Archetypes and affordable social housing – the way forward

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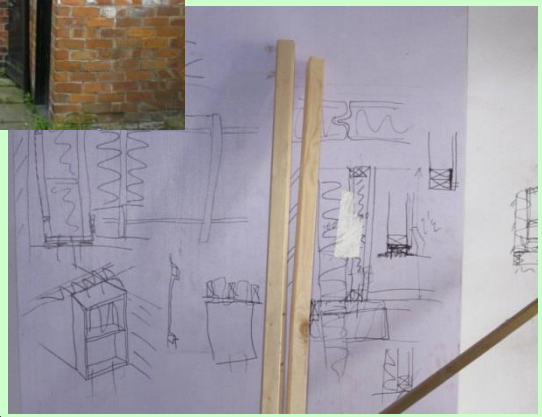

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Archetypes and affordable low carbon social housing – the way forward

Seminar structure

- To locate the current issues facing social housing providers within an overall low carbon housing context
- To summarise how previous and ongoing research with social housing partners (emh) has highlighted issues that need to be addressed
- To present innovations within the methodologies adopted for these projects
- To consider these in the context of ongoing and future work with partners

ME

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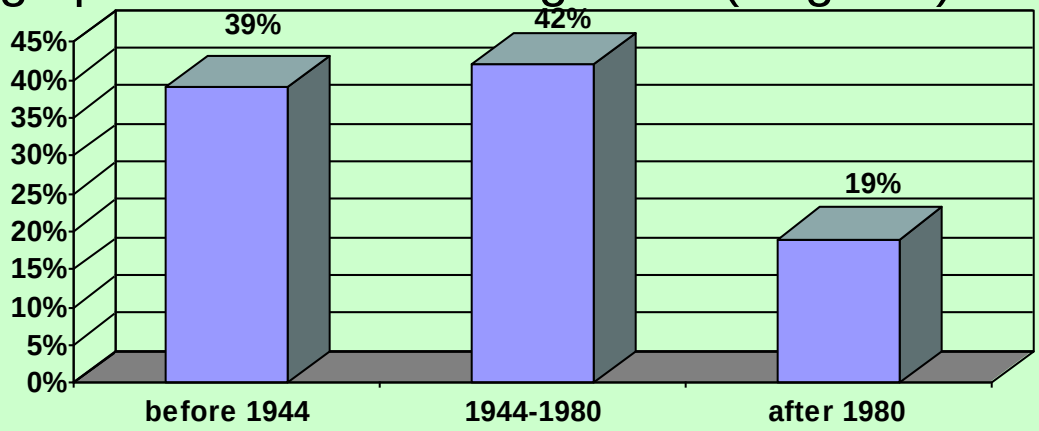
Case context: The UK housing stock

- UK housing stock rather different to most of Europe
- High level of private ownership
- 24 million homes in the United Kingdom, about 22 million in England
- Of which 70% private owned and approx. 15% private rental and 15% social housing
- Old stock: see chart
  - *estimated that **75% of the current stock will still exist*** **in 2050**

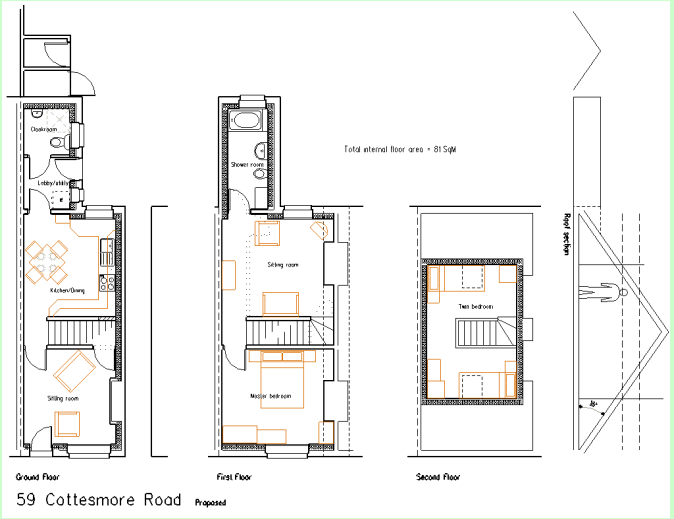
Age profile of UK housing stock (England)

