Hamson
Barron
Smith

HBS

Carrowbreck Meadow

Post Occupancy Evaluation

Sarah Lewis

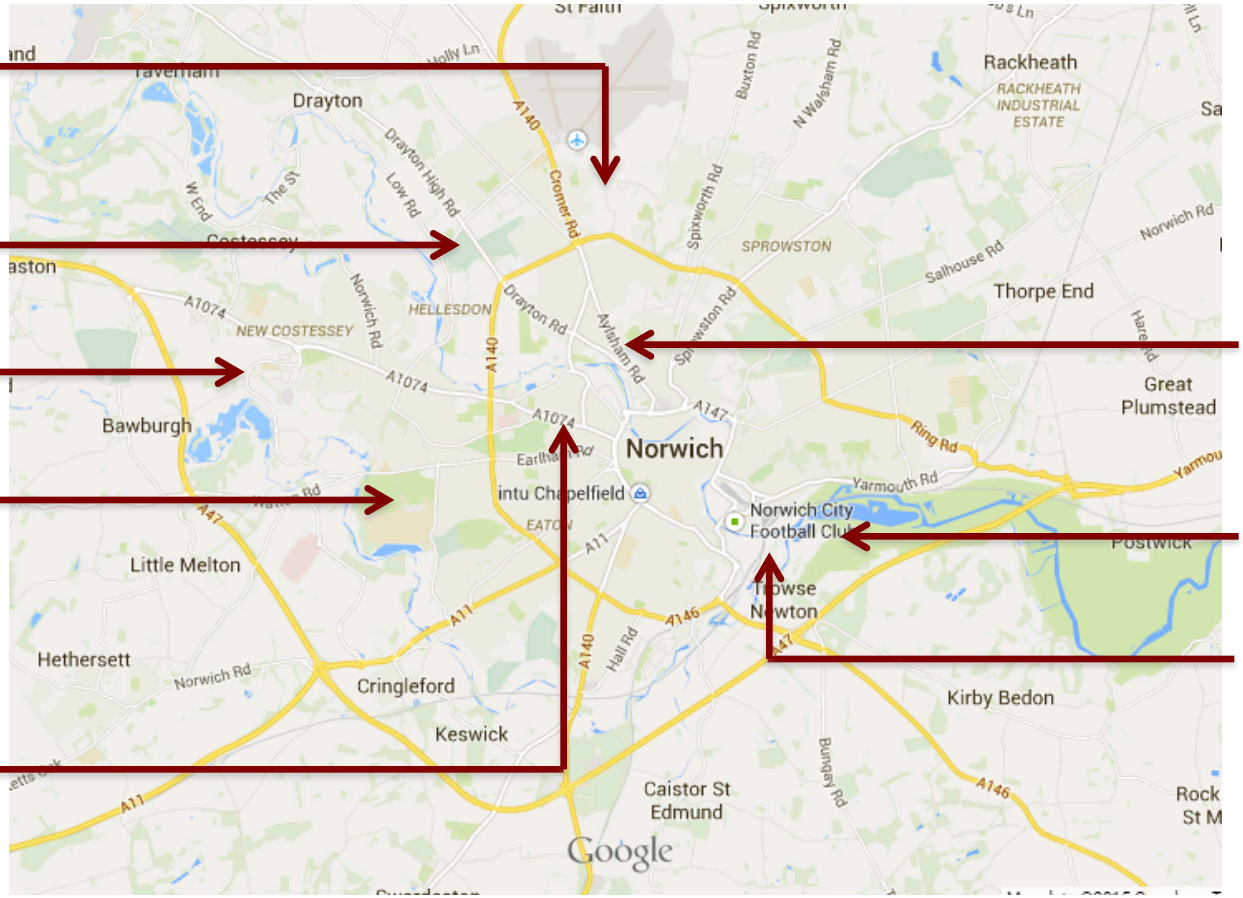
Hurricane Way
10-20 units
Stage 2

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


North
Drayton High Road
Carrowbreck Close
Carrowbreck Road
Carrowbreck House
Training Centre

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

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

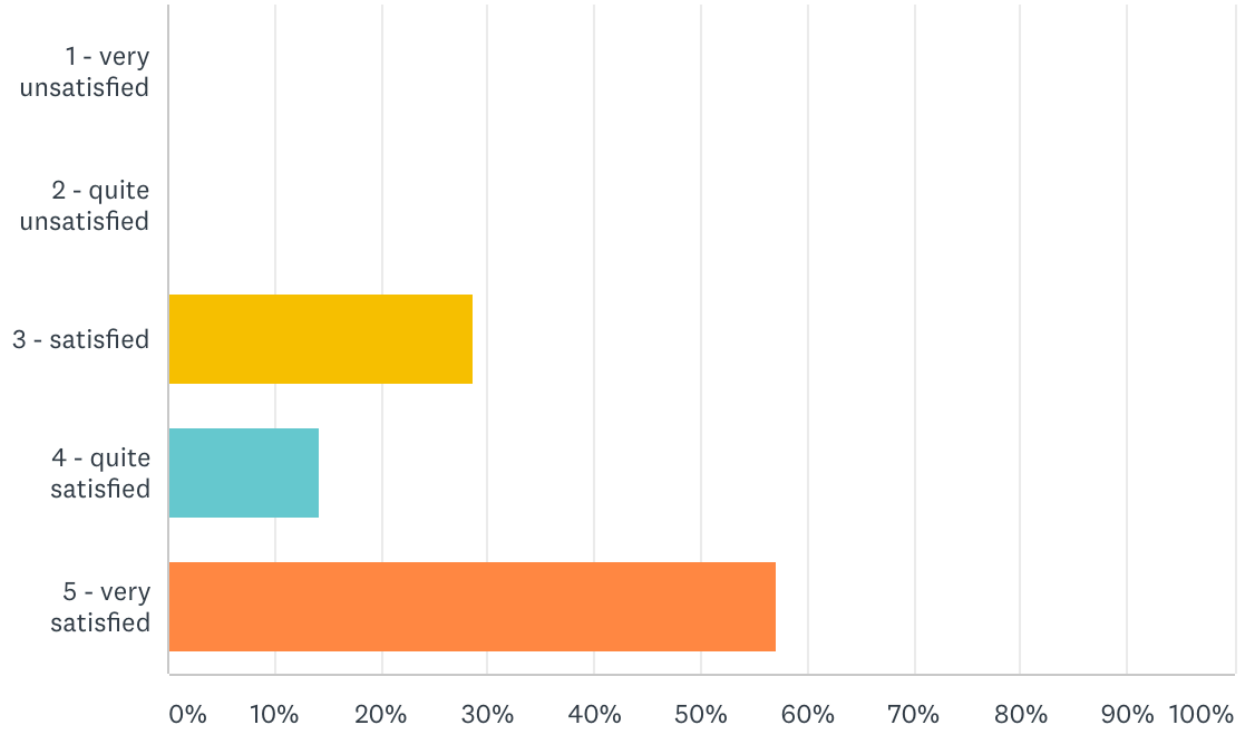
Occupant Surveys

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?



