Bath & West Community Energy
Generating local energy

Bath & West Community Energy

Cathy Crozier-Cole
Home Energy Service Manager

Jonathan Logsdon
Retrofit Coordinator

Go Green Widcombe
Wednesday 21st February 2024

Our Community Ownership Model

Clean Local Energy

We build and operate renewable energy projects for and on behalf of communities across our local area.

Member Led

We raise funds though local people investing money in BWCE, becoming members, receiving a fair return and having a democratic say in how we operate.

For Community Benefit

Surplus is distributed via our BWCE Fund to community projects that reduce carbon emissions and alleviate fuel poverty - £380,000 donated to date to 91 projects.

Local Power for Local People

Since 2010 BWCE has raised £22.5 million to build 13.35 MW of Community Renewables – enough to match demand of 4,500 homes

Ground mount solar

- 5 ground mount systems ranging from 250kW to 5MW

Roof top solar & hydro

- 28 roof top systems on schools and community buildings ranging from 10 to 260kW

Hydro

- 1 small modern water wheel

Wind turbines

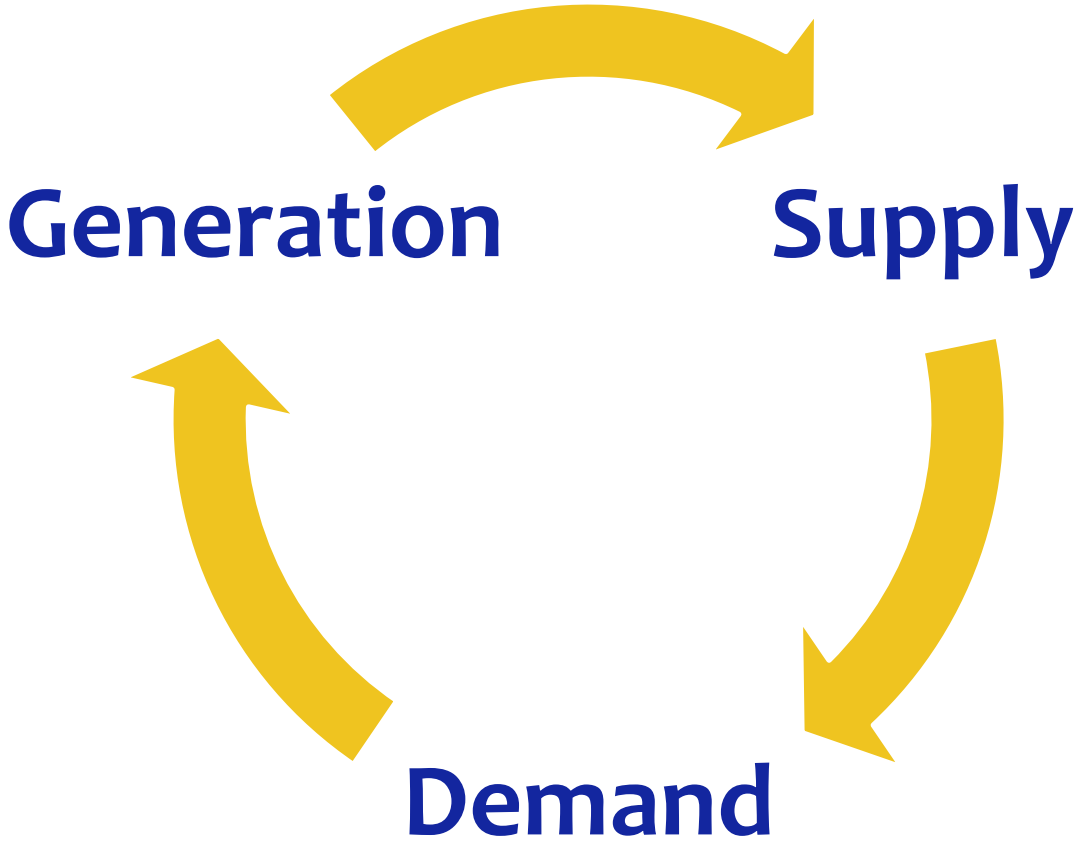
- Currently seeking sites

Solar on Local Schools

	KW	Capital Cost
Built out in 2022 – rooftop solar		
Ralph Allen School 3	25	£19,250
Writhlington School	170	£114,750
Hayesfield School	91	£87,155
Somervale School	114	£93,138
Beechen Cliff School	262	£191,260
Norton Hill School	160	£124,640
Three Ways School	129	£92,500
Corsham School 2	33	£26,004
Built out in 2023 to date – rooftop solar		
St Augustine's College	70	£56,000
St Marks School	52	£46,540
St Johns School	41	£39,483
Total	**1,147**	**£890,720**

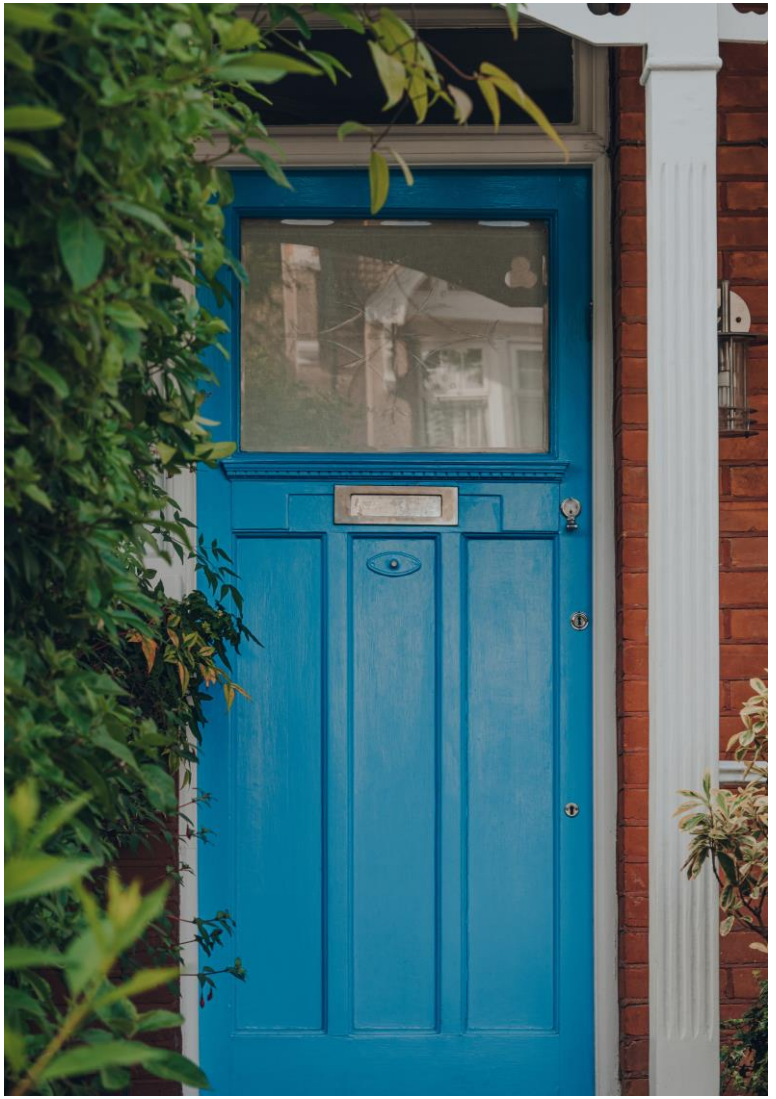
Developed ethical site selection guidelines

Localised Energy Model



BWCE Home Energy Service

- **One front door**
  - Support hub for whole retrofit journey
- **Expert independent advice**
  - Home energy assessments and retrofit coordination services
- **Local inspiration and connection**
  - Open homes events, talks, workshops, local case studies, peer-to-peer support
- **Not for profit, community based model**
  - With surplus used to support those at risk of fuel poverty



Home Energy Service Team

Sara Grimes

Cathy Crozier-Cole

Jonny Logsdon

Sally Merrett

Benny Talbot

Catherine Adams

Nicola Passam

Solving the maze: Retrofitting your home

What is ‘retrofitting’?

‘Retrofit’ refers to any improvement work on an existing building to:

- improve its energy performance
- make it easier to heat, and able to retain that heat for longer
- replace fossil fuels with renewable energy

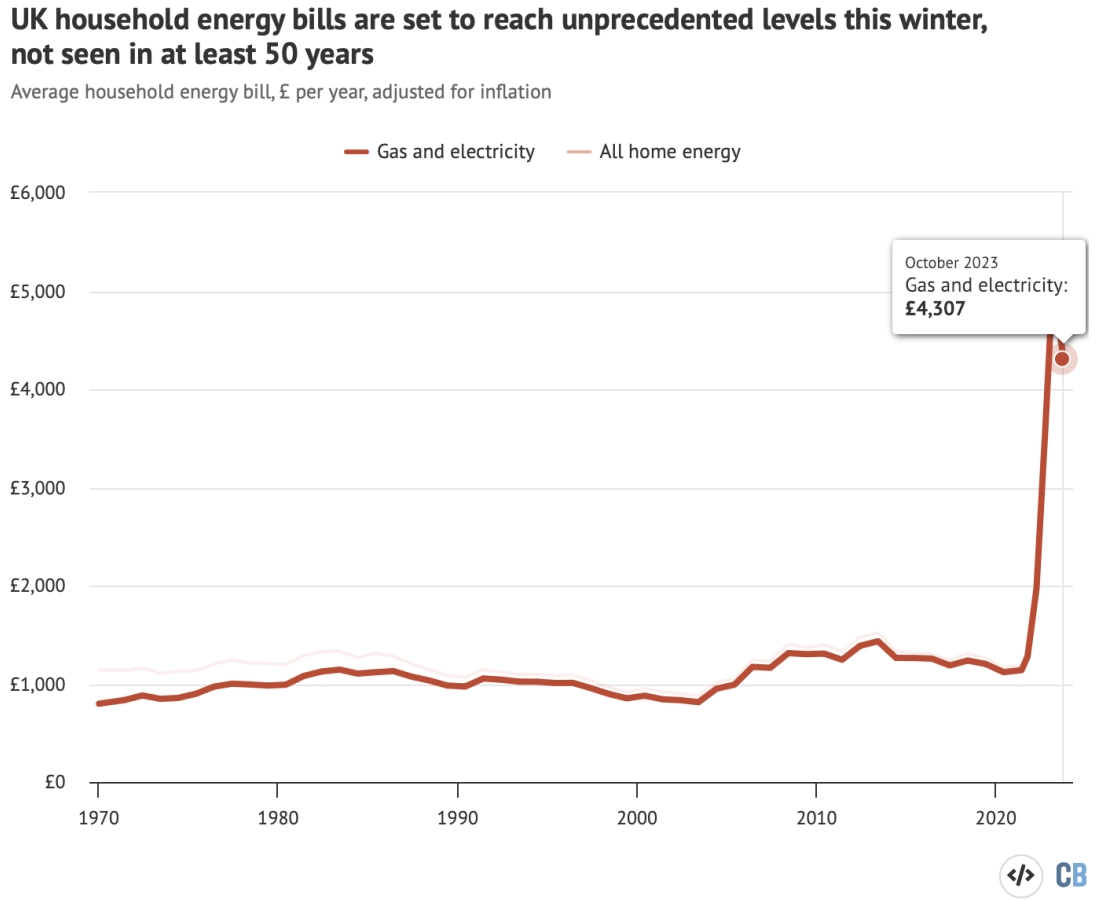
Bath and West Community Energy

Why ‘retrofit’ your home?

- Reduce carbon impact
- Reduce energy bills
- Protect against rising prices
- Improve comfort and be warmer
- Improve indoor air quality
- Improve building durability
- Increase asset value

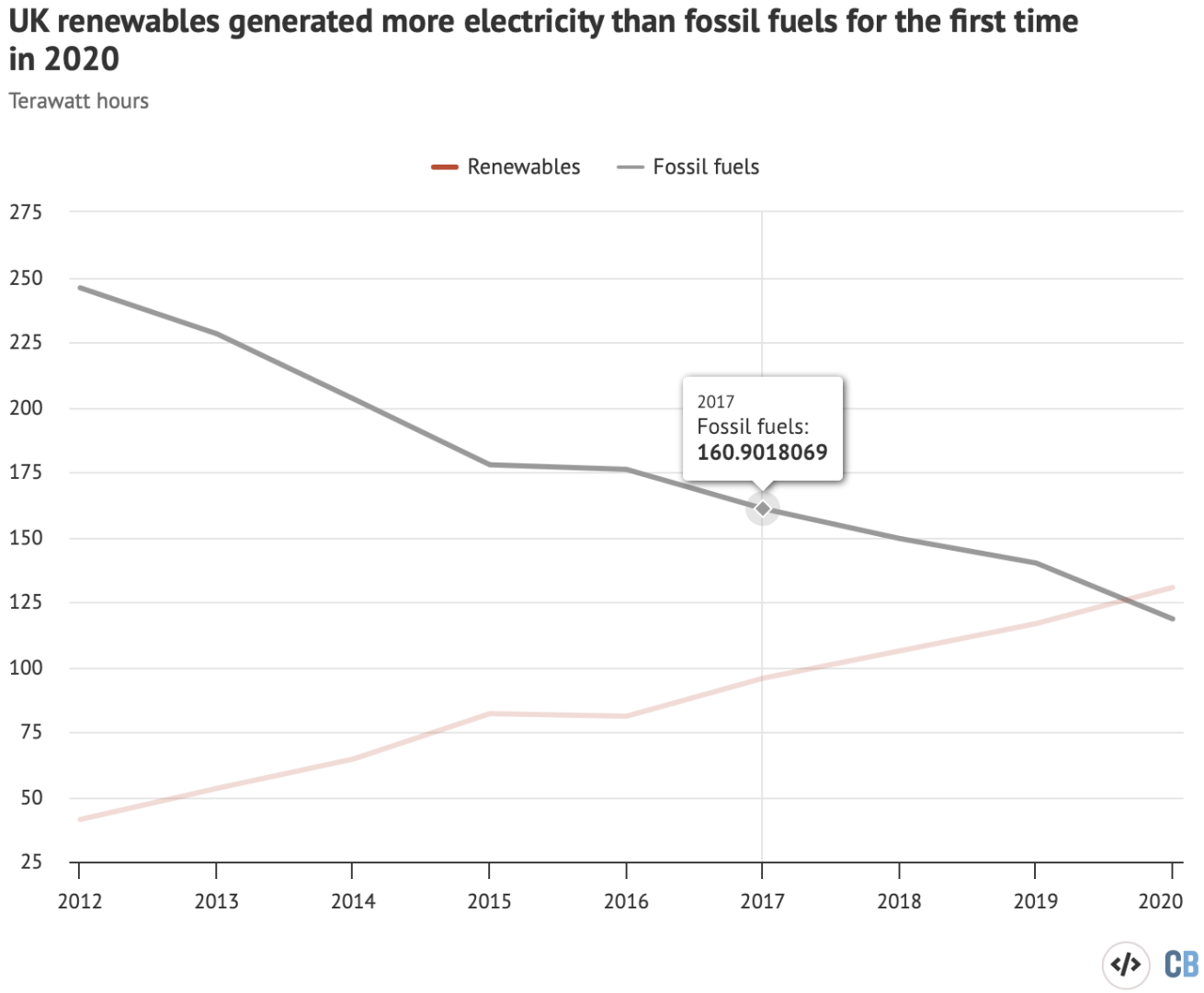
What are your drivers?

