

Carrowbreck Meadow

Post Occupancy Evaluation

Sarah Lewis



Hurricane Way

10-20 units

Stage 2

Carrowbreck Meadow

14 units

Complete 2016

Three Score

112 Passivhaus

Stage 5

UEA

Enterprise

Centre

3500m2

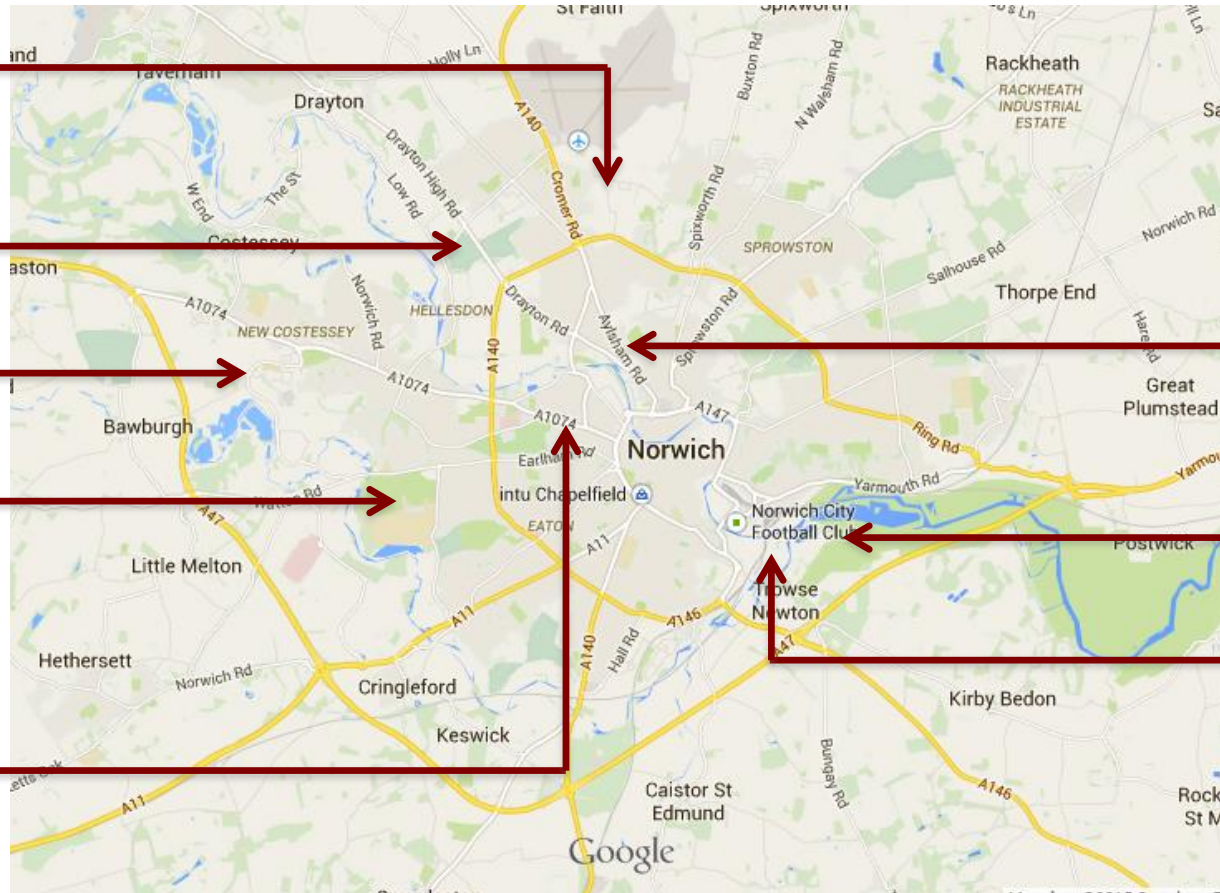
Complete

2016

Goldsmith St

105 units

Stage 5



Hansard

Close

10 units

Stage 5

Norwich

Power

House

100 units

Stage 1

Broadland HA

250 units

Stage 3



Site Plan

Post Occupancy Evaluation (as part of Soft Landings)

- Provides follow-through and feedback over the first few years of occupation
- Develops insights for continuous improvement process



The Questions We Are Aiming to Answer:

- How well is the building working?
- How well does it compare with its peers?
- Where can it be improved?
- What lessons can be learned?



Carrowbreck POE Consists of:

- Occupant Semi-structured Interviews
- Utility Bill Collection
- Occupant Surveys
- Remote Web-based Monitoring



Occupant Surveys

- Moving In and Design
- Comfort and Control



65% response rate
to web-based surveys

Occupant Surveys

88.9% satisfied to very satisfied
with the overall design and layout of
the development and their home



Occupant Surveys

100% of recipients listed the woodland setting, proximity to Norwich and modern design as factors in their decision to buy



Only 65% listed the sustainable credentials as a factor

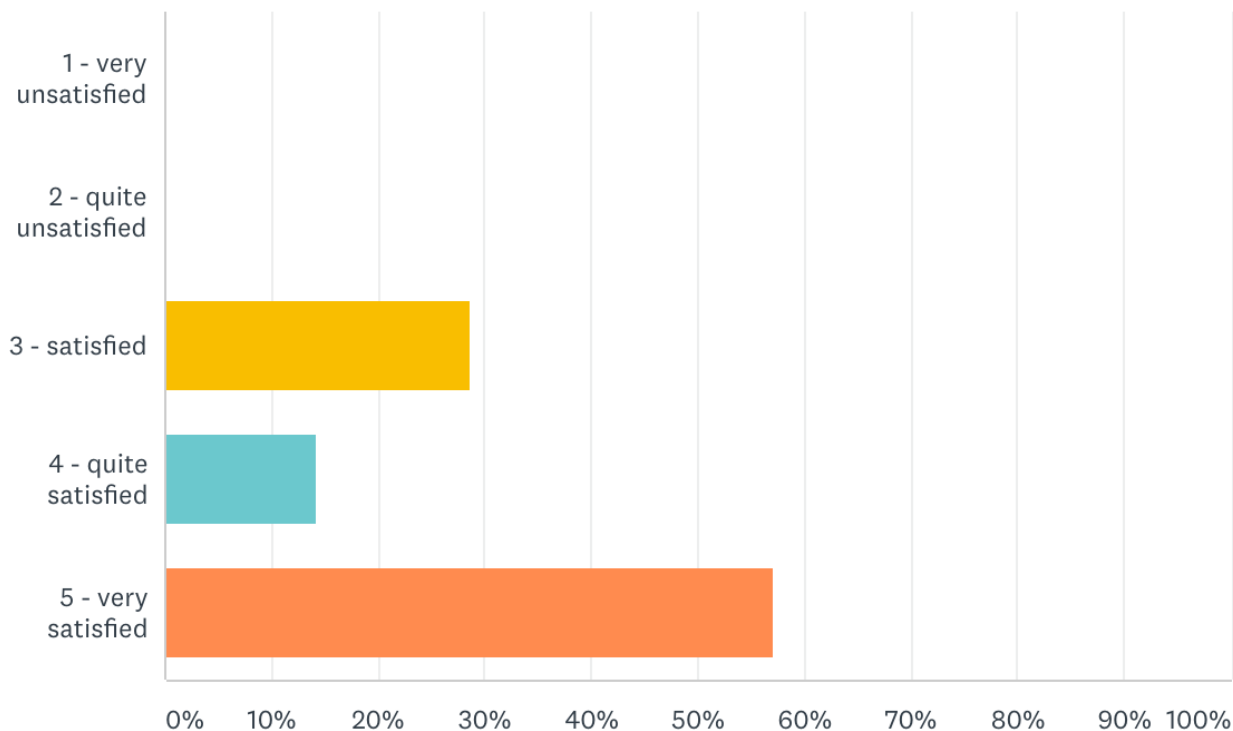
Occupant Surveys

Q: Having lived in Carrowbreck Meadow, if you were to move home again would you chose to buy another Passivhaus?

