greenoak housing association

greenhomes

people, fabric & technology; a decade in use

greenhomes objectives

The greenhomes key design objectives were;

- To provide homes people want to live in now and in the future,
- To be truly sustainable in social, economic and environmental terms,
- To meet and attempt to exceed the ‘best practice’ standards generally,
- To be flexible and adaptable to changing needs,
- To minimise ecological impact over lifetime,
- To be affordable to run and manage achieving best value over lifetime,
- **To become a replicable model that Greenoak and others could develop further.**

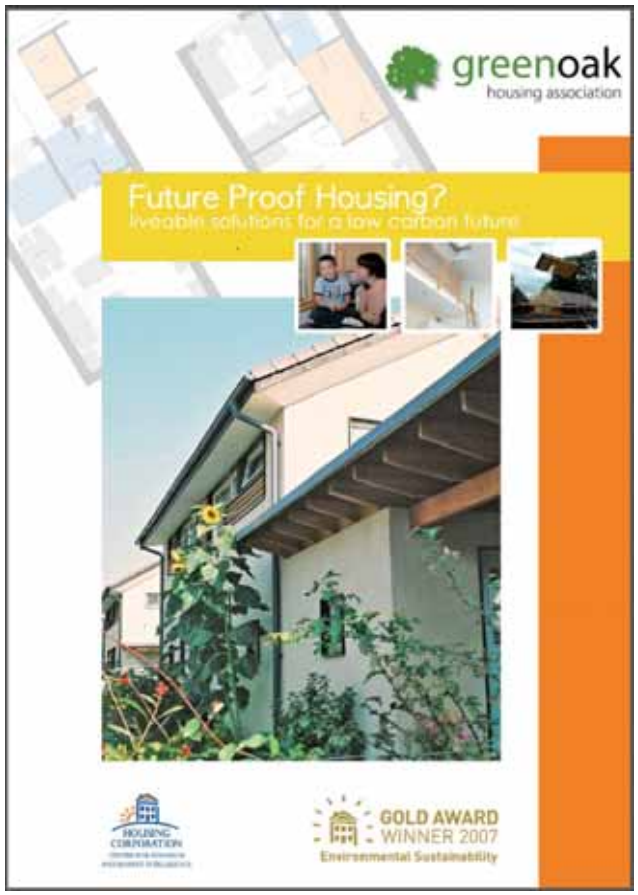
first two schemes

Dartmouth Ave
Sheerwater
Woking
14 Family Houses
(2, 3 & 4 Bedrooms)
completed 2005

Manor Farm Close
Normandy
Guildford
12 Family Houses
(1, 2, 3 & 4 Bedrooms)
completed 2006

But how successful is this model of housing in reality?
Are they affordable, comfortable, good homes to live in?
Why don't other HA's develop similar models?

innovation & good practice



- Completed 2008
- First and second greenhomes development
- 2-3 years after completion
- Post Occupancy Evaluation
  - Monthly meter readings
  - Detailed interviews with residents
- Outline of what Greenoak was trying to achieve in developing the greenhome model
- Identified barriers to mainstreaming greenhomes approach

So what did we learn?

High satisfaction levels

But not for the reasons we were expecting…..

What do residents like most about their greenhomes?

1. spacious
2. light and airy
3. the design of the houses
4. low running costs

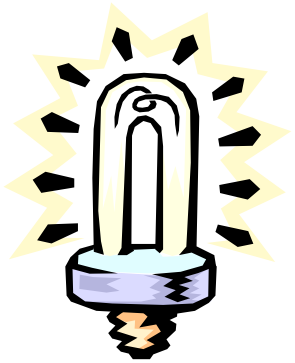
residents value good design

passive works

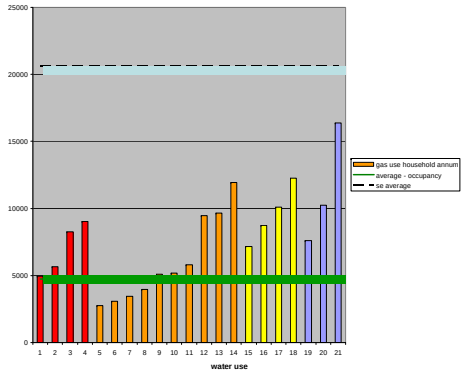
Average greenhome household annual savings …..