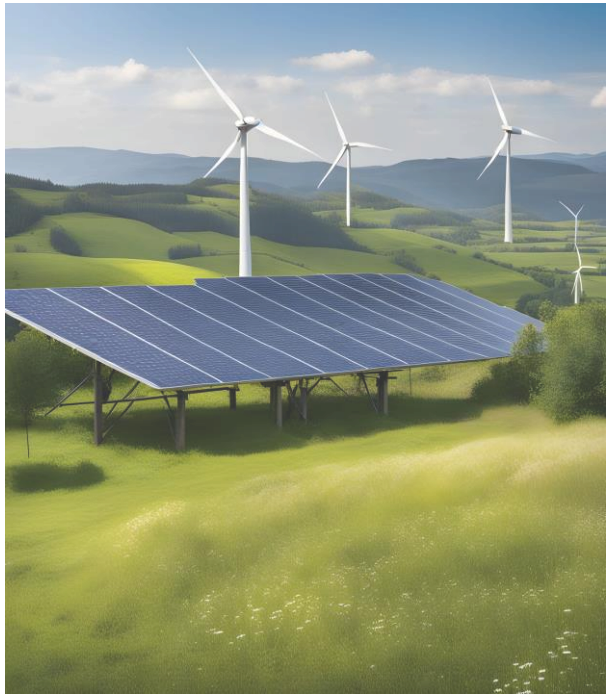
Context – rising energy prices



Average household energy bill, £ per year, adjusted for inflation. Source: Carbon Brief analysis of government data with forecasts from Investec Securities, Cornwall Insights and Auxilione. See below for detailed methodology. Chart by Tom Prater for Carbon Brief using Highcharts.

The grid is decarbonizing – the future is electric





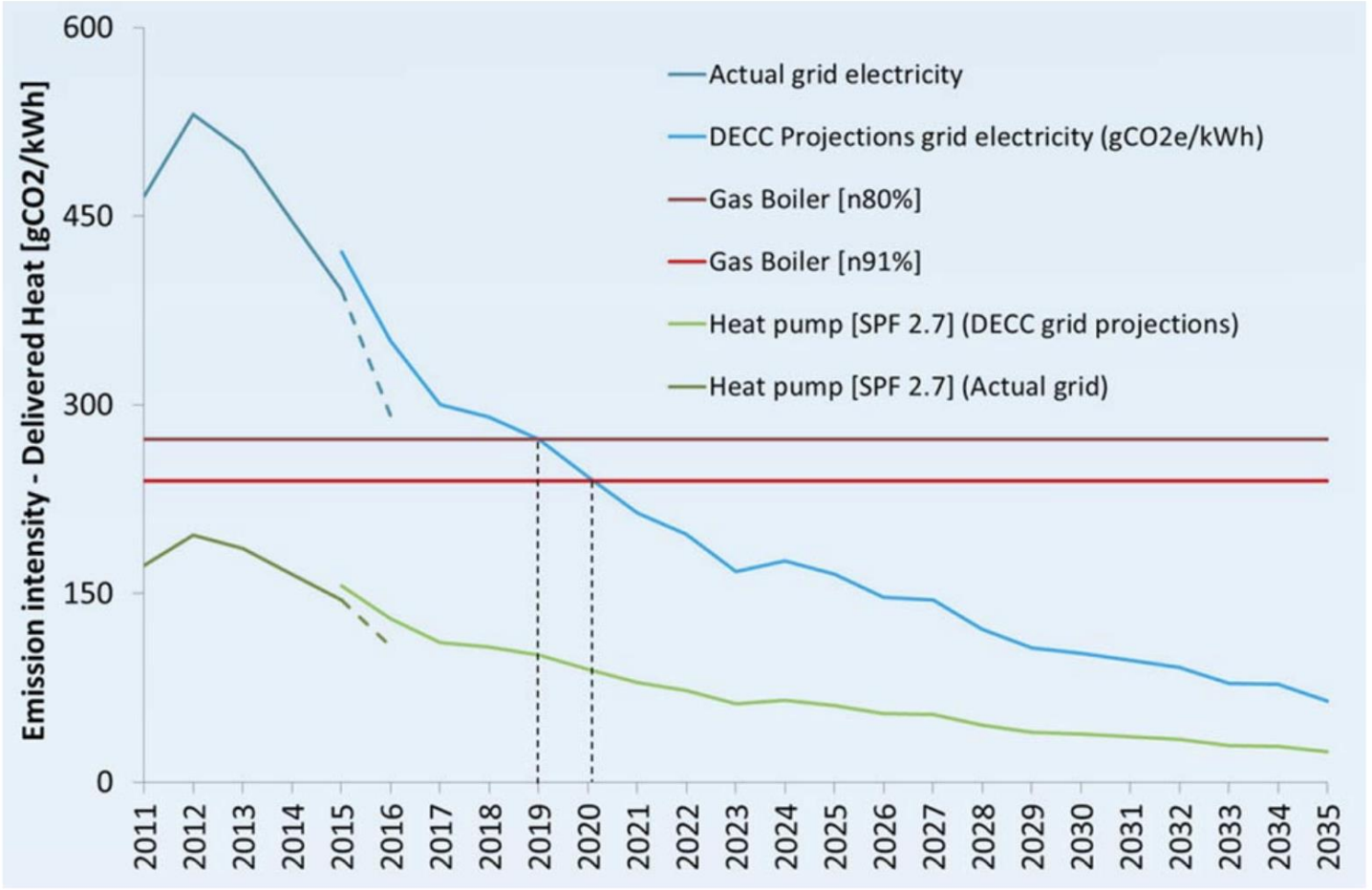
Heat pumps are the new condensing gas boilers

Carbon ranking	2012 emissions (tCO_2/home) with grid intensity 519g CO_2/kWh		2016 emissions (tCO_2/home) with grid intensity 288g CO_2/kWh	
Low carbon	Gas CHP district heat	1.74	ASHP heat and DHW	1.15 ↑
	ASHP heat and DHW	2.07	ASHP heat, direct DHW	1.53 ↑↑↑
	Local gas boilers	2.13	Local gas boilers	1.67 -
	Gas boiler DH	2.40	Electric storage heat	1.87 ↑↑
	ASHP heat, direct DHW	2.72	Gas boiler DH	1.94 ↓
Highest carbon	Electric storage heat	3.37	Gas CHP district heat	2.06 ↓↓↓↓↓

Carbon ranking	2025 emissions (tCO_2/home) with grid intensity 165g CO_2/kWh		2035 emissions (tCO_2/home) with grid intensity 65g CO_2/kWh	
Low carbon	ASHP heat and DHW	0.66	ASHP heat & DHW	0.26 -
	ASHP heat, direct DHW	0.87	ASHP heat, direct DHW	0.34 -
	Electric storage heat	1.07 ↑	Electric storage heat	0.42 -
	Local gas boilers	1.42 ↓	Local gas boilers	1.22 -
	Gas boiler DH	1.69	Gas boiler DH	1.49 -
Highest carbon	Gas CHP district heat	2.23	Gas CHP district heat	2.36 -

www.cibsejournal.com/opinion/moving-to-a-zero-carbon-electrically-powered-future/

How heat pumps are changing the game



Grid emissions and projected emissions, UK, with gas boiler emissions for comparison

www.cibsejournal.com/opinion/moving-to-a-zero-carbon-electrically-powered-future/

But… decarbonisation can only get us so far

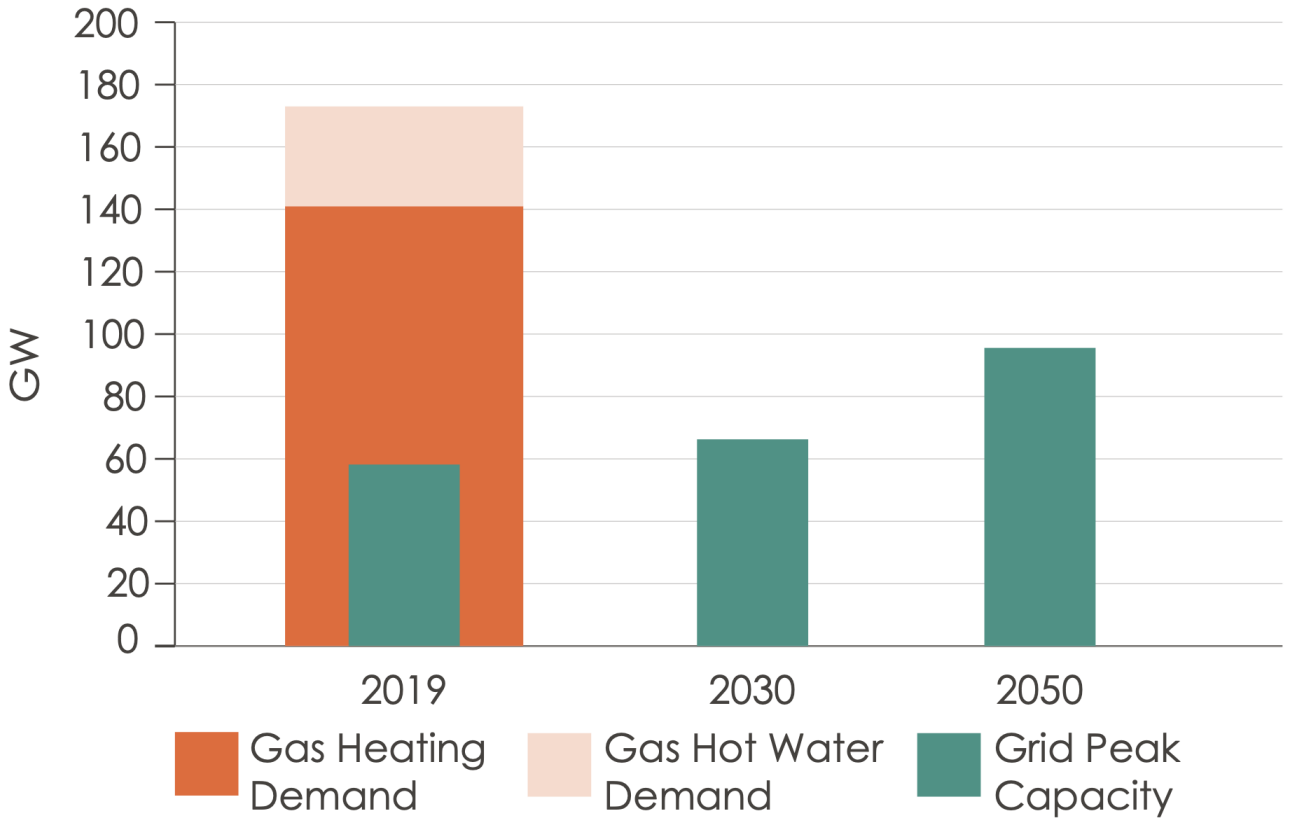
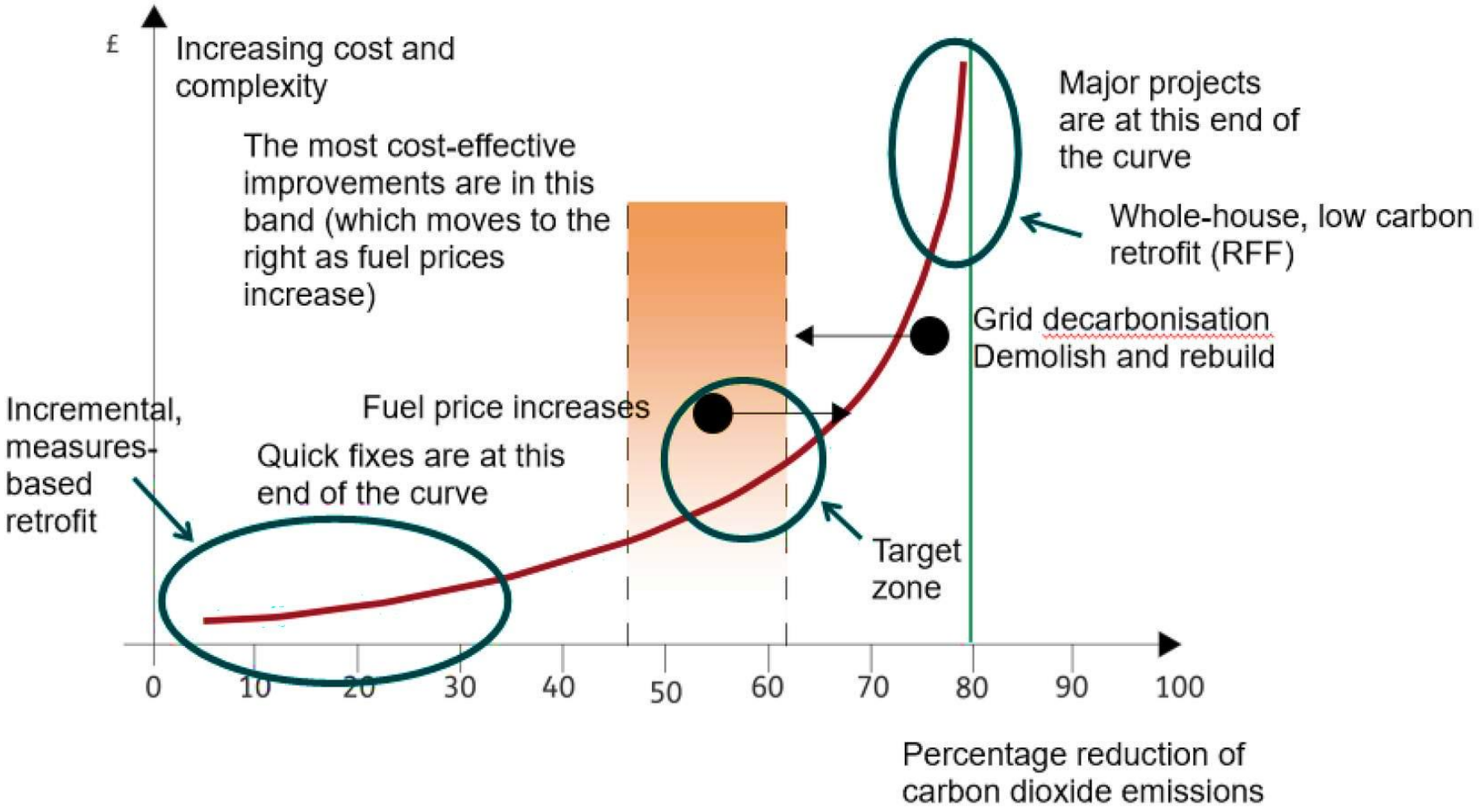


Figure 1.11 - Gas heating demand and gas hot water demand compared to electrical grid peak capacity.

LETI Climate Emergency Retrofit Guide How existing homes can be adapted to meet UK climate targets

Retrofit standards – how far to go?