85.7% said they would now either prefer to live in a Passivhaus or only move if it was into another Passivhaus

Occupant Surveys

How satisfied are you with your energy bills?



Occupant Surveys

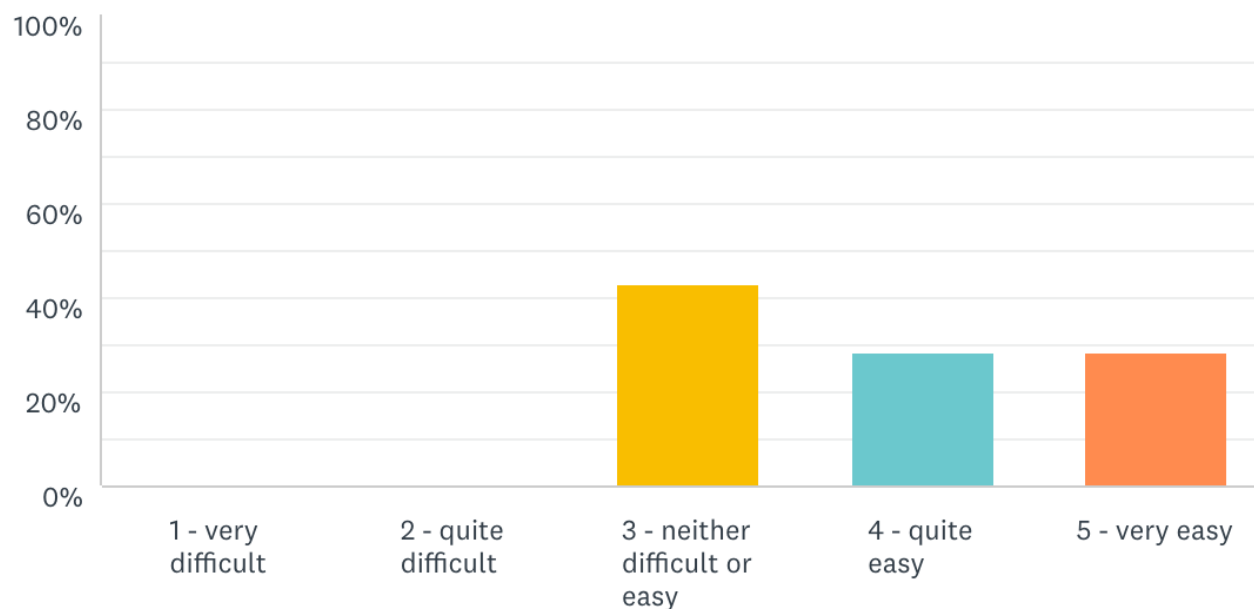
How easy is it to use the heating?

85% said it
was the same or
easier than they
were used to



Occupant Surveys

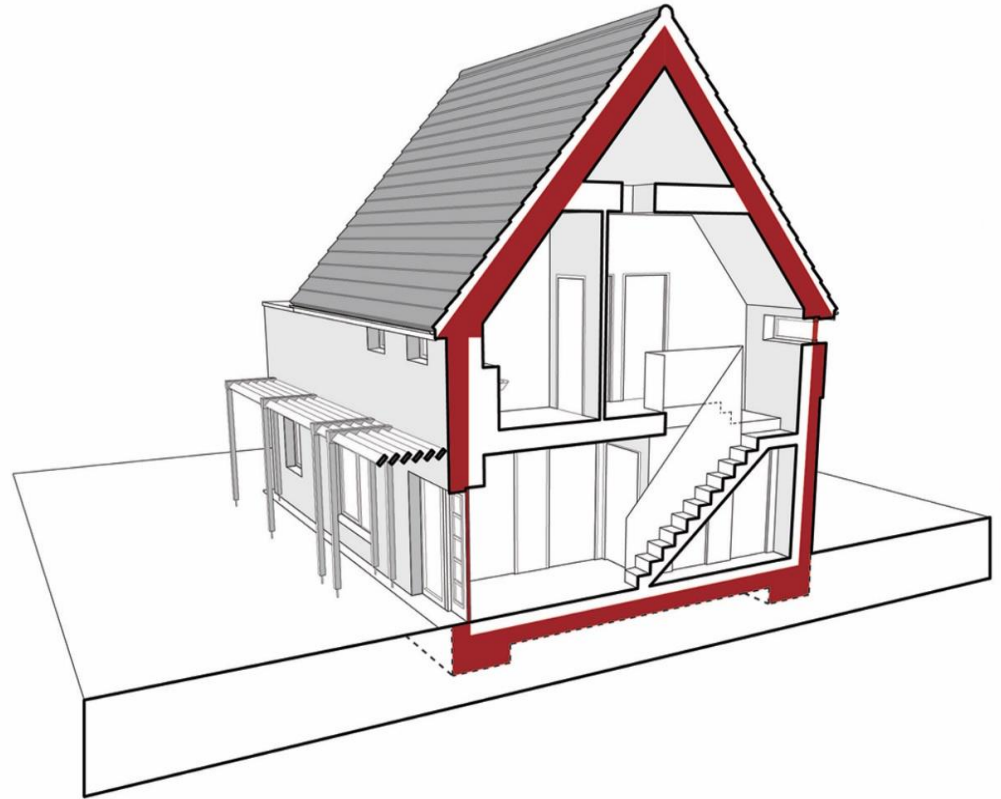
How easy is it to use the ventilation system?