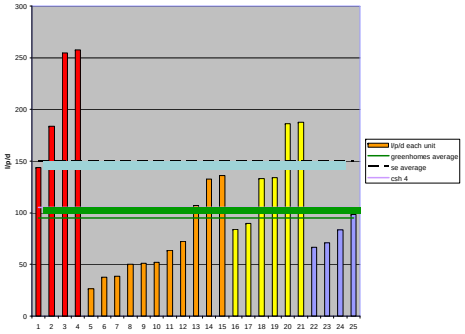
£461 on gas

£354 on water

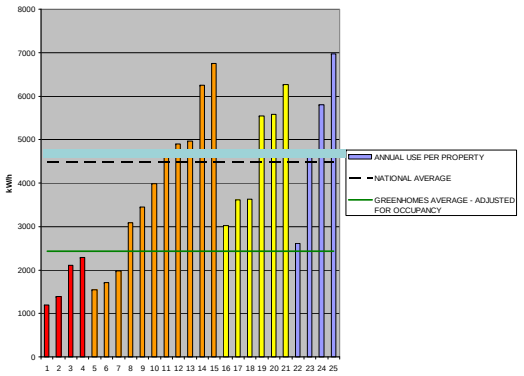


£38 on electricity



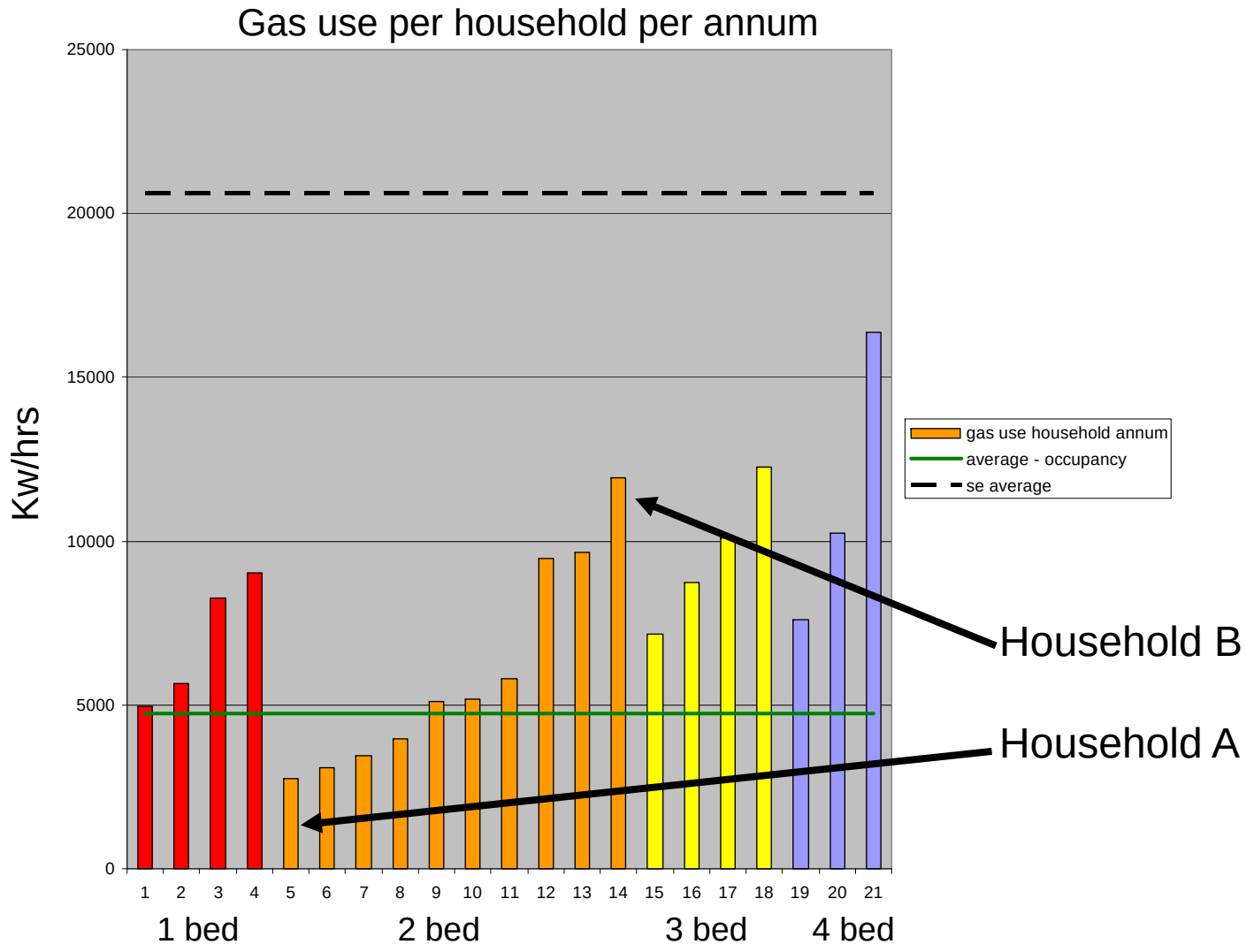


ELECTRICITY USE PER UNIT PER ANNUM



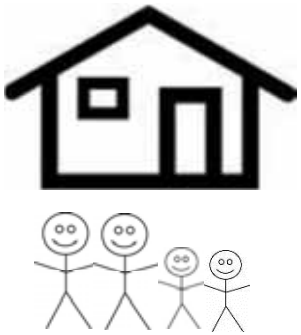
passive savings

reducing gas consumption



but it could be even better..

