BUILD TEST SOLUTIONS

Using Measured Heat Loss to Optimise Heat Pump Design

Dr Richard Jack, BTS
Leah Robson, Your Energy Your Way

9th April 2026

Today’s speakers

Dr. Richard Jack
Build Test Solutions

Leah Robson
Your Energy Your Way

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Contents

- Richard - A bit of building physics & worked examples
- Leah - an installer’s perspective
- Q&A

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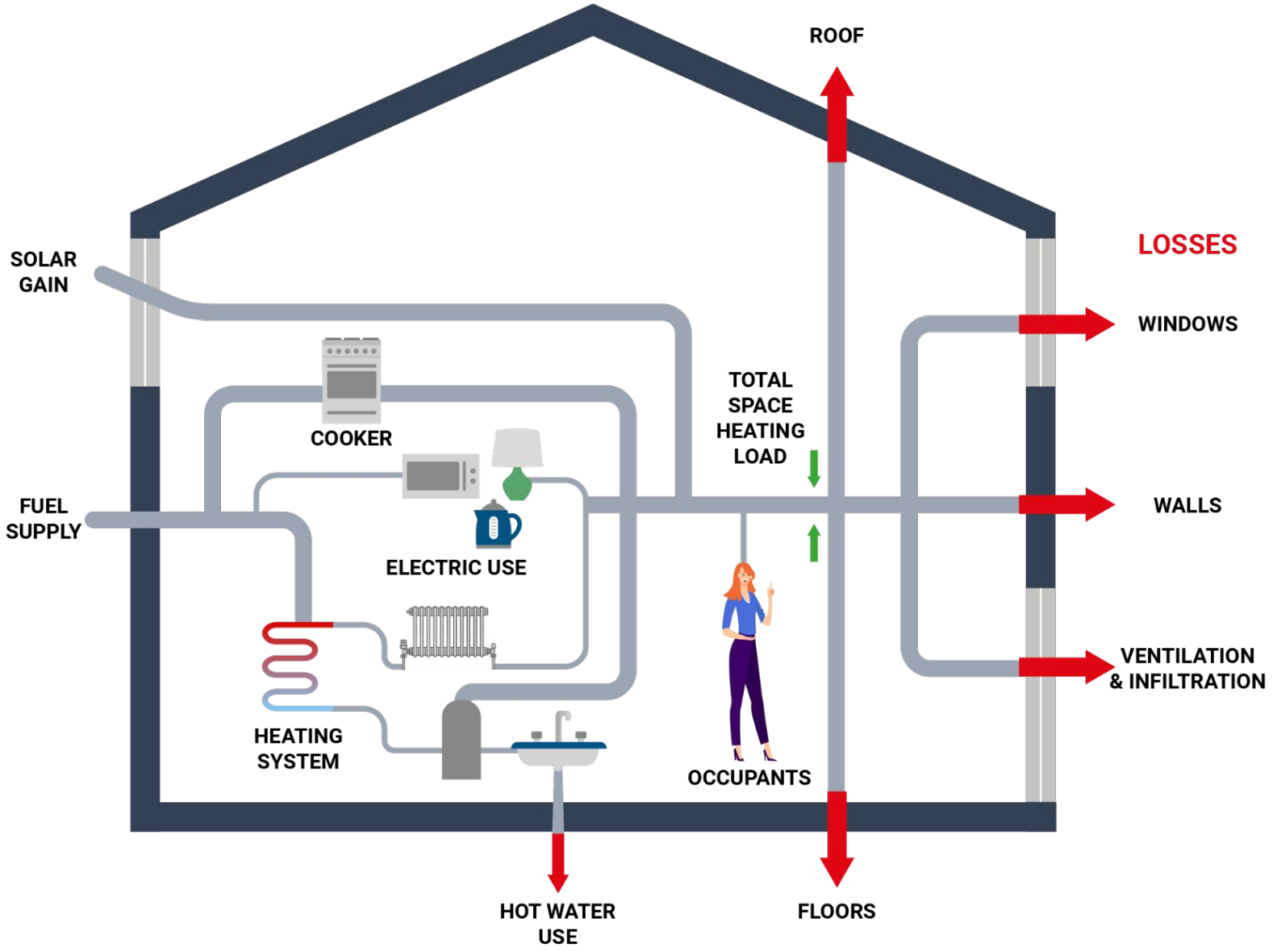
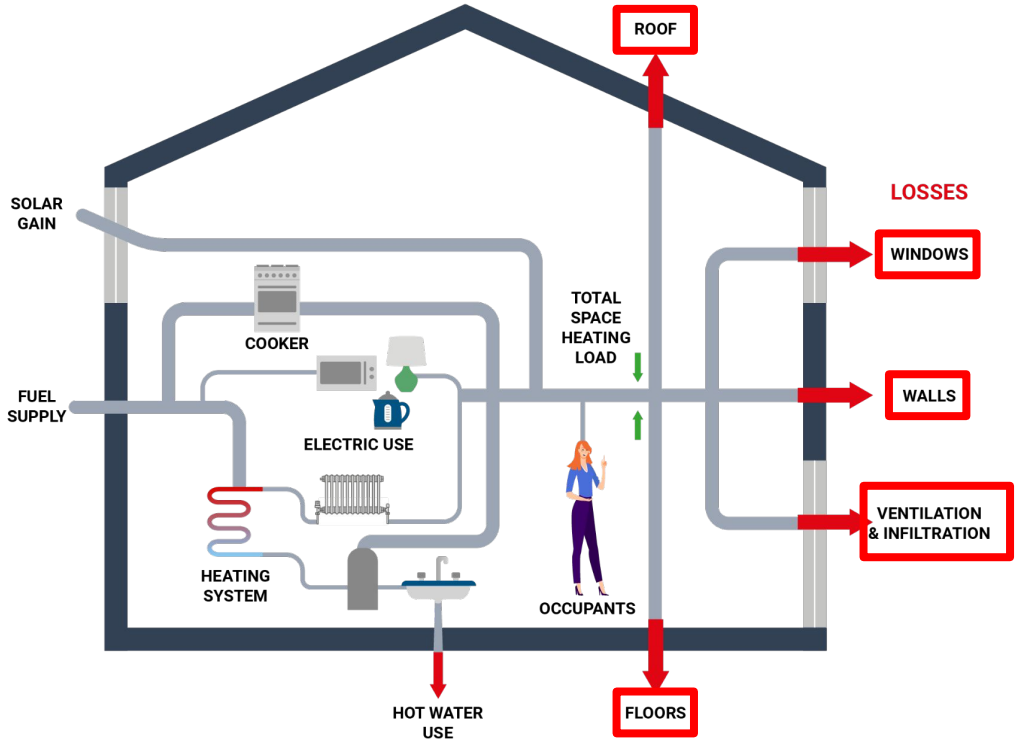
A bit of building physics 👌


