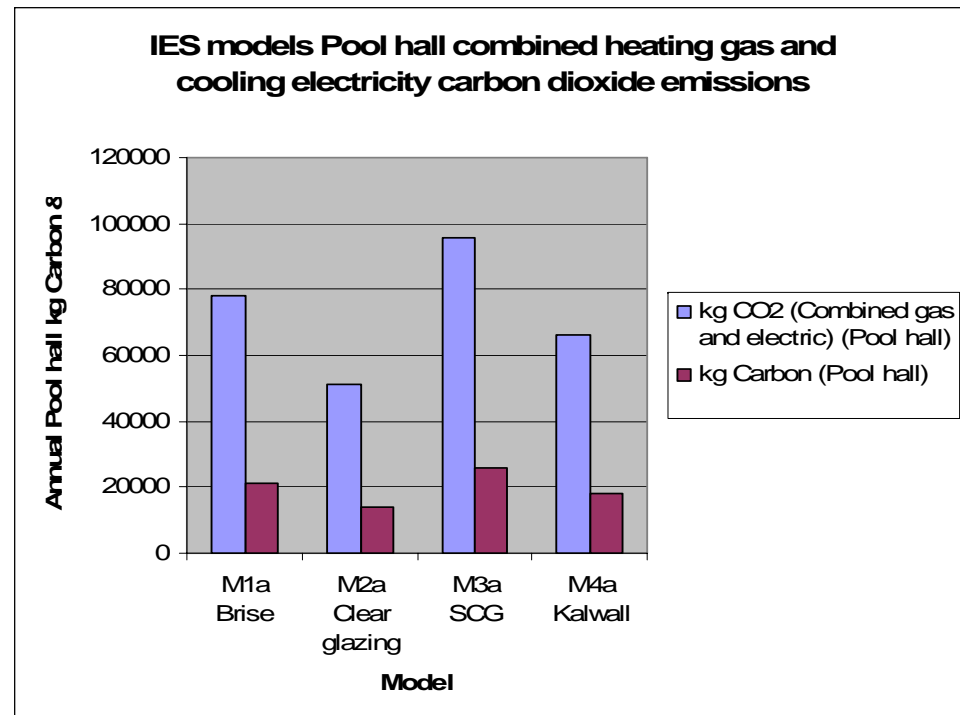


# Pool Hall facade modelling

## 4 options modelled

1. Brise soleil (BS) with clear glazing
2. No BS, clear glazing
3. No BS, solar control glazing
4. Kalwall insulation

The use of Option 2 shown as best as can be made to make use of solar gain to maintain the pool hall conditions.