Graph of cost against emission reduction, Retrofit Academy PAS2035 Retrofit Coordinator Course notes

AECB ‘Retrofit Step-By-Step’ standard

https://aecb.net/aecb-carbonlite-retrofit/

AECB 'Retrofit Step-By-Step' standard

Step one:

- **Heat pump @ flow temp 45°C**
- **Basic fabric:**
  - Loft insulation 400mm
  - Cavity wall insulation
  - Double glazing
- **Air permeability < 5m³/m².hr**
- **Continuous MEV or MVHR**
- **Overheating risk <5-10%**

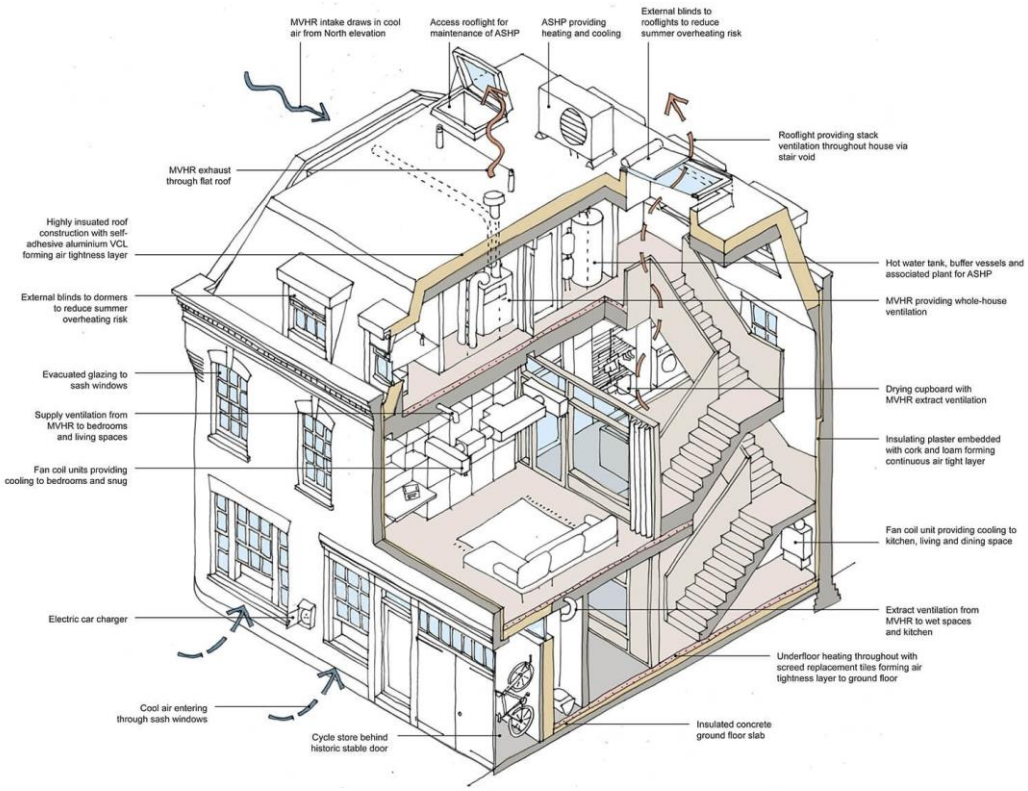
Plus modelled scenario showing how to get to **Step two**…

Step two:

- **<50 kWh/m².yr space heating**
- **Enhanced fabric:**
  - Solid wall insulation
  - Improved (e.g. triple) glazing
  - Floor insulation
- **Air permeability < 2m³/m².hr**
- **Continuous MEV or MVHR**
- **Overheating risk <3-5%**

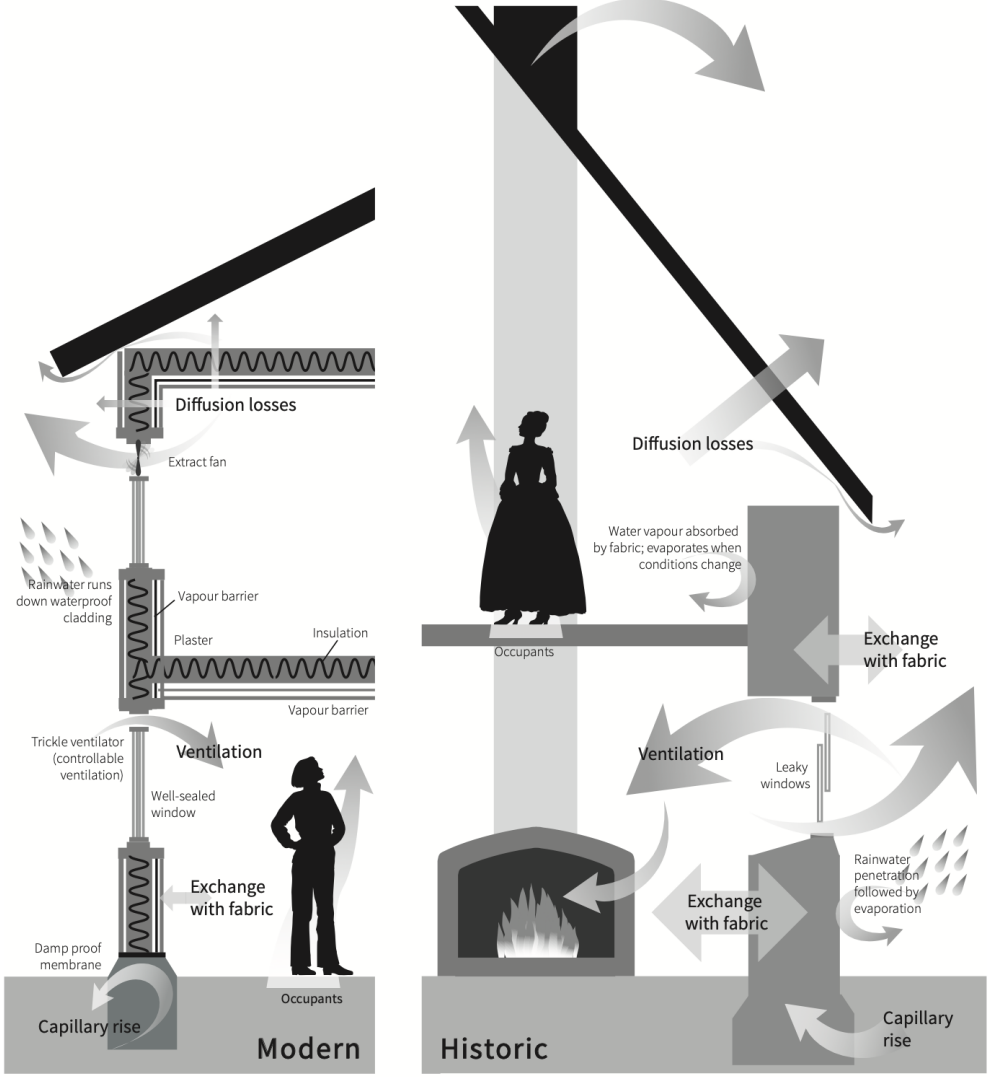
https://aecb.net/aecb-carbonlite-retrofit/

Taking a whole house approach



Mews House deep retrofit in London by Prewett Bizley Architects

Understand every home is different



- Modern homes work differently to traditionally built (pre-1920s) homes
- Changing the performance of one building element can have 'unintended consequences' on other parts of the building

Figure 4
Typical differences in the movement of moisture and air in modern and traditional construction.

Unintended consequences of retrofitting

Airtightness and insulation measures will require effective ventilation strategy and proper detailing in order to avoid problems like mould growth on window reveals

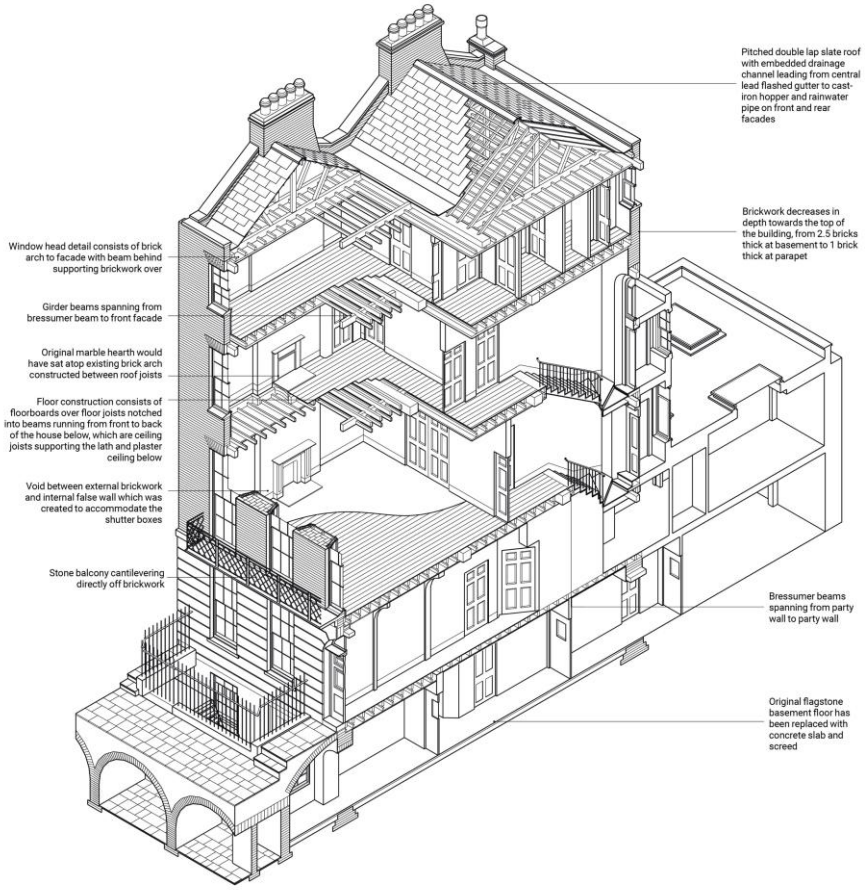
Sub floor ventilation needs to be addressed if insulating in order to avoid problems such as damp or rotting floor joists

Not all holes are bad!

Appreciate historical significance

1840s Tithe Map

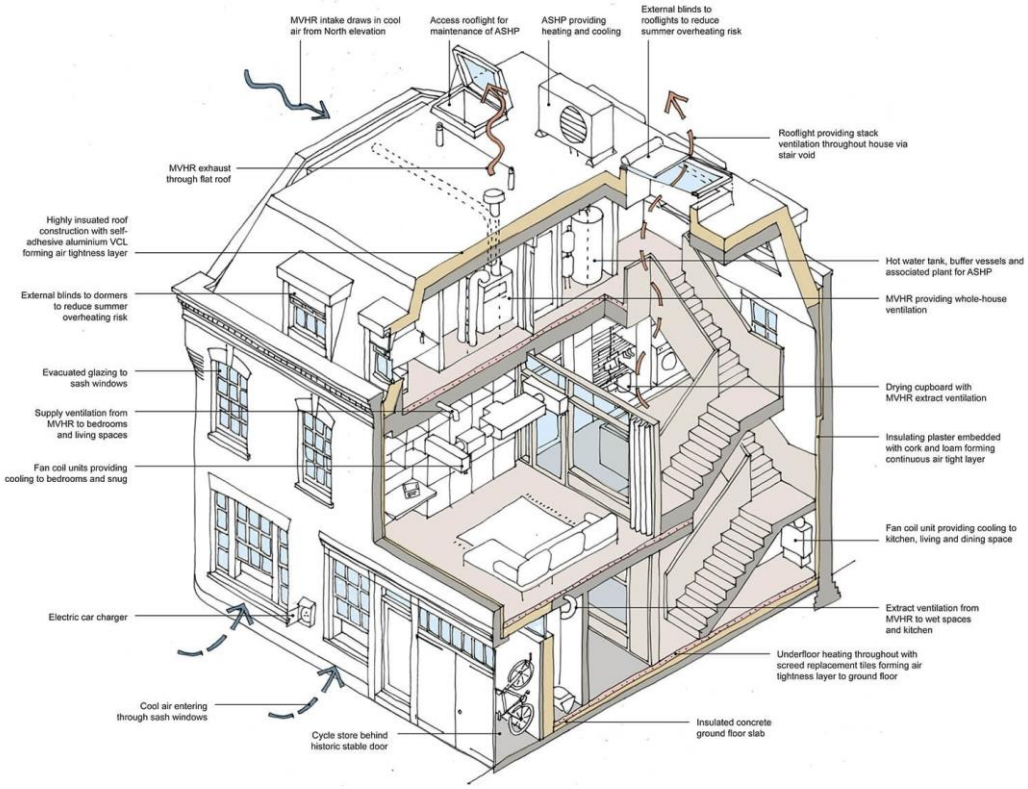
1894-1903 OS Map 25" 2nd Ed



Bloomsbury House Retrofit by Prewett Bizley

- No blanket solutions – context is key
- In all settings we advocate assessing significance as per BS7913: 2013

Prewett Bizley Mews House Deep Retrofit

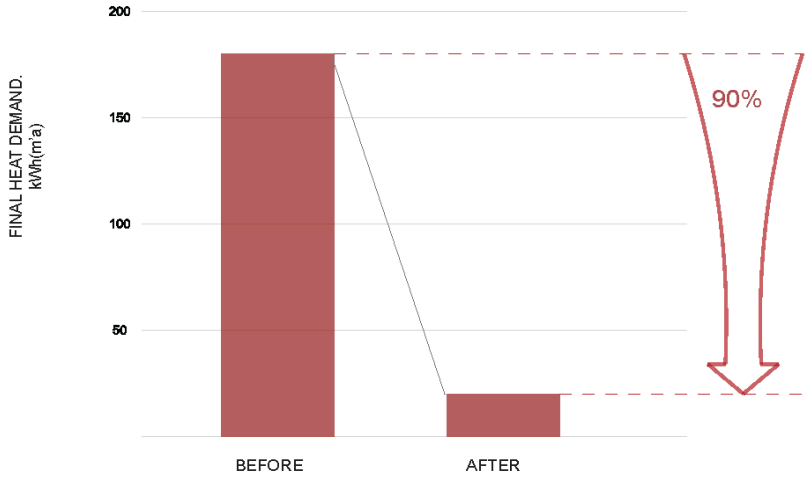


www.prewettbizley.com/mews-house-deep-retrofit

Prewett Bizley Mews House Deep Retrofit

90% reduction in lifetime carbon through:

- Air source heat pump (heat & cool)
- Whole-house ventilation (MVHR)
- Insulating lime & cork plaster
- Highly insulated floor and roof
- Sash window vacuum glazing
- Airtight detailing throughout
- External blinds on upper windows
- EV charger & cycle store