ROOF
LOSSES
SOLAR GAIN
WINDOWS
TOTAL SPACE HEATING LOAD
COOKER
FUEL SUPPLY
WALLS
ELECTRIC USE
VENTILATION & INFILTRATION
HEATING SYSTEM
OCCUPANTS
HOT WATER USE
FLOORS

How does a heat loss calculation work?



1. Take each **heat loss path**
2. Estimate performance: U-values, air changes
3. Multiply assumed performance by area
4. Add them up

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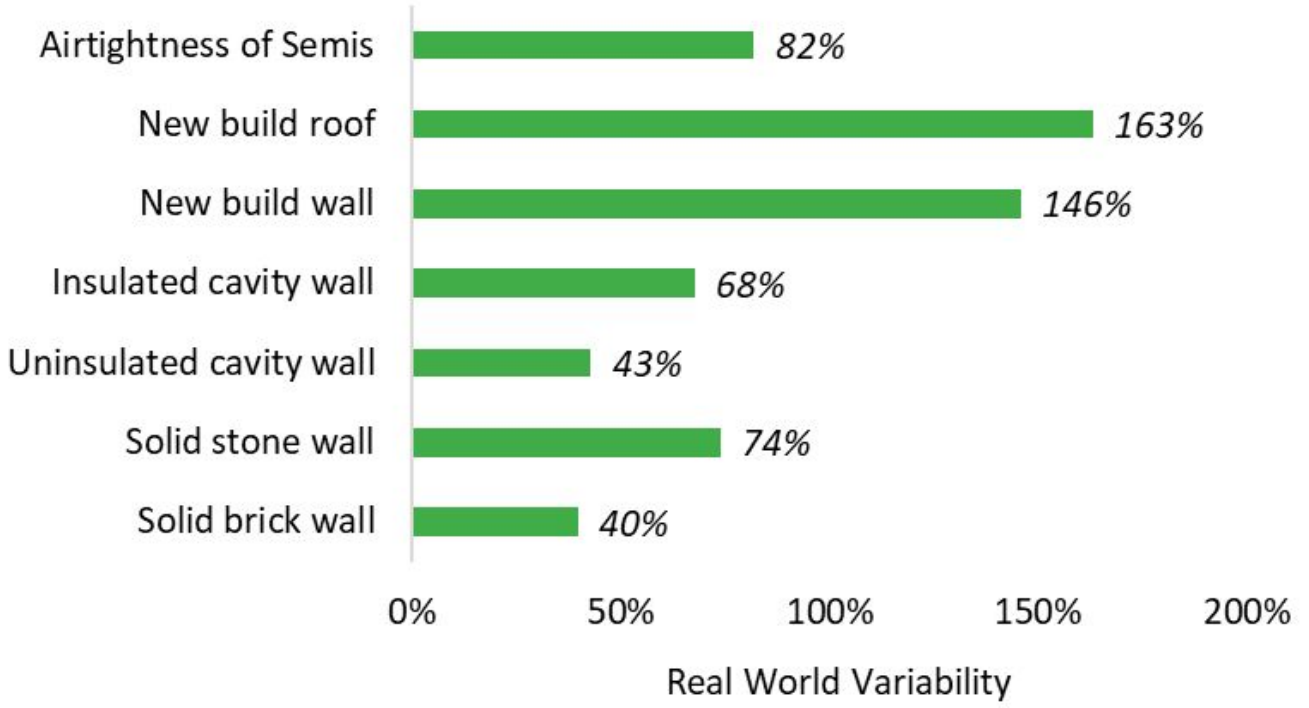
What's wrong with that?

Real building performance is *incredibly* varied



Data from:
BRE (2016). Solid wall heat losses and the potential for energy saving.
Baker (2011). U-values and traditional buildings: In situ measurements and their comparisons to calculated values.
Hulme, J & Doran, S. (2014). In-situ measurements of wall U-values in English housing..
Gupta & Gregg (2020). State of the nation review: Performance evaluation of new homes.