Occupant Surveys

Winter comfort

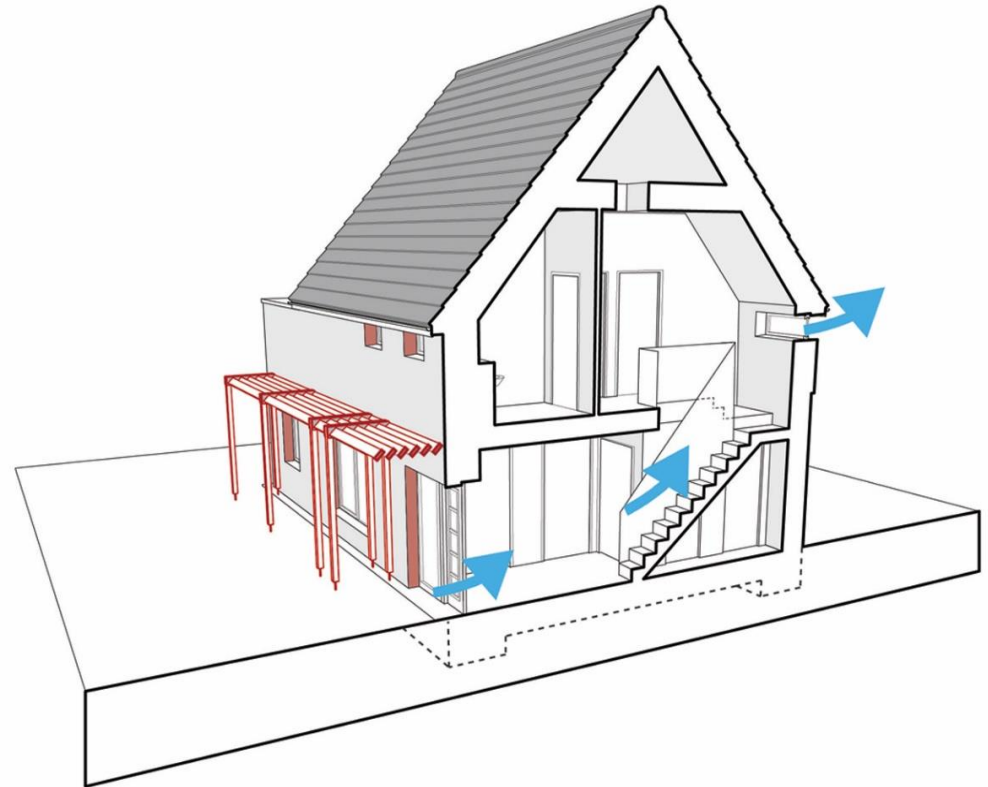
85.7% said it
was comfortable to
very comfortable