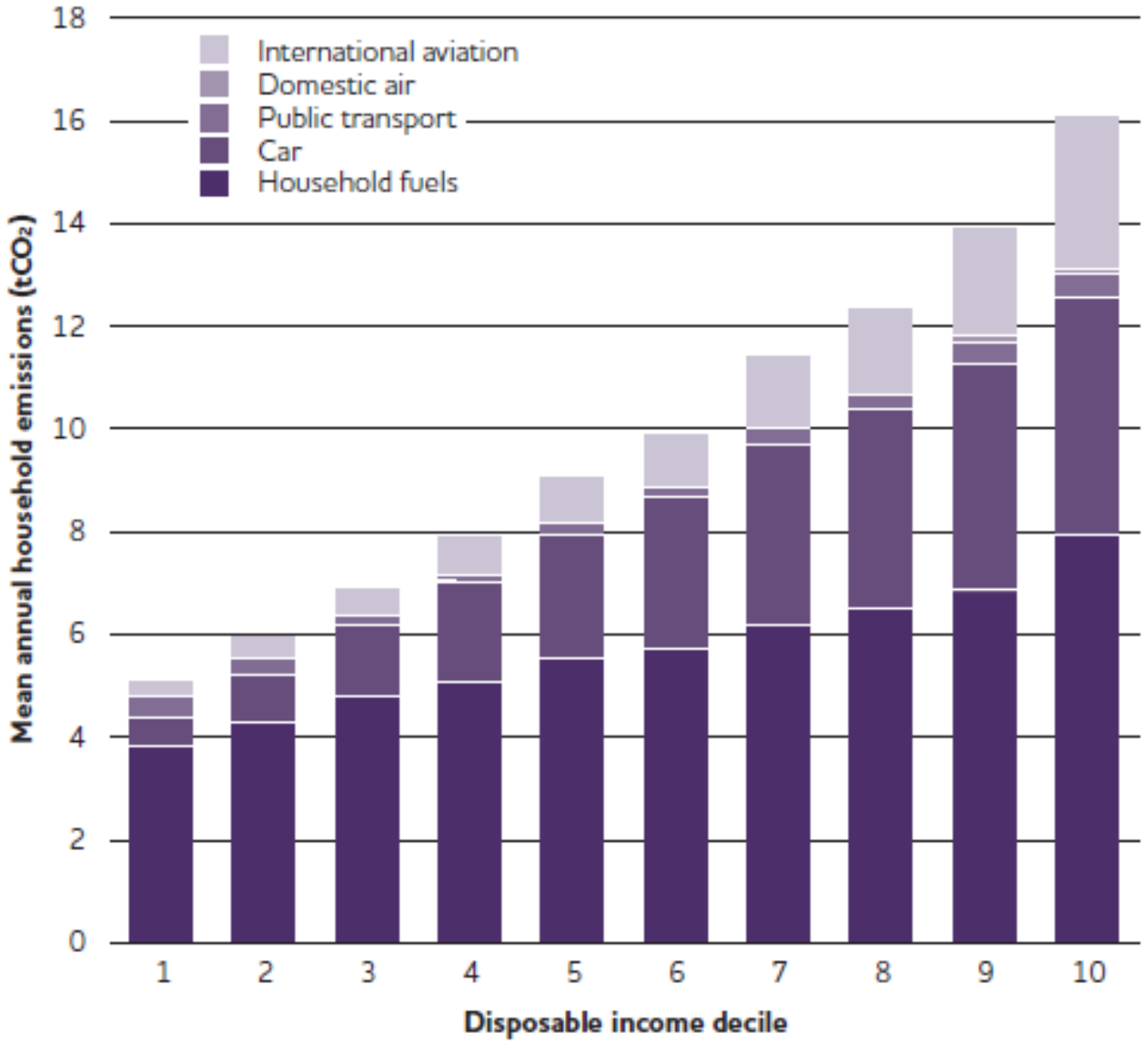
www.prewettbizley.com/mews-house-deep-retrofit

What's my home like? Patterns of occupation…

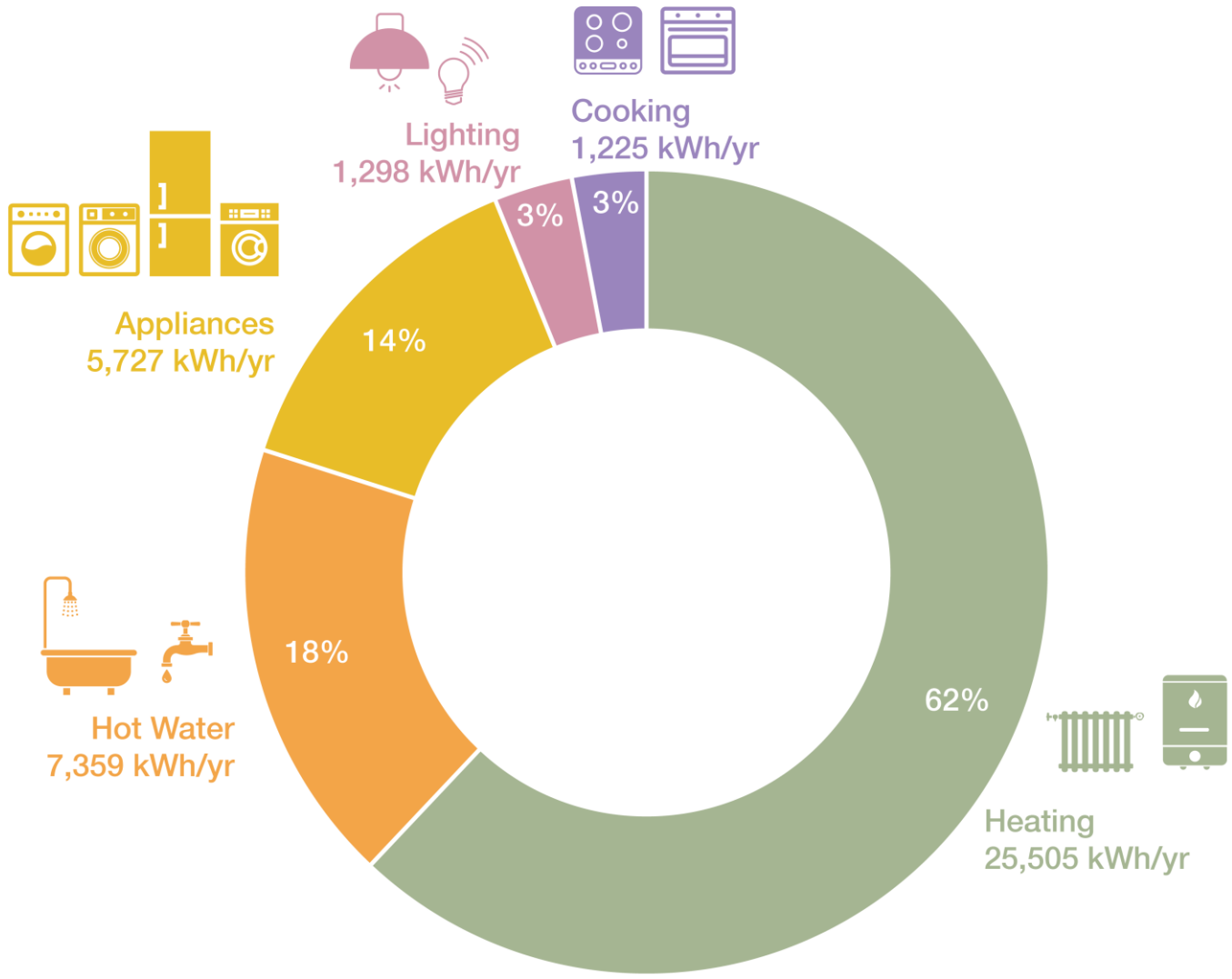
- **Modern or traditional construction?**
- **Listed, Conservation area, Non-designated?**
- **Flat, detached house, semi-detached?**
- **Gas central heating or other?**
- **Owned or rented?**
- **Circumstances:**
  - house purchase, starting a family, major renovation, futureproofing for retirement, love/hate DIY ?!

What's true for you?

What's my home's carbon footprint?

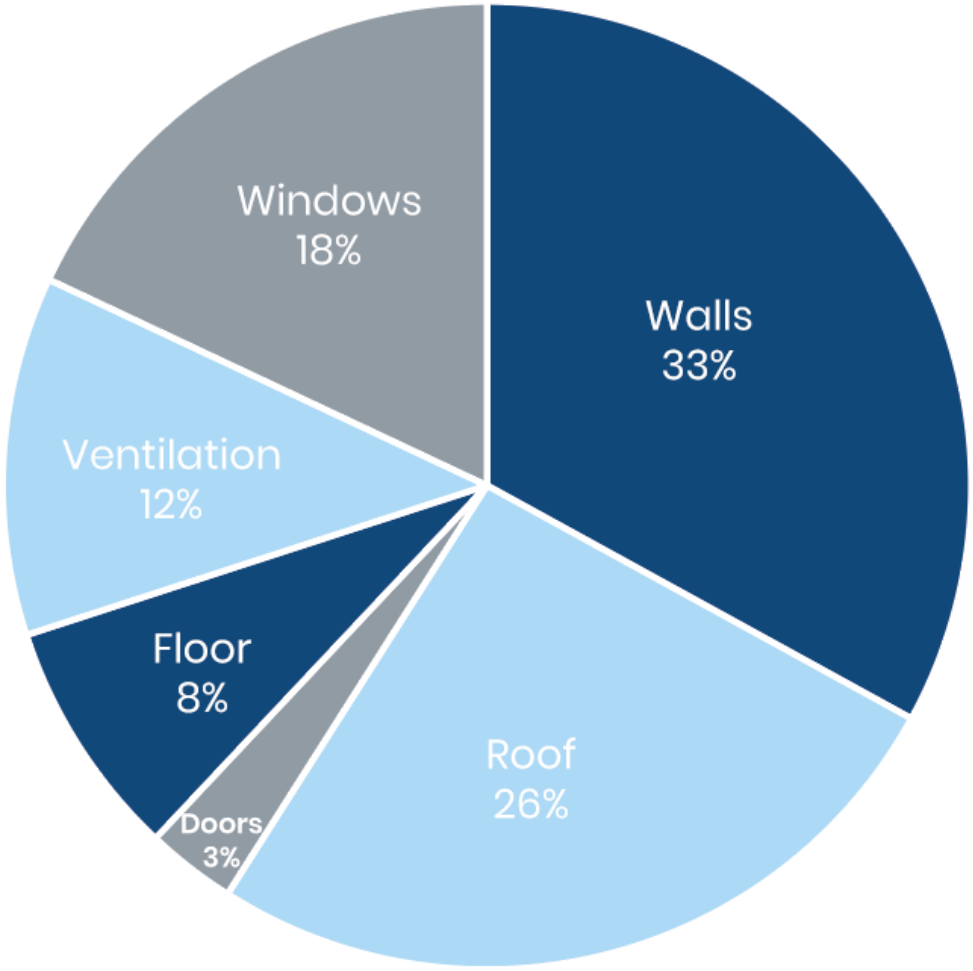


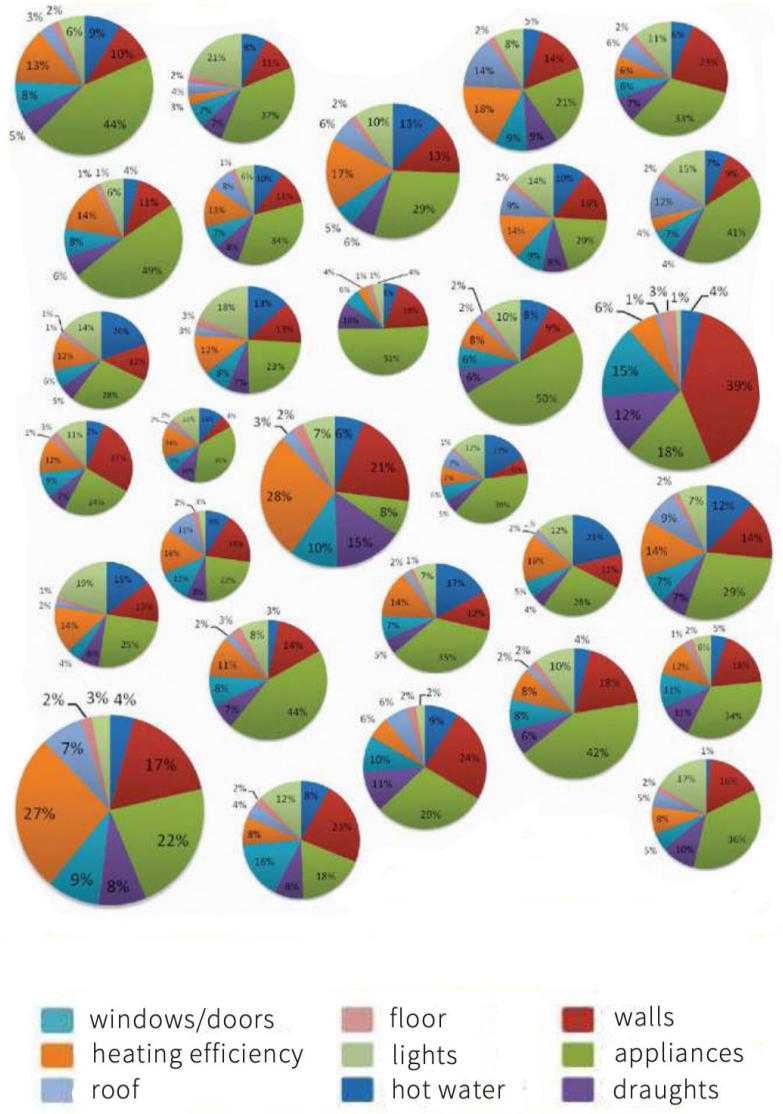
Where’s my energy bill going?



Source: The Devon Retrofit Guide

Where's my space heating going?





Source: Energy Saving Trust & Parity Projects

Retrofitting your home: the options

- Heating & hot water
- Air tightness and draughtproofing
- Ventilation and indoor air quality
- Windows and doors
- Insulation and building fabric
- Solar PV and battery storage

Heating & Hot Water – Air Source Heat Pumps

Why purchase a heat pump?

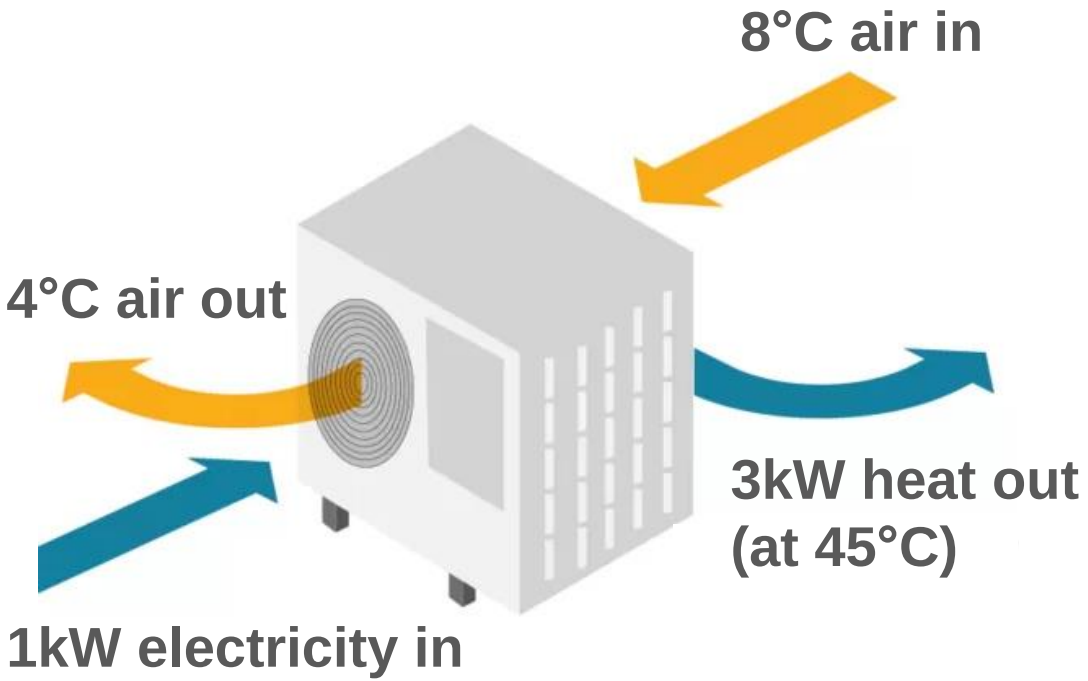
- Up to 85% low carbon emissions than a gas boiler
- Will continue to reduce as grid decarbonises
- Similar running costs to gas boiler (can be cheaper with ‘time-of-use’ tariff)
- Bigger carbon reduction than any other measure

Grants £7.5k available – Government’s Boiler Upgrade Scheme
www.gov.uk/apply-boiler-upgrade-scheme

Air Source Heat Pumps – how do they work?