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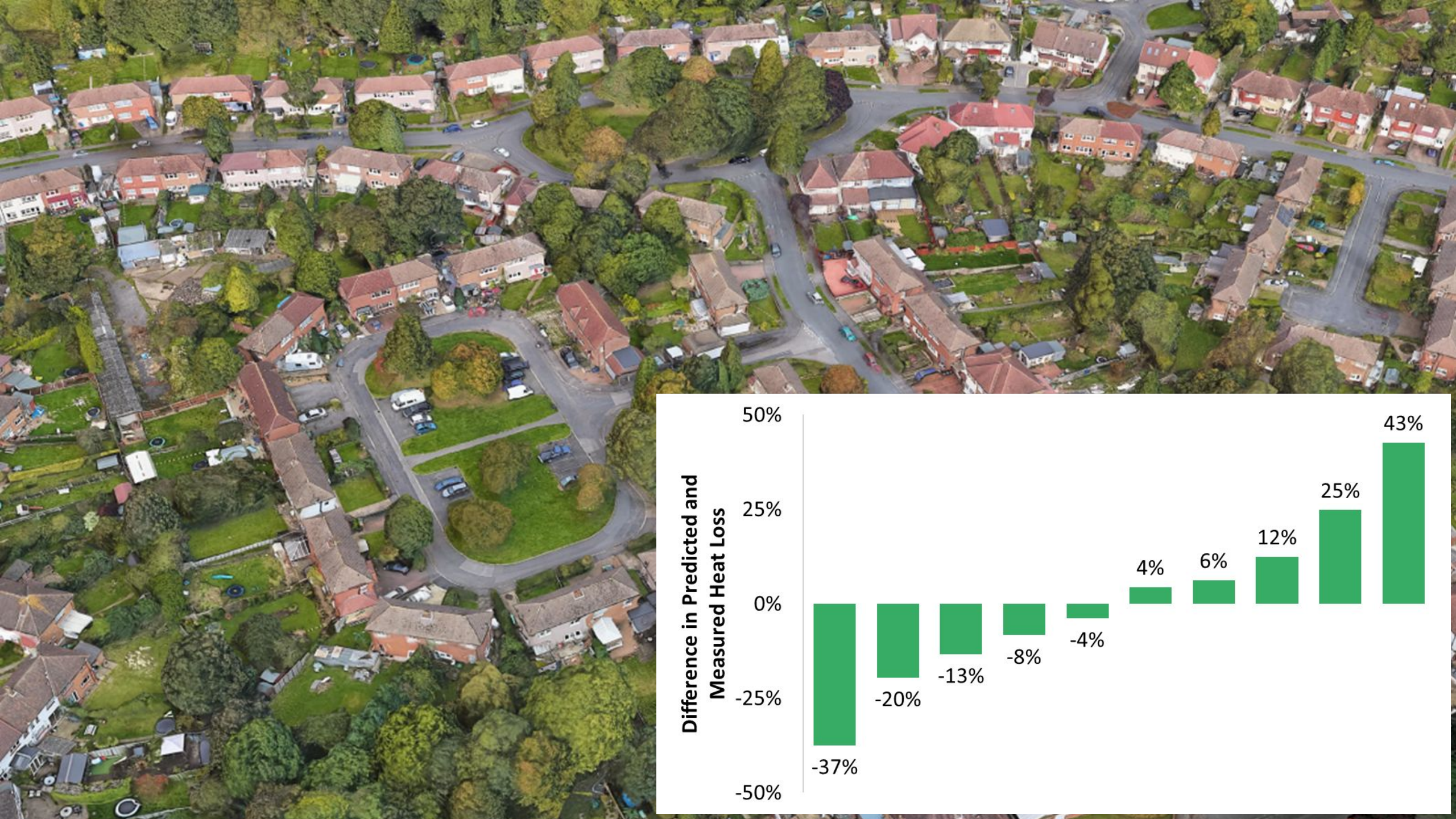
Difference in Predicted and Measured Heat Loss
50%
25%
0%
-25%
-50%
-37%
-20%
-13%
-8%
-4%
4%
6%
12%
25%
43%

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What can we measure?

Bit by bit, or altogether

Bit by bit - calibrate the model:

- U-values | *1 hour*
- Airtightness | *30 mins*
- Ventilation flow rates | *30 mins*

Altogether - directly measure overall heat loss:

- SmartHTC | *30 mins, requires 3wk data*

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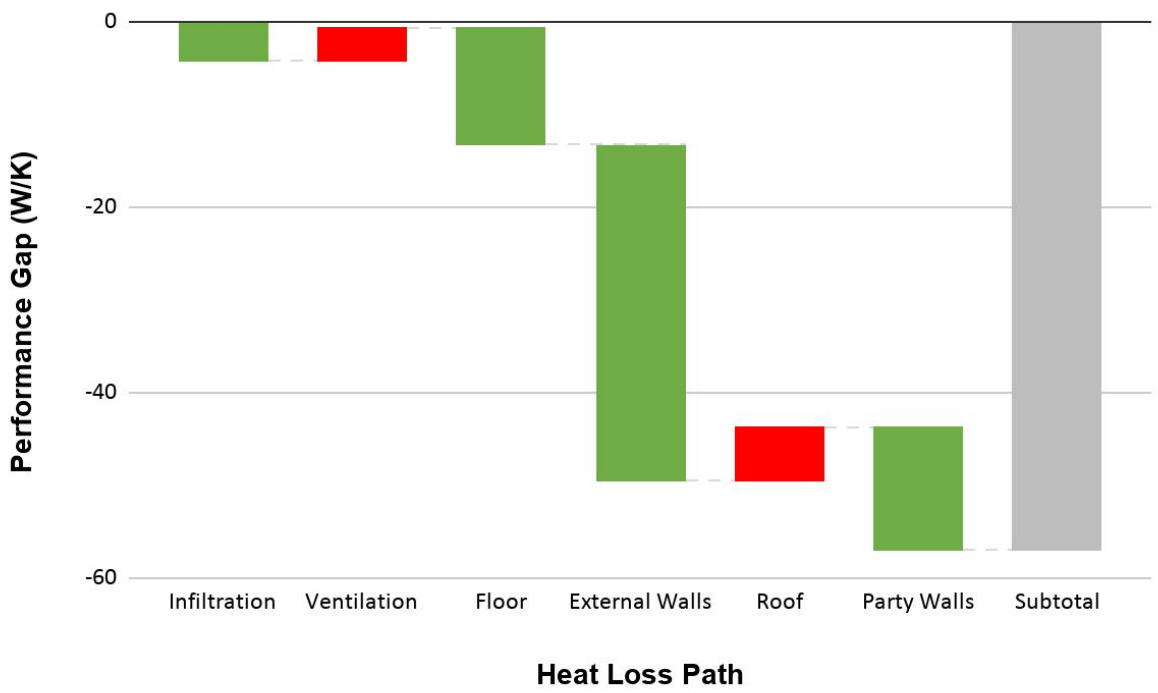
Worked Example



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Worked Example

- Calculation - 210W/K, 5.1kWp
- SmartHTC - 127W/K, 3.0kWp

Could stop here…

- Airtightness & U-values explain the difference
- & calibrate room/emitter results

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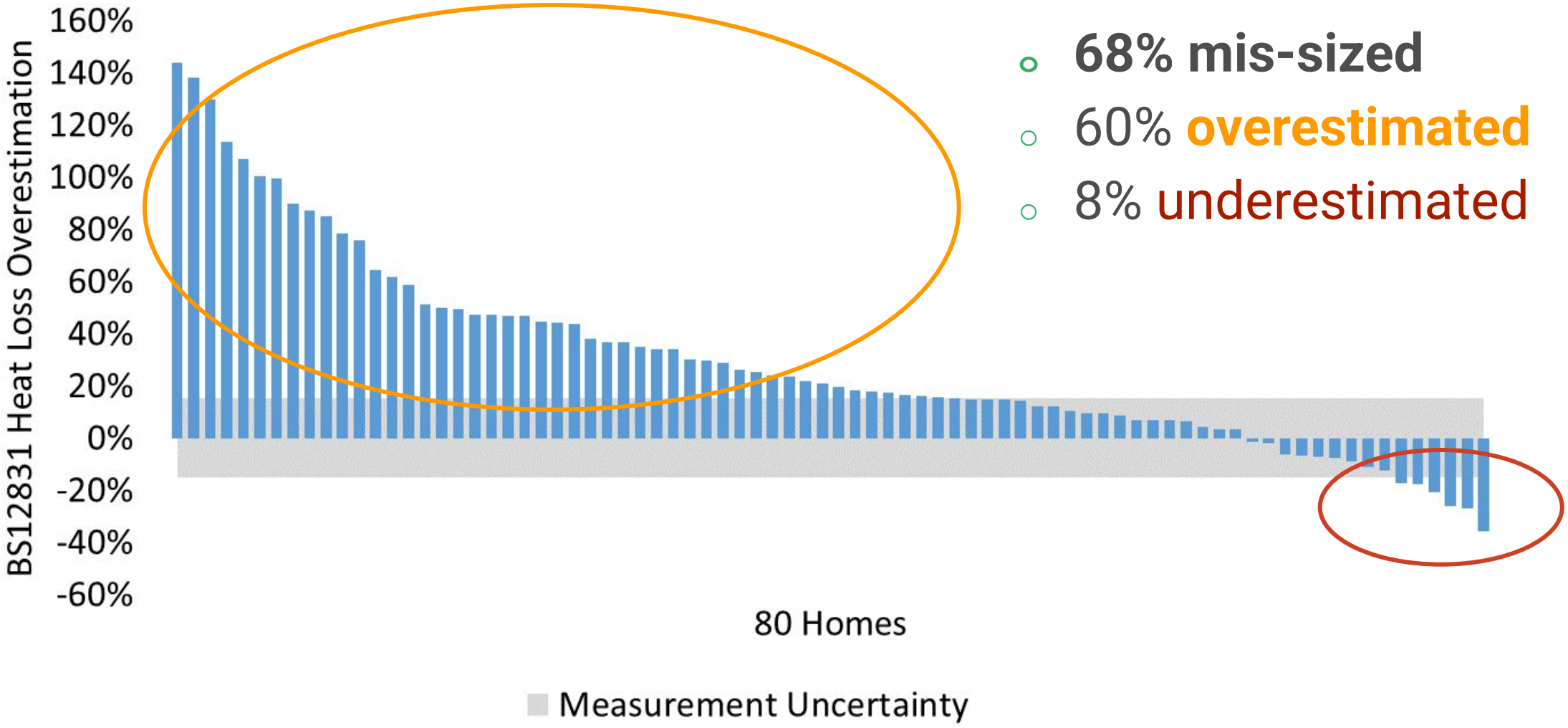
Heat Pump Sizing Field Trial