Occupant Surveys

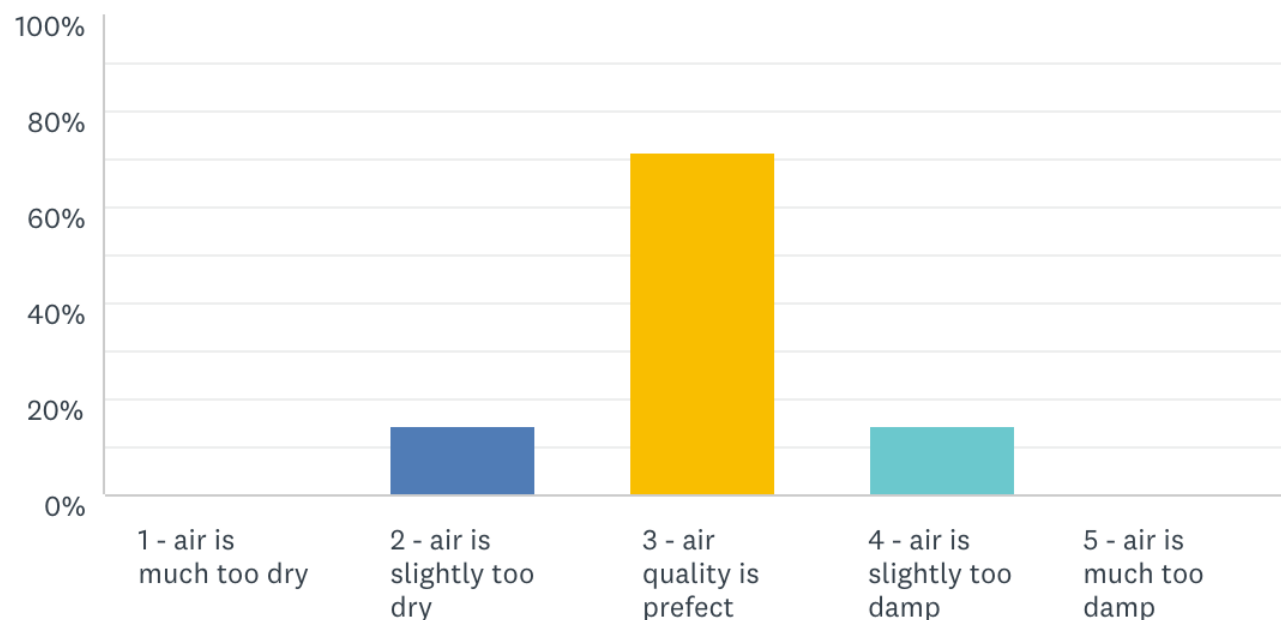
Summer comfort

85.7% said it
was comfortable to
very comfortable

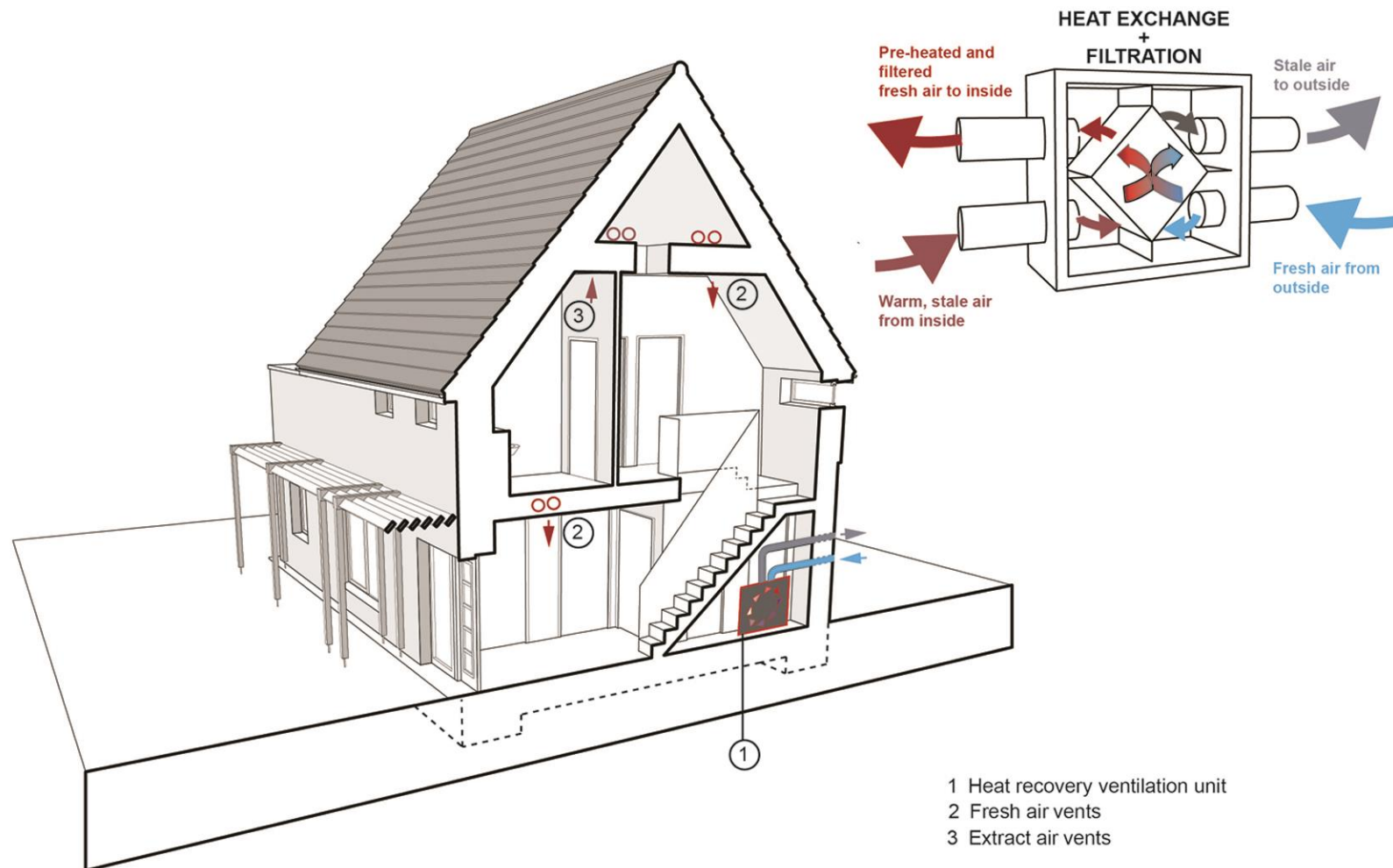


Occupant Surveys

How is the quality of the air in your home?

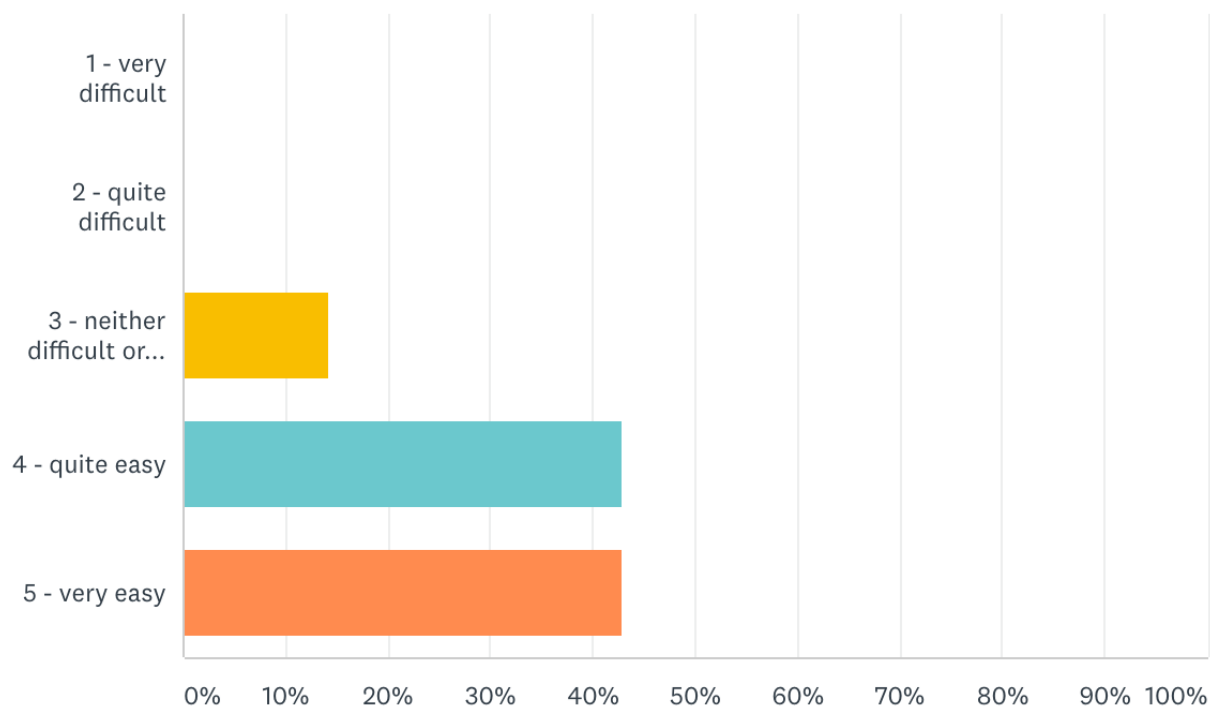


Occupant Surveys



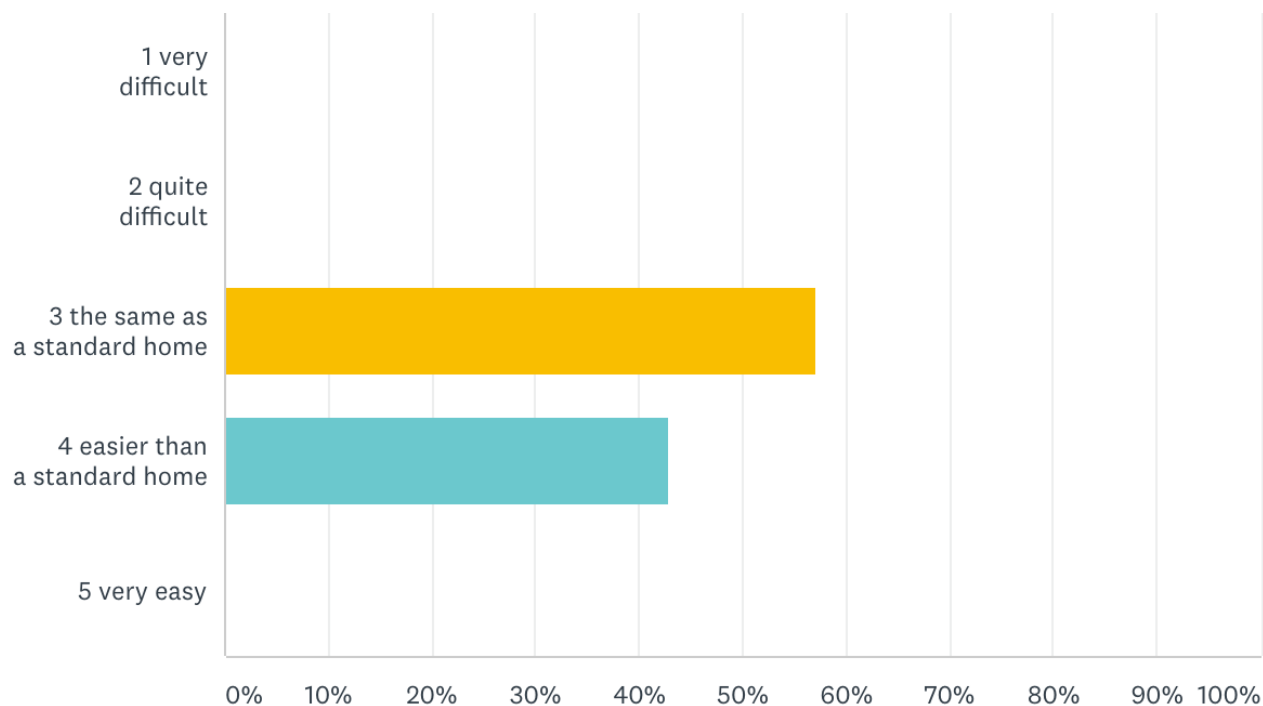
Occupant Surveys

How easy is it to change the filters in your ventilation system?