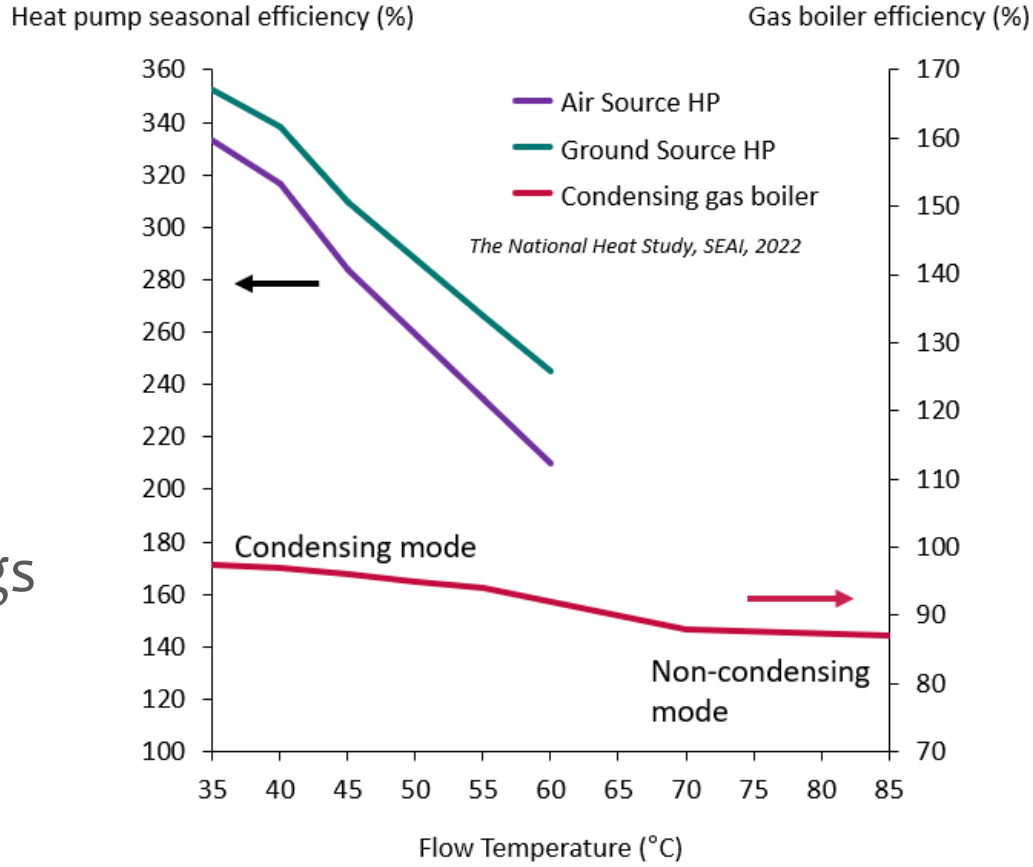
An Air Source Heat Pump:

- Extracts heat from outside air
- Converts this heat into hot water, like a fridge in reverse
- 1 unit electricity in, and between 1.5 and 5.0 units of heat out, depending on flow temperature
- Coefficient of Performance (COP) **150% to 500% efficiency**



Air Source Heat Pumps – considerations

- **Outside**
  - Space in front, behind & either side
  - Route for pipework
  - Can be on wall or flat roof
  - Noise (but modern HPs quiet)
  - Specific rules for listed buildings & conservation areas
- **Inside**
  - New hot water cylinder
  - Radiators & flow temperature
  - Route for pipework
  - Opportunity to get rid of gas?



Source: Transition Bath Heat Pump Advisory Service

Flow temperature matters!

Transition Bath Heat Pump Advisory Service

- Free webinars
- Personalised advice
- Home visits
- www.transitionbath.org/heat-pump-advisory-service/

Transition Bath
climate · community · future

Air Tightness and Draughtproofing

Blower door air permeability/ leakage test

Thermography

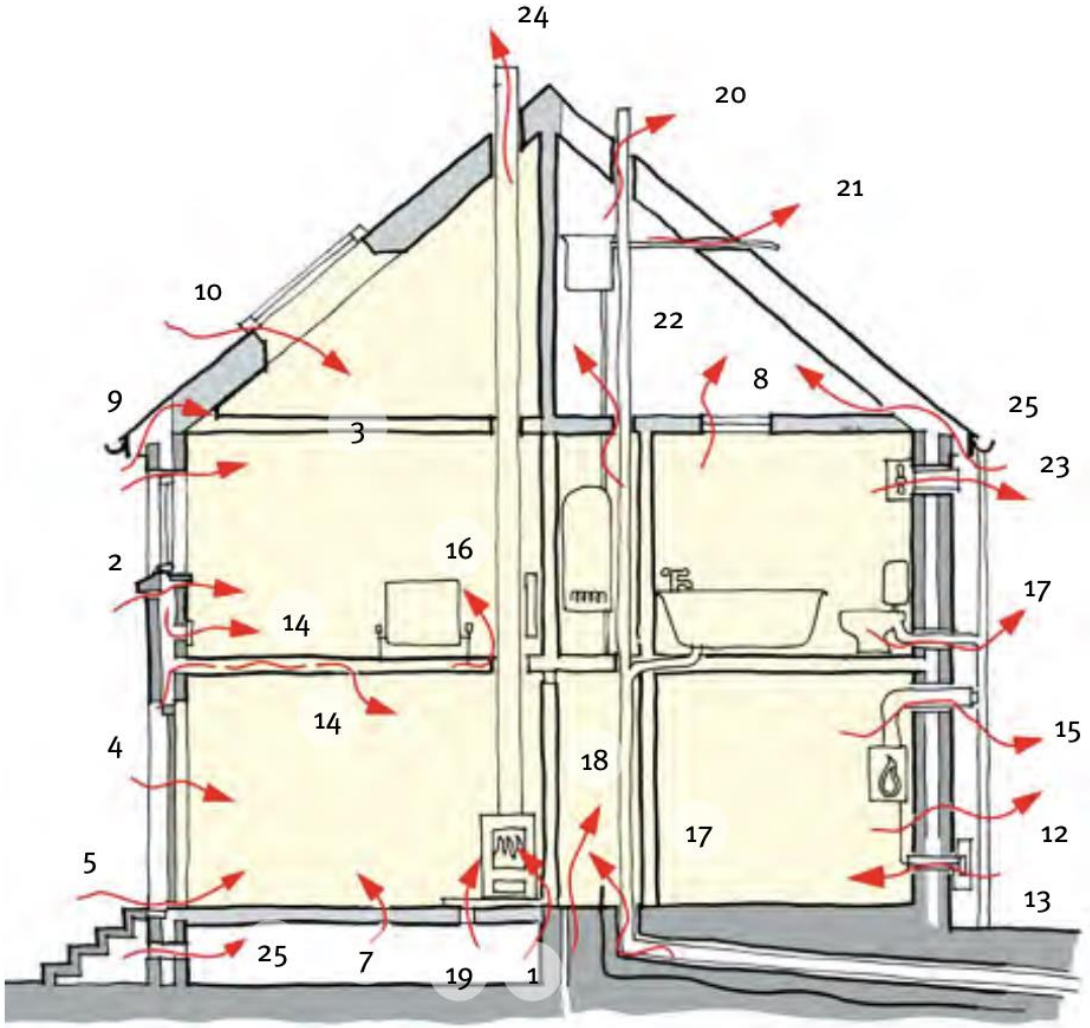


Diagram indicating the many ways in which air can infiltrate a building with a cavity wall (key to right)

Air Tightness and Draughtproofing

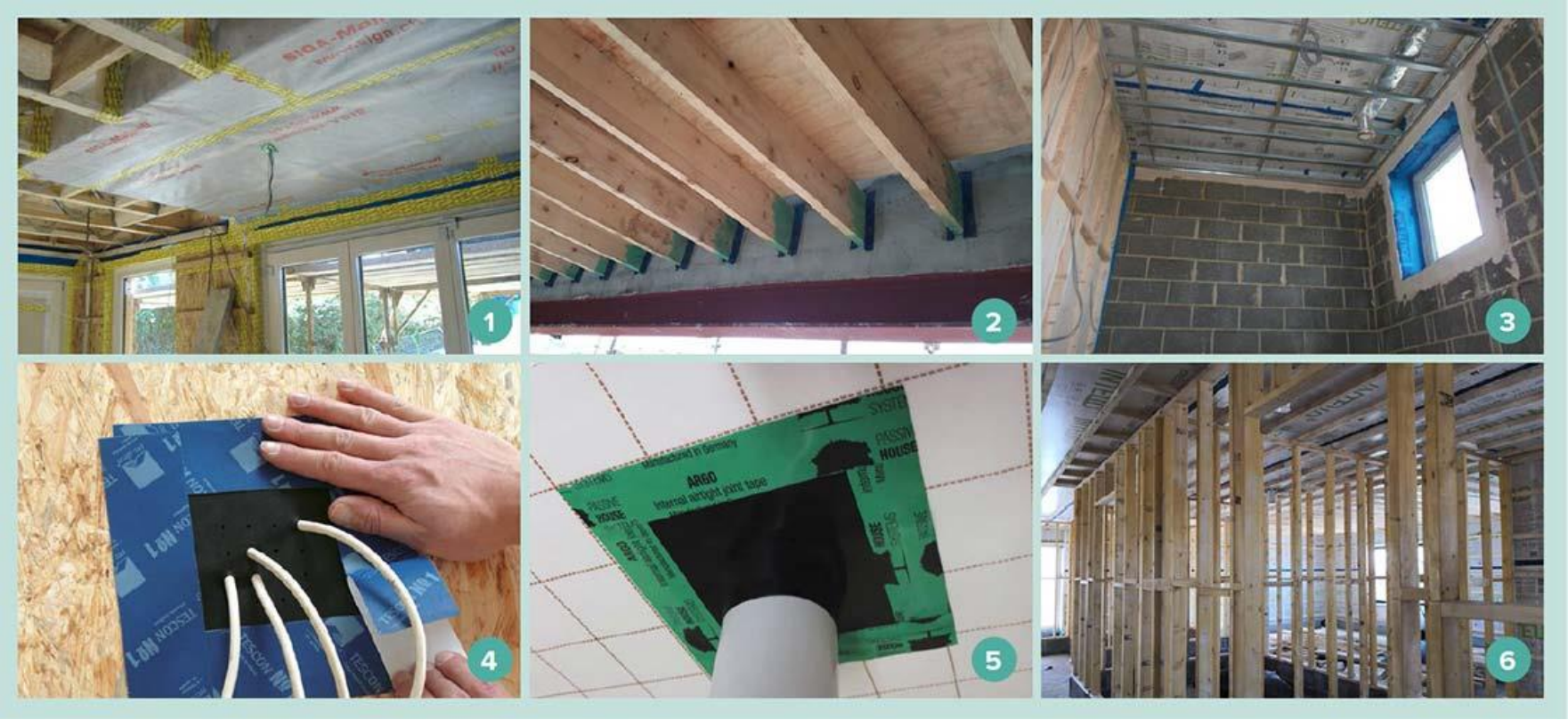
“Seal tight, ventilate right”

Figure 8 (top)
Brush pile seals added to a sash window.

Figure 9 (middle)
Brush pile seals can be inserted into window and door beads.
© Core sash windows.

Figure 10 (bottom)
A brush pile seal being inserted into a window sash.
© Core sash windows.

Air Tightness in new build and major renovation



1) Airtightness membrane at the underside of a ceiling with taping around web-joists and other junctions; 2) airtightness taping around joist ends; 3) taping of membrane overlaps to underside of ceiling, with service cavity beneath; 4) specialised seals around penetration for wires; 5) and ductwork; 6) airtight membranes installed by Clioma House prior to the installation of internal studwork in a Long Life Structures build.

2) Source: Passive House Plus Magazine, Feb 2019

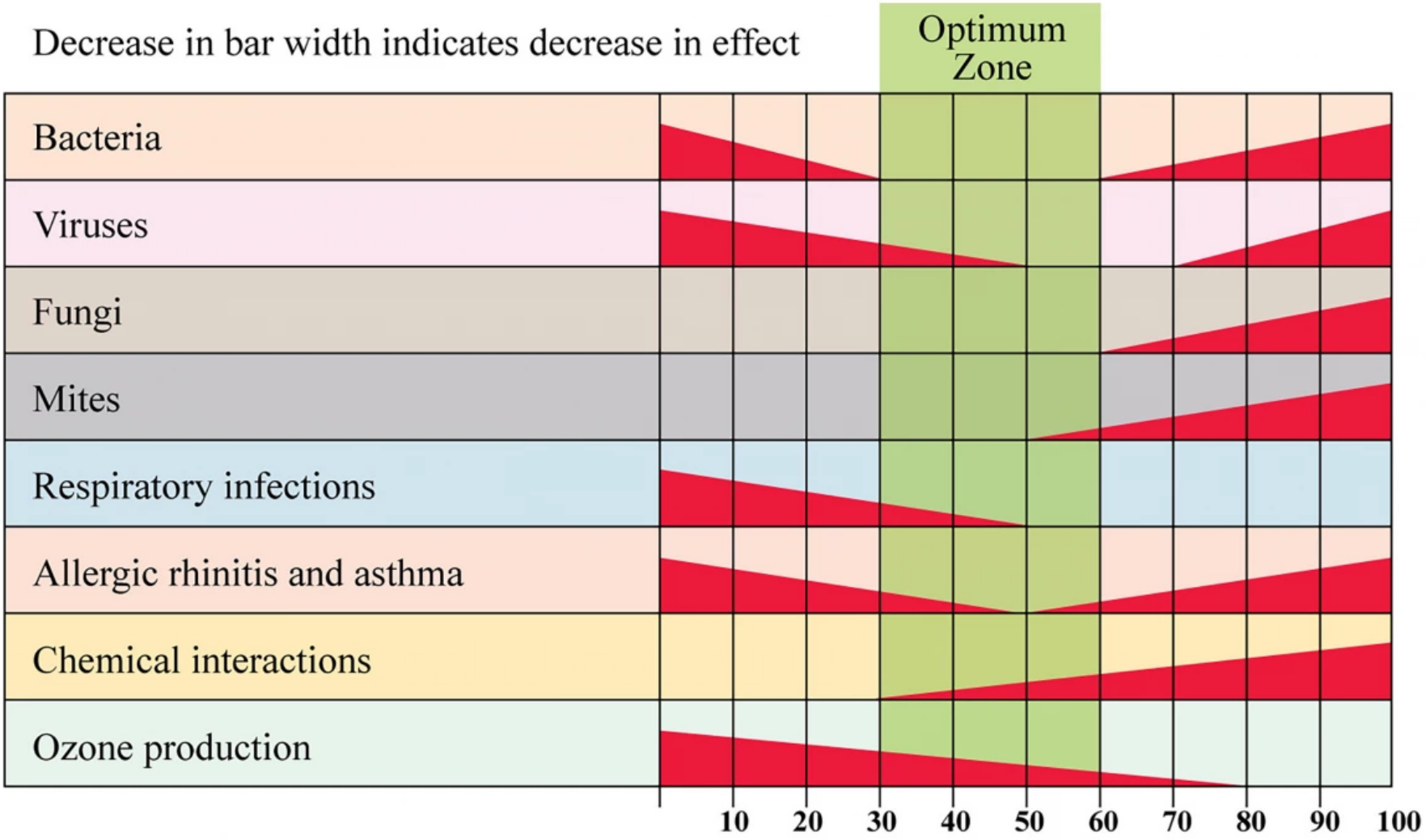
Ventilation and Indoor Air Quality

- **Ventilation is "air movement that's designed, intentional & controllable"**
  - Older buildings: Openable windows, openable chimneys, fires and stoves (working in conjunction with stack and cross ventilation)
  - Modern buildings: Openable windows, mechanical extracts fans, trickle vents
- **Infiltration – or air leakage – is "process of air getting in and out of a building that wasn't designed, intended or controllable"**
  - Air permeability ($m^3/m^2.hr$ @ 50 pascals) is most commonly used term