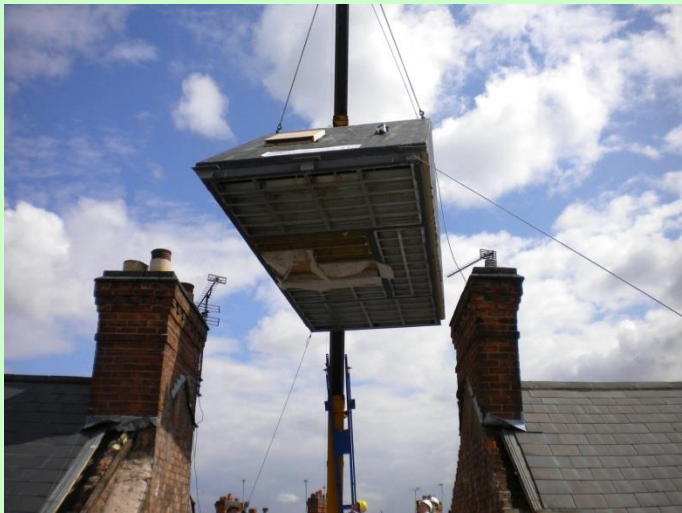


How many refurbs a day by 2050?

Cottesmore road – retrofit for the future (low carbon learning)

- Wall U value 2.0 $W/m^{-2}K^{-1}$ → 0.12 $W/m^{-2}K^{-1}$
- Window U value 2.2 $W/m^{-2}K^{-1}$ → 0.9 $W/m^{-2}K^{-1}$
- Total primary energy: 551→ 117 kWh/m^{-2} (-79%)
- Total CO_2: 92 → 20 kg CO_2/m^{-2} (-78%)





Key lessons from Cottesmore Rd retrofit

- The variation in properties will influence the retrofit response (customisation - ease of scaling up)
- Contiguous dwellings or pepper potted properties will influence ability to scale up
- Lack of knowledge all round, even among professionals
- ‘Deep’ retrofit very disruptive and messy process, especially if internal insulation
- Prefabricated (MMC) units can be used for speed and quality, and to improve living space (but may not be cheaper until economies of scale kick in)
- Need to engage with tenants

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History of the Knowledge Exchange Partnership (KEP)

- January 2011
- How do we know what renewable technology to install?
- How do we know that what we are installing now is right?
- How do we communicate best practise use to our customers?
- What funding is available for renewables, how do we access it?
- Which renewable technologies work best together?
- What legislation is likely to be imposed?

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Why do social housing providers need to answer these questions?

Moral Reasons

- 31,000 excess winter deaths in 2012/13 England and Wales (29% up on previous year)
- Welfare reform and rising energy bills (addressing fuel poverty)
- Health, Education and Well-being

Why answer these questions?

Business and Financial Plan

- To be one of the best – retain tenants
- Actions contribute to national environmental protection and sustainable development
- Develop safe and decent neighbourhoods
- Tackle Social Exclusion and fuel poverty
- Provide affordable homes

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Why answer these questions?

Business and Financial plan

- Emh have a £10 million spend pa on its housing stock – specifications need to be informed
- Running cost affordability of homes
- Commercial opportunities
- External funding opportunities

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Why do we need to answer the questions?

Legislative

- Energy Act 2011 (Energy Company Obligation – (ECO) Green Deal)
- Fuel poverty strategy - Band C stock by 2030
- UK is legally required to reduce its green house gas emissions by 80% based on 1990 figures by 2050
- Ongoing changes and uncertainties – i.e. election?

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Has the KEP research answered the questions?

Many, but not all:-

- Behavioural change techniques
- Communication techniques
- User interfaces with systems
- Emerging interventions

Has the KEP been successful?

Yes 1

It has heavily influenced a step change in how emh deliver their asset management function and its thinking in terms of component replacements

Yes 2

New commercial opportunities have been identified and seized upon which has put emh in a strong position to react positively and promptly to the ever changing energy policy landscape

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Has the KEP been successful?

Yes 3

Knowledge and understanding gained provided the assurance to participate with the Green Deal ‘Go Early’ programme.

Yes 4

Profiling identified our ‘most at risk’ stock enabling emh access to over £1 million funds for tackling fuel poverty

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Has the KEP been successful?

Yes 5

Comparison modelling has allowed emh to see which technologies will make the biggest saving for the tenants and evaluate the capital costs and income generation potential

Yes 6

Staff training has been identified and completed and will be continuous

Has the KEP been successful?

