Whole House Solutions
The current evidence base

Three new European studies

Christine Liddell
Three new European studies

Study 1
“Up until recently, international research papers which evaluated actual energy consumption post-retrofit had to base their analysis on theoretical models. Now that actual housing stock data are available, it emerges that these sometimes overestimated the benefits of retrofits by as much as 50%, and sometimes underestimated benefits by as much as 30%.”
Dutch housing stock study

- 31,000 retrofitted homes
- No uniform strategy for renovations
- All with only one new energy efficiency measure installed
Majcened et al., 2016

31,000 retrofitted homes
one measure installed

% gas reduction

- Draughtproof
- Windows
- Envelope
- Heating/hot water
- Window replacement was seldom deep – probably underestimates potential.

- A new boiler has the same order of impact, in almost all situations.

31,000 retrofitted homes

% gas reduction

- Draughtproof
- Windows
- Envelope
- Heating/hot water
31,000 retrofitted homes

Where 2 measures were installed:

- one measure saved 1x
- two measures saved 1.57x

% gas reduction

- Draughtproof
- Windows
- Envelope
- Heating/hot water
Three new European studies

Study 2
Hamilton et al., 2016
English housing stock
169,000 homes

- Home Energy Efficiency database
  (n = 16.4M homes)
- What measures did each home have?
- Linked to energy supplier meter point data
Hamilton et al., 2016
English housing stock
169,000 homes

• Improved fabric measure: 4% less gas
• Improved heating measure: 10% less gas
• Improved fabric + heating measures: 12% less (not 14%)
Hamilton et al., 2016

English housing stock
169,000 homes

- Improved fabric measure: 4% less gas
  
  Cavity, not loft insulation made this difference
  Ceiling effect for loft insulation in evidence

- Improved heating measure: 10% less gas
  
  More than half of this from boiler replacement (gas to gas replacement)
Choosing the **optimal combination** meant that reductions in gas consumption were *better than additive*.

*Three wisely chosen measures installed together increased savings by 40% more than doing them one at a time.*
Three new European studies

Study 3
Simpson et al., 2015
20 real-life case studies

<table>
<thead>
<tr>
<th>Retrofit measure</th>
<th>% less gas</th>
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</thead>
<tbody>
<tr>
<td>Loft insulation</td>
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<tr>
<td>Ground floor</td>
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<td>Wall</td>
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<tr>
<td><strong>ALL AT ONCE</strong></td>
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Simpson et al., 2015
20 real-life case studies

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</tr>
<tr>
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<td>3%</td>
</tr>
<tr>
<td>Wall</td>
<td>15%</td>
</tr>
<tr>
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<td>Boiler</td>
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**Simpson et al., 2015**

20 real-life case studies

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<td><strong>Installed all at once</strong></td>
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<td><strong>Total</strong></td>
<td><strong>62%</strong></td>
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Two key concepts when planning for Whole House Solutions

**Bespoke** – find the optimal combination

A new boiler in a low EE house works 440–1300 hours more in a year (Simpson et al., 2015)

The new boiler can be sized for the new fabric

**Concierge service** – boost uptake through making it comfortable
Hamilton et al., 2016
English housing stock
169,000 homes

The UCL team’s conclusion:

“This research shows that these savings are achievable using widely available technologies and insulating techniques that rely on an existing deployment system and skill base.”