Ventilation and Indoor Air Quality

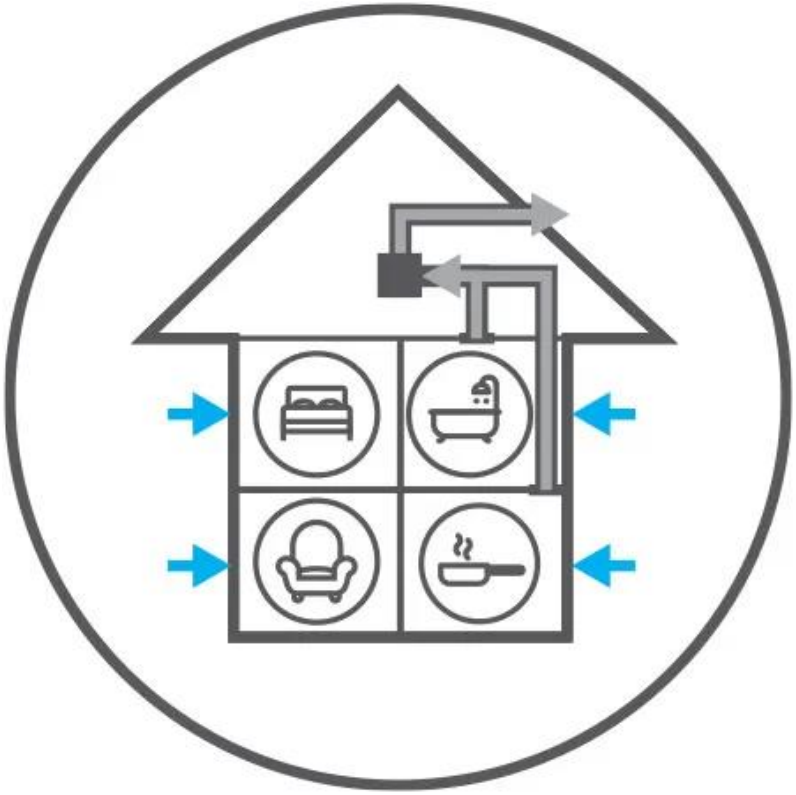
- **Purpose of ventilation:**
  1. Remove excess moisture / humidity
  2. Remove pollutants (VOCs, CO_2, viruses, bacteria, dust mites, particulates, odours)
  3. Provide fresh air / oxygen
  4. Cooling

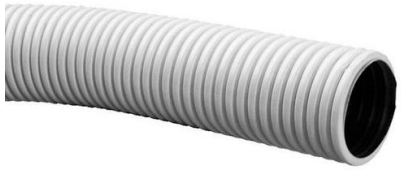
Ventilation and Indoor Air Quality



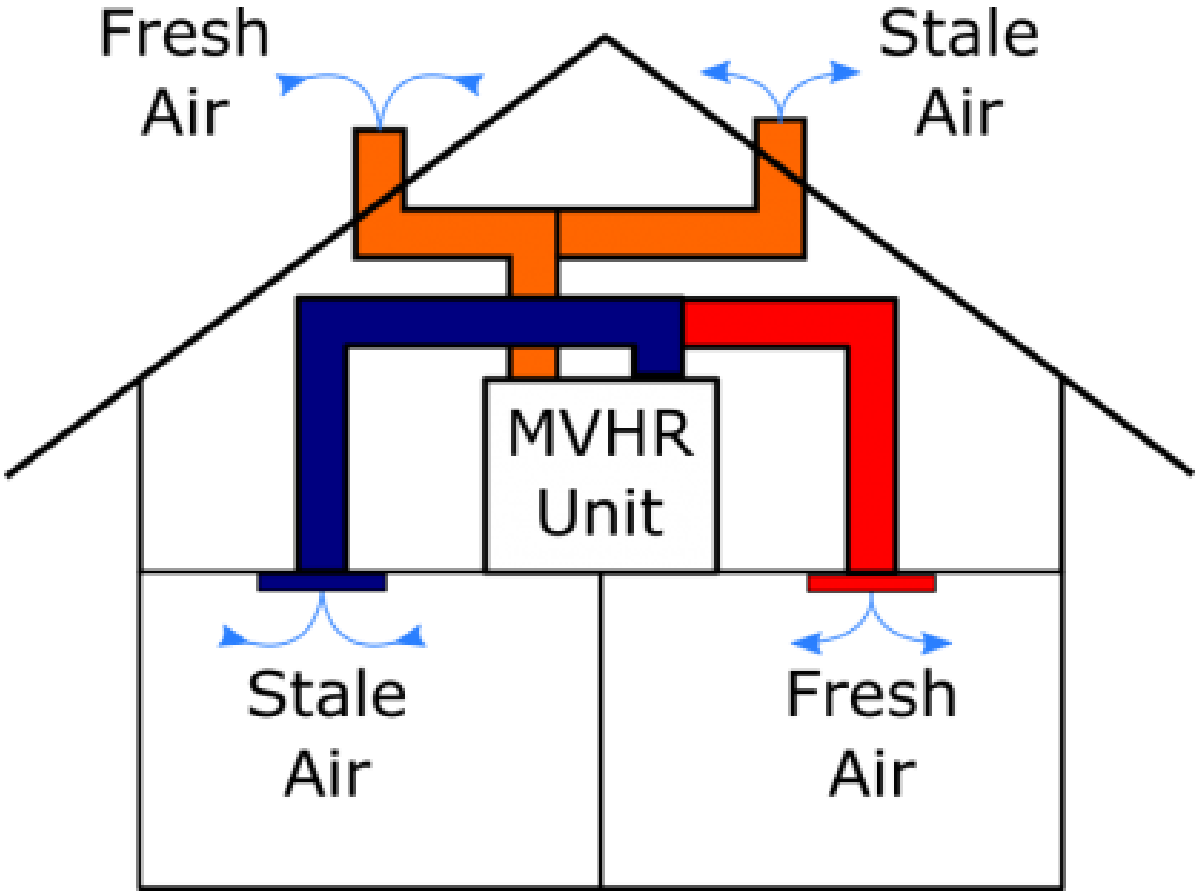
Intermittent Extract Ventilation

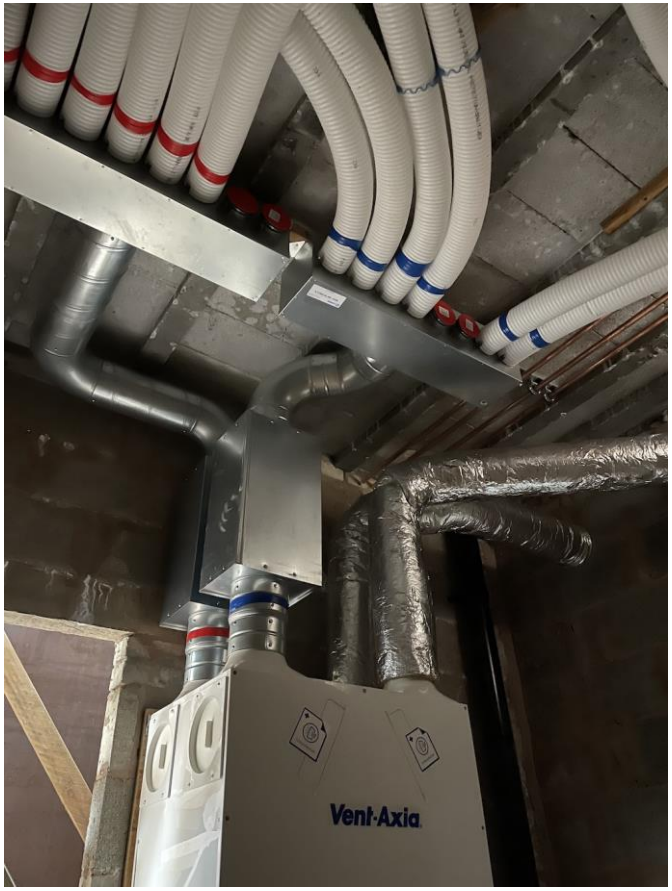
Centralised & Decentralised Mechanical Extract Ventilation (MEV)





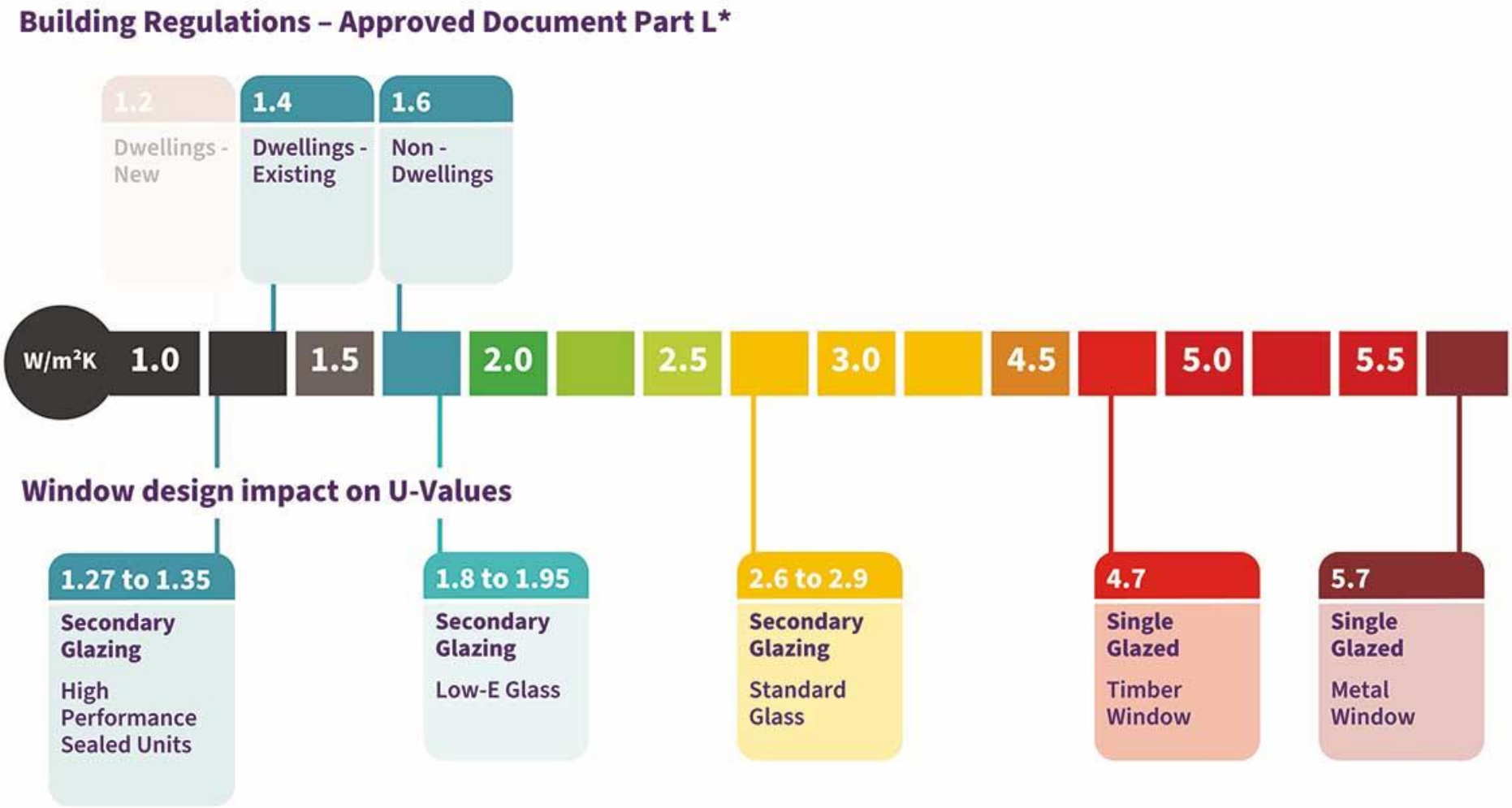
Mechanical Ventilation with Heat Recovery (MVHR)





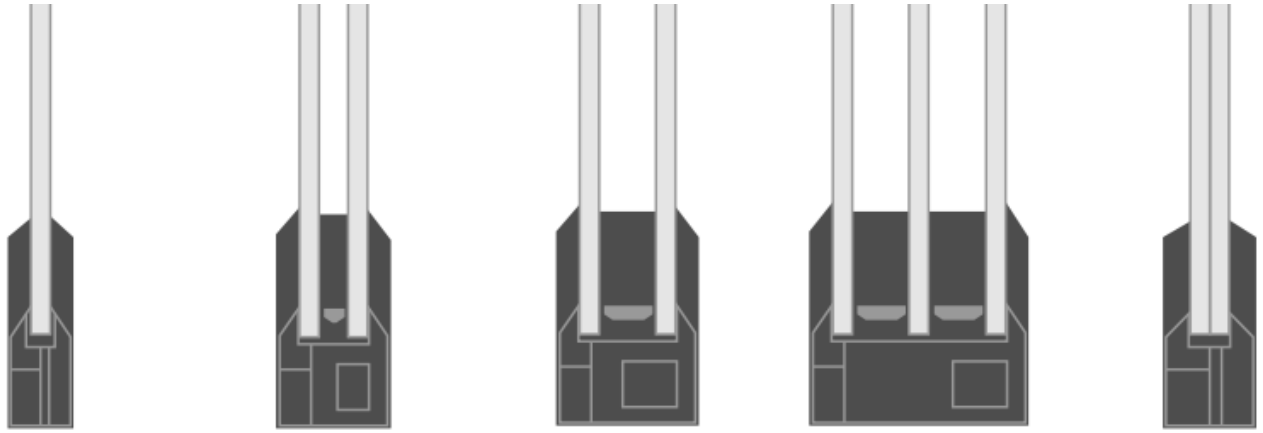
Whole-house system in which air is drawn in and pre-heated (heat recovery)

Window Upgrades



*Exemptions may apply to Listed and period properties.