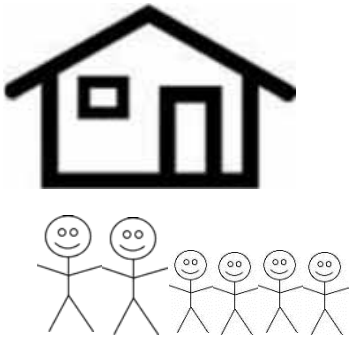
Comparison of lowest and highest gas consuming households (2 beds only)



£128
per annum

511kg CO_2
per annum

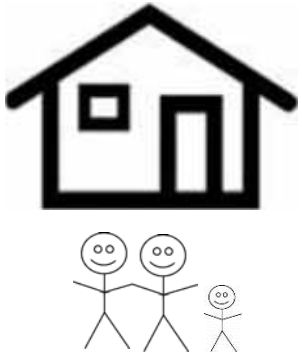
Household A



£487
per annum

1945kg CO_2
per annum

Household B



£625
per annum

2497kg CO_2
per annum

UK average 2 bed Household

Main learning points 2008

The greenhomes model is successful in achieving energy and water savings in use and is popular with residents.

Addressing behaviour change through the green doctor service – available to all residents.

Some residents expressed dissatisfaction with summertime internal temperatures – all residents issued with openers for Velux windows and given advice on passive cooling techniques.

Eco void standard – taking every opportunity to improve energy efficiency of all stock through simple, passive methods.

Offering sustainability training or partnership working to other Housing Associations – to address the skills gap identified as a significant barrier to mainstreaming.

greenhomes evolve

Abbey Walk
Storrington
Horsham
12 family houses
(2,3 & 4 Bedrooms)

Fourth generation greenhomes
Designed to PassivHaus standard

but are they aging gracefully?

First scheme in Woking is 10 years old this year.

Is the building fabric still performing?

Very few schemes in the UK of this age built to this standard.

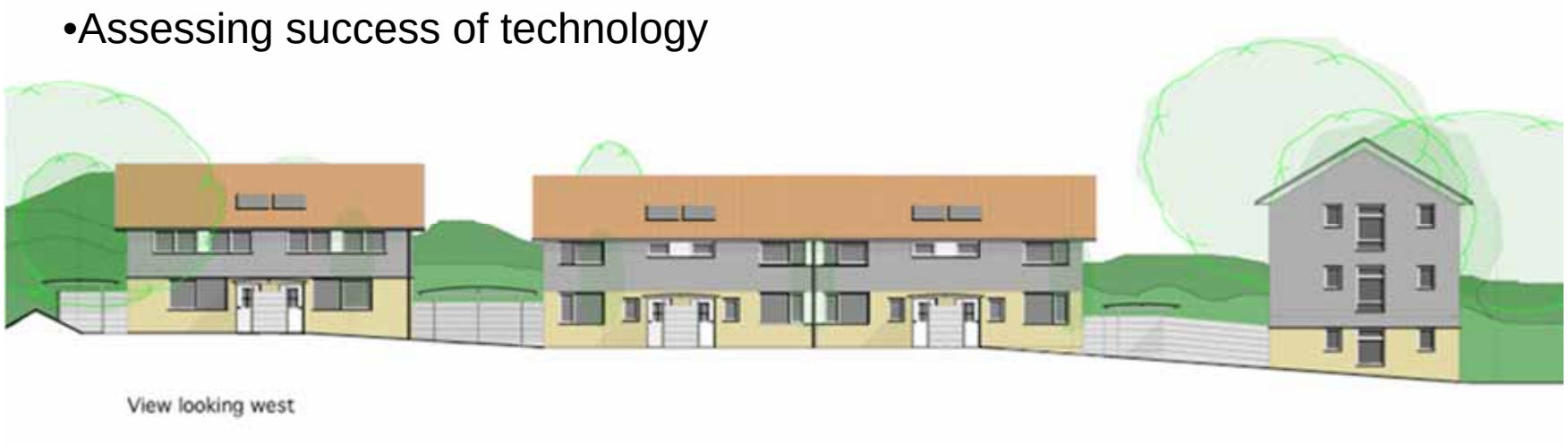
Building and environmental standards in new or retrofitted housing must increase in the coming years if the UK is to hit it's CO_2 reduction commitment by 2050.