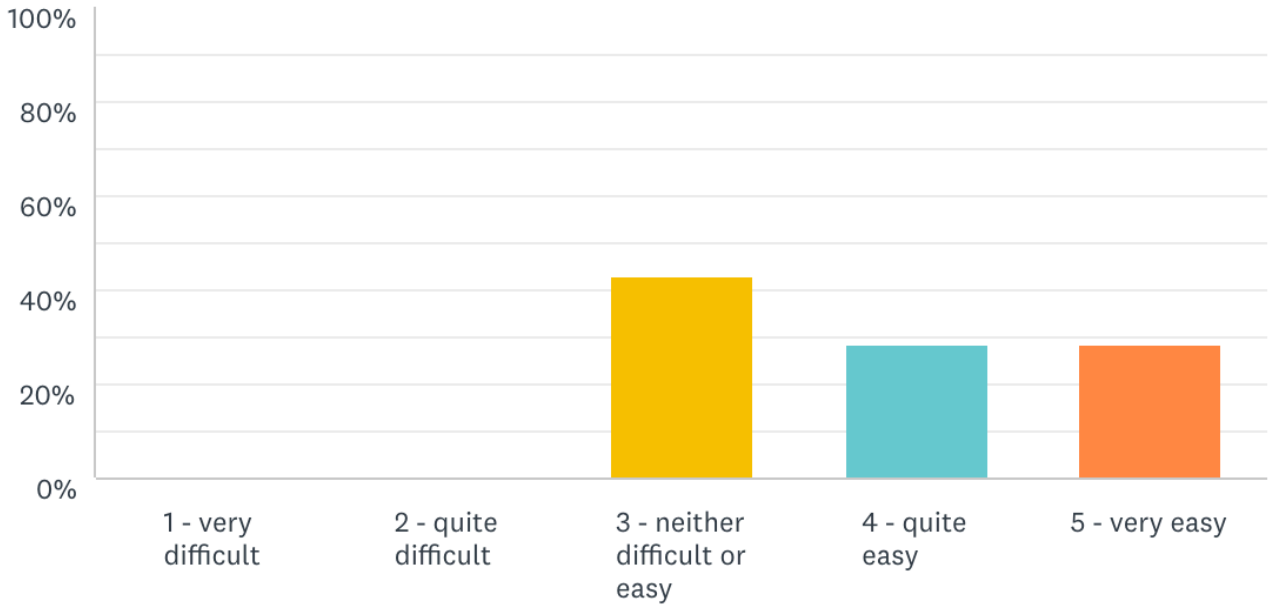
Occupant Surveys

How easy is it to use the heating?

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

Occupant Surveys

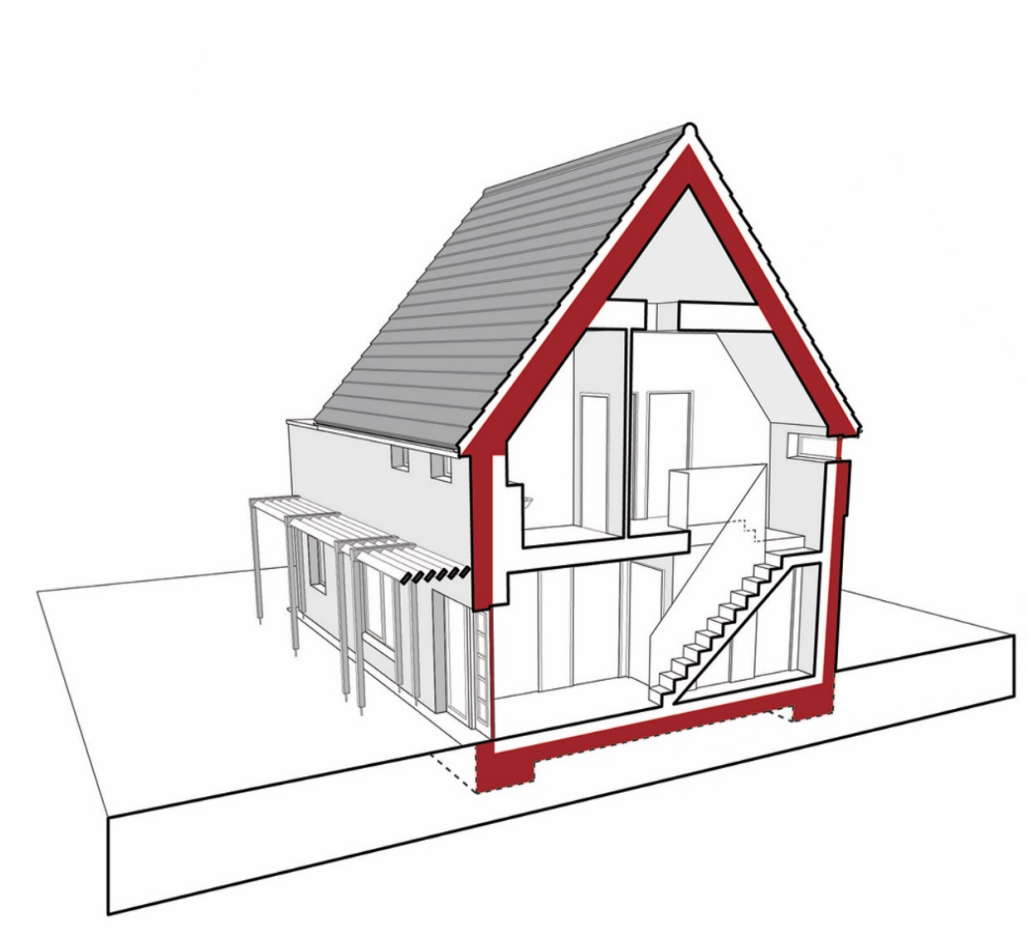
How easy is it to use the ventilation system?



