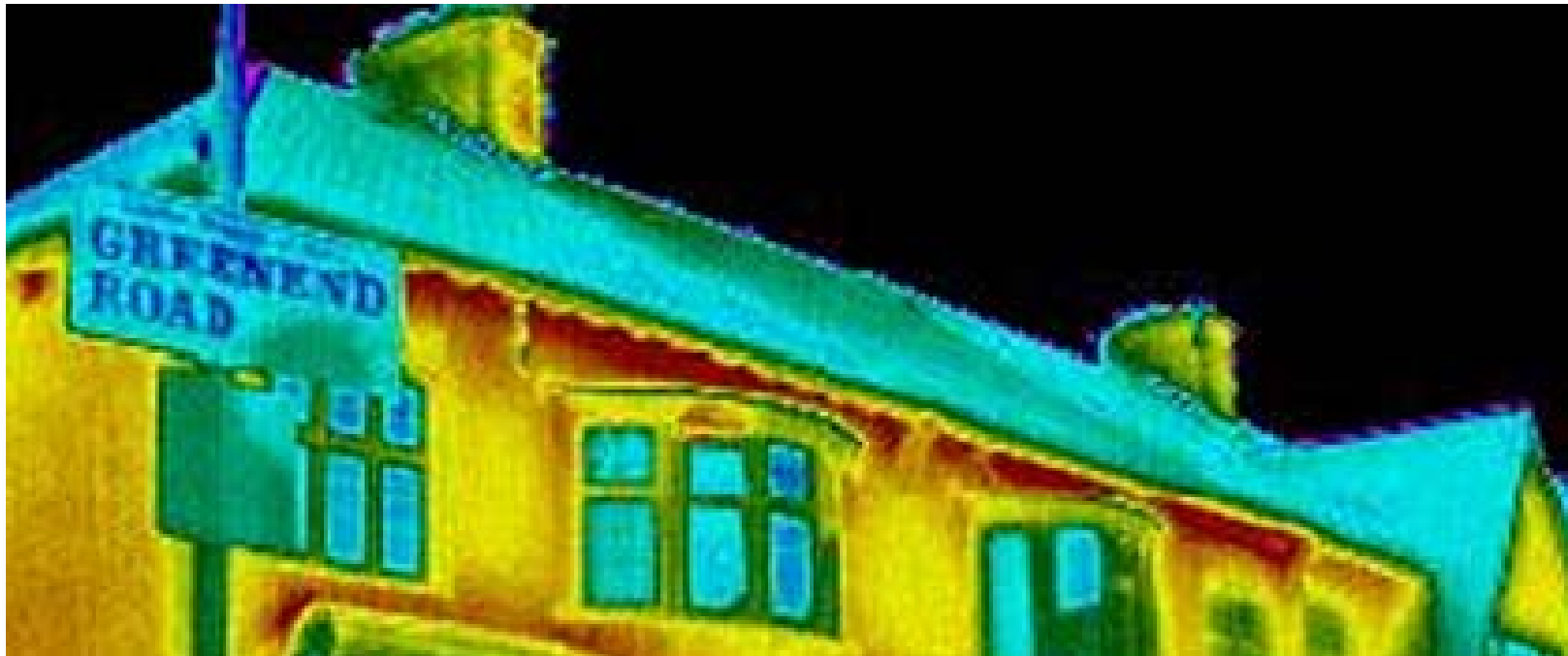




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## **Green Streets: Analysis and policy implications**

### **- Initial Results**

July 2008

Matthew Lockwood

Climate Change Team



# Overview

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# Summary of conclusions

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- Based on the data from British Gas and the interviews conducted so far:
- The Green Streets competition has led to large (20%+, 30% in Leeds) and so far sustained average energy and carbon savings in most cities
- Initial analysis of the data suggests that behavioural change is playing a big role alongside installed measures
- Some highly motivated households are close to halving their energy use
- But there are also a small number of households with increases in energy use. Some of these may be explained by changes in circumstances (e.g. having a baby since the start of the competition), but others need further investigation



# Summary of conclusions

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- The nature of the competition meant that people felt the information they were given on energy saving was trusted
- The back up from the energy efficiency experts and BG more widely was important
- The competition element has been important for motivating behaviour change
- Green Streets has had a positive impact on community spirit and neighbourliness in some of the streets



# Summary of policy recommendations

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- Based on our interim analysis of Green Streets, our initial policy recommendations are that Government should work with the energy supply industry to:
  - develop a dedicated network of independent neighbourhood-based energy advisers
  - develop finance packages for energy saving measures. Requirement for energy efficiency upgrades at the point of sale would kick-start the green mortgage market. A feed-in tariff for solar-PV is also likely to lead to finance packages
  - put in place competitions for saving energy at street, neighbourhood, city and national levels



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# Introduction to Green Streets – the issue

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- Domestic energy use in the UK is responsible for around 25% of the UK's CO<sub>2</sub> emissions...
- ...and makes up 58% of CO<sub>2</sub> emissions from the average individual's direct energy use, including home energy, driving and flying<sup>1</sup>
- This is an average of 4.5 tonnes per home
- The UK Government wants all new homes to be "Zero Carbon" by 2016
- But around 90% of homes that will be standing in 2020 have already been built
- Existing homes are the big problem

1. Retallack et al (2007) *Positive Energy* (London: ippr)



# Introduction to Green Streets – the concept

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- Green Streets is a unique social experiment in energy and carbon savings
- A year-long challenge to reduce energy use and emissions by as much as possible
- 64 households - 8 each from a street in 8 cities (Birmingham, Cardiff, Edinburgh, Leeds, London, Manchester, Southampton and Plymouth)
- A mix of British Gas and non-British Gas customers, with no requirement to switch suppliers to take part
- Competing for a prize of £50,000 to spend on a community project if the participants' choice



# Introduction to Green Streets – measures and data

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- British Gas supplied up to £30,000 of energy savings measures (e.g. insulation, low energy lighting, A++ rated appliances, high efficiency condensing boilers, solar thermal and PV) to each street
- Households in each street also backed up by a British Gas dedicated energy efficiency expert
- In each street, households jointly decided how to spend their budget
- Measures were installed at the end of January 2008
- Energy use data (gas and electricity) now being recorded monthly, and compared with 2007 benchmark, corrected for differences in weather



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# Methodology

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- **Quantitative data**
  - 64 original participants
  - 1 dropout
  - Assumed data for some households excluded from analysis, leaving 50 data points for gas and 46 for electricity
  - Of these households, c.25-30% of 2007 baseline data based on estimated meter reads
- **Qualitative data**
  - Face-to-face interviews with 12 households
  - Selected on basis of large energy savings or increases



# Caveats

- Self-selecting group of participating households
- 25-30% of baseline meter readings involved minor estimations
- Limited number of face-to-face interviews
- Initial data analysis and policy implications



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# Motivations

- Motivations for taking part in the project were both financial and environmental:

*The green agenda was interesting, I think that more than anything...we were really interested to see what things they would do to improve the energy performance of the house - London*

*We wanted a free boiler, to be honest.... We thought it'd be good for the kids to get involved and you know appreciate the fact that what it costs and what can be saved" - Birmingham*

*"Both financially and environmentally and let's be honest if you're going to get people involved financial will come before the environmental, and if you can get both together you're onto a winner." - Southampton*