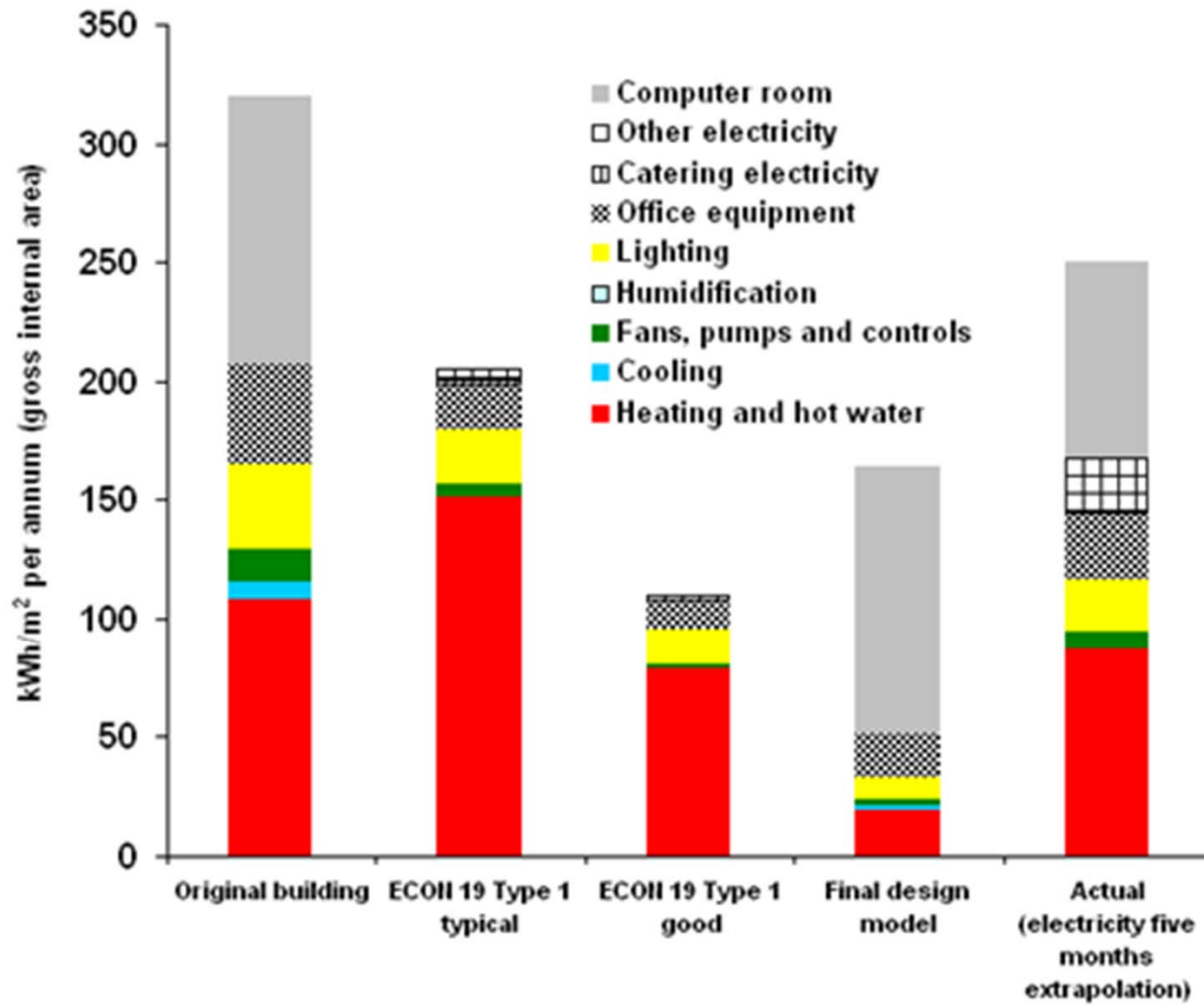
## Project 3: Police Headquarters



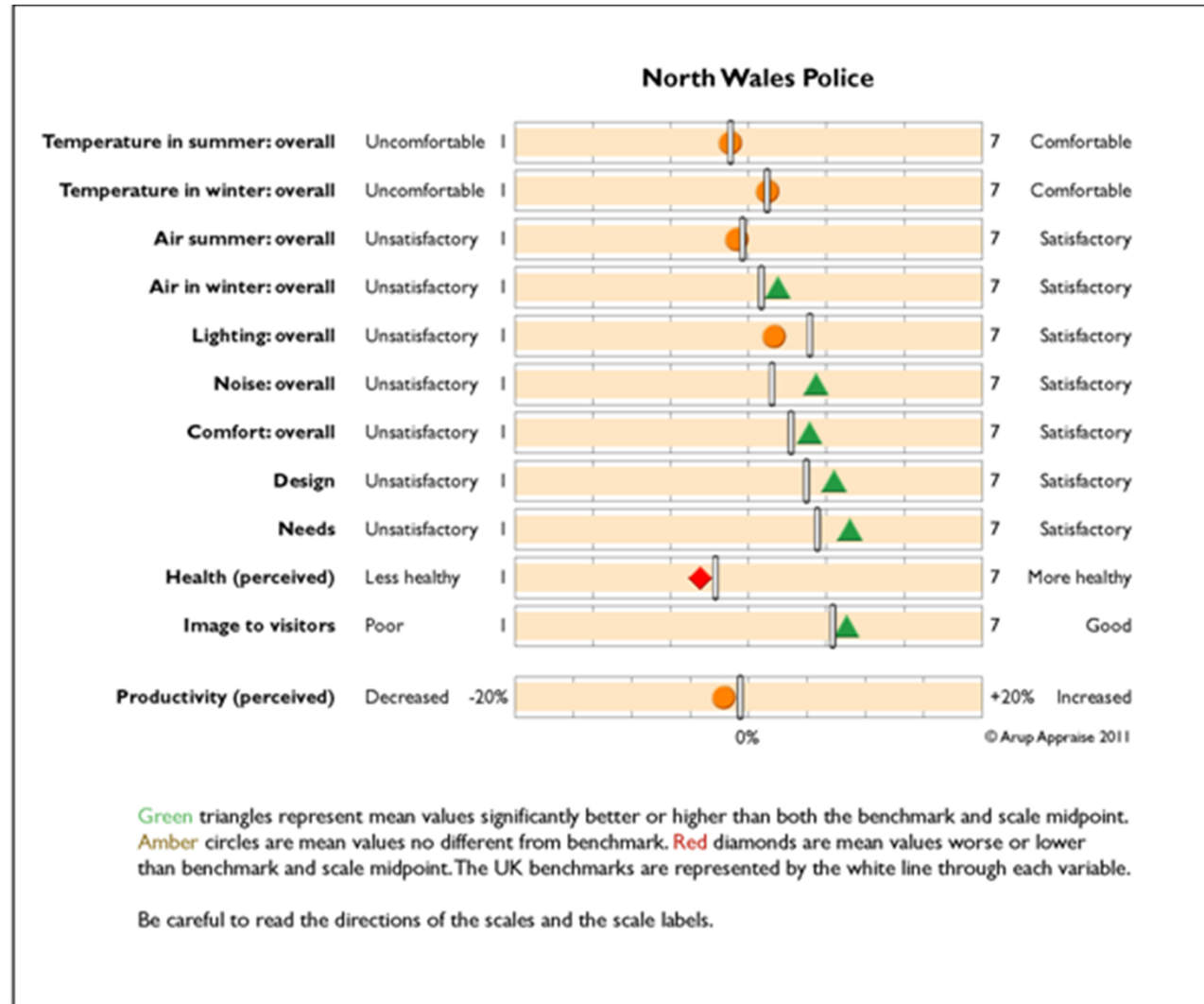
- Police HQ in Colwyn Bay, North Wales.
- NWP wanted to 'upgrade' the building but avoid installing air conditioning
  - Major issues with overheating in certain areas
- Minimising energy usage was a primarily objective for the design team from the start