Occupant Surveys

Winter comfort

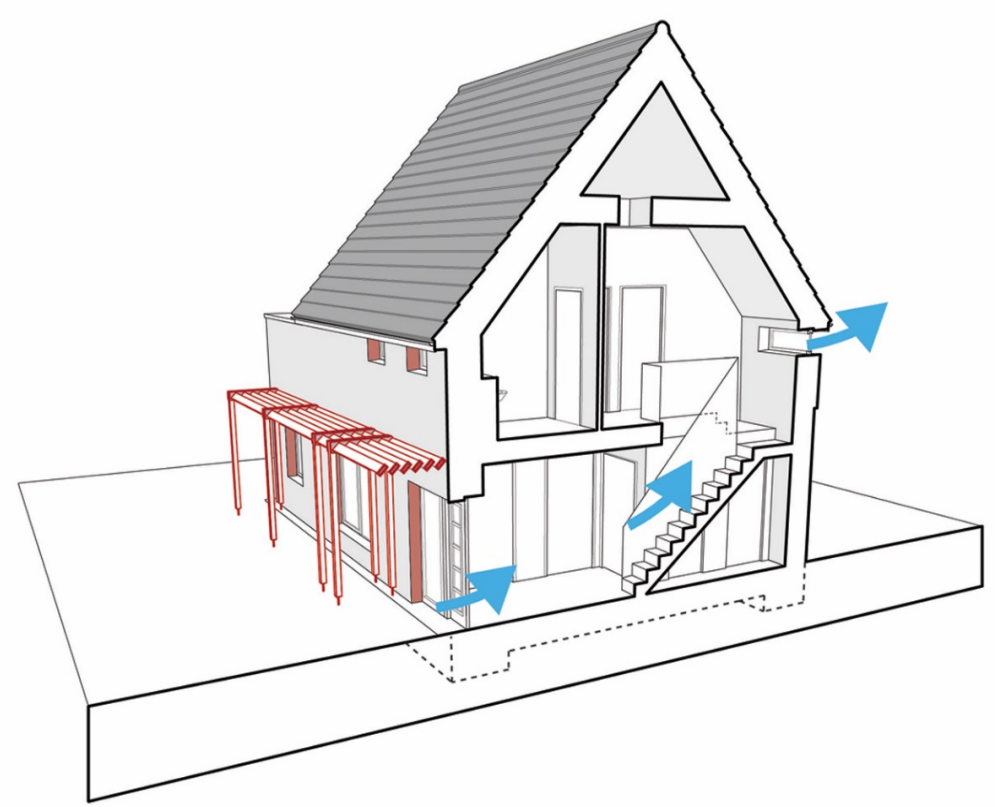
85.7% said it was comfortable to very comfortable