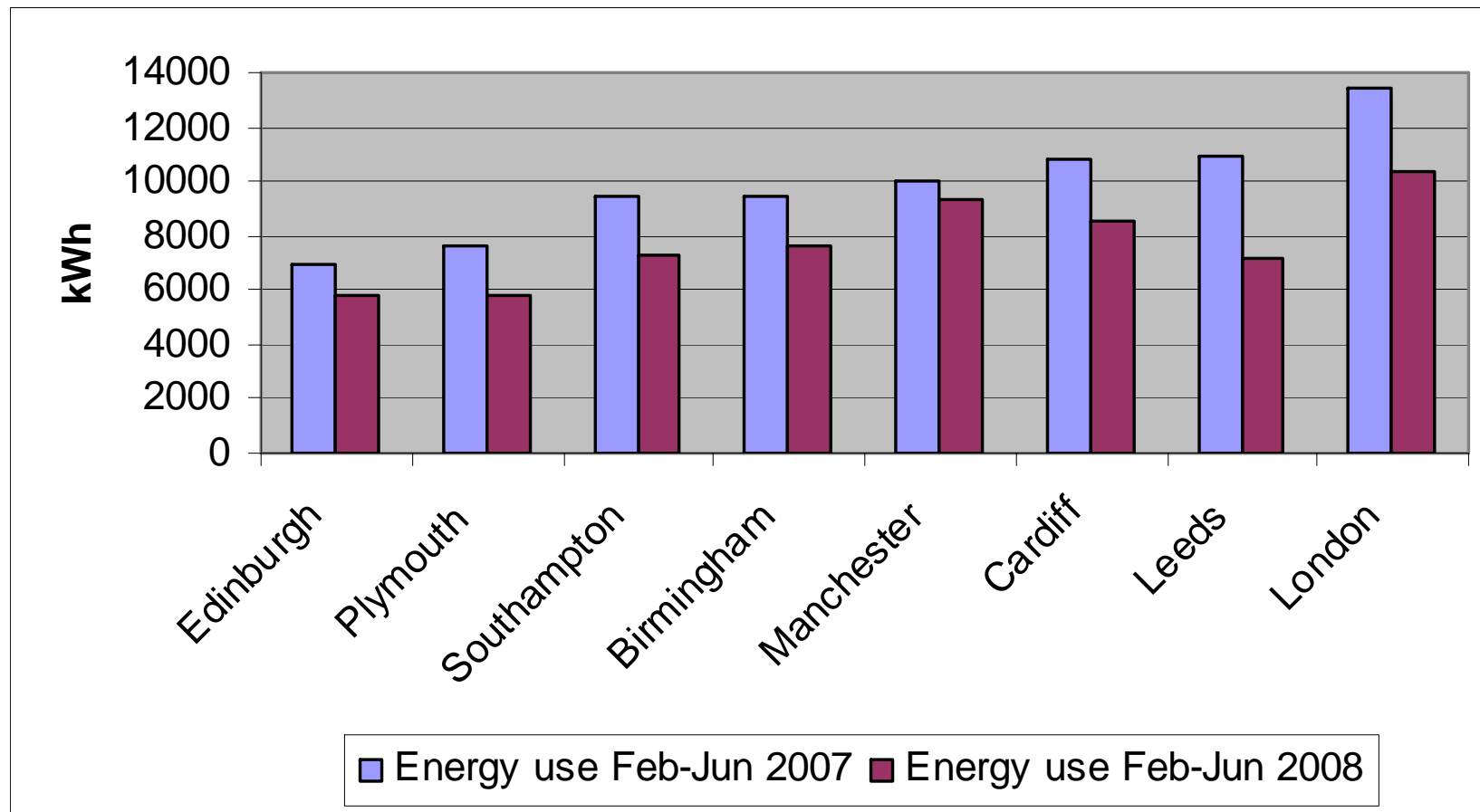
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# Green Streets energy savings have been substantial so far...

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Average household energy use, February to June 2007 and 2008

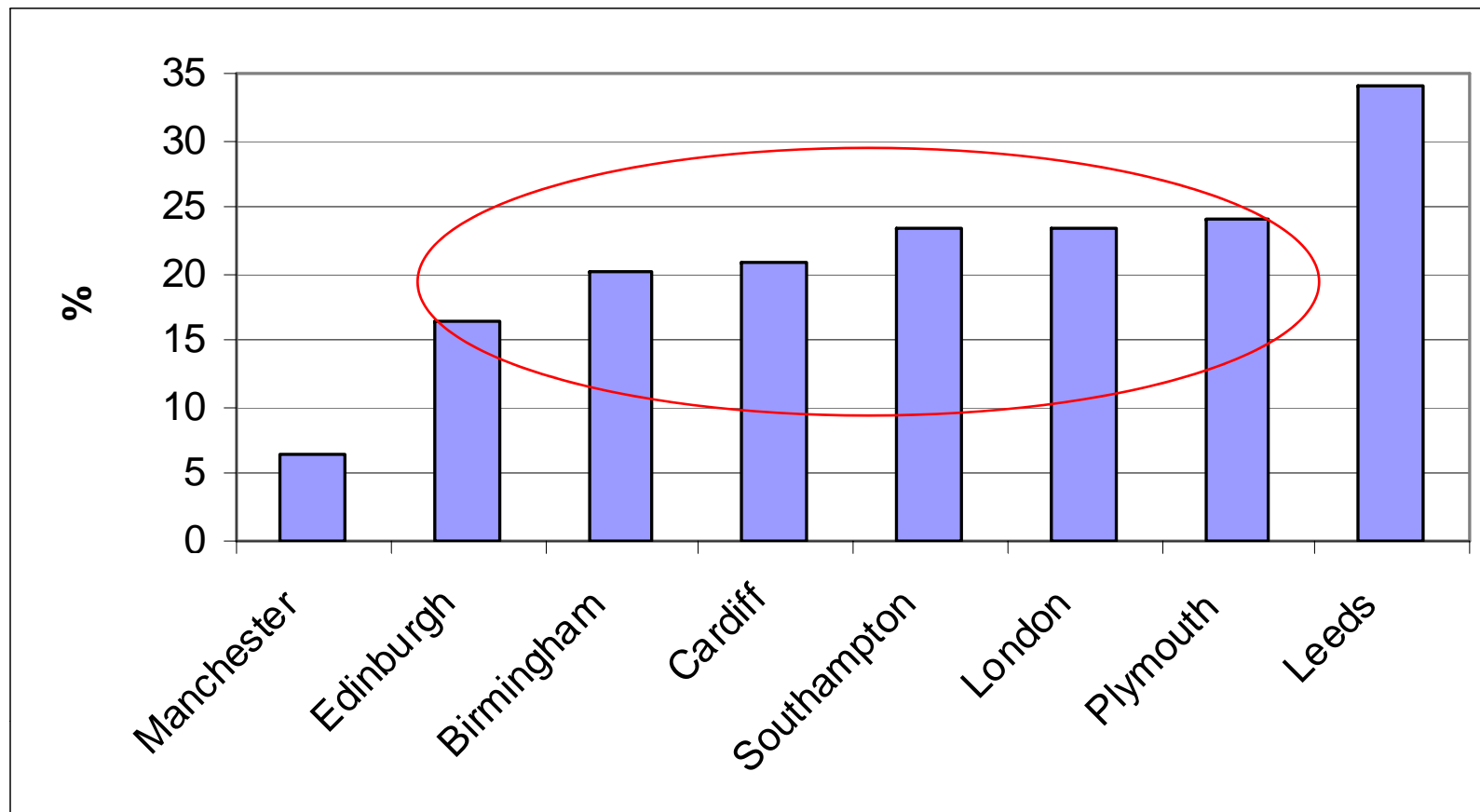




...with most streets achieving between 15 and 25% energy savings...

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### Energy savings in GS households, Feb-June 2008 from 2007 baseline