Window Upgrades – Comparing performance



	Single Glazing	Slim Double Glazing	Double-Glazing	Triple Glazing	FINEO
Thickness	4mm	11mm	28mm	36mm	6.7mm
U-Value (W/m^2K)	5.8	1.9	1.2	0.8	0.7
Light Transmission	90	80	80	71	80
Sound Reduction Rw (C;Ctr) dB	29 (-2; -3)	31 (-2; -5)	31 (-2; -5)	32 (-1; -5)	35 (-2;-5)

Historic building solution…

Window Upgrades – Options

1. **Retain and repair (draughtproof)**
   - i.e. new brushes for old sash windows (DIY or professional)
2. **Secondary glazing**
   - including glazing and Perspex systems (DIY or professional)
3. **Double glazing**
   - in which case go for as high performing as you can get
4. **Triple glazing**
   - probably only worth it if you are doing serious upgrades to rest of house (as high cost, embodied carbon etc)

And of course….shutters, curtains and blinds!

Window Upgrades – 1. Retain and Repair

Refurbishment of Sash Windows in a Grade II listed home in Combe Down, opened as part of Green Open Homes B&NES

Bath and West Community Energy

Window Upgrades – 2. Secondary Glazing

Examples of Secondary Glazing with Perspex
(Credit: Green Open Homes B&NES / Mitchell and Dickinson)

Window Upgrades – 3. Double Glazing

High performance double glazing
(credit: Rationel)

Slimline double glazing
Grade II – Lansdown Place East – new replica timber double glazed dormer windows, replacing poor quality 1980's replicas
(credit: Bath Preservation Trust)

Ultra slim vacuum glazing panels
(credit: Fineo)

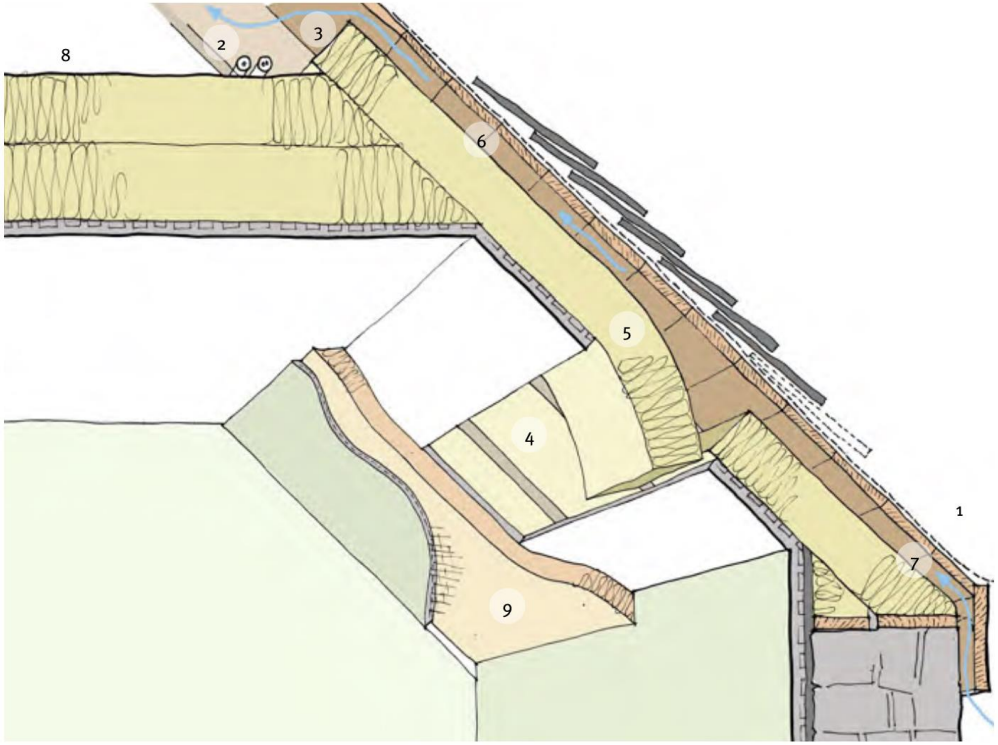
Window Upgrades – 4. Triple Glazing

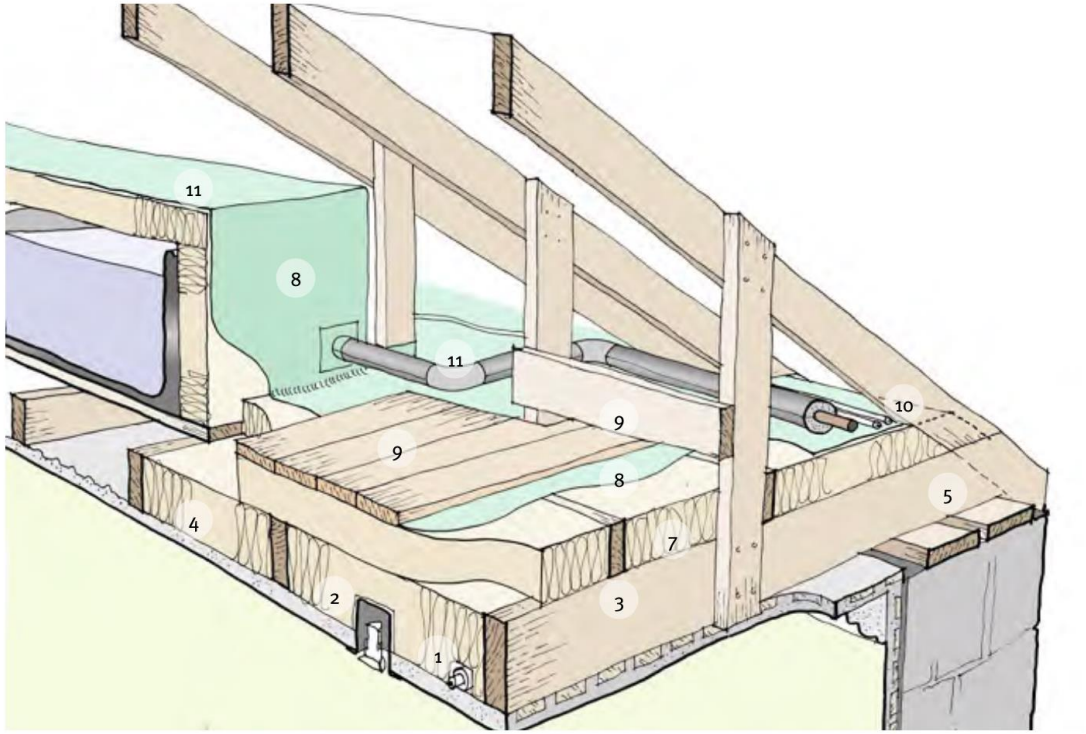
Triple glazing as part of major renovation

Timber or aluminium clad triple glazing with thermally broken seals

Roof Insulation

Heat rises – stop it leaking out!



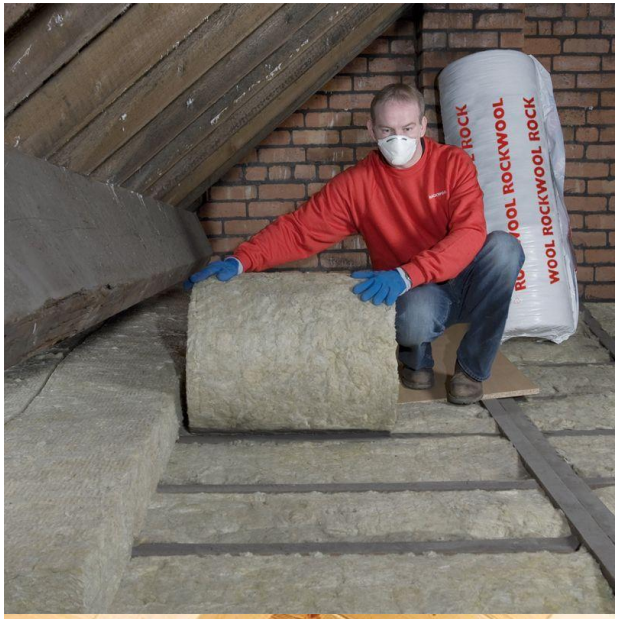


Don’t block the roof ventilation path at eaves

Remember to insulate and draughtproof the loft hatch

Images: Sustainable Renovation,
A SEDA Guide to Best Practice

Roof Insulation – Materials



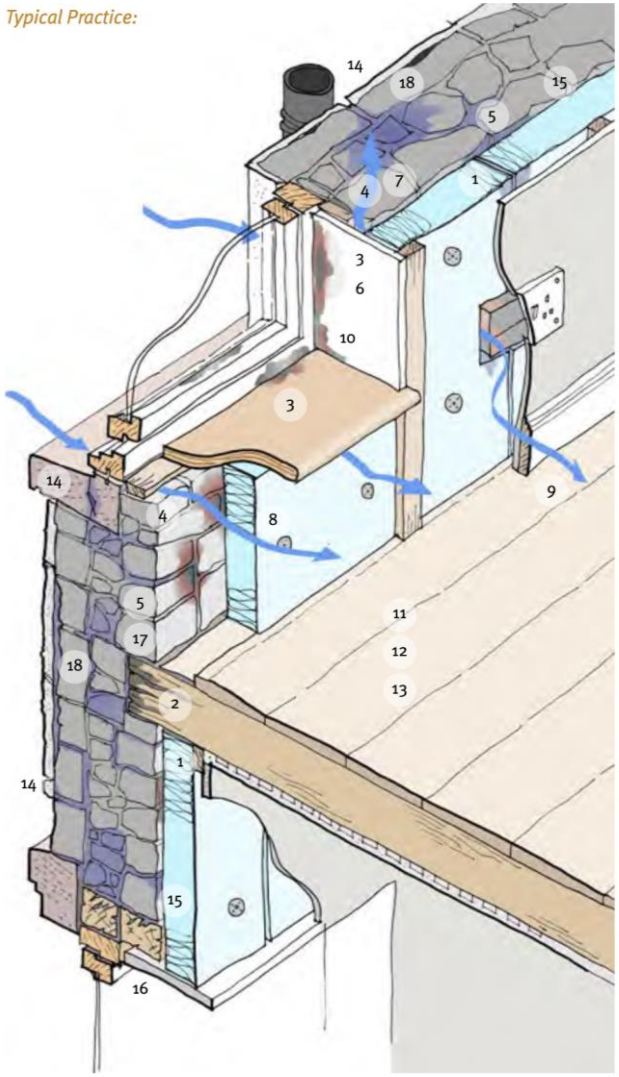
Mineral fibre

Sheep's wool

Wood fibre

Hemp fibre

Internal Wall Insulation

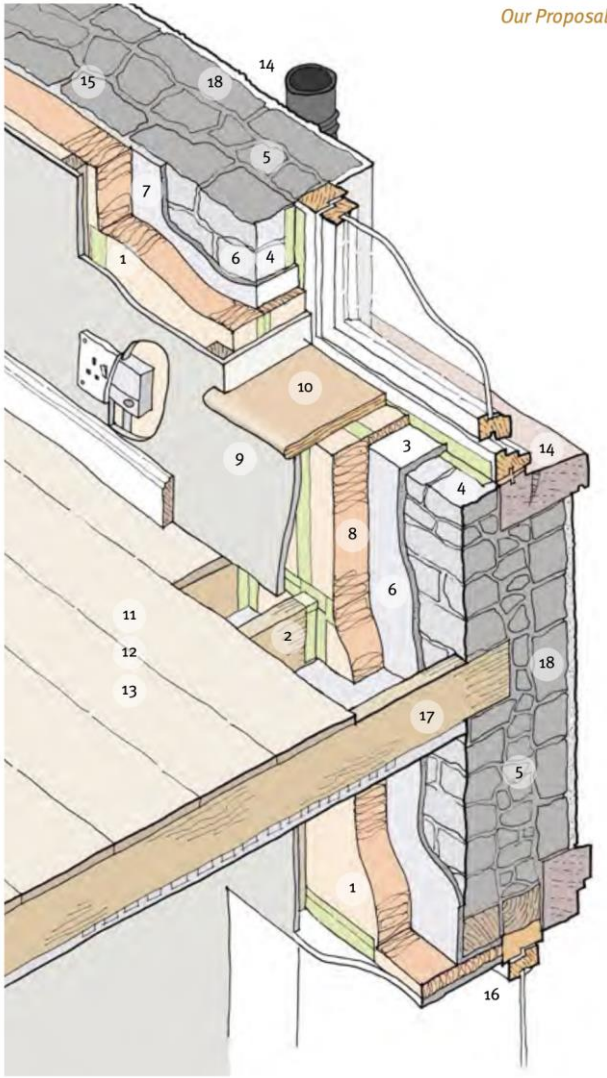


Images: Sustainable Renovation, A SEDA Guide to Best Practice

Unintended consequences – mould within structure

Thinking has moved on:

- **Vapour permeable**
- **Breathable best**
- **Little but detail it well**



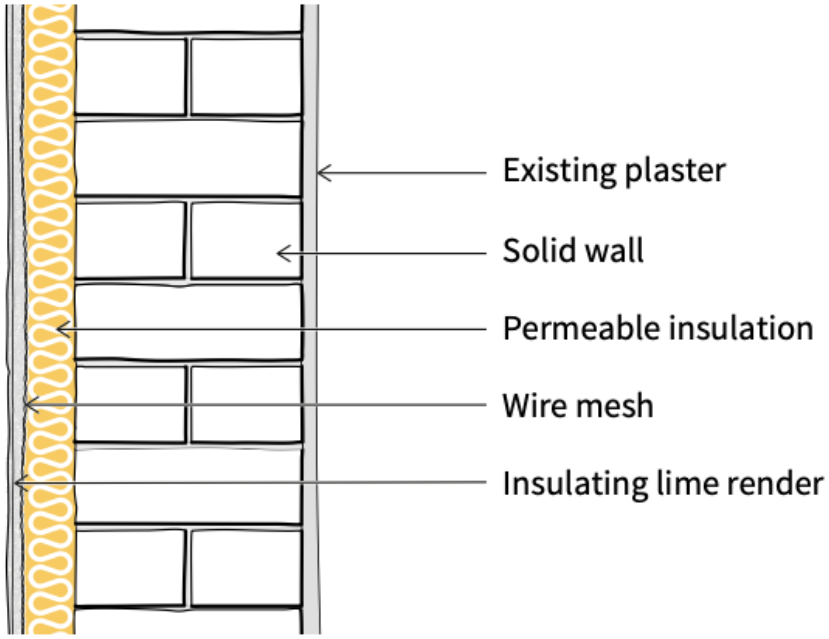
Internal Wall Insulation – Materials

Wood fibre board

Cork lime plaster

External Wall Insulation

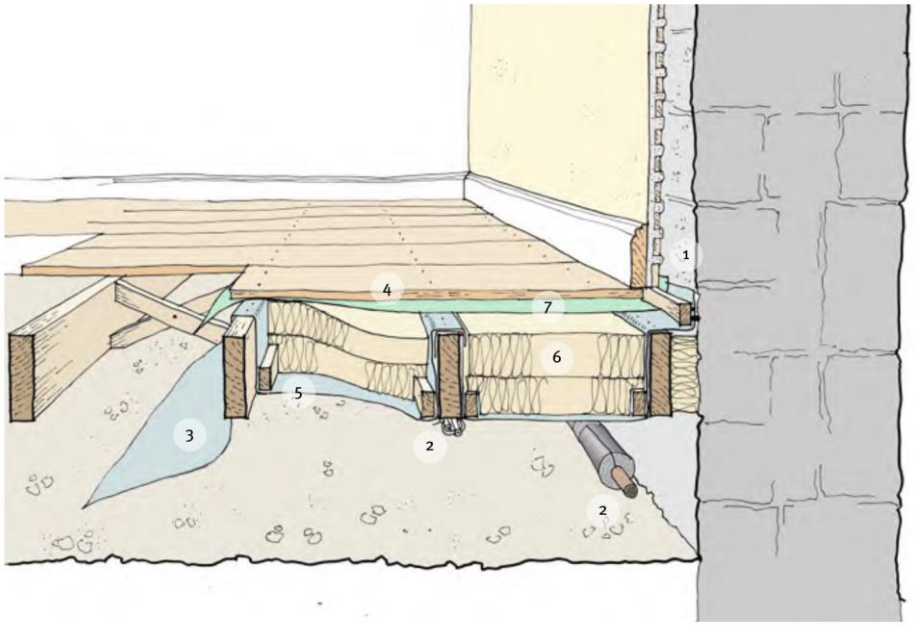
Different Approaches to the Front & Rear?