Occupant Surveys

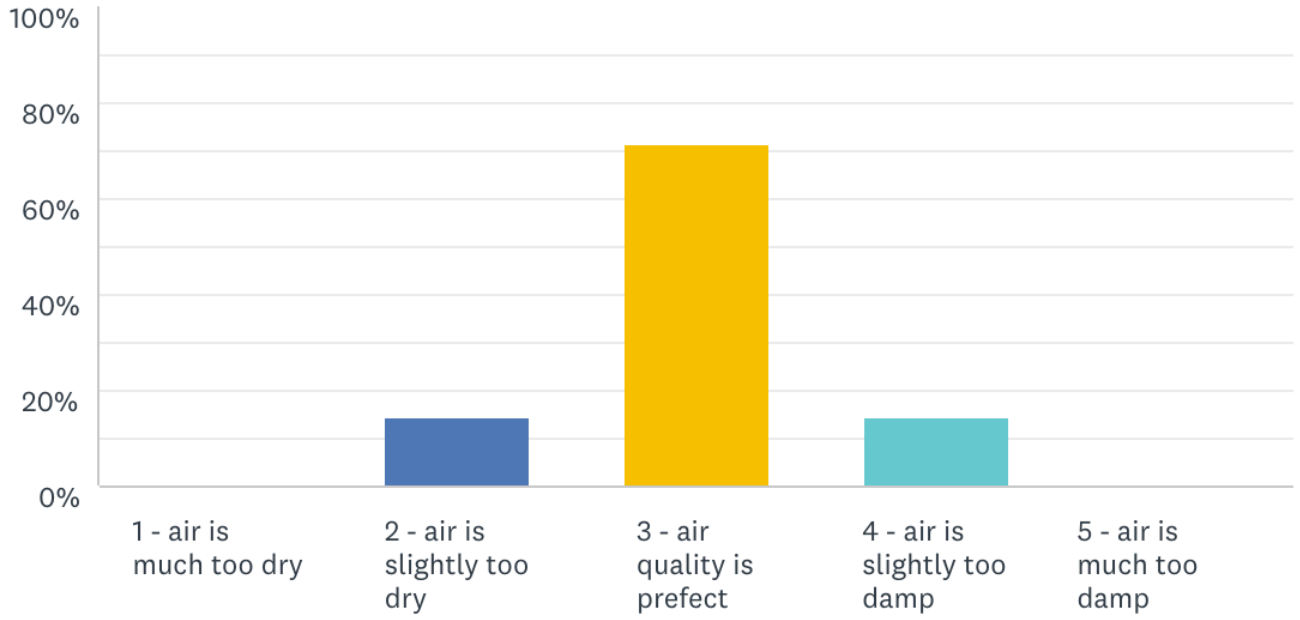
Summer comfort

85.7% said it was comfortable to very comfortable

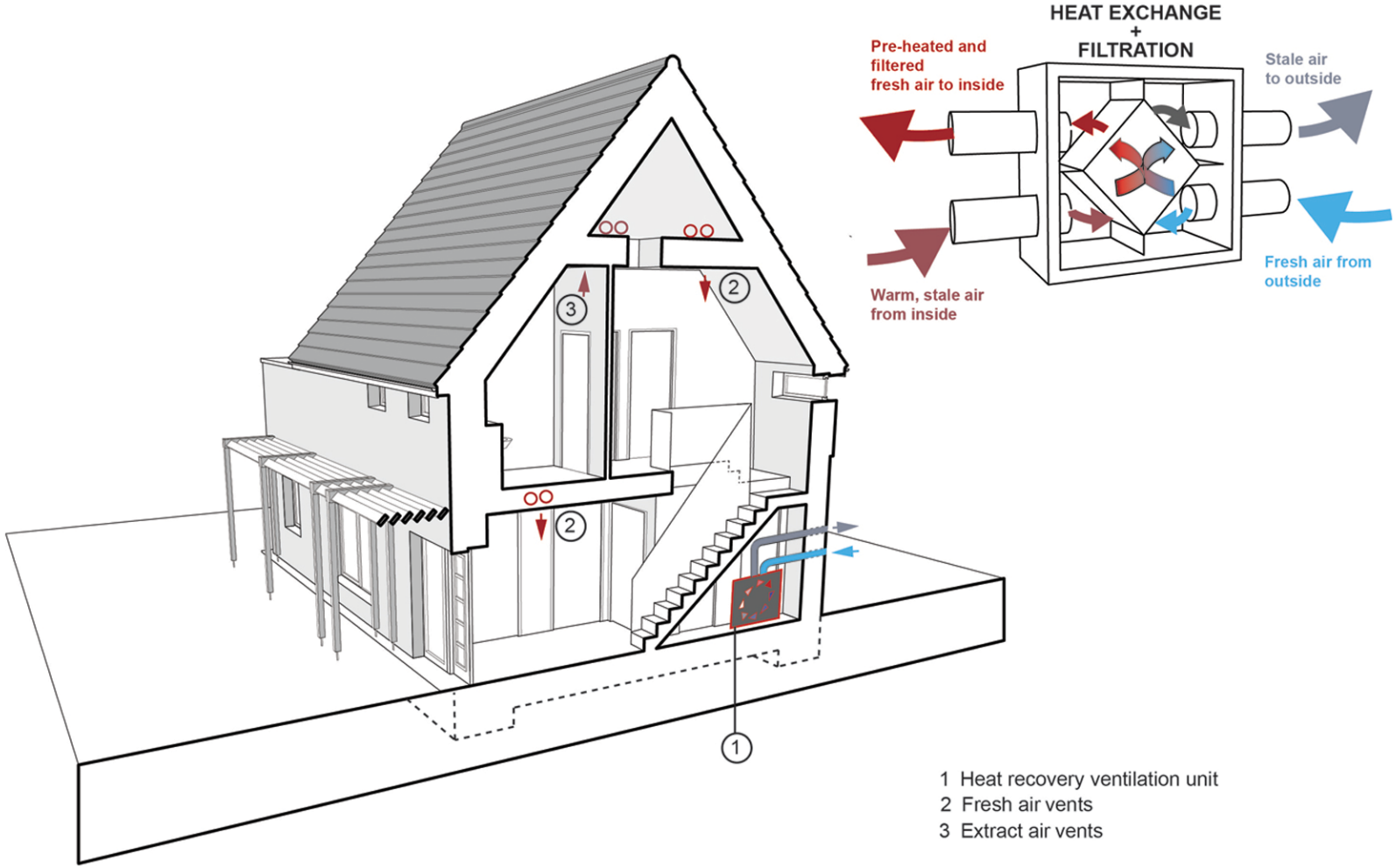


Occupant Surveys

How is the quality of the air in your home?