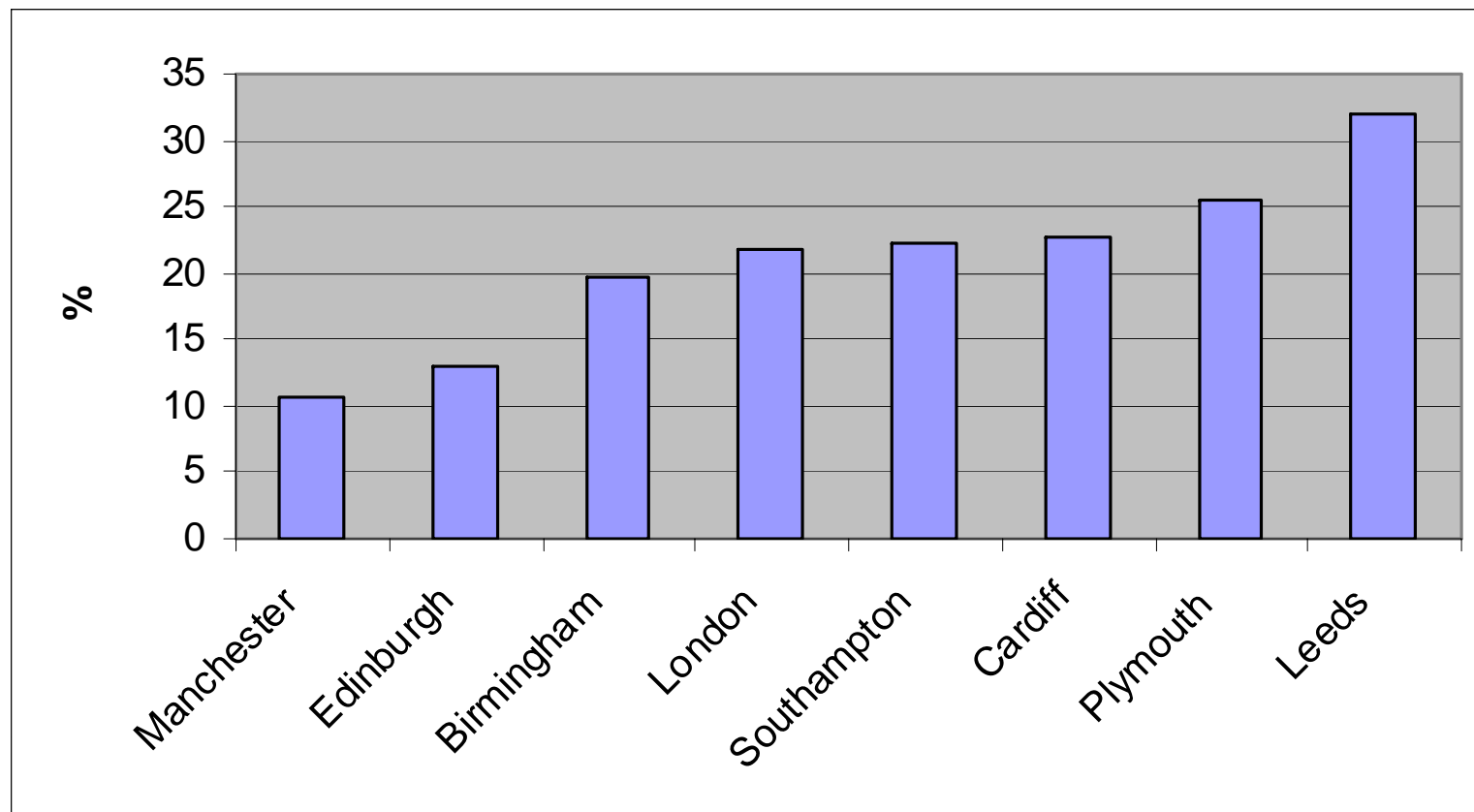




## ...and cuts in carbon emissions averaging 20%

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### Reductions in carbon emissions from GS households, Feb-Jun 2008 from 2007 baseline

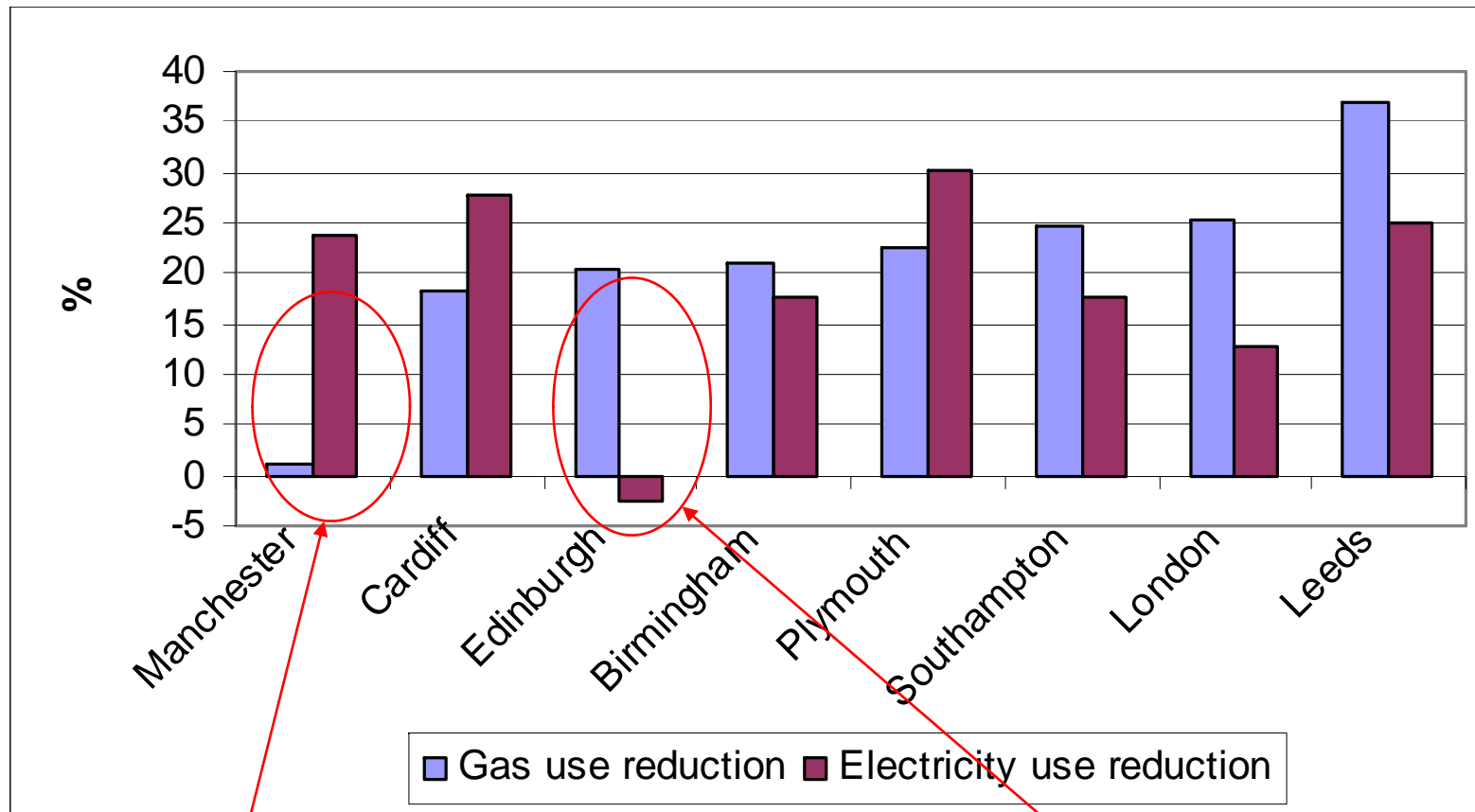


Calculated using factors from DEFRA Guidelines for Company Reporting on Greenhouse Gas Emissions



# Gas savings are most consistent...

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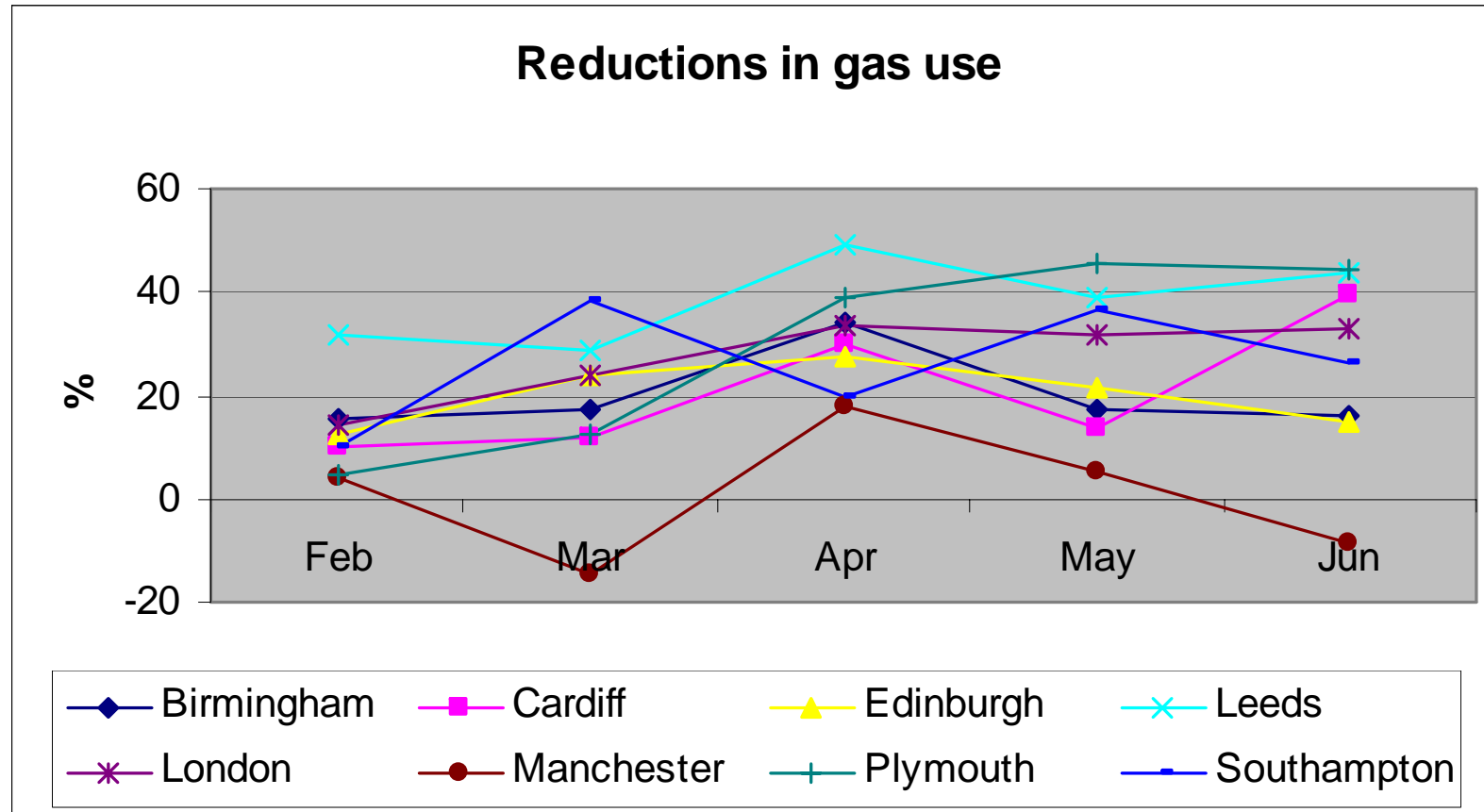
Manchester is an outlier on gas