## North Wales Police administration building energy consumption



# Occupant survey



# Project 4: Council Office refurbishment

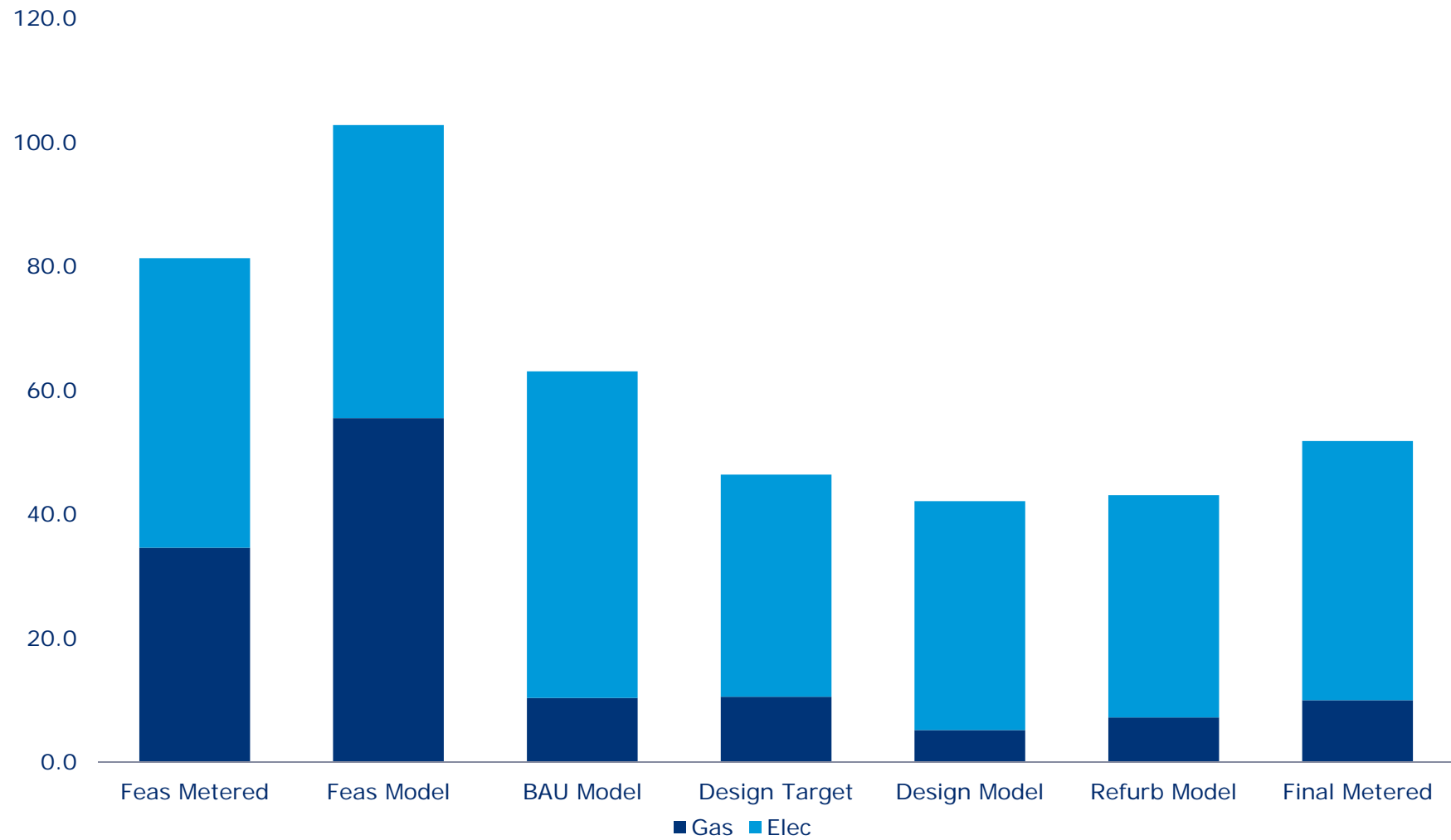


- “Deep” refurbishment
- Complete removal of the original building envelope down to the structural concrete frame
- Replacement of all building fabric
- Construction of a new ground floor on what was the top deck of the car park
- Complete renewal of all services

# Before and After



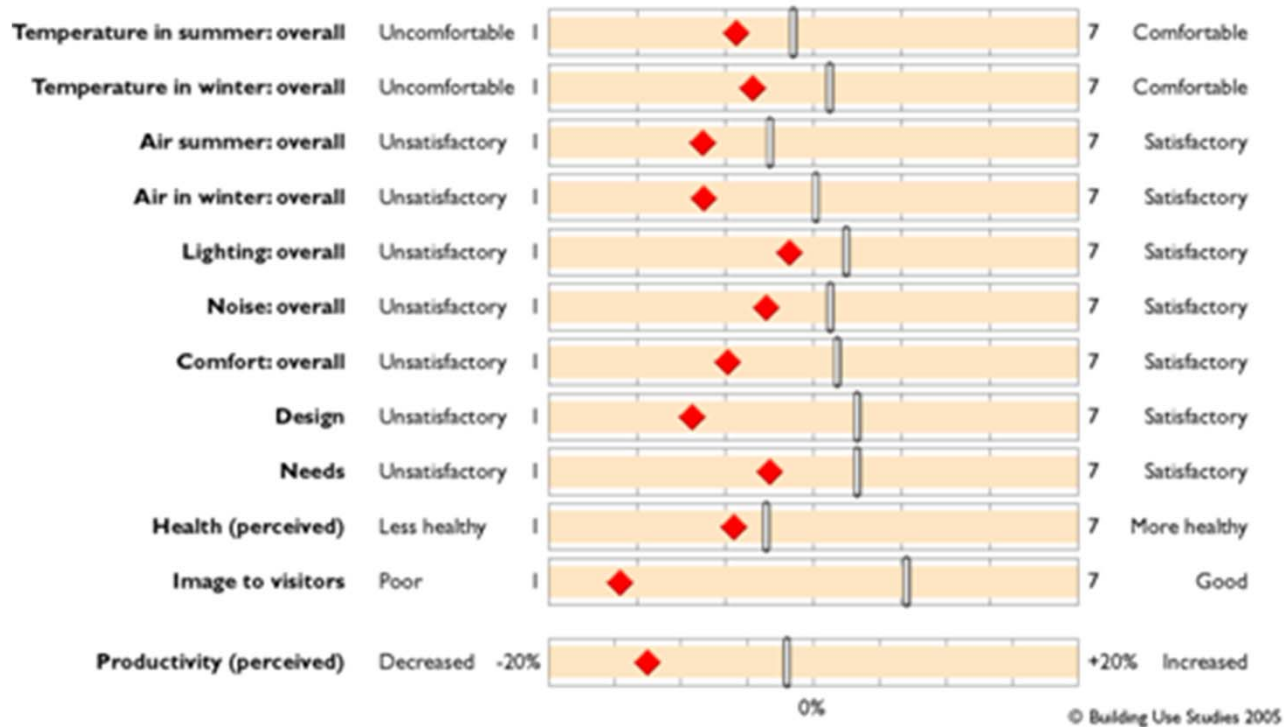
# Carbon savings modelled and actual (kg CO<sub>2</sub>/m<sup>2</sup> per annum)



