Digital Housing

Smart homes – utilising technology in social housing

Matthew Rhodes

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Encraft works at the leading edge of the low carbon built environment

We support housing providers and the construction sector nationally through three specialised teams.

**Distributed Energy Projects**
- Community energy
- Smart grids
- District heating and CHP
- Feasibility studies
- Project development
- Programme management

![Kate Ashworth](image1.jpg)
Kate Ashworth
CEng MIMechE
Practice Head

**Building Physics**
- Certified Passivhaus Consultants
- Building energy modelling
- Very low carbon retrofit
- First-principles design
- Technology analysis

![Helen Brown](image2.jpg)
Helen Brown
MPhys, Certified Passivhaus Consultant
Practice Head

**Web Applications**
- Microgeneration specification tools
- Planning compliance
- Asset review
- Bespoke web applications
- Mobile devices

![Graham Eastwick](image3.jpg)
Graham Eastwick
CEng MIET
Practice Head

CUSTOMER-LED INNOVATION
Agenda

• A personal perspective on technology in housing and smart homes
• The vision
• What is actually happening
  • Products and technologies
• Issues and barriers
• Some example projects
• Ways forward
• Discussion
My own experience is that people are the key to unlocking the potential of technology

- Smart homes projects since 2008
- Renewables in housing since 2003
- IT since 1981 (!)

- Current and recent projects
  - Modern infrastructure for new housing (2012)
  - EMPower community energy system
  - Optimising Regional Clusters of Smart Electricity Networks
The vision is to at least halve everyone’s fuel bills: there are three stages of smart technology.
Basic smart controls are about automating what we could do anyway (or recognizing laziness...)

These technologies are getting cheaper and prettier!
These technologies also help make the benefits of energy saving visible (and even trendy)
So suddenly home energy is very easy

Programs itself so you don’t have to.

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There are significant potential gains at individual property level

Heat Genius allows you to control your heating from anywhere via your mobile, laptop or tablet.

Heat Genius learns when you use your rooms and schedules your heating to only turn on when you need it – saving you time and money!

Save energy by only heating rooms when you need them

- 6:30AM: bedrooms warm up before people wake up
- 7:30AM: bathroom and kitchen ready and warm
- 10:00AM: person working from home, only study is heated
- 7:00PM: everyone home, kitchen and living room heated
- 9:30PM: living room and bedrooms warm
- 11:00PM: everyone sleeping, bedrooms set to night time temperature
Smart technologies can also help engage and maximise the value from micro-generation
You can also start managing energy assets across portfolios more efficiently
Stage two is the critical one – connecting and optimising across houses

Mrs Smith is exporting electricity to the grid at 4.7p/kWh

Mr Jones is buying electricity from the grid at 28p/kWh

If ONLY we could CONNECT, everybody wins!
There are several economic opportunities

• Local balancing of supply and demand
  • Between houses
  • Between time periods (load shifting)
• Demand response services
  • STOR
  • Frequency Response
  • “The people’s power station”

Technically all these need is a meter and the capability to switch appliances on and off remotely
Housing is the next frontier for services already well-established in the industrial sector.
The real benefits for housing will come when smart investment combines with connected controls.

1. Energy supply and demand is optimised within a community first.

2. The national system works at a higher level to balance demand and supply between communities.
The kind of investment required goes beyond smart meters and controls

<table>
<thead>
<tr>
<th>Smart grid option</th>
<th>IRR for ESCO</th>
<th>Investor capital cost</th>
<th>Extra build cost/dwelling</th>
<th>Annual revenue to occupant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heat pumps with thermal stores</td>
<td>8%</td>
<td>£10m</td>
<td>£1000</td>
<td>£142</td>
</tr>
<tr>
<td>District heating with central thermal store</td>
<td>8%</td>
<td>£12m</td>
<td>£400</td>
<td>£42</td>
</tr>
<tr>
<td>PV modules with storage</td>
<td>8%</td>
<td>£1m</td>
<td>£850</td>
<td>£360</td>
</tr>
</tbody>
</table>

These are figures for a 1311 unit new build development in Warwickshire
So the biggest benefits come from a tailored mix of technologies:

- Smart meters (data) +
- Smart control (ability to act) +
- Infrastructure (only connect) +
- Energy storage (time shifting)

You can’t value any one of these in isolation!
Even at single property level, there’s a lot more you can gain with a little investment in infrastructure.
Each stage faces different barriers

Stage 1 - “Why bother?” (Residents can do it themselves)

Solution:

....make it seductive,
...and cheap!
Stage 2 – why connect?

Mrs Smith is exporting electricity to the grid at 4.7p/kWh

If ONLY we could CONNECT, everybody wins!

This needs vision and the right circumstances – it will only make sense in limited cases to start with
In practice, there are both technical and regulatory barriers preventing wider benefits

- Top-down networks
- Markets designed around suppliers not customers (commodity supply price not cost of product)
- Regulations designed assuming the information technology of 1989 (and in some places 1965)
Housing providers can overcome these barriers in different ways

1. **Opportunistic investments on the right sites**
   - Where you can control the infrastructure
   - Where you can establish a ‘gatekeeper’ model
   - Where you can use data to direct investment and take a strategic view

2. **By entering the energy market and managing resident fuel bills**
   - Accepting customer management risk
   - Accessing potentially much bigger (but incidental) benefits of cutting out Big 6 overheads and profits
Local energy services models create a context where smart technologies add more value

EMPower Connected Community Pilot
Corsham, Wiltshire
EMPower is developing the technologies to support community control.
Some housing providers are already looking beyond geographically-limited pilots

- Glasgow/Our Power
- Nottingham
- London
- Bristol
- Northampton
- Birmingham
- Portsmouth
- Manchester
The cumulative benefits should be substantial

<table>
<thead>
<tr>
<th>Current bills</th>
<th>£1300 p.a.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smart home management</td>
<td>-£195 p.a.</td>
</tr>
<tr>
<td>Connected community</td>
<td>-£ 98 p.a.*</td>
</tr>
<tr>
<td>Community managed ESCO</td>
<td>-£400 p.a.**</td>
</tr>
<tr>
<td>Smarter bills</td>
<td>£ 607 p.a.</td>
</tr>
</tbody>
</table>

* will require ESCO or license
** re-investing part of these savings in energy efficiency projects could provide a route to zero bills
The way forward

Smart homes are just the beginning

Look for opportunities to connect + invest

- District heating and chp schemes
- New build estates
- Heat is easier than electricity (but less valuable)
- Energy storage (incl. electric vehicles) is key

If you want to cut fuel poverty using smart technology, think about becoming an energy company
Any questions

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