Edinburgh is an outlier on electricity



# Energy reductions are holding up over time...

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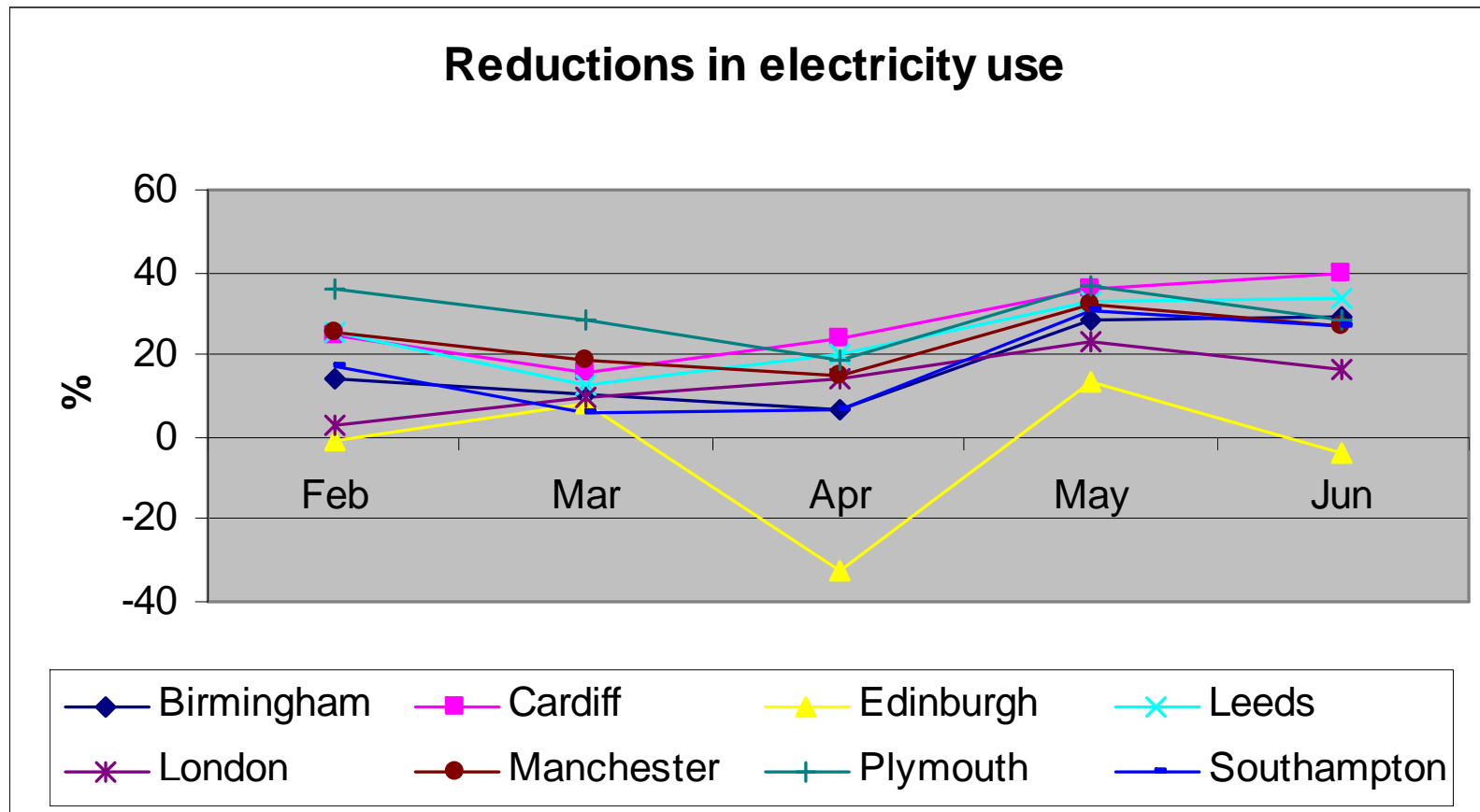


***“We will sustain the changes in habits...they have now become, over the past 4 to 5 months...almost second nature” - Southampton***



# Energy reductions are holding up over time...

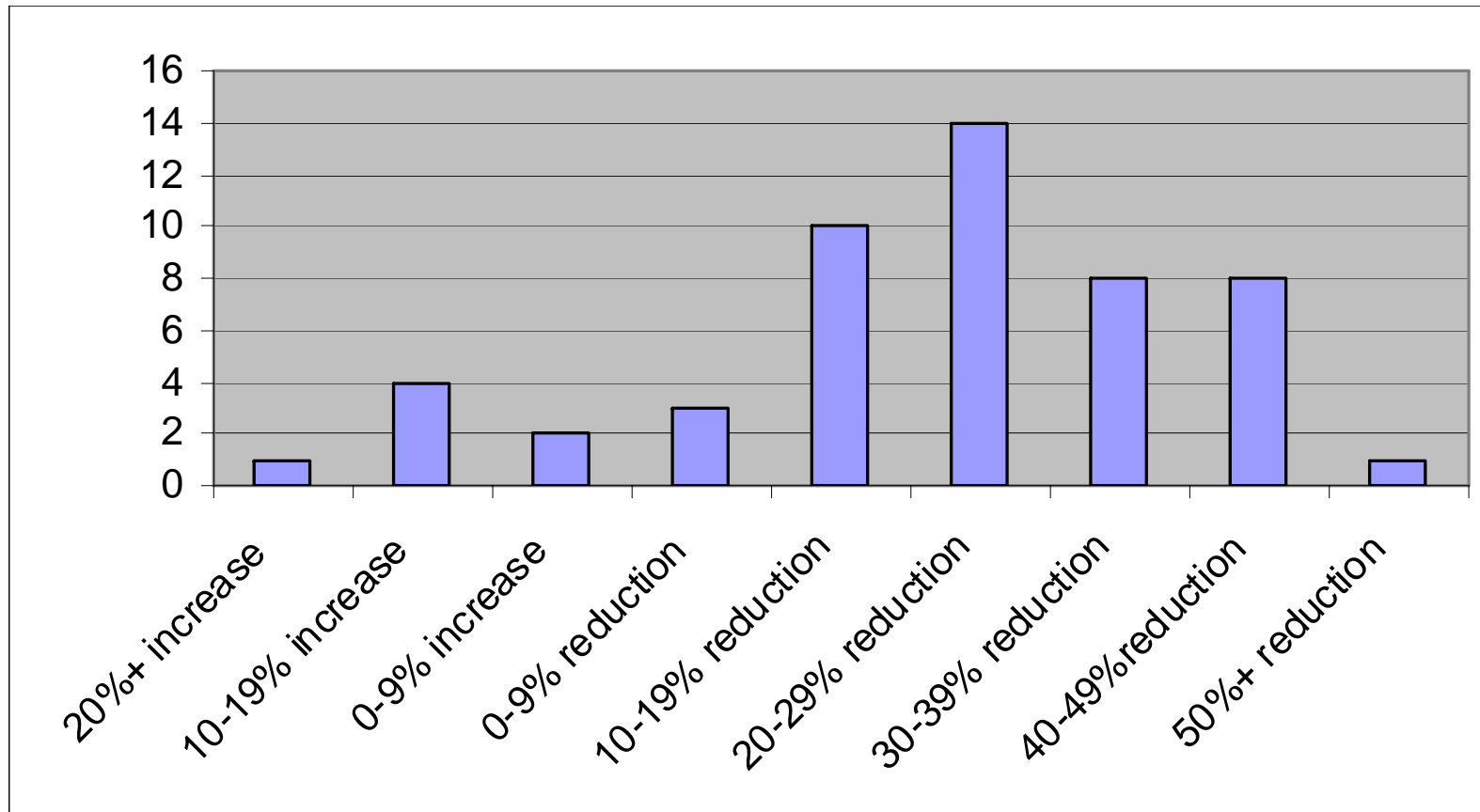
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# Large spread in individual gas use changes...

