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Aspirations for new buildings, and actual performance data

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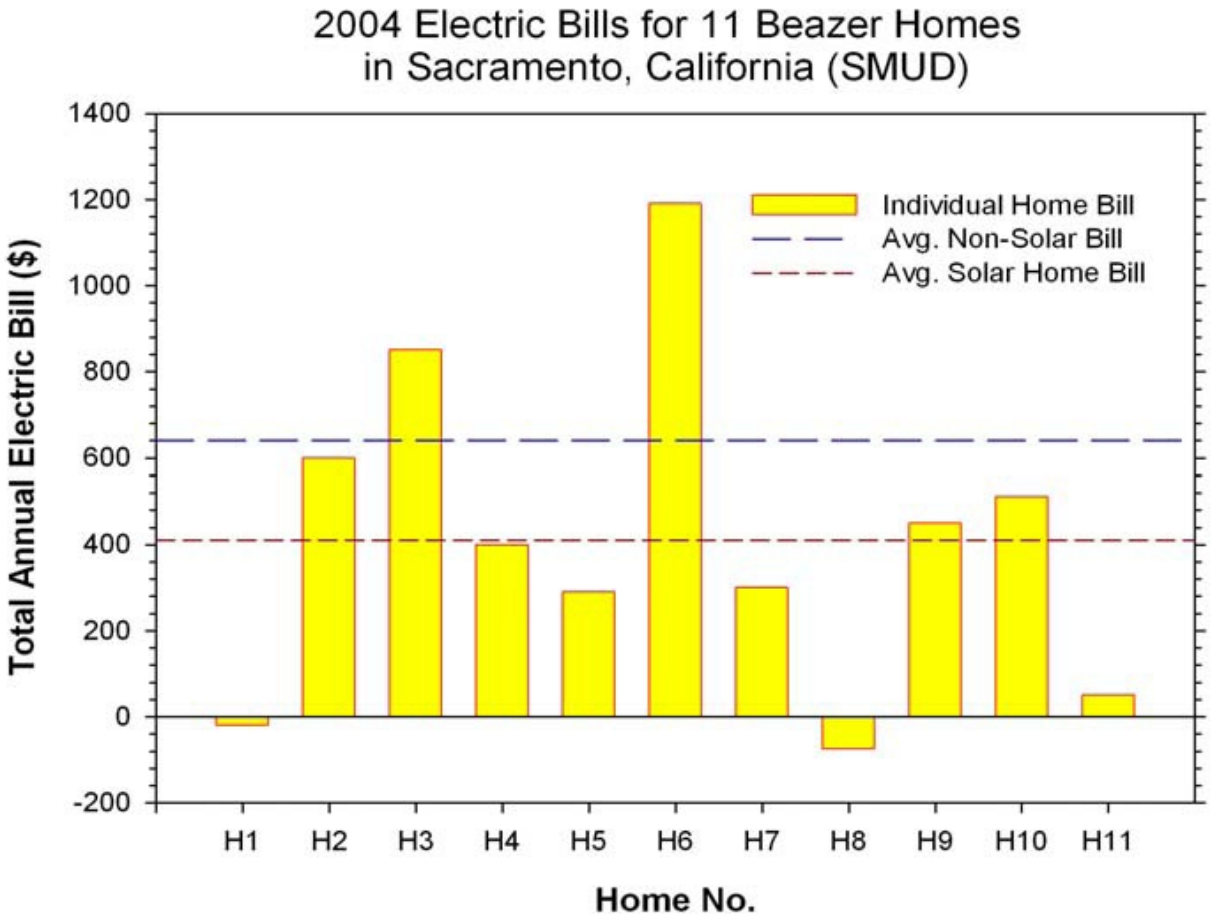
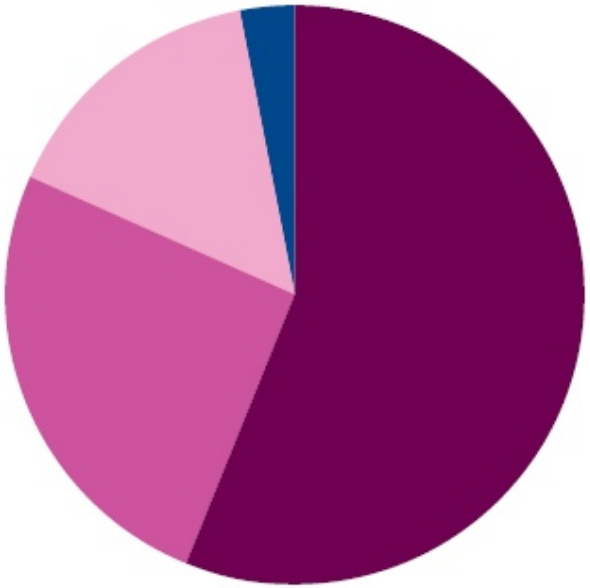
Zero-energy homes?