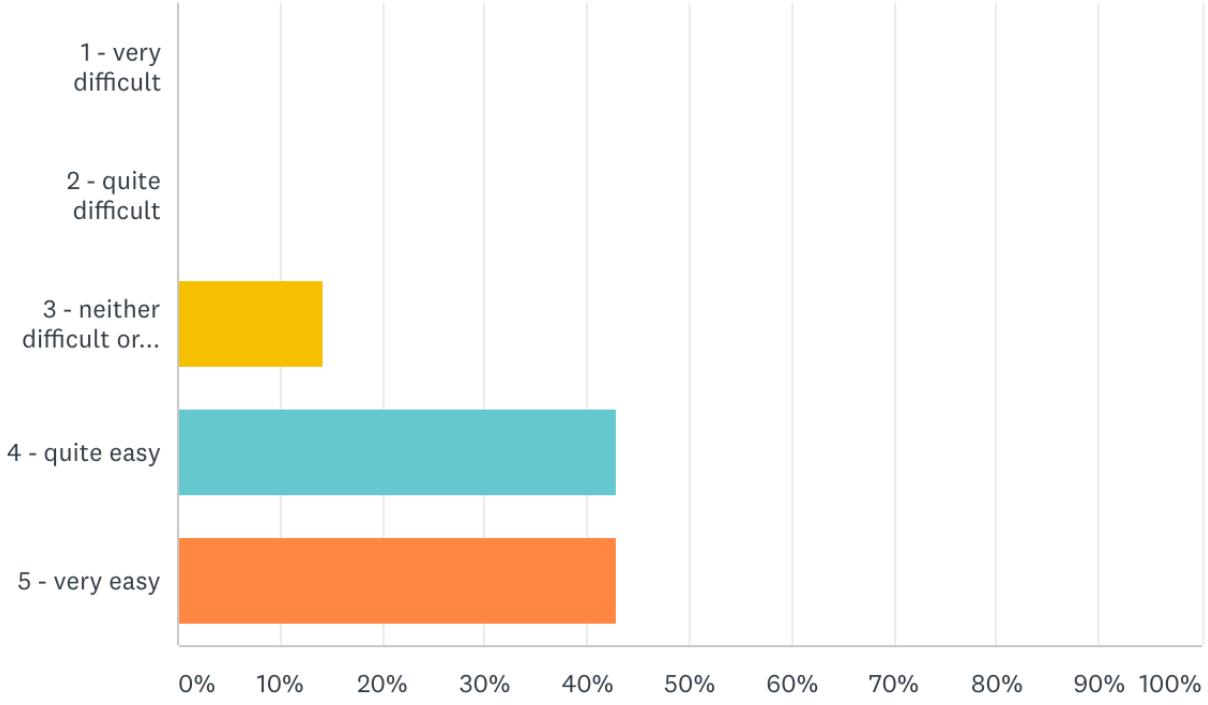


Occupant Surveys



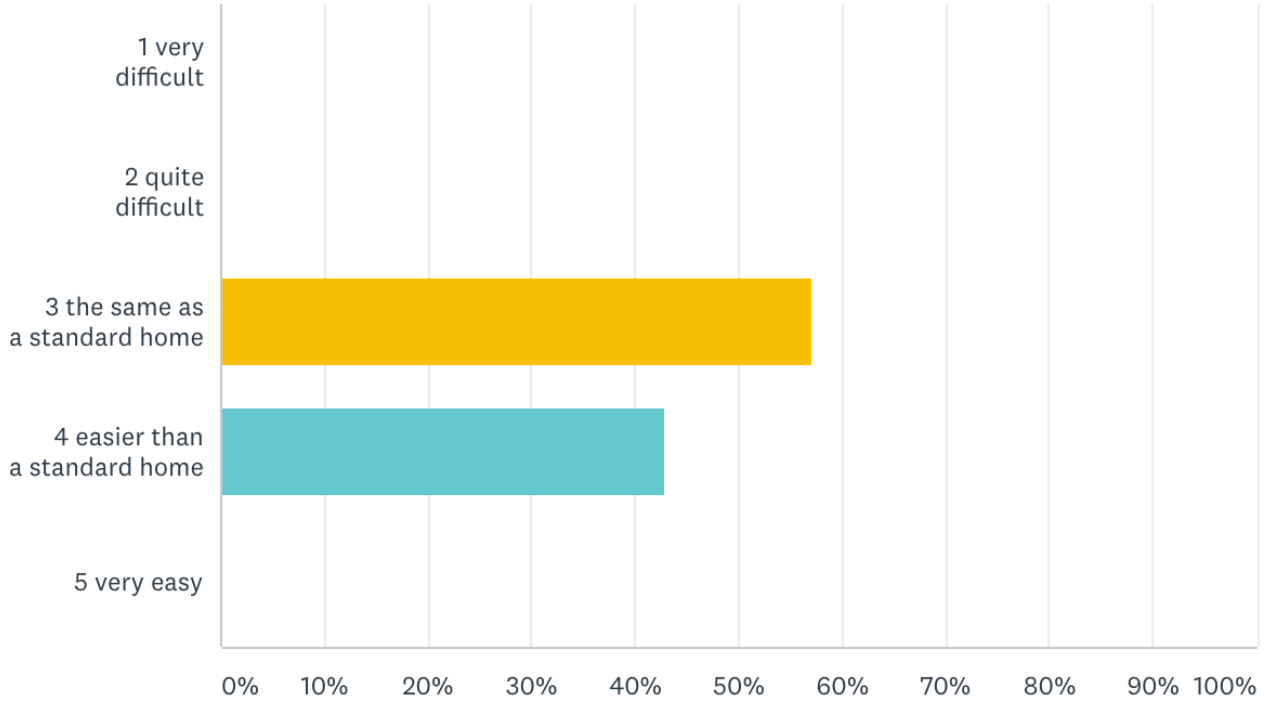
Occupant Surveys

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



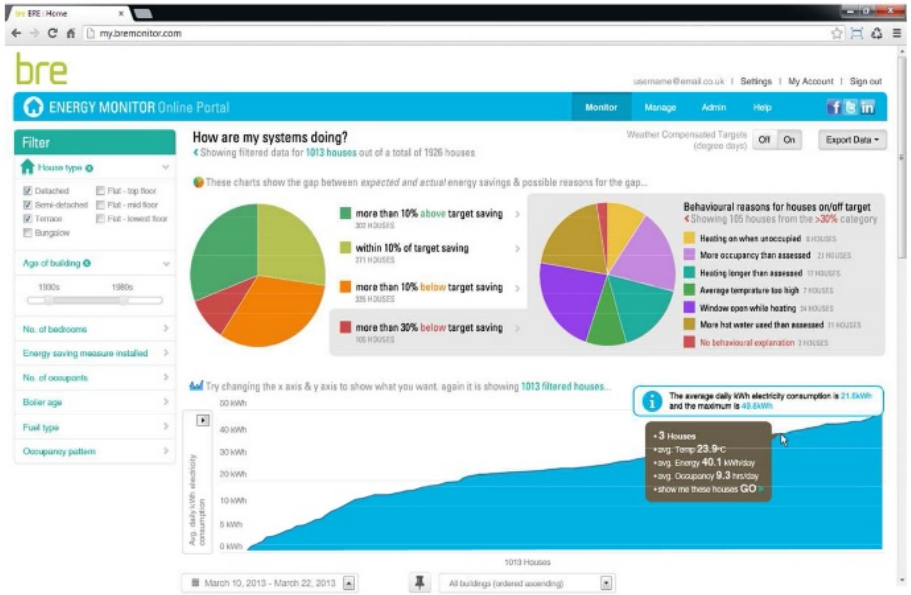
Occupant Surveys

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-RJ11	Gas meter pulse counter, includes T3519 pulse counter and pre-wired T7320CAB (RJ11 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

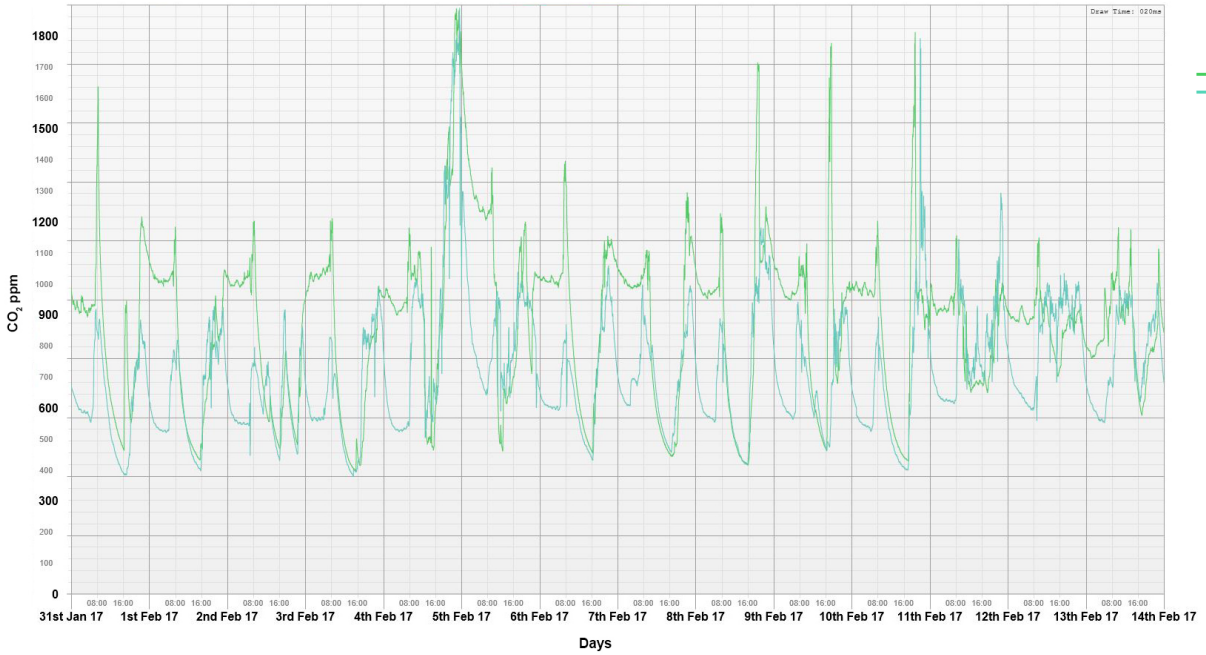
What are we monitoring:

- Comfort and Health:
  - CO_2
  - Temperature
  - Relative humidity (rH)

- Energy Use:
  - Gas used for space heating
  - Gas used for hot water
  - Electricity use