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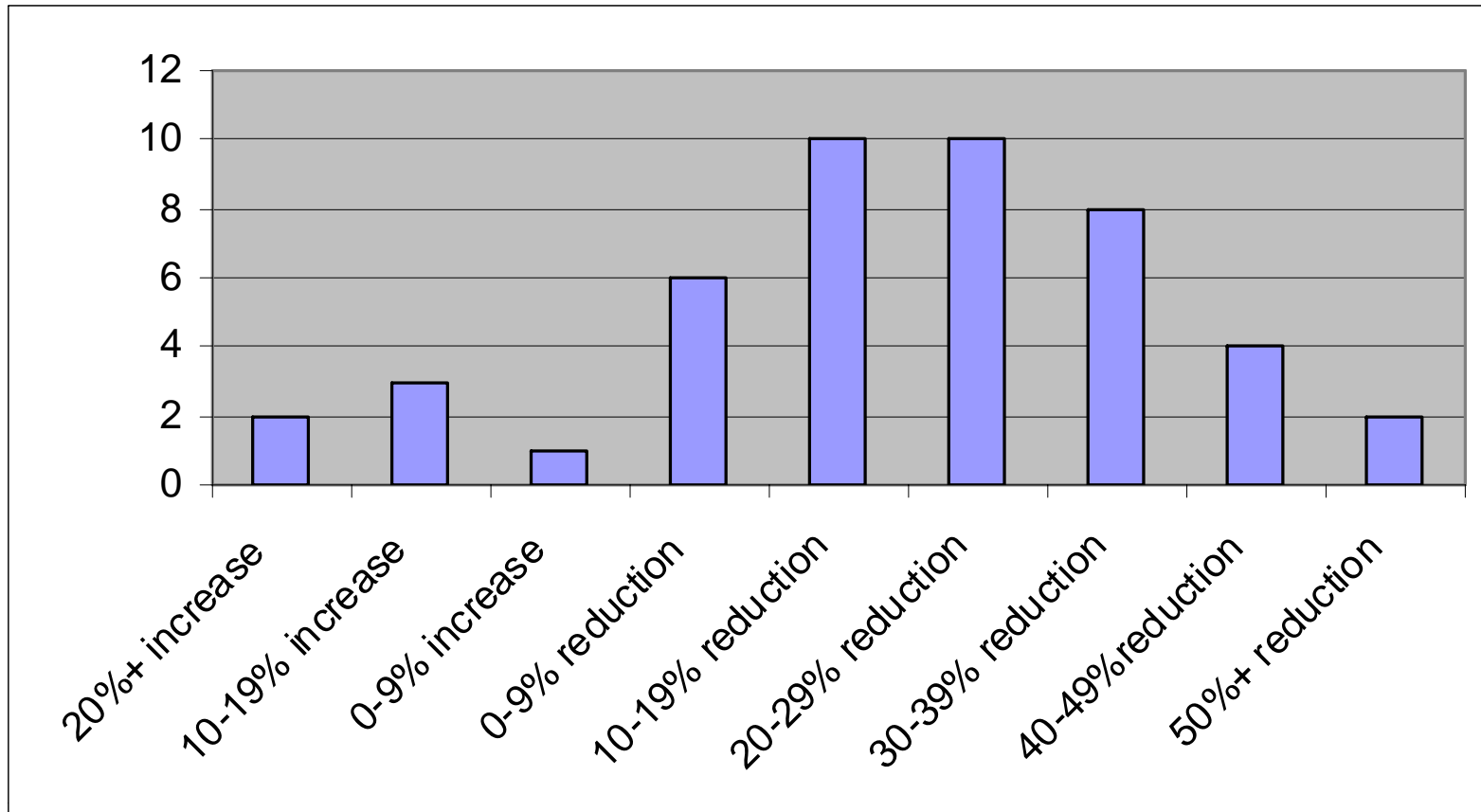


**Individual gas use changes, Feb to Jun 2008 from 2007 baseline**



# ...and in individual electricity use changes

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**Individual electricity use changes, Feb to Jun 2008 from 2007 baseline**

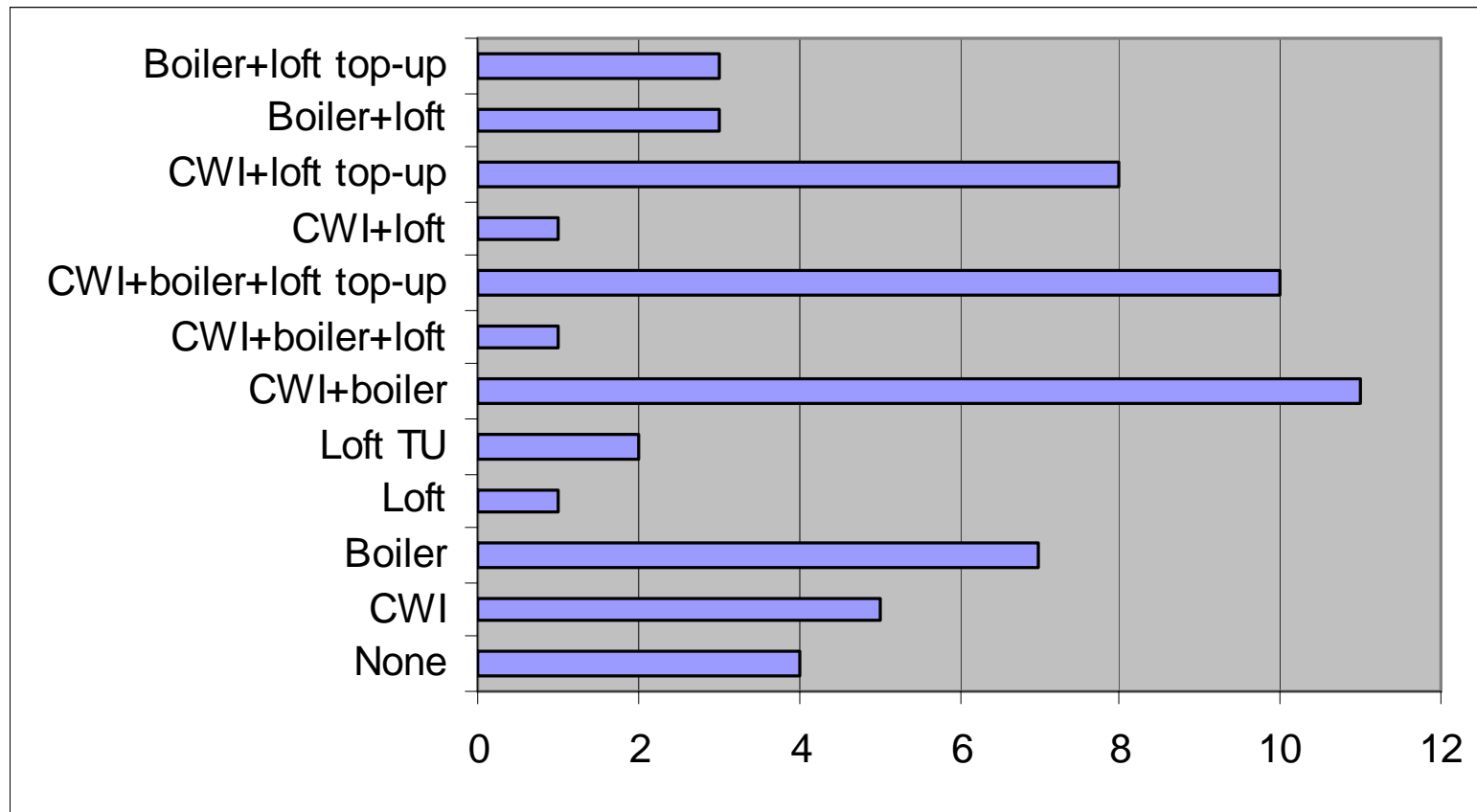


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# Almost all houses had some major heat measures installed...

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**Key: CWI = cavity wall insulation; Boiler = condensing boiler; Loft = loft insulation; Loft top-up=loft insulation top-up to 250 mm**



## Installed heat measures will have an effect...

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- Expected annual gas savings from heat measures:
  - Cavity wall insulation = c.15%
  - New condensing boiler = c.9%
  - Loft insulation = c.7.5%

Source: Illustrative Mix of measures for CERT 2008-11, available on-line at:

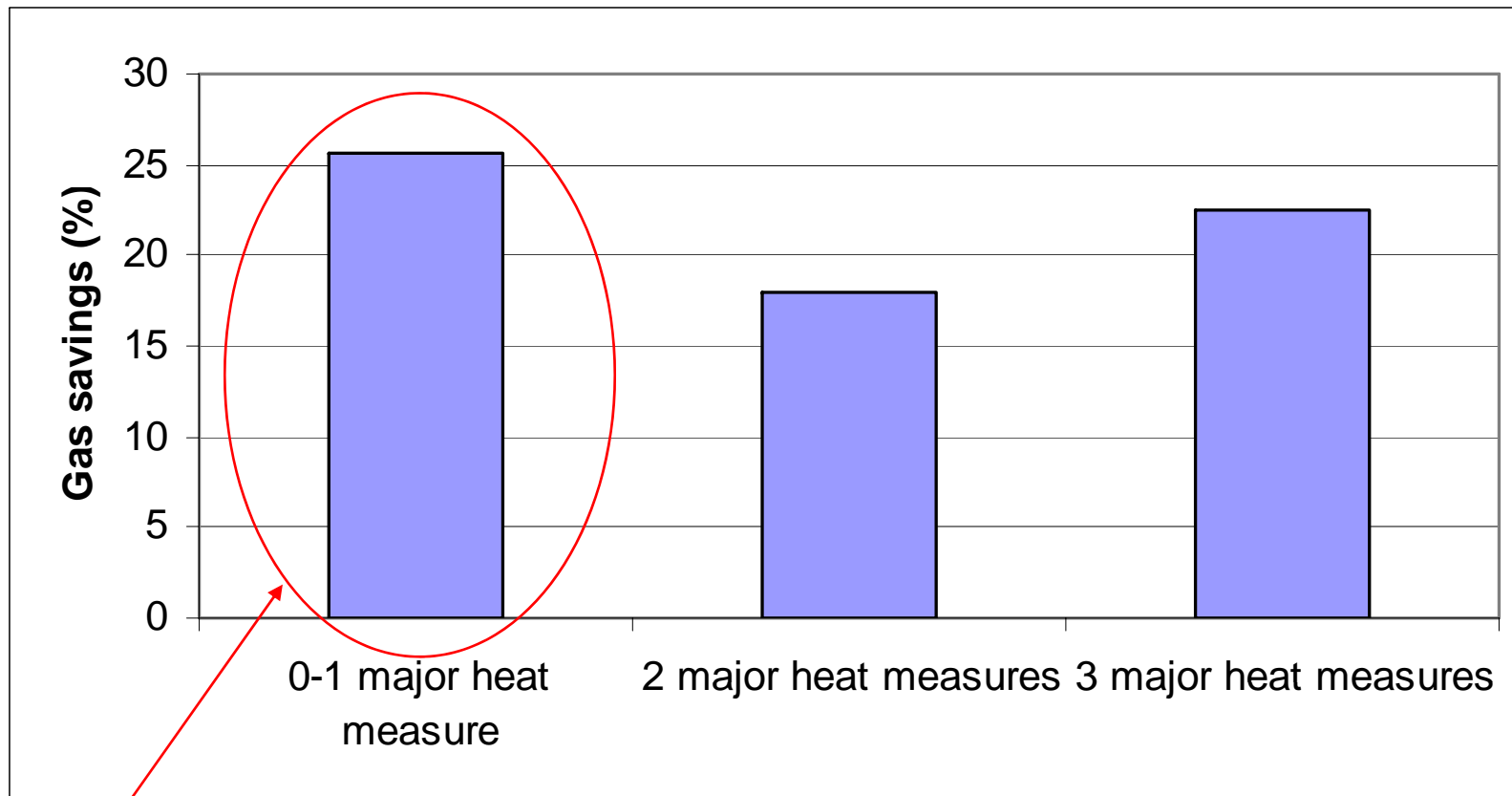
[http://www.opsi.gov.uk/si/si2008/draft/em/ukdsiem\\_9780110805306\\_en.pdf](http://www.opsi.gov.uk/si/si2008/draft/em/ukdsiem_9780110805306_en.pdf). Based on a three-bed semi-detached house with annual gas consumption of 20,500 kWh/yr. Assumes a comfort factor of 15% for CWI and loft insulation. A-rated condensing boiler replaces conventional gas boiler.

***For the sake of £200 we've probably saved that on our gas bill already – 6 months in. If only we'd done that years earlier. Never thought of doing it did we, or if we had we didn't think we'd make such good savings. - Southampton***



## ...but behavioural change may also be playing an important role

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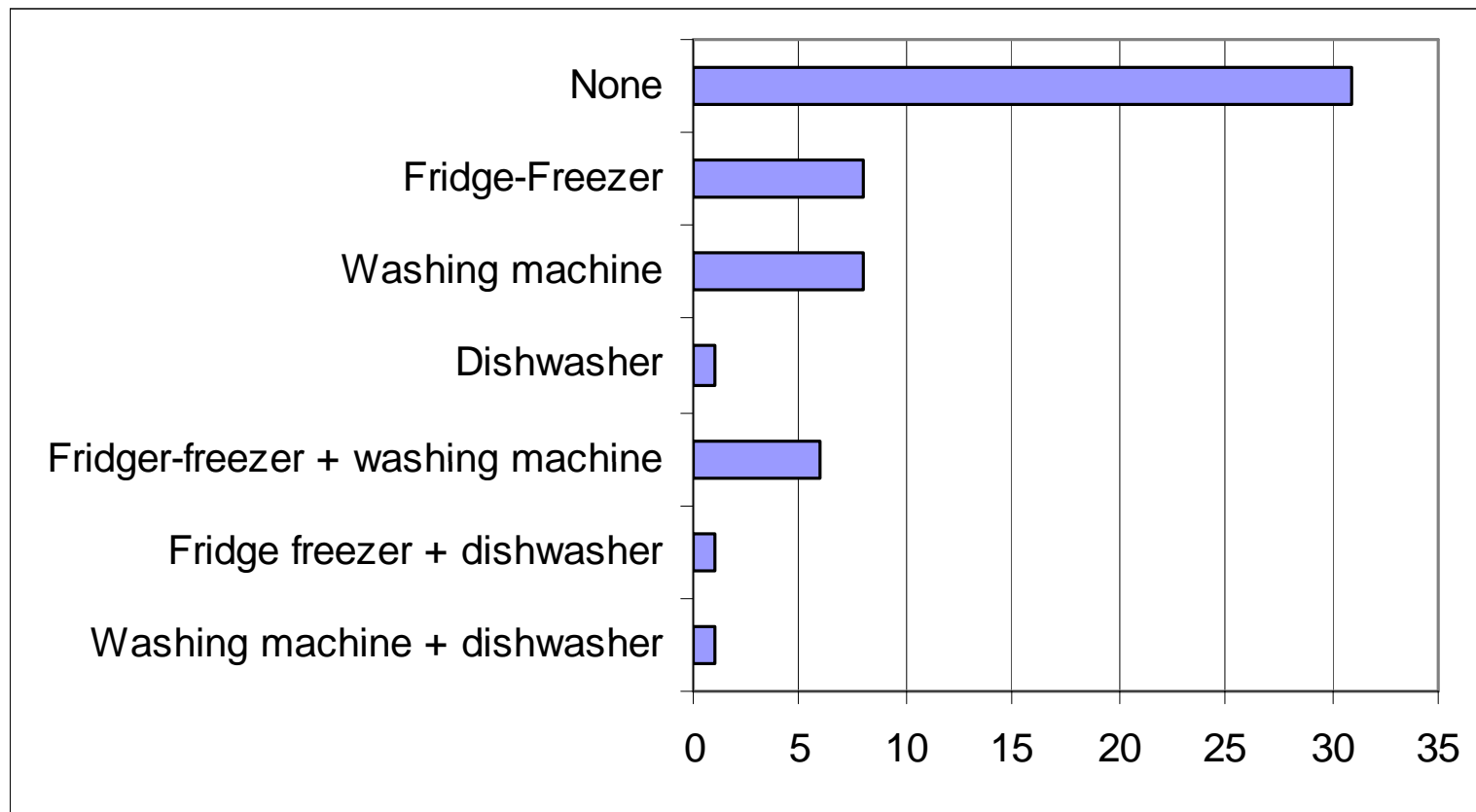


**Some households in the Green Streets project have had only one or no major heat measures, but are achieving major savings. Initial feedback from energy advisers suggest that these come from behavioural change**



# About half the households received energy efficient replacement appliances

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## Electricity savings from low-energy appliances and lights are lower...