Yes 7

The tangible benefits are described above. What is difficult to quantify is the level of learning that has rubbed off onto many staff members who now have an enthusiastic desire and attitude to routinely seek out carbon saving opportunities within their every day activities for the benefits of both our residents and the organisation.

Cultural Change

Methodological innovation behind Cottesmore Rd, KEP and Eracobuild

Behavioural archetypes – simplify and adapt DECC's pro-environmental behaviour model

Based upon how people use controls

Group 1 - Real time on/off - those that use it as needed - reactionary

Group 2 - Hands off – rely on the system - disconnected

Group 3 - Planners – those who frequently use controls - interface

Building Archetypes

- Selection Criteria
- Age Group and type
- Total number of Archetypes identified 26
- More available but selection is based upon the numbers of properties that fall into each archetype
- Numbers MUST be realistic

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Putting the Information Together

Property Archetype	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	
User Group 1	2	4	2	3	4	4	3	2	6	2	1	3	3	5	4	6	3	3	4	2	3	3	5	2	2	3	84
User Group 2	1	3	2	2	1	2	2	4	2	2	1	2	3	2	5	5	2	1	1	2	3	2	2	1	3	2	58
User Group 3	2	3	4	2	3	1	2	1	1	4	3	2	1	4	2	3	3	2	1	1	2	7	2	4	3	2	65
Totals	6	12	11	11	13	13	14	15	18	18	16	19	20	25	26	30	25	24	25	25	29	34	32	31	33	33	207

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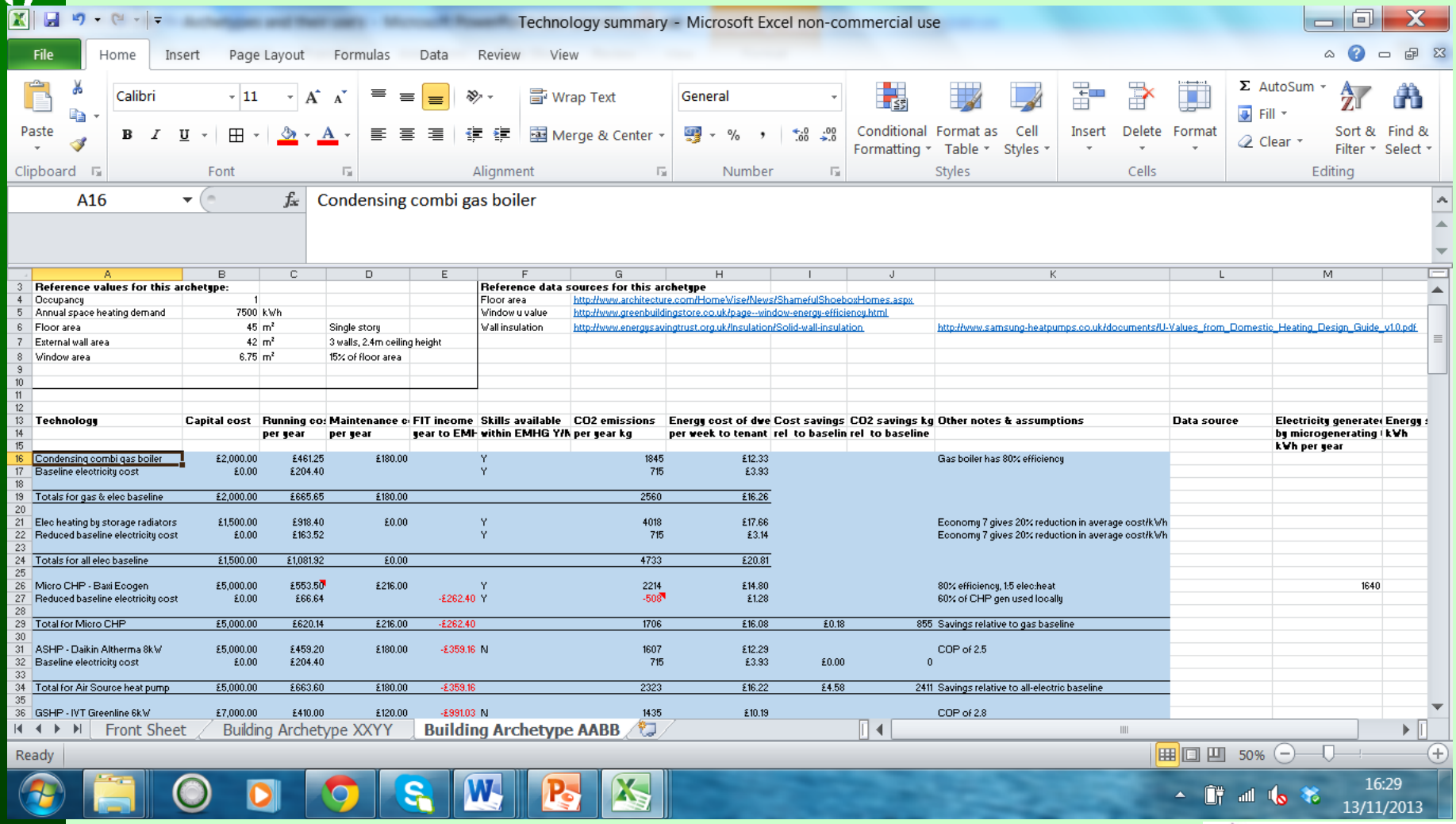
Technology Review