Occupant Surveys





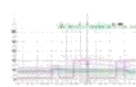









Overall how easy is your Passivhaus to maintain?



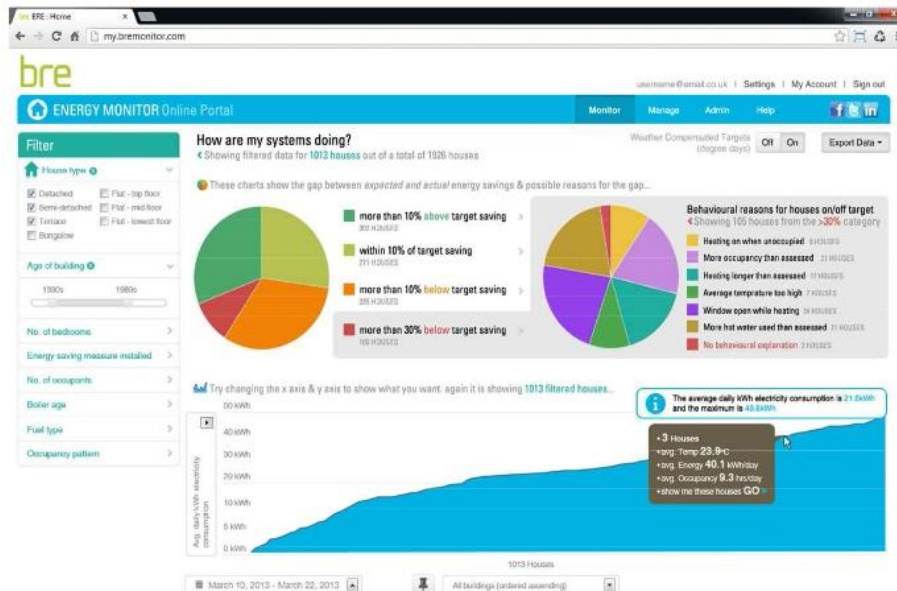
Remote Web-based Monitoring

Supplied and installed by Tensor

BRE House Monitoring Price List

Product	Description	Quantity	Price GBP
T3521	 BRE Energy Monitor 'Hub' with WiFi and energy monitoring software.	1	415.00
NET-WT-3G1	 BRE Energy Monitor 'Hub' with WiFi and energy monitoring software and 3G capability	1	130.00
3G-24	 3G SIM card and connection contract (mobile phone provider to be decided when the order is placed for this part)	Price TBA Per Order	TBA
BRE-UPLOAD	 BRE Data Upload Software Tool to allow sensor raw data transactions to be uploaded into the Cloud Server	1-off fee	150.00
BRE-AAP	 BRE Data Analysis Application Software Tool that provides hosting to the Cloud Server and a software license to access and analyse data. Charged as a monthly fee. Includes BRE software support	Per Unit	15.00 pcm
T3522	 Internal temperature sensor	1	76.00
T3524	 Occupancy Sensor	1	45.00
T3528	 External Temperature Sensor	1	90.00
T3527	 Boiler flow and return and sensor probes Hot Water tank and sensor probes	1	96.00
T3542	 Room temperature and humidity sensor	1	50.00
T3571	 CO2 Sensor	1	180.00
T3519	 Generic (Electricity & Gas) pulse counter	1	75.00
T3519-RU11	 Gas meter pulse counter, includes T3519 pulse counter and pre-wired T7320CAB (RU11 cable, eg for Schlumberger meters)	1	104.00
T3519-ITRN	 T3519-ITRN - Gas meter pulse counter, comprises T3519 pulse counter and pre-wired T7320CAB and T7320-IT (an ITRON cable and sensor attached)	1	110.00

* requires 3G SIM card and phone provider's contract



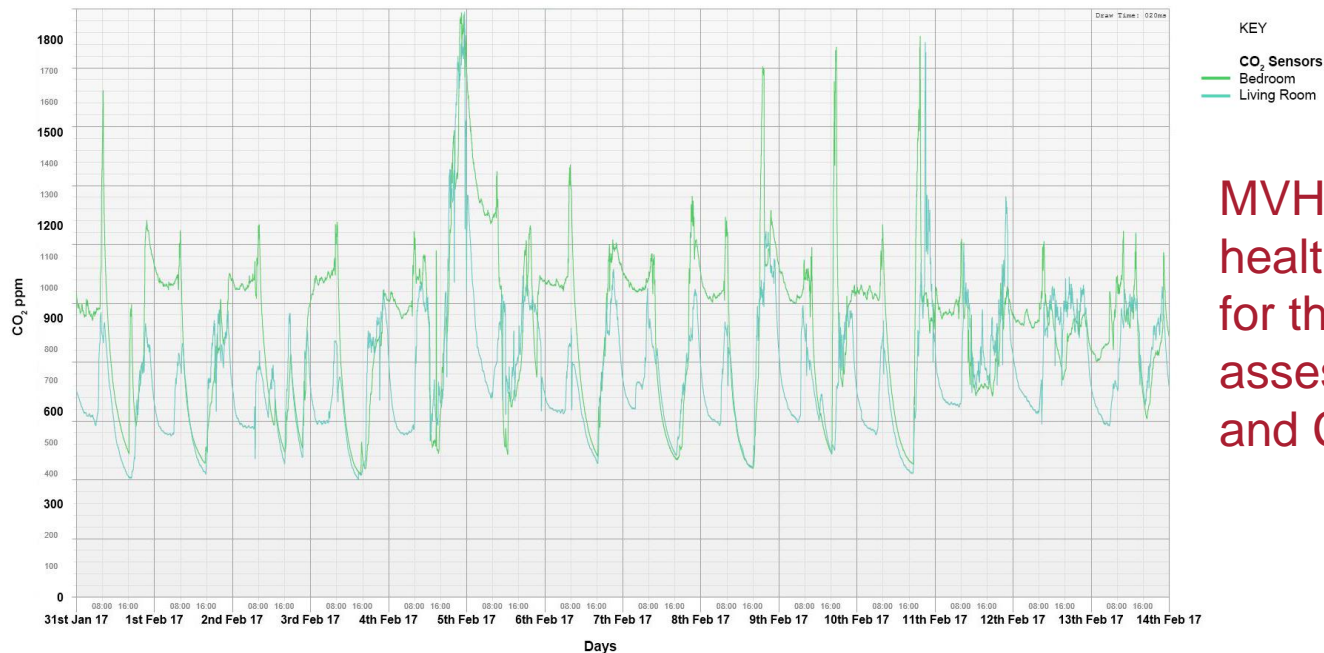
What are we monitoring:

- Comfort and Health:
 - CO₂
 - Temperature
 - Relative humidity (rH)
- Energy Use:
 - Gas used for space heating
 - Gas used for hot water
 - Electricity use