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- Expected electricity savings from low energy appliances and lighting:
  - 10 compact fluorescent light-bulbs = c.2%
  - Fridge-freezer = c.1%
  - Washing machine = c.3%

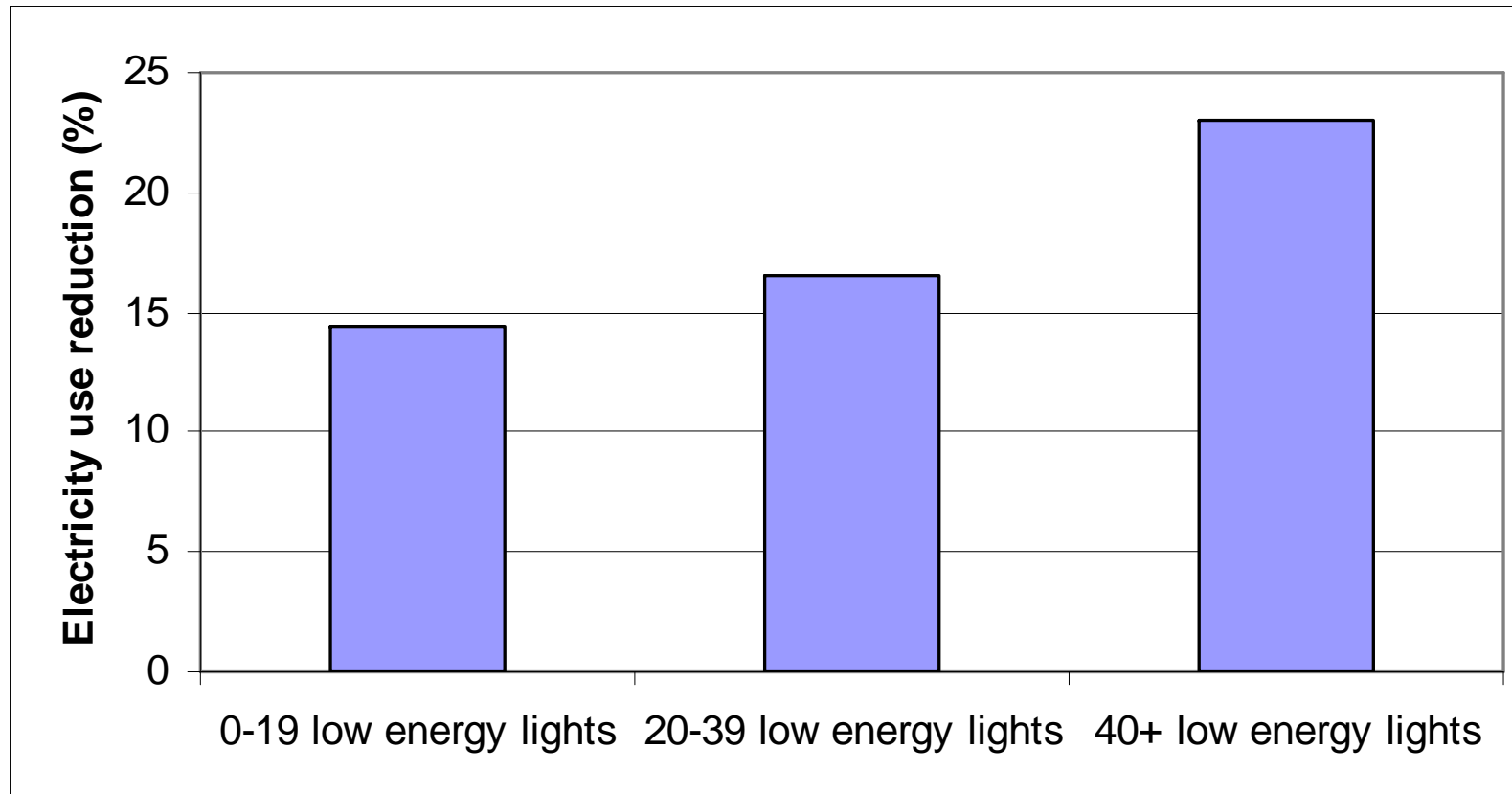
Source: Illustrative Mix of measures for CERT 2008-11, available on-line at:  
[http://www.opsi.gov.uk/si/si2008/draft/em/ukdsiem\\_9780110805306\\_en.pdf](http://www.opsi.gov.uk/si/si2008/draft/em/ukdsiem_9780110805306_en.pdf).

Based on an average annual electricity consumption of 3,300 kWh/yr. CFLs replace conventional incandescent light-bulbs. gas boiler. A+ rated appliances replace the weighted market average.



## ...but impact of low-energy lighting replacement is visible in GS households

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Combines both CFLs replacing conventional light bulbs and LEDs replacing halogen downlighters



# Low energy lighting

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- However, a number of households, mainly in the London street, declined to fit LED downlighters, because of the quality of the light and because they could not be used with a dimmer switch

*We were adamant we wanted like for like, and it turned out they couldn't replace them...they tried hard, but you could hardly see from one side of the room to another... You can't get them on a dimmer – London*



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# Behavioural change

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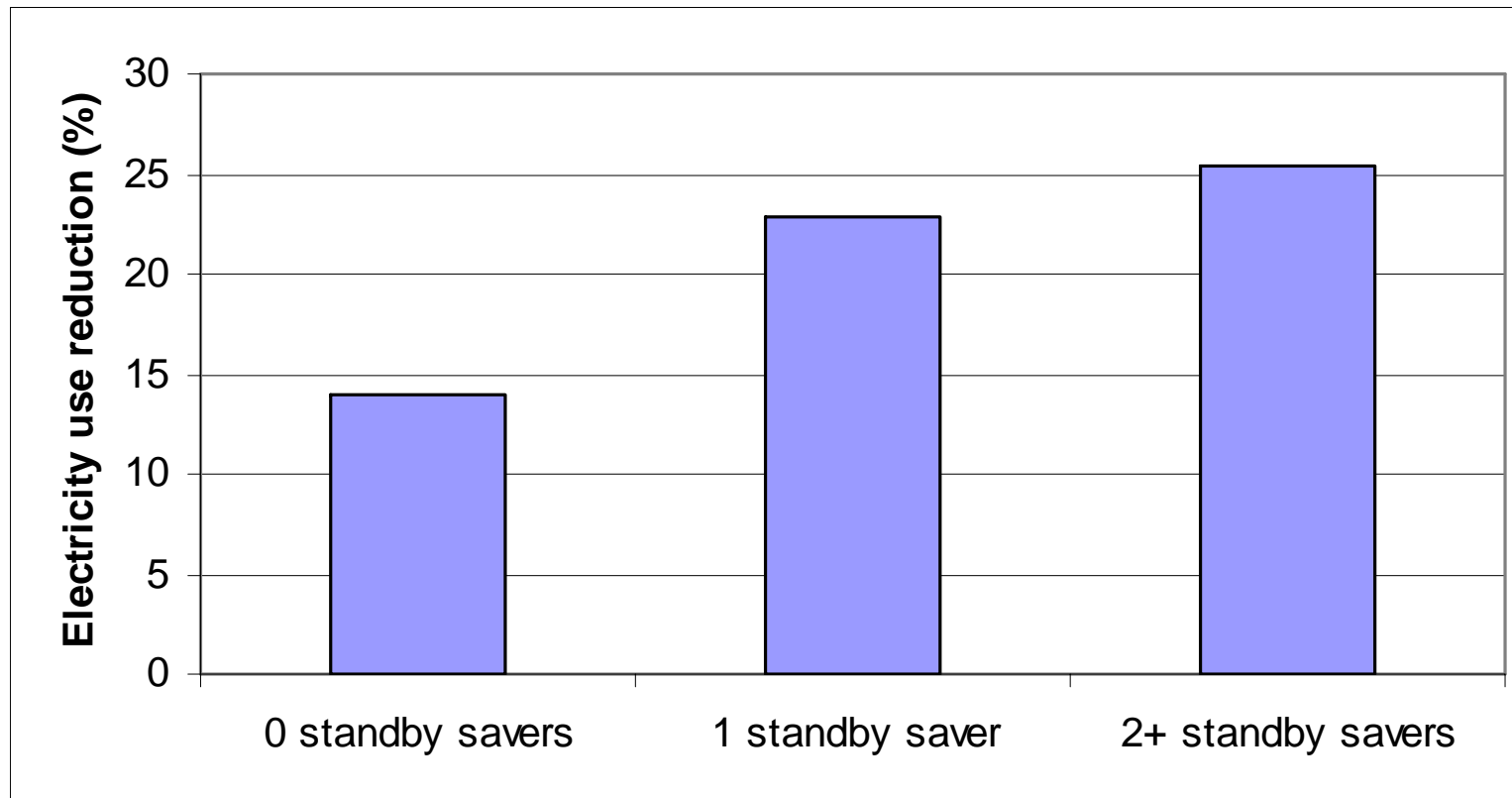
- Significant energy savings by households with relatively modest measures points to the importance of behaviour change
- Example of one London household which achieved a 45% reduction in gas use
  - Loft insulation fitted, but no new boiler or cavity wall insulation
  - The major part of savings were achieved through hugely improved efficiency of heating system through thermostats fitted properly and correctly used



# Behaviour change

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- Households that opted for more standby savers saved on average more electricity. The differences are too large to be due to the use of the standby savers alone, but choice of standby savers may be a good proxy of effort in behavioural change.