Important that we understand the implications of increased insulation and airtightness in homes –

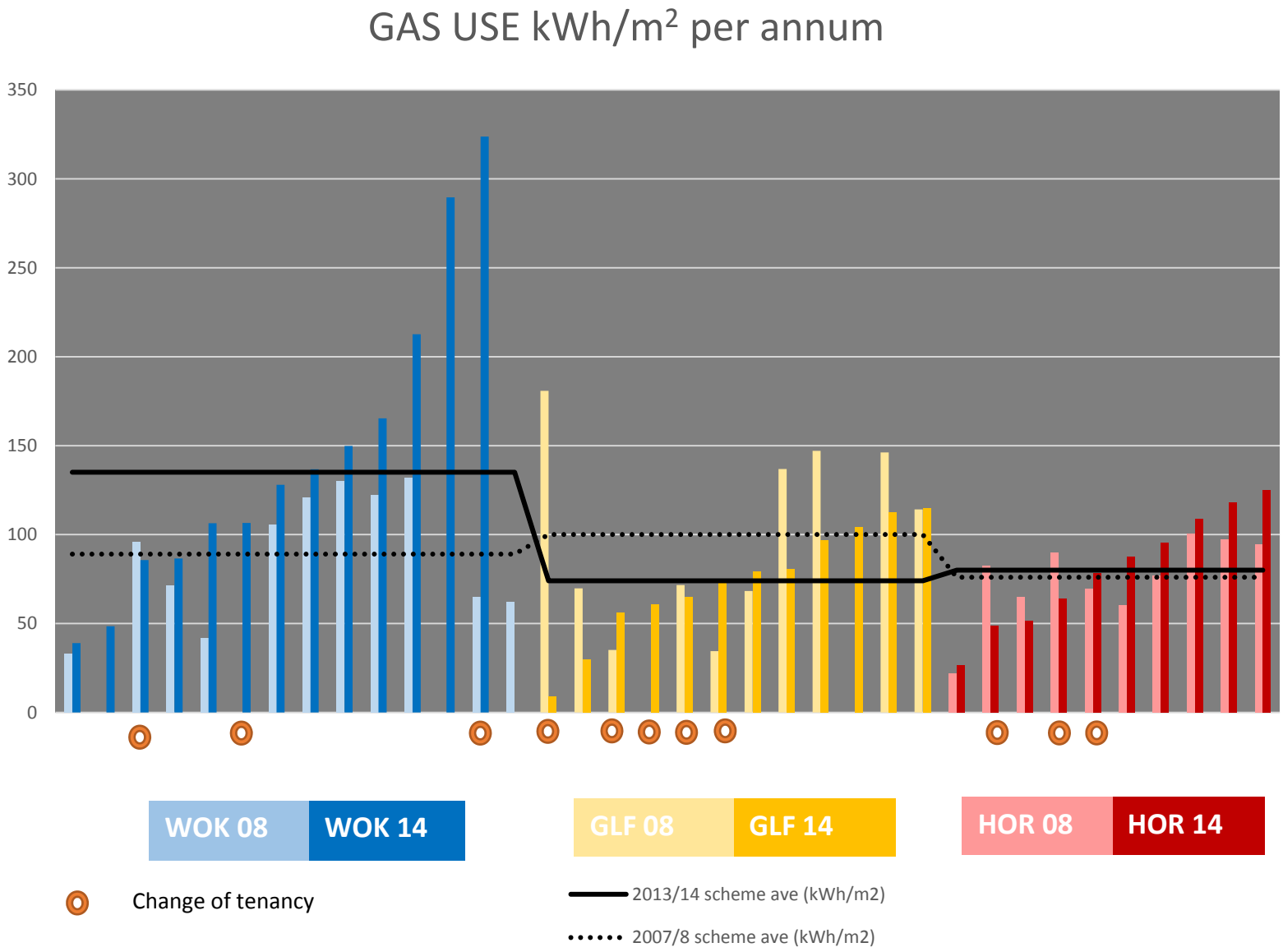
Overheating – Ventilation – Air quality

2014 / 15 research project

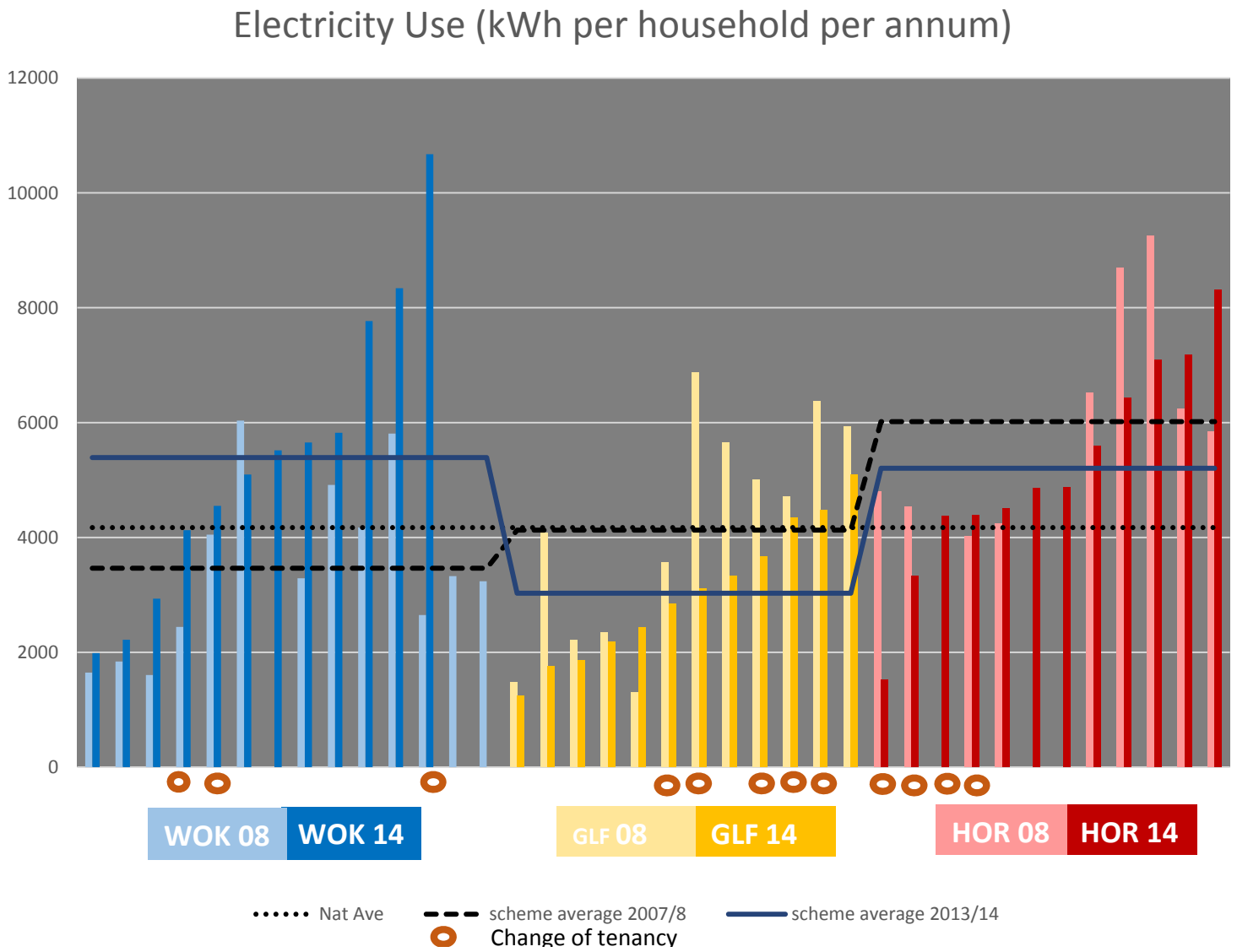
- Further analysis of energy & water use data
- Resident satisfaction levels
- Assessment of maintenance costs
- Comparison of management issues and arrears figures
- Monitoring of internal temperatures
- Detailed overheating assessment
- Air tightness testing
- Thermal imaging
- Assessing success of technology