Performance Measured

CO₂ Air Quality – typical winter 2 week period

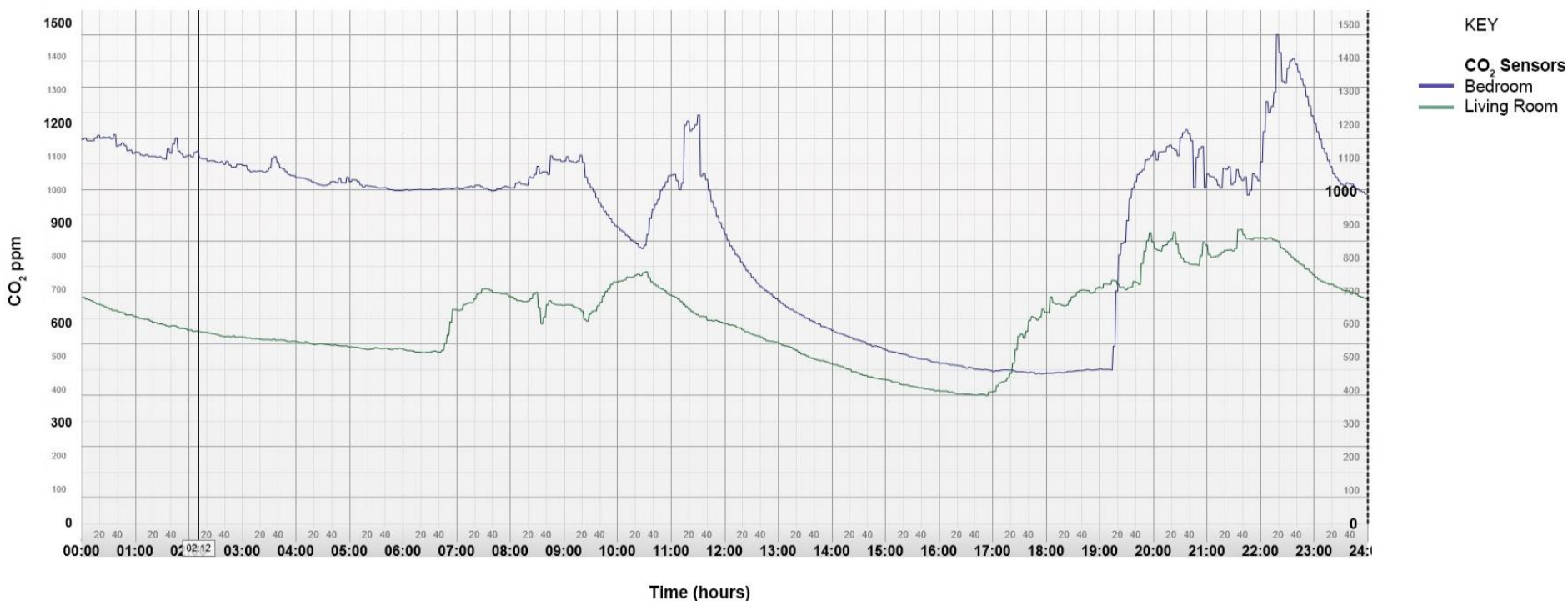


MVHR is maintaining a healthy indoor environment for the occupants when assessed against ASHRAE and CIBSE guidance

- CO₂ levels rarely exceed 900ppm in the living room and average less than 700ppm
- CO₂ levels only exceed 1200ppm in the bedroom room for around one hr/day and average less than 900ppm