# Examples of behaviour change

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- Households used the full range of behavioural changes, including some quite innovative approaches:
  - Turning off lights
  - Not leaving appliances on standby
  - Not using a tumble drier
  - Washing clothes at lower temperatures
  - Using a dishwasher instead of washing up in the sink
  - Fewer baths
  - Not overfilling kettles
  - Using and turning down thermostats
  - Using thermostatic radiator valves to heat only rooms
  - Turning down the hot water temperature boiler setting in summer
  - Turning off the oven early and using the remaining heat to complete the cooking
  - Washing hair early in the evening to allow it to dry naturally and not use a hair dryer
  - Eating by candlelight



# Differing attitudes to behaviour change

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- Energy use increases and reductions appear to be related to how easy people feel it is to change habits

*The easiest thing to do is to turn bits off – Southampton, medium energy reduction*

*You'll change your habits and not your lifestyle and I think there is a difference. – Southampton, large energy reduction*

*The fantastic thing about this project is that with fairly limited amounts of money you can save significant amounts of energy – London, large energy reduction*



# Differing attitudes to behaviour change

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- Energy use increases and reductions appear to be related to how easy people feel it is to change habits

*It's difficult to make the kids change. And it's hard yourself a bit. Especially X (daughter), X is the hardest one because she uses more things. She's terrible with the computer - Birmingham, medium energy increase*

Q. How have you two ( the parents) found giving up these habits?  
A. Mum: *Slow to change, I don't like giving up the tumble dryer, that's my bad habit.* Dad: *We go through little spasms where I blame her and she blames me.* - Birmingham, medium energy increase



# Use of hand-held meters

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- Hand-held electricity meters were widely seen as a good motivator by making energy use visible

*It's been brilliant for the children...I think it's been brilliant for us, too. We had great fun when it first arrived – you put the kettle on, you put the iron on, you put the micro-wave on, and [you see] that is big money” - London*

*Because we have this energy monitor thing which actually shows you how much electricity at any one time... how much it's costing you.. that was a revelation really. With that you can actually see how much something is costing you when you switch it on.... That's something I think every household should have, one of those. - Southampton*



# Use of hand-held meters

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There was also agreement that the novelty wore off, but this did not necessarily mean that behaviour change was reversed

*I think the best thing to do is to rent it to a household for a month... it doesn't take long to realise what uses most energy and what you can then save just by monitoring the use of things like the kettle, the iron, things like hair straighteners. - Southampton*

*The children...they don't notice it any more...like all these things, the interest passes... - London*



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# The role of energy advisors

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- The energy advisors played an important role in sorting out problems and providing information:

*He's always thinking oh I might be able to get you a energy leaflet on that, or I've seen a little notebook with you know a hundred suggestions in, I'll see if I can get that for you. - Birmingham*

*[our adviser] was very effective when they were organising the changes they were going to make.... Making everyone feel comfortable about it - Southampton*

*we had our thermal imaging, before and after, and we looked at ours and its just like two different coloured photographs. But he actually came round to each house.... He went through that all explained what was what - Birmingham*



# The role of energy advisors

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- The fact that advice is seen not to be linked to any commercial advantage was important for some:

*That's a big part of this thing...because these people...you know that they're doing it as a demonstration project, so there's no sense of being conned...That's the thing that was the most bizarre and amazing thing about the project to start with, that someone was offering you good clear advice for nothing - London*



# The role of energy advisors

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- People skills are as important as technical knowledge

*X is brilliant... They're friends as well - Southampton*

*If there's any problem he will look into it and sort it out.  
He's very approachable. - Birmingham*

*He's very enthusiastic. A bit of a cheerleader. -  
Southampton*



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# Competition element

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- The competition element – especially between street or cities - has played an important motivational role for behaviour change for many participants:

*I like the challenge as well. I like the idea of pitting myself against the other seven and also that my team are pitting themselves against seven other teams up and down the country, and I get really upset when we start dropping.... - Birmingham*

*I don't want to be the one in our eight households that's not saving the most energy... that's seen not to be trying. – Southampton*

*I don't think that we're particularly competitive about it [within the street]...I feel more competitive against Plymouth, Leeds, Edinburgh, than I do against my neighbours - London*



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## Street interaction has led to wider community spirit, as much or more than the sharing of energy saving tips

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*We have all shared tips. Another one we picked up on, I think it might be in one of the leaflets we had, turn your oven off before you finish cooking. It sounds daft, why do that? But it's still hot. That will save energy. That's what we're thinking about. - Southampton*

*We've not only gained from the green initiative and what we're doing and saving the energy but we've also met our neighbours and that's been a really good thing. - Southampton*

*The community coming together for the competition has been brilliant - Southampton*

*I've certainly met people that I didn't know existed...the last two meetings have been held in people's houses so we've got to know them, and see them, and know their names - London*



# Street interaction

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Q: Would you say that [the project] has changed the community feeling on the street?

A: *Yes, definitely, definitely, definitely* - London

*...we're like a little family, all of us, and it's its very nice. I wouldn't have had any means of introducing myself or the confidence had I not been involved in this. You don't go up to strangers in the street and introduce yourself do you? But no, it's been wonderful. If I've got nothing else out of it than the people I've met it's still been worthwhile.* - Birmingham

This aspect of the project seems to be strongest in the shorter streets. There are many potential benefits for other aspects of social and public policy that arise as a result.



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# Policy implications -1

- Green Streets is a small-scale, well-resourced experiment
- Can elements of Green Streets be replicated on a larger scale via policy?



# Policy implications - 2

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- Existing research<sup>1</sup> show several barriers to people installing measures themselves, including lack of trusted information, hassle of installation and, for more expensive measures, capital cost
- Green Streets project addresses all of these:
  - Information that was perceived not to be biased because not selling a product
  - Full back-up via street experts and British Gas
  - Free measures and appliances (average of £3,750 per household)
- Green Streets also adds new elements, especially interaction with other local households and a competition

1. See Retallack et al (2007) *Positive Energy* (London: ippr) for a comprehensive discussion of evidence on barriers to domestic energy efficiency improvements



# Policy implications - 3

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- Three specific policy implications for Government and energy suppliers working in partnership:
  1. Neighbourhood energy advisers
  2. Finance packages for expensive measures
  3. Energy saving competitions



# Policy implications - 4

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## ***Neighbourhood Energy Advisers***

- *Trusted* source of advice and information needed, more accessible to households than existing energy advice services
- Would have to be independent of any one supplier
- Training could build on Energy Performance Certificate assessors programme
- Importance of area-based adviser – allows contact between households (e.g. neighbourhood meetings, competitions)



# Policy implications - 5

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## ***Neighbourhood energy advisers***

- Green Streets ratio of 1:8 is far too expensive to replicate, but one adviser per local authority ward would mean a ratio of about 1:2,500 households, or 1 per 20 streets or so
- This would mean approximately 10,000 advisers across the UK
- Costs would be in the region of c.£500 million/year, but can be seen within the context of UK energy bills of ~£23 billion, on which 20% saving is £4.6 billion



# Policy implications - 6

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## ***Overcoming the capital cost barrier***

- Innovative incentive and finance packages will be important to help get people through the capital cost barriers
- Existing examples include council tax reductions for households that fit energy efficiency measures
- But Government support and a policy framework will be necessary for more widespread approaches



# Policy implications - 7

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## ***Green finance packages***

- Could build on EPCs and be folded into mortgage loans (indicative cost of energy improvements at £3,000 ~ 1.5% of UK average home price).
- In the USA, energy efficiency mortgages (EEMs) have been available since the 1970s. But the market has been most strongly driven by regulations requiring energy efficiency upgrades at point of sale or renovation (e.g. Berkeley Residential Energy Conservation Ordinance in California).
- Within an appropriate policy framework, energy suppliers could also offer finance packages. For micro-generation, a feed-in tariff would mean a predictable income stream, which would be a good basis and therefore predictable income stream will lead to suppliers offering finance packages. There is some anecdotal evidence that solar PV can add to the value to a home (<http://www.micropower.co.uk/publications/gleeson.pdf>, [www.solarcentury.co.uk](http://www.solarcentury.co.uk)).



# Policy implications - 8

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- Examples of finance options for a package of cavity wall insulation and loft insulation, with up-front cost of £524 installed:

	3 year loan		7 year loan	
	0% finance	7% finance	0% finance	7% finance
Annual repayments	£175	£200	£75	£97
Annual expected gas bill savings	£275	£275	£275	£275

Cost and energy savings assumptions based on British Gas and Energy Saving Trust figures. Gas cost = 3.06 p/kWh



# Policy implications - 9

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- If gas prices rise to levels predicted by the recent Eclipse Energy Group report<sup>1</sup>, annual savings increase substantially:

	3 year loan		7 year loan	
	0% finance	7% finance	0% finance	7% finance
Annual repayments	£175	£200	£75	£97
Annual expected gas bill savings	£395	£395	£395	£395

Cost and savings assumptions based on British Gas and Energy Saving Trust figures. Gas cost = 4.4 p/kWh  
 1. Eclipse Energy Group (2008) *Under the Influence of Oil: UK Gas Markets and their Prospects in a Global Gas Market looking towards 2020*, Report to Centrica (Stavanger, Norway)



# Policy implications - 10

## ***Competition***

- The competition element is fun, motivating and can sustain interest
- Could work at street, neighbourhood, city and national levels
- Relatively low cost to run
  - Neighbourhood level prizes of £100, city level prizes of £5,000 and a national prize of £50,000 would cost less than £4m
- But needs accurate data and benchmarking, which would require smart metering



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