- **68% mis-sized**
- 60% **overestimated**
- 8% underestimated

Does Right Sizing Matter?

I think it means:

- Often thousands £ difference to install cost
- Less disruption
- Better running efficiency?
- Minimise undersizing risk

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An Installer's Perspective

Measurement and Air Source Heat Pump Sizing

Produced by: Your Energy Your Way CIC

www.yourenergyyourway.co.uk

info@yourenergyyourway.co.uk

9 April, 2026

Introducing Colin and Deborah

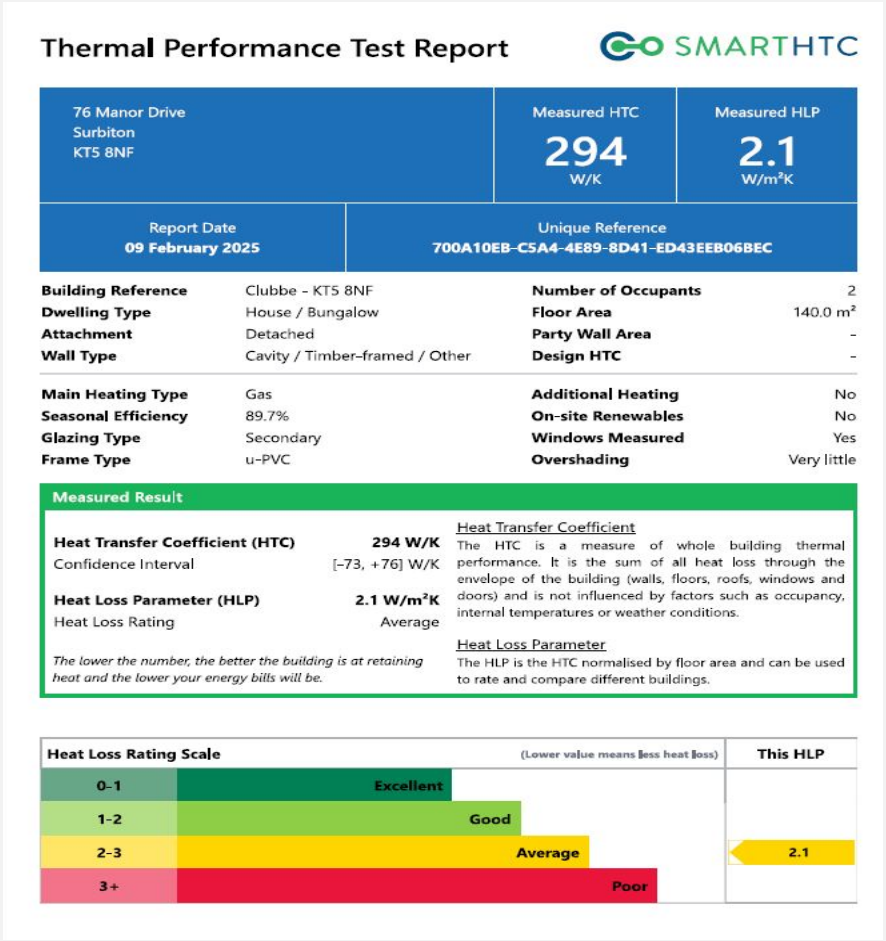
Whole House Report

Measurements Taken:

- Air tightness test
- Thermal imaging survey
- Data loggers to measure heat loss
- Conventional heat loss survey

Results

- Data loggers: heat loss of 6.1kW with a confidence interval of 4.6kW to 7.7kW
- Conventional heat loss: heat loss of 9.31kW.
- Air tightness 7.19 m3h-1m-2 @50 Pa
- Infrared U value measurement



Thermal Performance Test Report

SMARTHTC

76 Manor Drive Surbiton KT5 8NF	Measured HTC 294 W/K	Measured HLP 2.1 W/m²K
Report Date 09 February 2025	Unique Reference 700A10EB-C5A4-4E89-8D41-ED43EEB06BEC	

Building Reference	Clubbe - KT5 8NF	**Number of Occupants**	2
Dwelling Type	House / Bungalow	**Floor Area**	140.0 m²
Attachment	Detached	**Party Wall Area**	-
Wall Type	Cavity / Timber-framed / Other	**Design HTC**	-
Main Heating Type	Gas	**Additional Heating**	No
Seasonal Efficiency	89.7%	**On-site Renewables**	No
Glazing Type	Secondary	**Windows Measured**	Yes
Frame Type	u-PVC	**Overshading**	Very little

Measured Result

Heat Transfer Coefficient (HTC)	**294 W/K**
Confidence Interval	[-73, +76] W/K
Heat Loss Parameter (HLP)	**2.1 W/m²K**
Heat Loss Rating	Average

The lower the number, the better the building is at retaining heat and the lower your energy bills will be.

Heat Transfer Coefficient

The HTC is a measure of whole building thermal performance. It is the sum of all heat loss through the envelope of the building (walls, floors, roofs, windows and doors) and is not influenced by factors such as occupancy, internal temperatures or weather conditions.

Heat Loss Parameter

The HLP is the HTC normalised by floor area and can be used to rate and compare different buildings.

Heat Loss Rating Scale (Lower value means less heat loss)		This HLP
0-1	Excellent	
1-2	Good	
2-3	Average	2.1
3+	Poor	

So What?

- We installed an 8kW heat pump instead of a 12kW one
- We only upgraded 5 radiators instead of 12
- Reduced the install cost by approximately £2000
- More efficient running

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Further Information

Further Information

- **PODCAST**
  - **RISE podcast:**
    “Heat Pumps: tackling the problem of over and under specification”
    Dr. Richard Jack and Sarah Daly

    https://open.spotify.com/episode/58N6EAscHpyyY1B4qwW69X?si=8_lkEdLXQmmDxdIQVlPOGw&nd=1&dlsi=63fec3bfa6bd41b4