2014 / 15 research project



2014 / 15 research project



2014 / 15 research project

Average occupancy

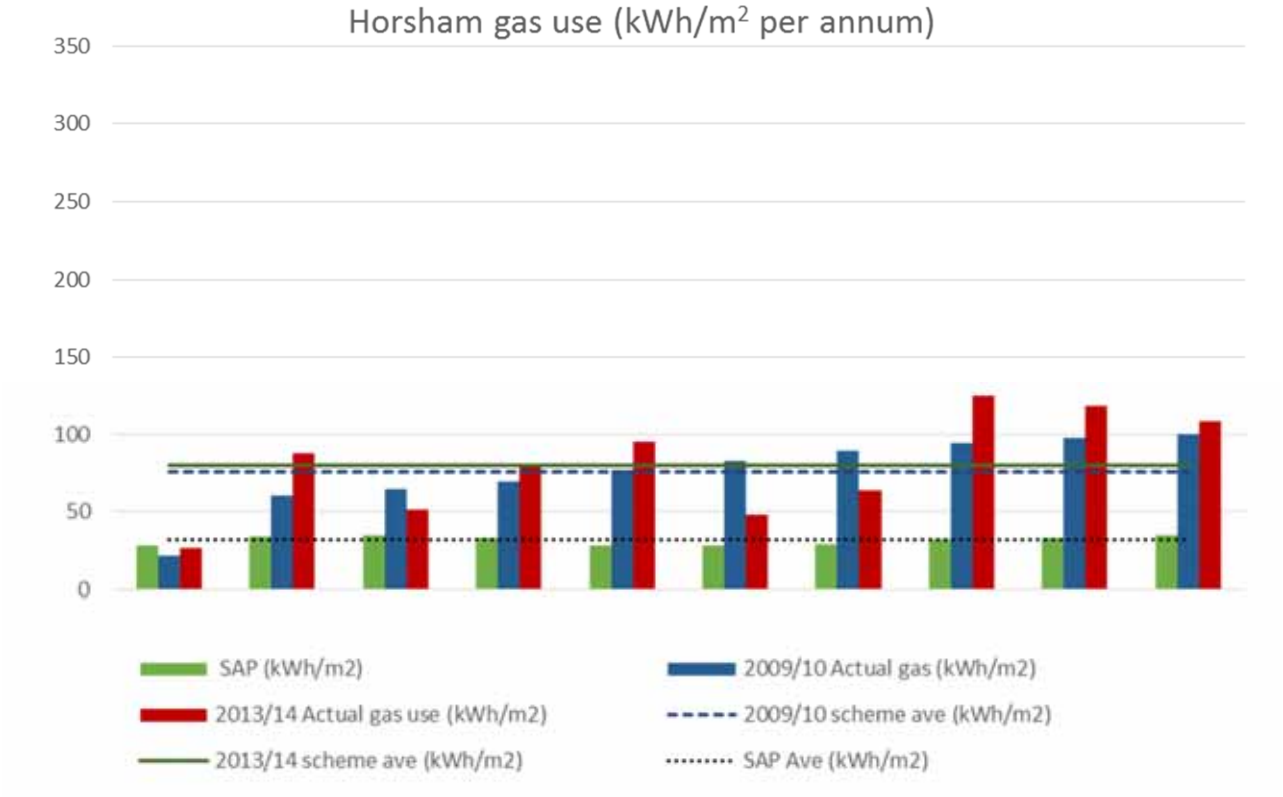
	design	2008	2014
WOKING	4.9	4.7	5.3
GUILDFORD	3.3	3.0	2.7
HORSHAM	5.2		5.4
NAT AVE		2.38	2.36

Record of occupancy not routinely updated

One greenhome had 3 adults and 9 children living in a house with design occupancy of 7. – implications for ventilation design & overheating

2014 / 15 research project

Addition of solar thermal system



Best performing scheme – total gas use

Worst performing scheme – actual gas use v SAP prediction

Suggests solar thermal system not achieving predicted savings

More research needed

More resident education

2014 / 15 research project

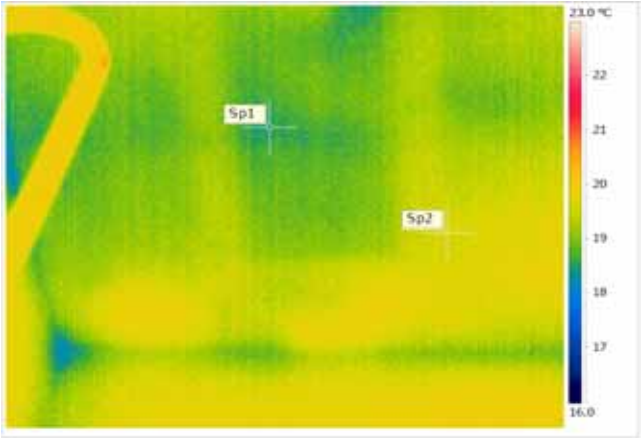
Building fabric tests

Airtightness re-testing results ($m^3/h.m^2$@50Pa)

House 1 was 2.70 now 2.94
House 2 was 2.85 now 3.31

MVHR investigation (Horsham)