	A	B	C	D	E	F	G	H	I	J	K	L	M
3	**Reference values for this archetype:**					**Reference data sources for this archetype**							
4	Occupancy	1				Floor area	http://www.architecture.com/HomeWise/News/ShamefulShoeboxHomes.aspx						
5	Annual space heating demand	7500	kWh			Window u value	http://www.greenbuildingstore.co.uk/page--window-energy-efficiency.html						
6	Floor area	45	m²	Single story		Wall insulation	http://www.energysavingtrust.org.uk/Insulation/Solid-wall-insulation				http://www.samsung-heatpumps.co.uk/documents/U-Values_from_Domestic_Heating_Design_Guide_v1.0.pdf		
7	External wall area	42	m²	3 walls, 2.4m ceiling height									
8	Window area	6.75	m²	15% of floor area									
9													
10													
11													
12													
13	**Technology**	**Capital cost**	**Running cos per year**	**Maintenance c per year**	**FIT income year to EMH**	**Skills available within EMHG Y/N**	**CO2 emissions per year kg**	**Energy cost of dwe per week to tenant**	**Cost savings rel to baselin**	**CO2 savings kg rel to baseline**	**Other notes & assumptions**	**Data source**	**Electricity generate by microgenerating kWh per year**	**Energy kWh**
14														
15														
16	Condensing combi gas boiler	£2,000.00	£461.25	£180.00		Y	1845	£12.33			Gas boiler has 80% efficiency			
17	Baseline electricity cost	£0.00	£204.40			Y	715	£3.93						
18														
19	Totals for gas & elec baseline	£2,000.00	£665.65	£180.00			2560	£16.26						
20														
21	Elec heating by storage radiators	£1,500.00	£918.40	£0.00		Y	4018	£17.66			Economy 7 gives 20% reduction in average cost/kWh			
22	Reduced baseline electricity cost	£0.00	£163.52			Y	715	£3.14			Economy 7 gives 20% reduction in average cost/kWh			
23														
24	Totals for all elec baseline	£1,500.00	£1,081.92	£0.00			4733	£20.81						
25														
26	Micro CHP - Baxi Ecogen	£5,000.00	£553.50	£216.00		Y	2214	£14.80			80% efficiency, 1:5 elec:heat		1640	
27	Reduced baseline electricity cost	£0.00	£66.64		-£262.40	Y	-508	£1.28			60% of CHP gen used locally			
28														
29	Total for Micro CHP	£5,000.00	£620.14	£216.00	-£262.40		1706	£16.08	£0.18	855	Savings relative to gas baseline			
30														
31	ASHP - Daikin Altherma 8kW	£5,000.00	£459.20	£180.00	-£359.16	N	1607	£12.29			COP of 2.5			
32	Baseline electricity cost	£0.00	£204.40				715	£3.93	£0.00	0				
33														
34	Total for Air Source heat pump	£5,000.00	£663.60	£180.00	-£359.16		2323	£16.22	£4.58	2411	Savings relative to all-electric baseline			
35														
36	GSHP - IVT Greenline 6kW	£7,000.00	£410.00	£120.00	-£991.03	N	1435	£10.19			COP of 2.8			