Performance Measured

CO_2 Air Quality – typical winter 2 week period

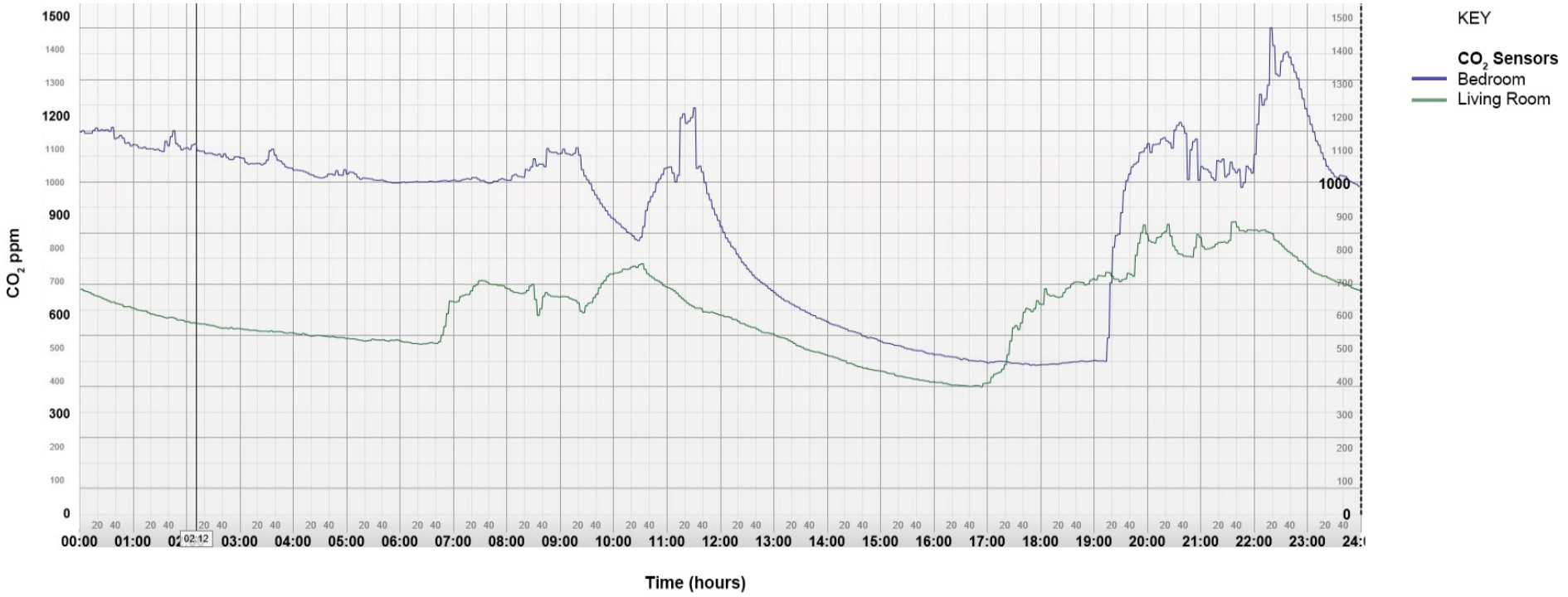


MVHR is maintaining a healthy indoor environment for the occupants when assessed against ASHRAE and CIBSE guidance

- $C0_2$ levels rarely exceed 900ppm in the living room and average less than 700ppm
- $C0_2$ levels only exceed 1200ppm in the bedroom room for around one hr/day and average less than 900ppm