- Solar PV + well-insulated + efficient appliances in new Sacramento homes

Bills for 11 identical ‘zero-energy’ homes: slapping solar PV on buildings is only effective up to a point … and arguably doesn’t address core issue of affordable, low-impact energy services



UK energy use in homes



Heating homes 57%
Heating water 25%
Appliances & lights 15%
Cooking 3%

Source: Department of Energy and Climate Change, Energy Trends (September 2008)

Smart design?

Sigma demonstration home, built to CSH level 5 – zero-C apart from appliances

All the family complained about … feeling unable to do much apart from opening windows.

'a significant amount of [induction] time was spent describing straightforward items such as windows and kitchen units, while more complex items such as lighting and heating controls were glossed over by referring the user to the guide book... The family did not use the book but tended to rely on trial and error, which didtn' work for heating, ventilation and lighting.

(Stevenson and Rijal, 2008)

Inevitable consequence … higher than design consumption, due to design and lack of understanding of HVAC

Midnight Oil project background

Managing and reducing carbon emissions is not a priority for the HE sector. In order to contribute to the UK's target of 60% emissions reduction by 2050, the sector should be reducing its emissions by a minimum of 2% per year. The data, incomplete as they are, have shown that, to the contrary, emissions from the sector are rising by more than this rate per annum.

... Oxford target of 20% carbon saving by 2010 over 1990 levels stands out as 'precise and ambitious', far from typical of university environment policies.

(Fawcett T, 2005. Energy use and carbon

From aspiration to reality ...

Oxford's emissions for 1990-91 were 40,873 t CO_2 - and had almost doubled to 80,118 t CO_2 by 2009-10.

Even allowing for expansion of the University estate over this period, emissions rose by 15% from 124 to 143kg CO_2/m^2.

(AECOM: carbon management baseline report)

How is this happening?

'Midnight Oil' study to investigate usage in four large 24-hour research buildings.

Buildings side by side

	Annual kWh (Gas)	Annual kWh (Electric)	m^2	kWh/ m^2	Researchers	kWh/ Researcher
BioChemistry	2,548,771	5,197,487	12,008	645	325	23,835
Gene Function	704,994	789,248	2,724	549	200	7,471
Old Road Campus Research	4,486,169	6,452,070	12,599	868	400	27,346
Chemistry	6,715,324	6,441,336	15,772	834	578	22,762

These four account for 16% of University energy /carbon (OUED)
50 labs account for 74%
All four have a high degree of central control

Summary

Most new buildings are failing to live up to promise, because of

- fundamental design flaws / overspecification
- construction errors
- normal variations in usage/comfort standards
- lack of understanding and appropriate controls – information is not enough

If low-carbon aspirations are not being met even by new buildings, important not to assume that 'new building' approach (including 'smart' controls) will work in old buildings. We need more real-life data, quant and qual.