Institute of Energy and Sustainable Development

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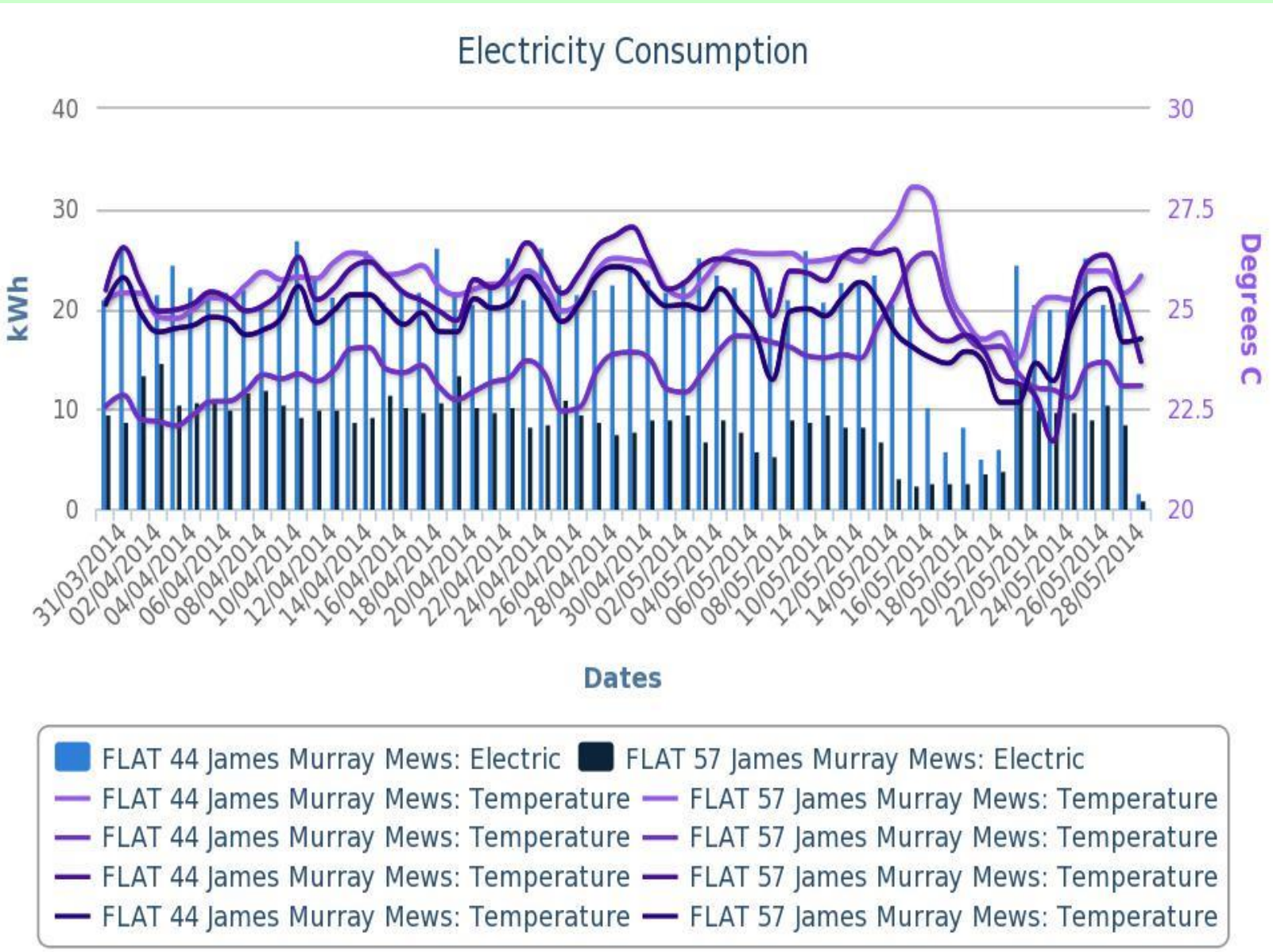
Where are we now?

- 160 properties selected
- Represents 22 property types that are most common across the group
- 3 user groups identified based upon how people interface with controls
- Technology applied from the commercial sector – existing technology
- Time delays in procurement and overcoming issues on monitoring gas

Where are we now?