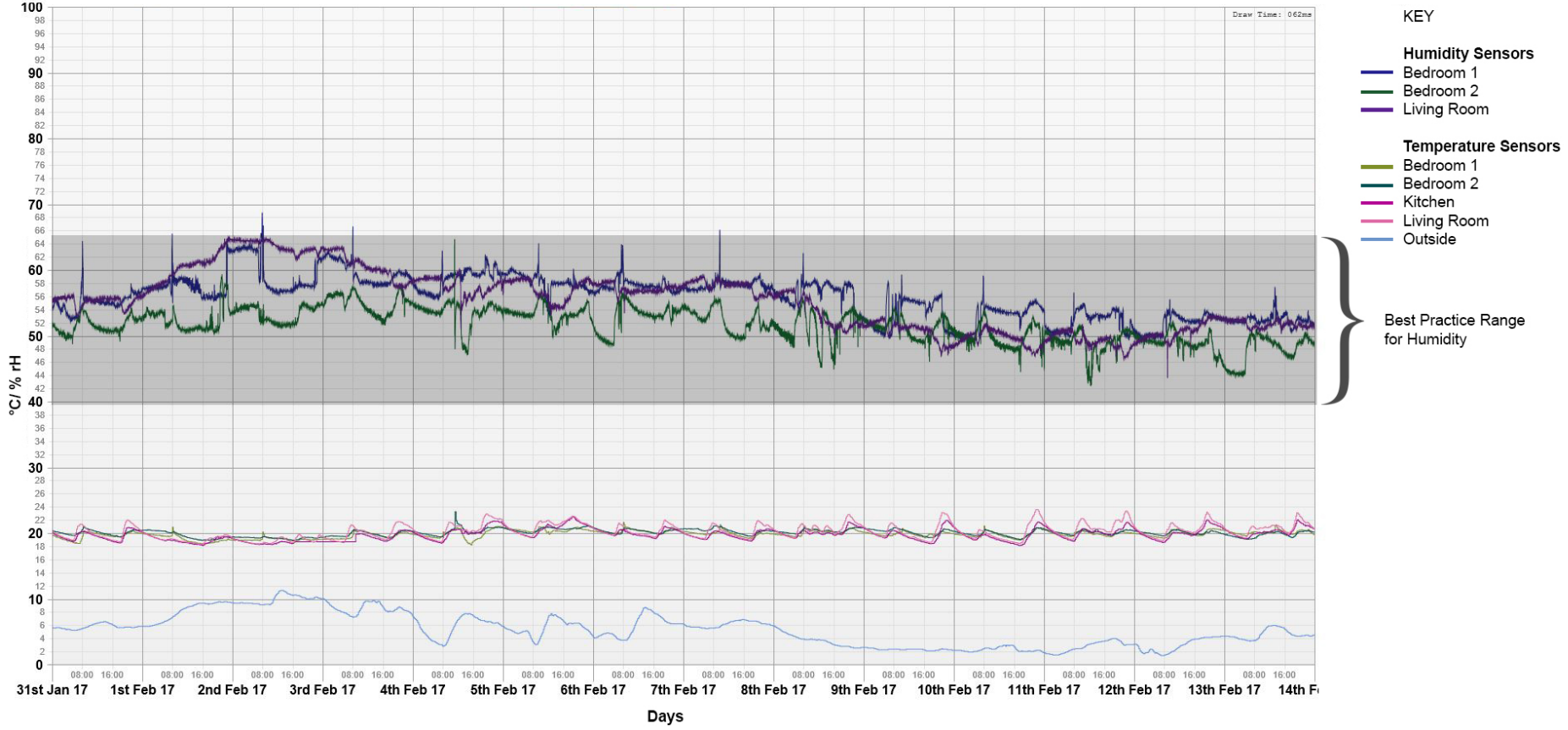
Performance Measured

CO_2– typical winter day Jan 2017



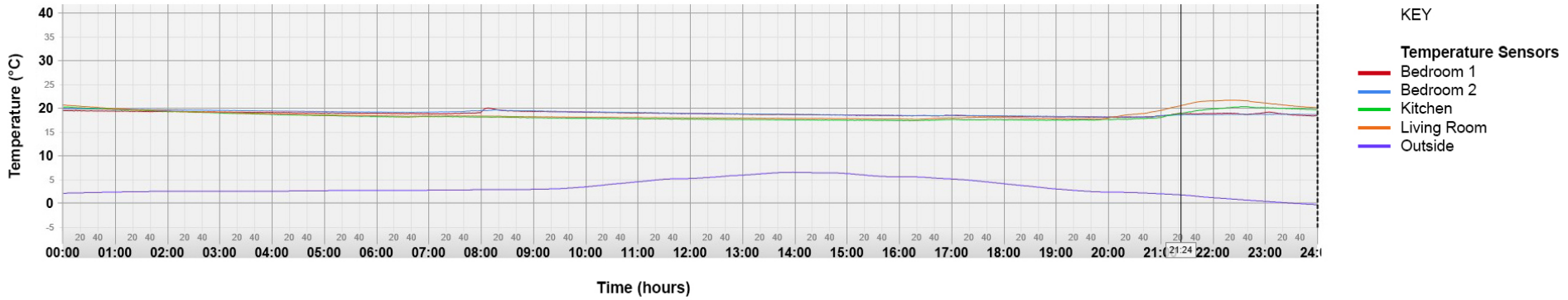
Performance Measured

Temp and rH Comfort – typical winter 2 week period



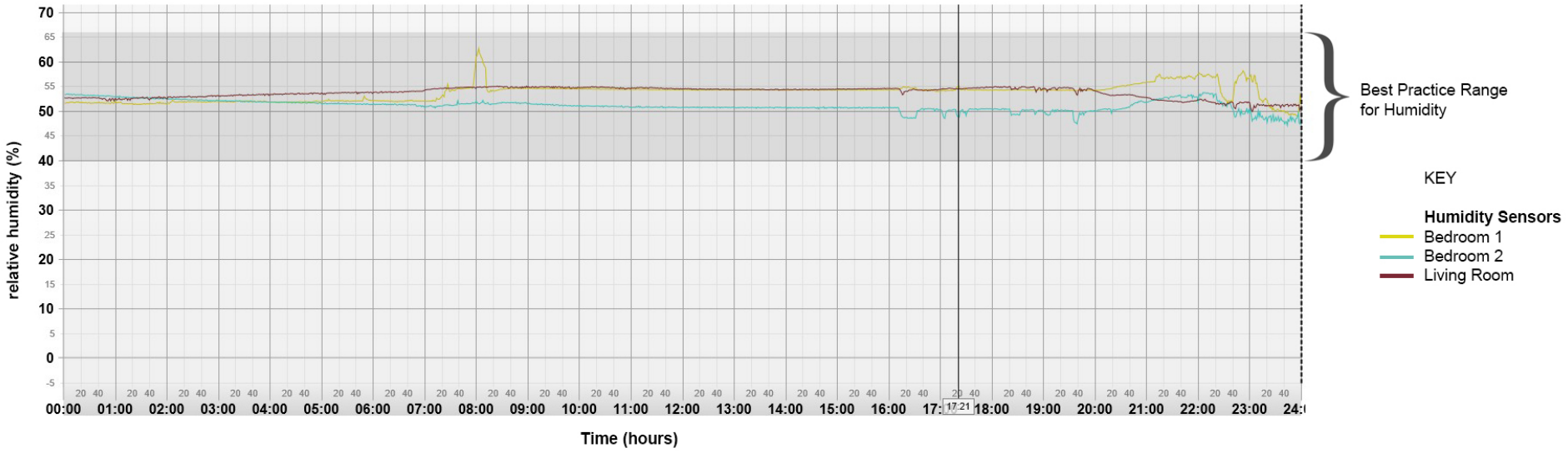
Performance Measured

Temp – typical winter day Jan 2017



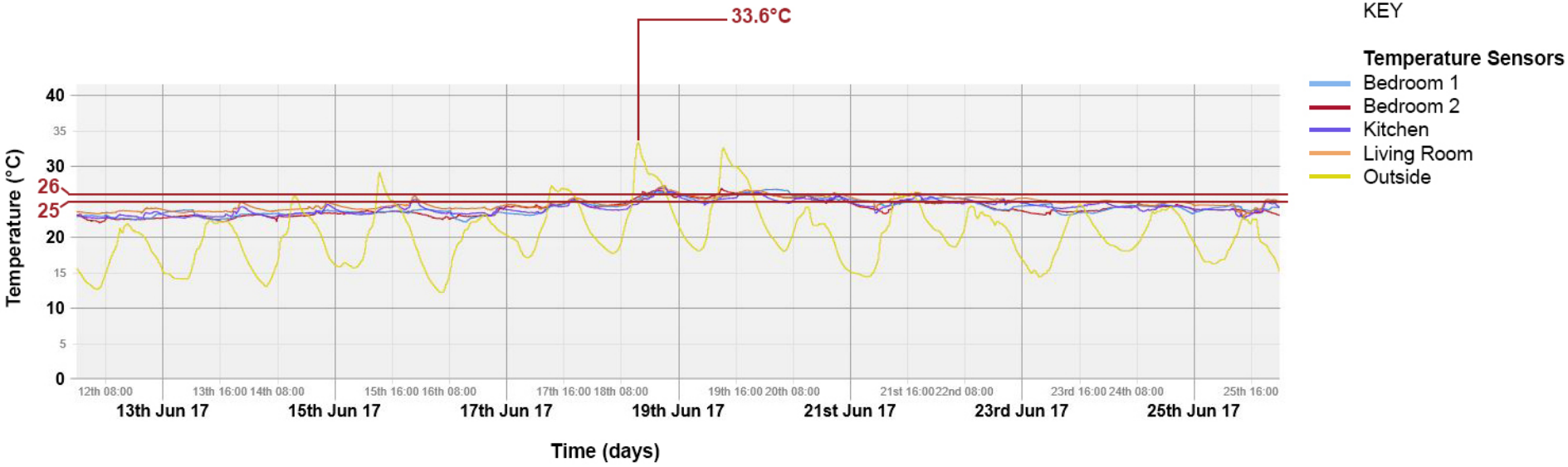
Performance Measured

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/m^2/a

Heating Demand:
13.86 kWh/m^2/a

Air Changes/Hr:
0.60 ACH@50pascals*

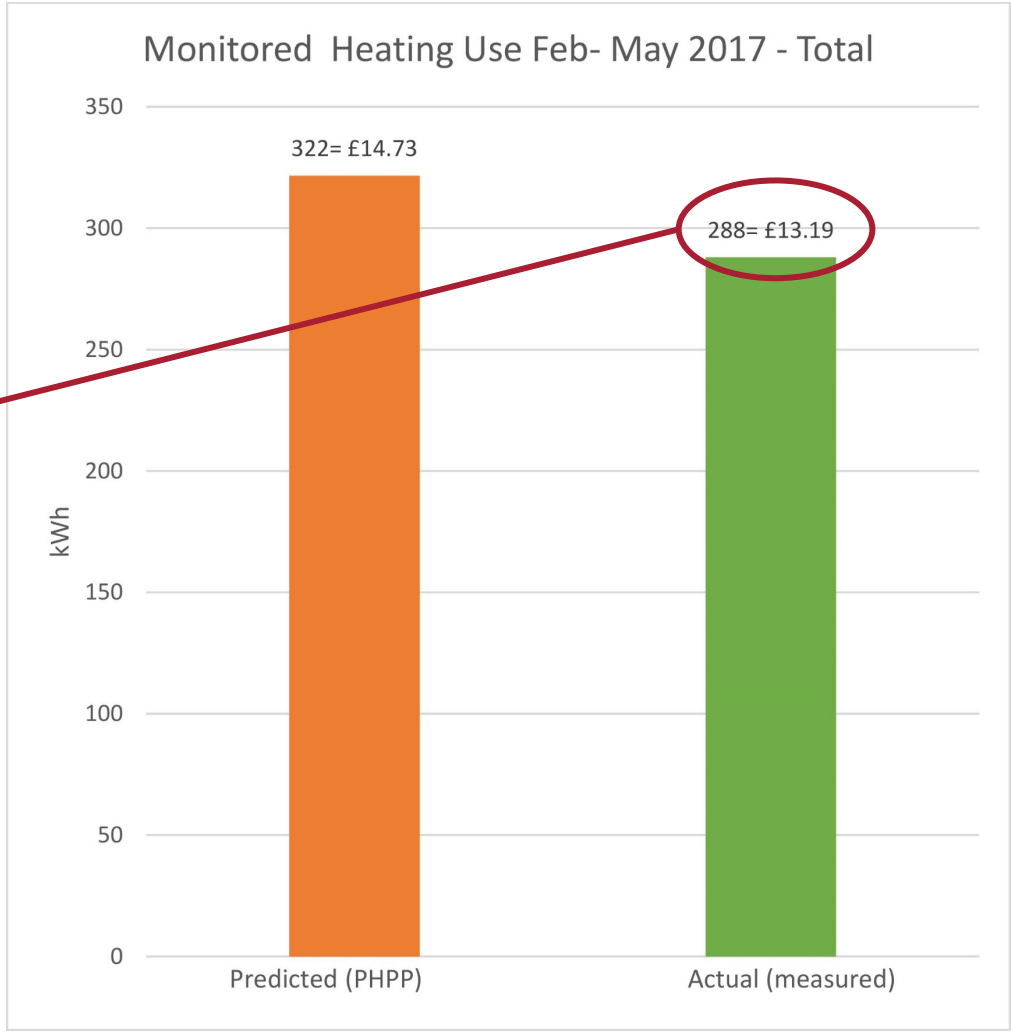
Heating Load:
10.36 W/m^2