RISE

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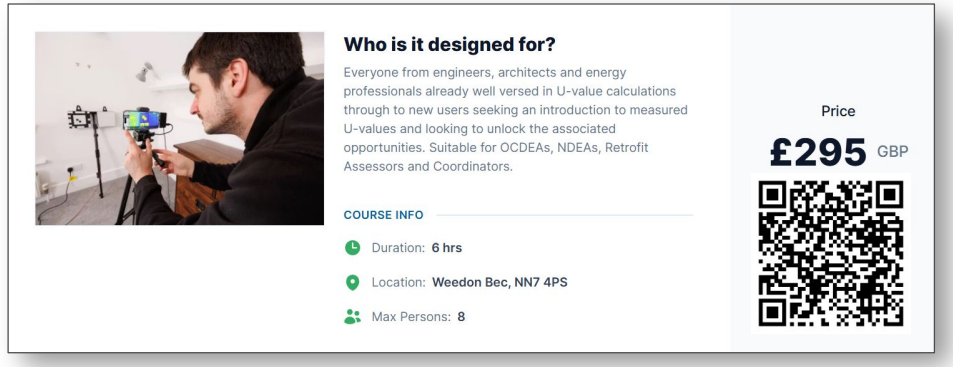
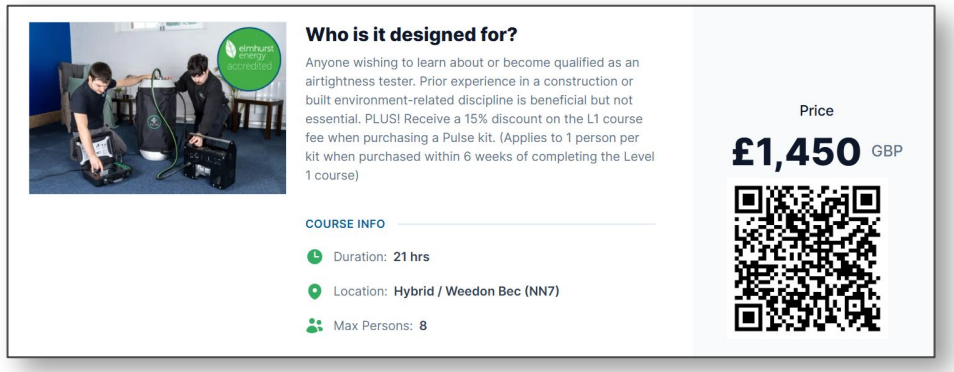
Training

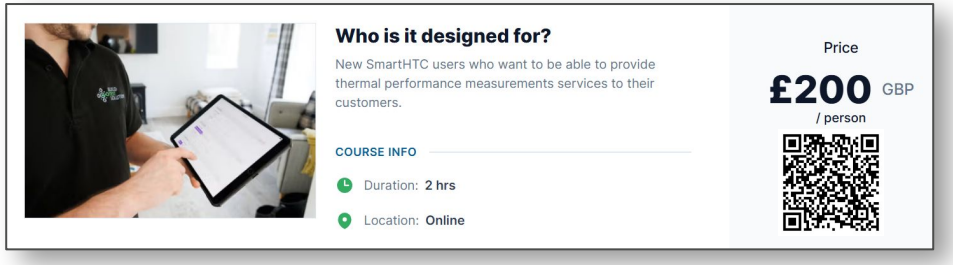
- **U-value training:**
  7 May 2026 / 1 June 2026



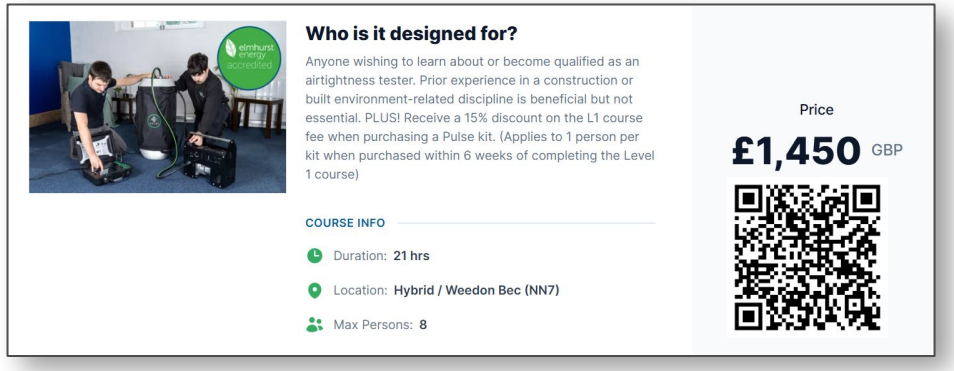
- **Level 1 air tightness testing:**
  14-16 April 2026 / 19-21 June 2026



- **SmartHTC User Training:**
  Contact for dates



- **Pulse Upskill training:**
  16 April 2026 / 21 June 2026



Diary Dates

- **EVENTS**
  - Making Measurement Mainstream, Hamilton - 6th May
  - Futurebuild, London, 12th-14th May
  - Elmhurst Conference, Glasgow - 20th May
  - PEPA Conference, Nottingham - 29th June

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Next Webinar

- **Measurement in action - case studies from the front line**

  4th June @ 1pm

  Presented by: Michael Huth

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Thank you!

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