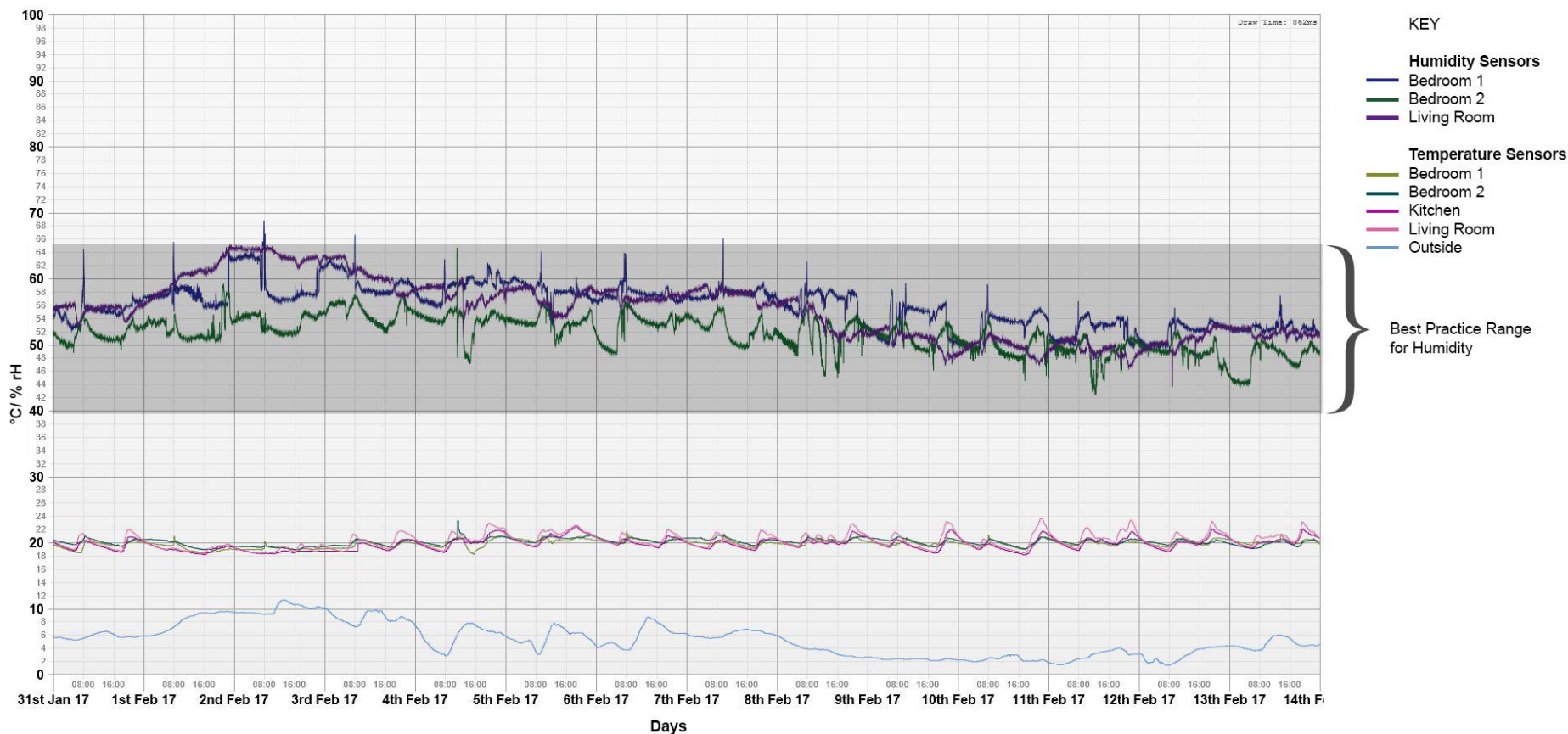
Performance Measured

CO₂— typical winter day Jan 2017



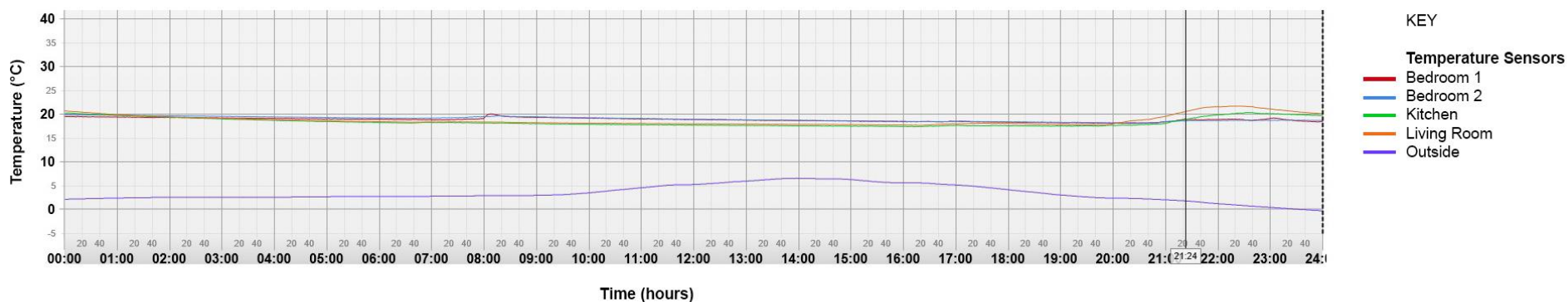
Performance Measured

Temp and rH Comfort – typical winter 2 week period



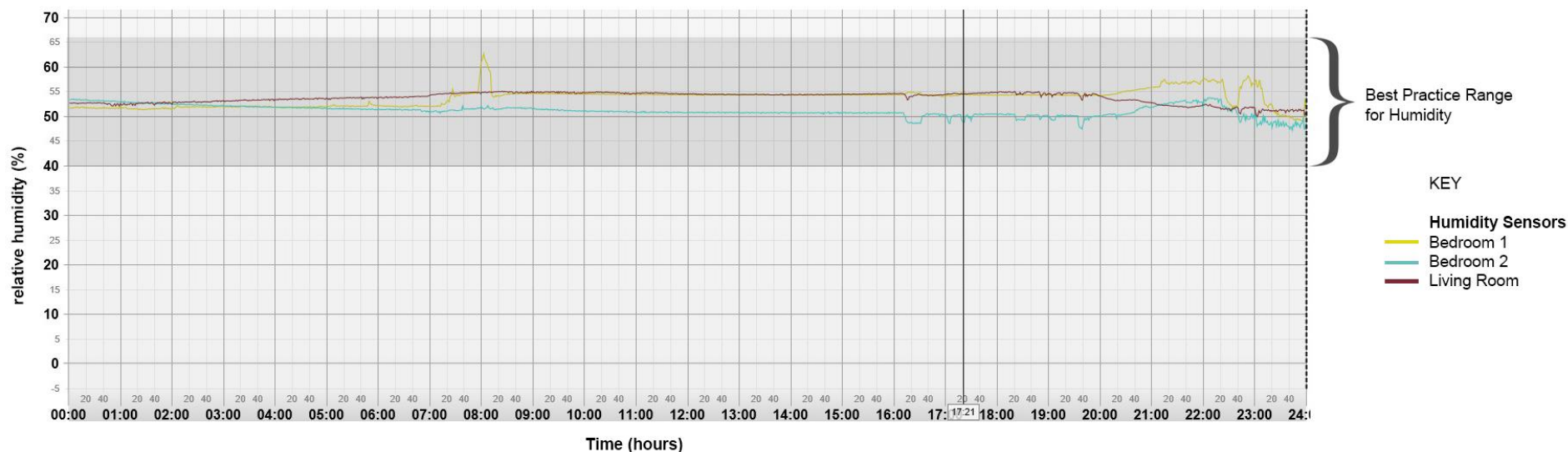
Performance Measured

Temp – typical winter day Jan 2017



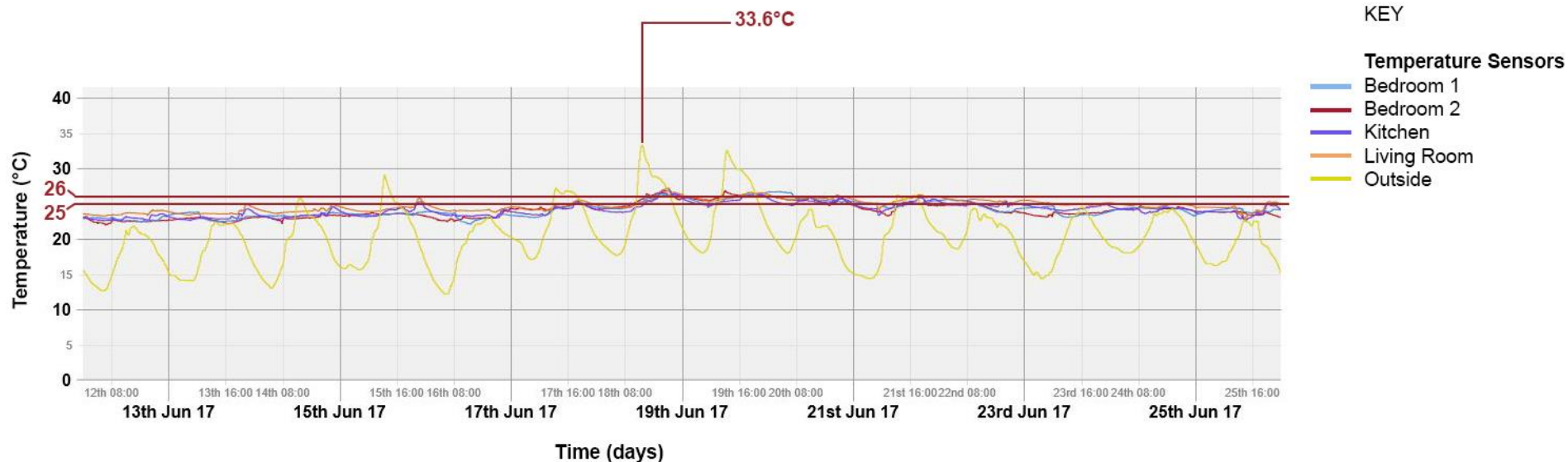
Performance Measured

rH– typical winter day Jan 2017



Performance Measured

Summer Heat Wave – 2 week period



- Overheating threshold for Passivhaus calculations is 25°C
(certification criteria states no more than 10% of the year which is 876 hrs/yr, we like to keep this down much lower at around 1-2% or 87-175 hrs/yr)
- UK guidance from CIBSE, recommends that bedrooms should not exceed 26°C for more than 1% of hours between 10pm and 7am
(this is equivalent to 33 hrs/yr)

“The air quality in the house is amazing.....we all now have amazingly wonderful sleeps at night which we believe is due to the air quality. The consistent temperature of this house is perfect.”