# Survey before refurbishment



Ashburton Court 2006 survey



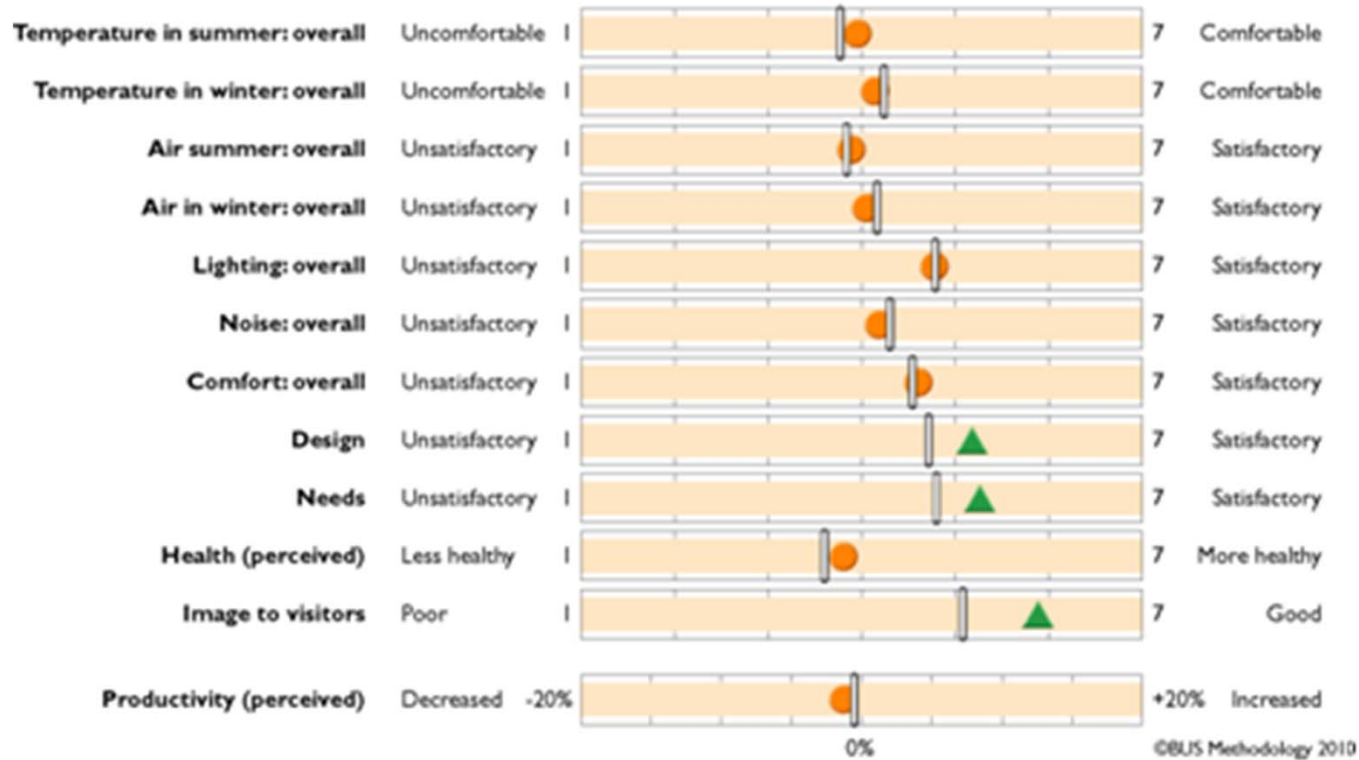
Green triangles represent mean values significantly better or higher than both the benchmark and scale midpoint. Amber circles are mean values no different from benchmark. Red diamonds are mean values worse or lower than benchmark and scale midpoint. The UK benchmarks are represented by the white line through each variable.

Be careful to read the directions of the scales and the scale labels.

# Survey after refurbishment



## Elizabeth 2 Court East



Green triangles represent mean values significantly better or higher than both the benchmark and scale midpoint. Amber circles are mean values no different from benchmark. Red diamonds are mean values worse or lower than benchmark and scale midpoint. The UK benchmarks are represented by the white line through each variable.

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