- A pulse is required, not always available
- Many tenants have pre-payment meters – a pulse exists, but not able to monitor
- Smart meters – Pulse available but permission to access it must come from the tenant and the operator
- Solution – install secondary meters with a pulse after the meter and monitor that. Not always easy


Electricity Consumption
kWh
Degrees C
Dates
40
30
20
10
0
30
27.5
25
22.5
20
31/03/2014
02/04/2014
04/04/2014
06/04/2014
08/04/2014
10/04/2014
12/04/2014
14/04/2014
16/04/2014
18/04/2014
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16/05/2014
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26/05/2014
28/05/2014
FLAT 44 James Murray Mews: Electric
FLAT 57 James Murray Mews: Electric
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FLAT 57 James Murray Mews: Temperature

A carbon Reduction Strategy for emh homes - ***6 To Do's***

1. Increase our minimum SAP ratings.
2. Apply the learnings of the Knowledge Exchange Partnership
3. Develop a resident engagement programme focusing on Fuel Poverty
4. Amend our asset management strategy so energy efficiency is embedded to reduce our tonnage of CO2 emissions by 40,000 tonnes by 2020.
5. Review the criteria for active asset management .
6. Introduce an energy management system into EMH homes operations across its buildings and assets.

7 Opportunities

1. Investigate Opportunities to further the Installation of renewable technologies -
2. Create an energy company.
3. Develop District Heating Schemes with partners
4. All new builds to be at Code level 6 for low energy
5. Embedding Affordable Warmth Officers, and a Fuel poverty manager into emh homes.
6. Looking at partnerships with other organisations to maximise funding e.g. The NHS
7. Selling Green Services across the sector to other housing associations, private landlords, owner occupiers.

The ‘WHOLE’ refers to viewing the system as a whole NOT attempting to solve the whole problem!

Thank You

Any questions?

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Building on the KEP – a new KTP to extract the business benefits

Project Objectives

To obtain KTP funding objectives have to:

1. be highly commercial - generate substantial growth in the sponsoring business and wealth in the wider community;
2. show real knowledge transfer that empowers the growth and wealth generating activities.

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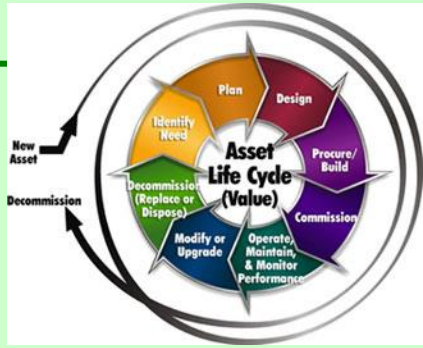
Project Objectives



Our chosen objectives for 2 year project:

1. Strengthen the asset management process
2. Develop and expand the role of the building services team
3. Devise a strategy for the Green team
4. Develop a communications strategy for working with tenants
5. Develop an “app” for delivery of energy monitoring data to tenants and others

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Asset Management

- Use energy-related criteria (among others) to inform our asset management strategy
- Consider sale of less attractive and inefficient properties allowing re-investment in new build
- KTP task is to build a decision process based on the data and archetypes from the KEP

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Monitoring and communication

- Develop a communication strategy for working with tenants to encourage and support behaviour change
- Monitor household investment programme and
- Test components and interventions to inform specifications

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Building Services Team

- Equip the team to win business outside emh
- Create “one stop shop” to provide property upgrades as well as heating, control, and monitoring technologies
- Opportunity arises from schemes e.g. Renewable Heat Incentive
- KTP will develop technology solutions and the business processes that satisfy funding criteria

RHI FOR THE HOME

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Green Team Strategy

- Complementary to Building Services business development
- Aim to provide advice and project management to clients beyond emh
- KTP will develop analysis tools and solution selection criteria
- KTP will also build up knowledge base on incentive and funding schemes

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App development

- KTP will work with EnergyDeck to develop a specification for the app
- Will provide simple and actionable energy use information for residents and other users
- Will promote Green Team services
- Will require additional funding beyond KTP to support coding and rollout

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Summary

- KTP will make productive use of the energy monitoring capability
- Provide a real basis for emh to grow
- Just need to get the words in the bid to tick the right boxes! (For Innovate UK aka TSB)

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The ‘WHOLE’ refers to viewing the system as a whole NOT attempting to solve the whole problem!

Thank You

Any questions?

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