Designed Performance

(averaged over 14 homes)

Primary Energy:

110 kWh/m²/a

Heating Demand:

13.86 kWh/m²/a

Air Changes/Hr:

0.60 ACH@50pascals*

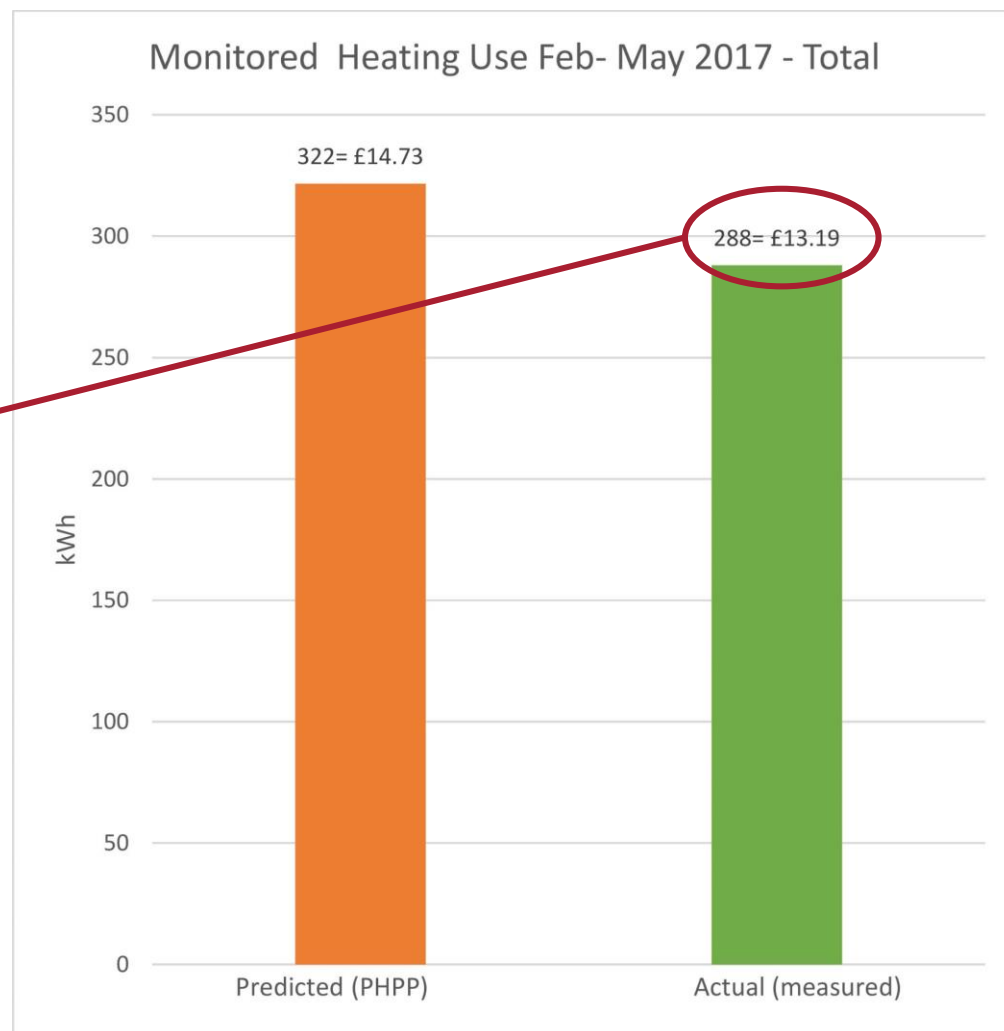
Heating Load:

10.36 W/m²

*final pressure test results average
0.45ACH@50pa

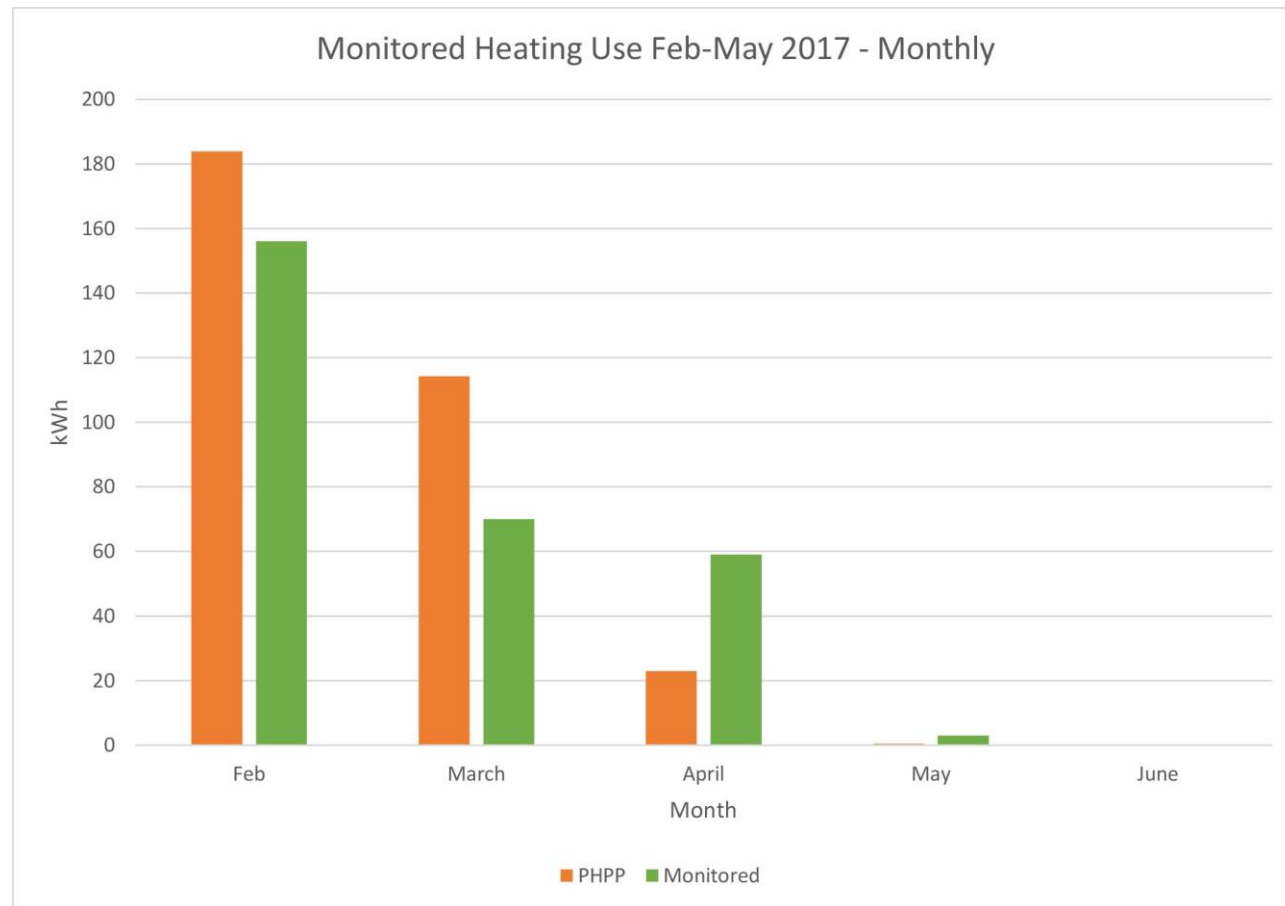
Performance Measured Space Heat Demand

£13.19



Performance Measured

Space Heat Demand



Soft landings Core Principles

<https://www.bsria.co.uk>



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