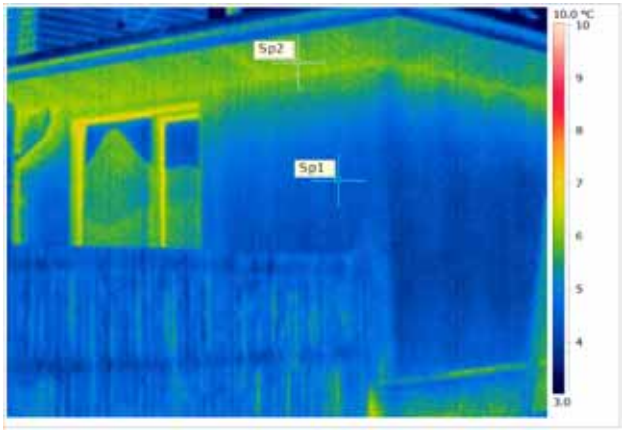
- Blocked intake ducting – reduced air in
- System unbalanced
- Wrong type of terminals & ductwork installed
- Suspected uninsulated ducting from outside to MVHR unit



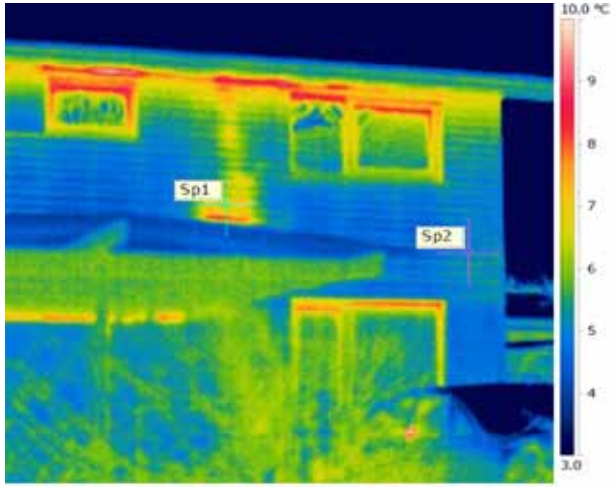
2014 / 15 research project

Building fabric tests

Thermal imaging



- No apparent thermal anomalies



- Heat escaping around tops of windows
- Suspect compressed insulation at eaves
- Visible heat plume from MVHR outlet

2014 / 15 research project

Resident satisfaction – overall figures

	DAR 2007	**DAR 2014**	NOR 2007	**NOR 2014**	**STO 2014**
High satisfaction	47%	**50%**	63%	**69%**	**16%**
Satisfied	47%	**44%**	31%	**31%**	**68%**
Dissatisfied or very dissatisfied	7%	**6%**	3%	**0%**	**16%**

Main learning points 2014

The greenhomes model is still successful in achieving energy and water savings in use and remains popular with residents.

Addressing behaviour change is not quick or easy, takes a lot of staff time.

Low maintenance does not mean no maintenance. Amount of maintenance required for MVHR is more than first thought.

All staff and contractors who have contact with resident should have training to recognise technology installed and be able to source correct advise.

Once is not enough – residents **and staff** need refresher information about the technology in the home and about passive techniques to maximise savings

Important to stay up to date with latest learning, particularly on technology. Applies to design, commissioning and maintaining the system.

Overheating

Why is overheating important?

- Detrimental effect on health – directly or indirectly
- Especially dangerous to already vulnerable groups

How is overheating defined?

- It isn't
- Thermal comfort is objective
- Some methods for predicting/measuring overheating use fixed temperatures others use methods based on internal relative to external temperatures.

What causes overheating?

- Unintended consequence of increased insulation and airtightness
- Lack of control over solar gain
- Inadequate purge ventilation
- High external night time temperatures
- Effect of internal heat gains – people, electrical equipment etc.
- Changing climate

Overheating

Are houses like the greenhomes prone to overheat?

- Highly insulated and airtight homes are more at risk because it is more difficult for built up heat to escape
- There is a theory that ‘lightweight’ houses, such as timber frame, are more vulnerable.
- Some residents have expressed dissatisfaction

How does the design of the greenhomes attempt to avoid overheating?

- Large roof overhang shades the upper windows from the high summer sun
- High insulation levels and triple glazed windows will keep heat out as well as in (if windows and doors are closed)
- White walls will reflect radiant heat rather than absorb it
- South or South East living spaces have timber pergola for shade
- Good design for cross ventilation or stack ventilation (with Velux windows)

Overheating

Did the greenhomes overheat in summer of 2013?

- Data loggers installed in 6 greenhomes, 2 on each schemes – measuring temperature and relative humidity
- 1 external data logger also installed on each scheme
- Participating residents asked about thermal comfort and window opening habits and prompts.
- Half the houses selected had known or suspected problems with internal temperature

Was the summer of 2013 particularly hot?