*final pressure test results average 0.45ACH@50pa

Performance Measured

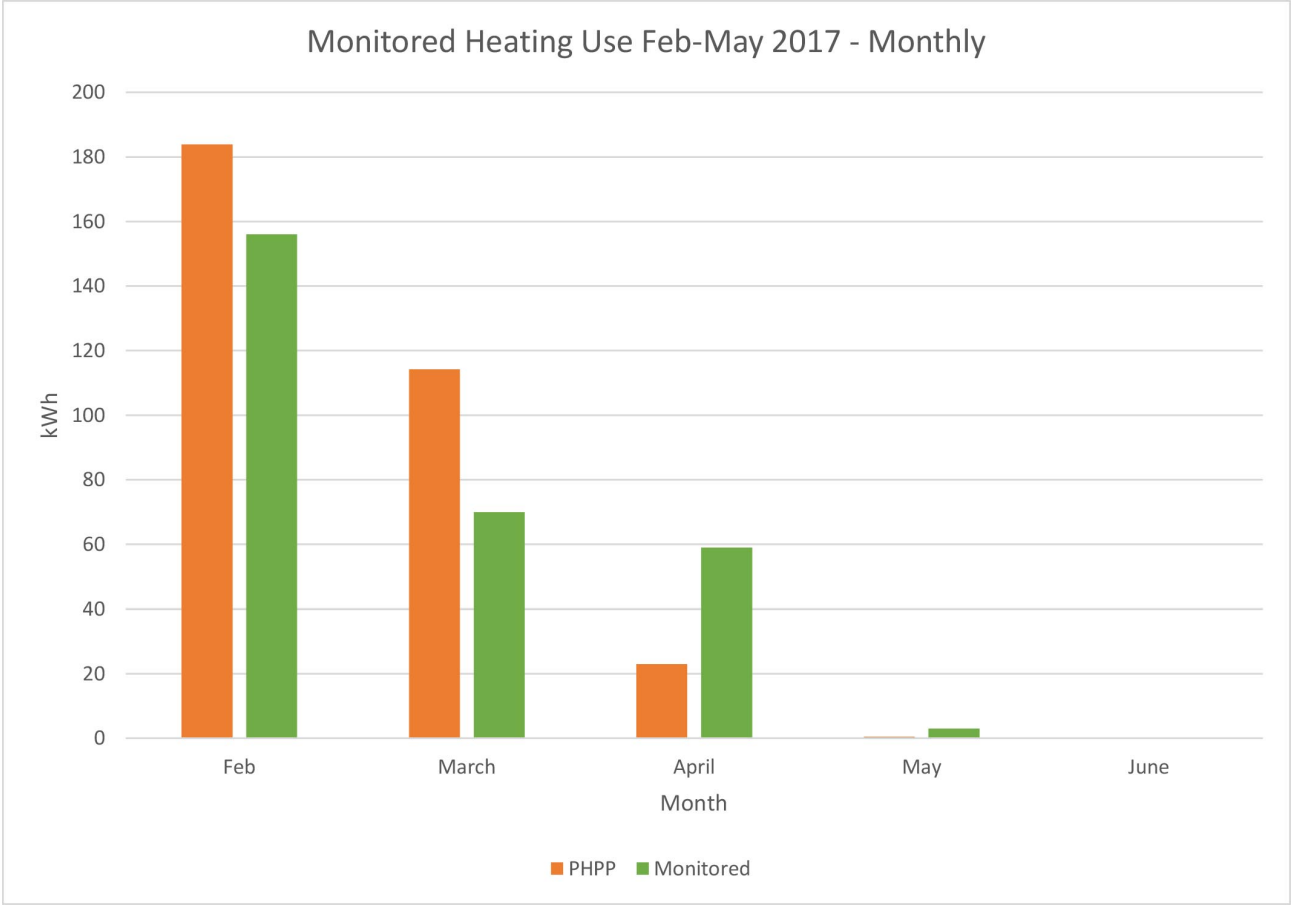
Space Heat Demand

£13.19



Performance Measured

Space Heat Demand



Soft landings Core Principles
https://www.bsria.co.uk

CARTER BUILDER
BROADLAND GROWTH
HBS

sarah.lewis@hamsonbarronsmith.com

UK Passivhaus Awards 2018
WINNER
Large Residential Category

HOUSING DESIGN AWARDS
DEFRA AWARD FOR RURAL HOUSING 2017

WINNER RIBA EAST AWARD 2017

WINNER RIBA NATIONAL AWARD 2017

RTPI AWARDS FOR PLANNING EXCELLENCE FINALIST 2017

CARTER BUILDER
BROADLAND GROWTH
HBS