- July had a significant heatwave
- June & August were around average

How did the measured internal temperatures compare to other houses in the UK?

- Temperature range measured were comparable to large scale UK studies with similar weather conditions
- Maximum temperatures reached were below that in National study
- Suggests that greenhomes are no more prone to overheating than other UK homes

Overheating

Learning points – measuring overheating

- Most methods for measuring overheating are designed for computer simulation not measured results – little use in existing buildings
- Some methods give unexpected results – when testing using methodology from the new European wide standard - BS EN 15251 – 2 greenhomes passed, 1 failed for being too hot, 3 failed for being uncomfortably cool!
- Best technique found was CIBSE TM 52 which is based on BS EN 15251 but defines three criteria for overheating.

Specific learning for greenhomes design

- Units which overheated were the expected ones which had extra, unshaded windows or issues with residents not opening windows
- Rooflights should be shaded or face north
- Low sun in spring and autumn is causing overheating, probably exacerbated by heating coming on – consider vertical shading
- Houses with MVHR without summer bypass are cooler than houses with MEV – investigate further

Overheating

Specific learning for Greenoak

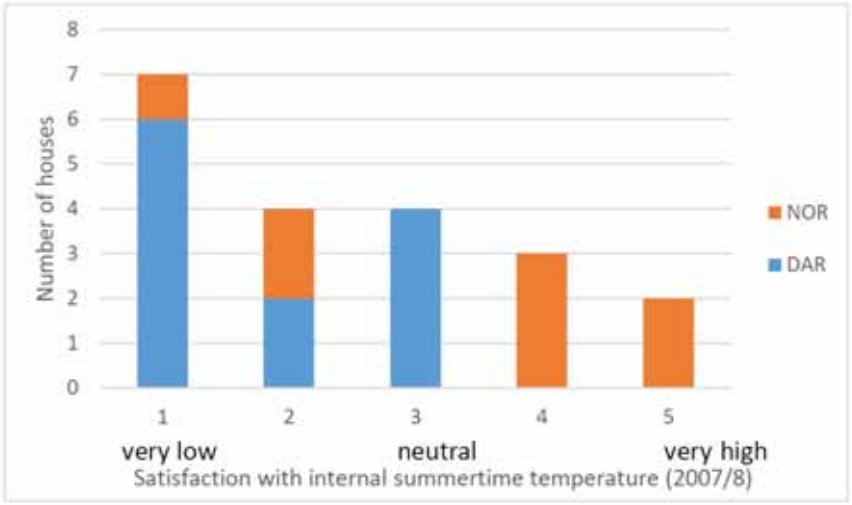
- Understand the need to take overheating seriously
- Work with all residents on passive cooling techniques
- Identify vulnerable houses and residents

- Train staff to understand which homes or residents may be particularly at risk
- Train staff on effective mitigation techniques
- Discourage the use of air conditioning units
- Ensure future schemes are designed with future climate in mind – model with predicted future weather files
- Ensure future schemes have realistic occupation and internal gains profiles suited to social housing

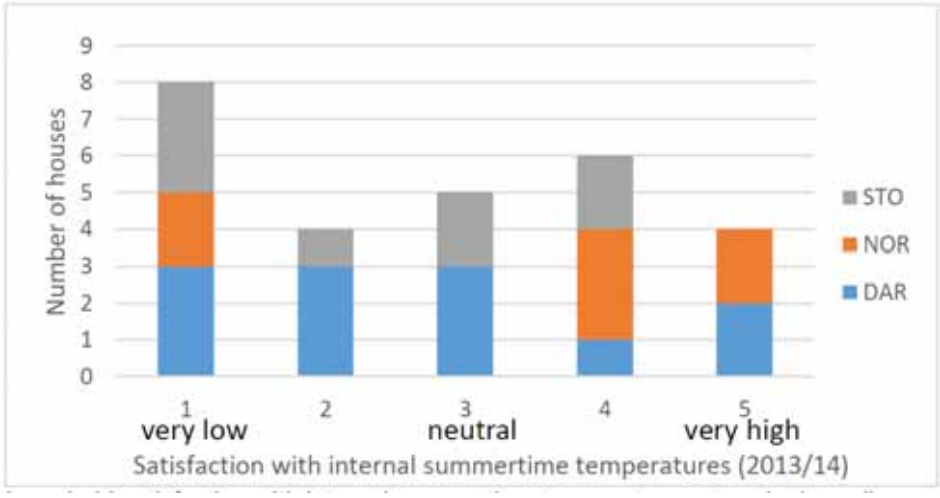
Overheating

Resident satisfaction with summertime temperatures

2007/8



2013/14



Thank you

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