External wall insulation using a vapour permeable insulation and lime render.

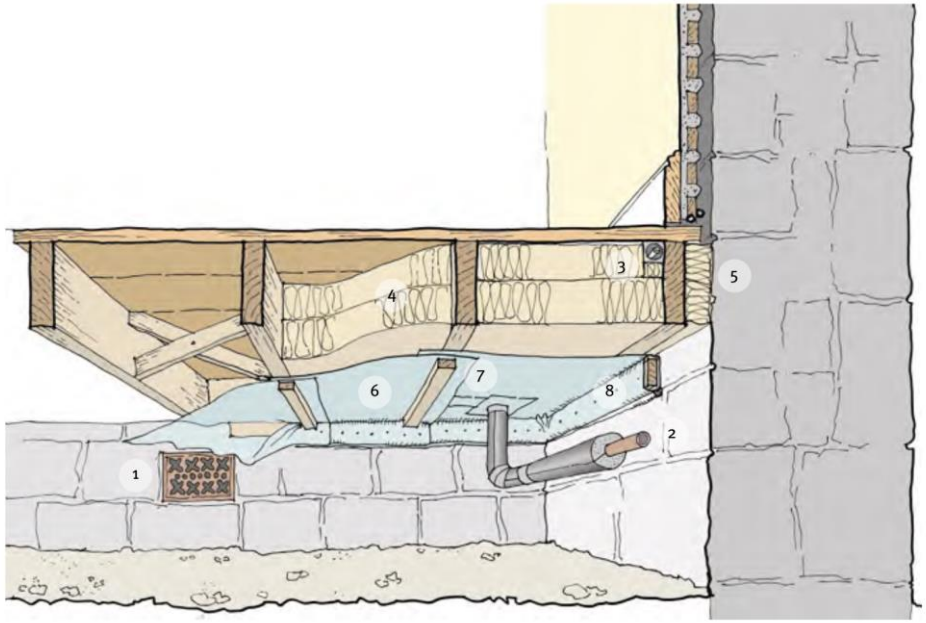
Floor Insulation

Suspended timber floors – ventilation of sub-floor is critical



Suspended timber floor insulation done from above.

Make sure sub floor ventilation is adequate i.e. a gap of more than 150mm and airbricks ventilators should be spaced at no more than 2m centres and within 450mm of the end of any wall.



Suspended timber floor insulation done from below.

Images: Sustainable Renovation,
A SEDA Guide to Best Practice

Solar PV and battery storage

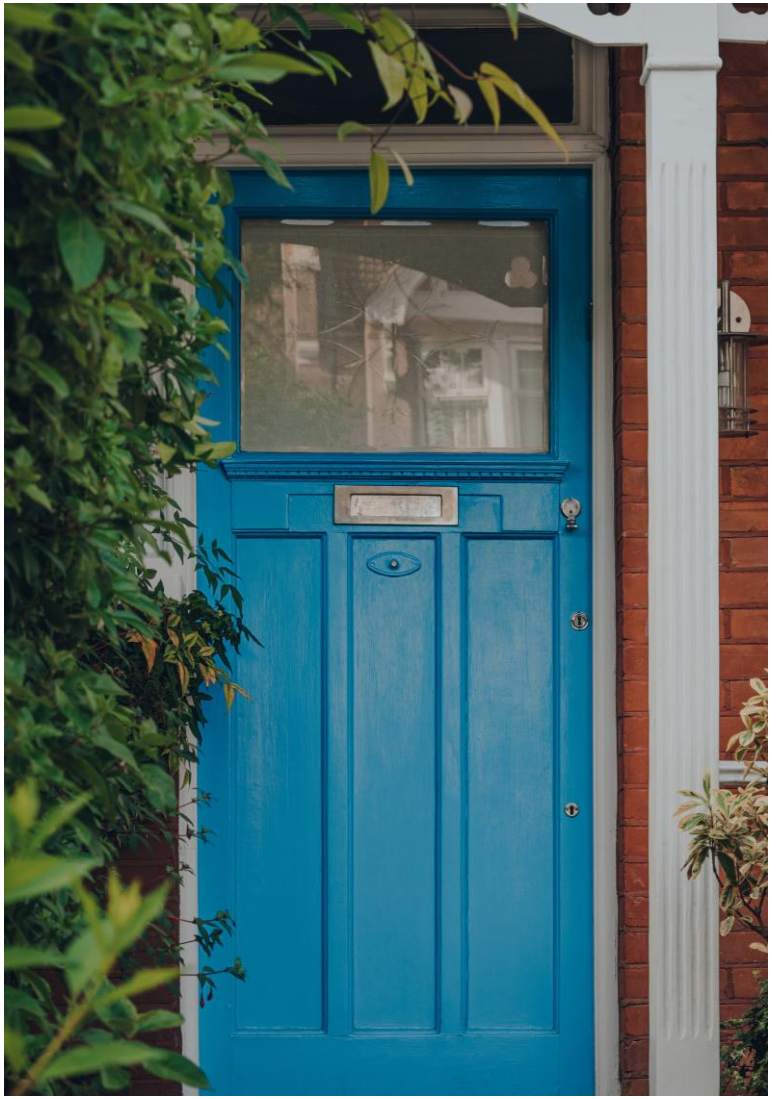
- In combination with demand reduction, renewables such as solar PV offer cost savings when combined with battery storage
- Ground mounted, wall mounted, roof mounted (including valley roofs)

Where can I get support?

- **BWCE's Home Energy Service**
  - Home Energy Surveys, Green Heritage Homes project, Green Open Homes events
- **Retrofit West**
  - Advice Line, Home Plan Builder, Assessment Vouchers
- **Other Local Partners**
  - B&NES Council – Energy at Home & Planning Portal
  - Bath Preservation Trust, Transition Bath, The Green Register, Centre for Sustainable Energy
- **Government's Boiler Upgrade Scheme**
- **Other Resources**

BWCE Home Energy Service

- **One front door**
  - Support hub for whole retrofit journey
- **Expert independent advice**
  - Home energy assessments and retrofit coordination services
- **Local inspiration and connection**
  - Open homes events, talks, workshops, local case studies, peer-to-peer support
- **Not for profit, community based model**
  - With surplus used to support those at risk of fuel poverty



What We Offer – Our Services

Our paid-for services include:

- **Home Energy Assessments**
  - **Futureproof Whole House Energy Survey** – full energy survey & options appraisal report
  - **Lower price point surveys** – coming soon
- **Retrofit Coordination**
  - **Procurement Support** – to oversee quotes and choose an installer
  - **Project Management** – through the whole retrofit process

What We Offer – Support and Inspiration

Wider community learning and empowerment programme:

- Green Open Homes events
- Talks, events and trainings
- ‘Advice surgeries’ for listed buildings
- Case studies, tips and blogs

Bath and West Community Energy

What We'll Offer – Support and Inspiration

And in due course…

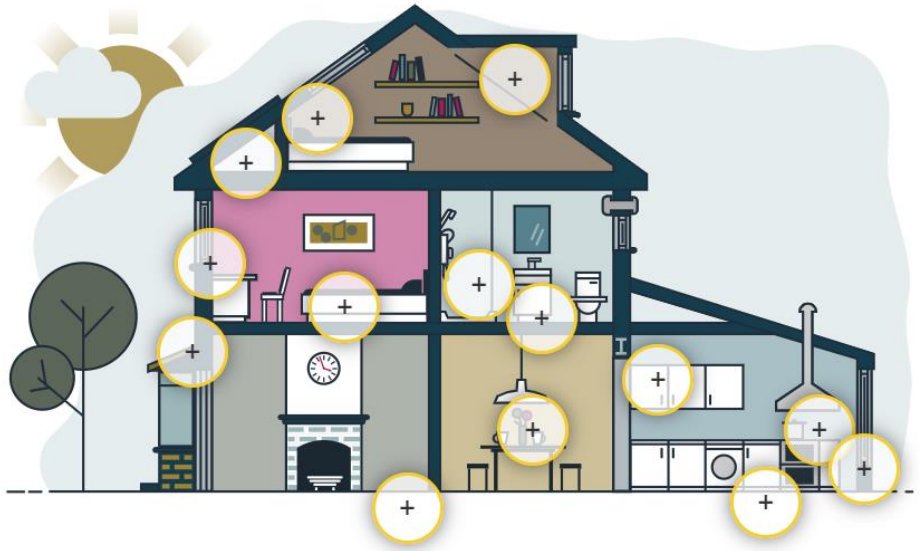
- 'Cosy Home Kits' for draughtproofing
- 'House Warming Parties'

Bath and West Community Energy

Our Futureproof Whole-House Energy Surveys

A Futureproof Survey includes:

- Detailed survey and in-depth options analysis for your home
- Recommendations on the most cost-effective and impactful measures
- Scenarios and packages based on different levels of cost, savings, disruption
- Issues to consider including planning and phasing
- Follow up consultation with Q&A



In partnership with:

FUTURE PROOF

centre for sustainable energy

PEOPLE POWERED RETROFIT

Futureproof Survey – the benefits

- **Get clear on exactly what you need to do**
  - for your unique home and how live in it
- **Understand what the smartest wins are**
  - in terms of energy bills, capital costs, carbon, disruption, comfort and health
- **Save time on research**
  - by cutting through complexity
- **Invest wisely**
  - so you get the results you want

Futureproof Assessment – prices

Include generous time-limited discounts of £250 from Retrofit West

~~£960~~ £710	for a 3-4 bed home
~~£780~~ £530	for a 1-2 bed home

FUTURE PROOF for Bath & North East Somerset

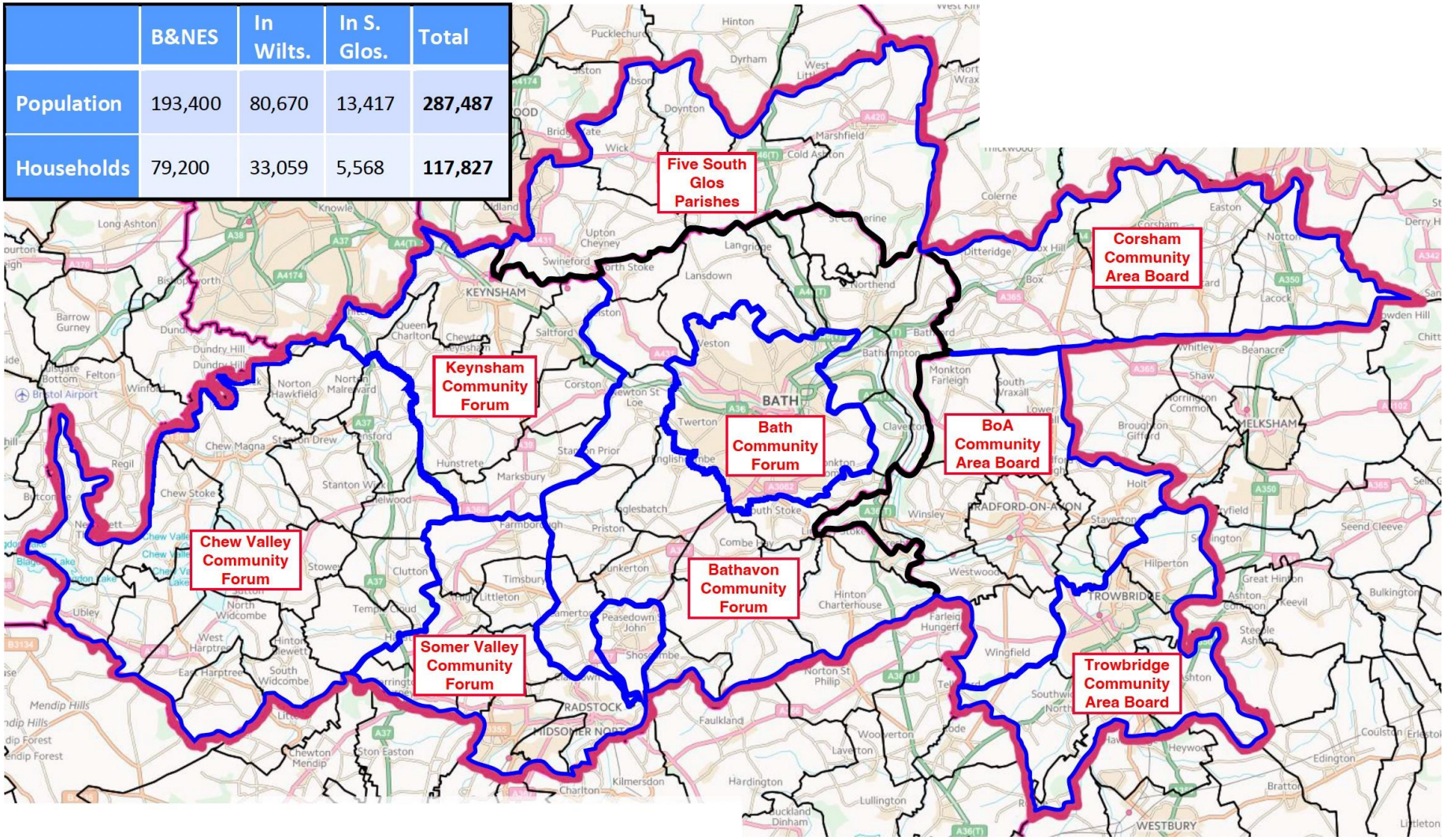
Retrofit West

WEST OF ENGLAND Combined Authority

Area of coverage

Bath & West Community Energy's Local Area

	B&NES	In Wilts.	In S. Glos.	Total
Population	193,400	80,670	13,417	**287,487**
Households	79,200	33,059	5,568	**117,827**



‘Green Heritage Homes’ project

“Increasing the rate of sensitive retrofitting of historic buildings by growing knowledge and confidence among householders and professionals”

GREEN HERITAGE HOMES

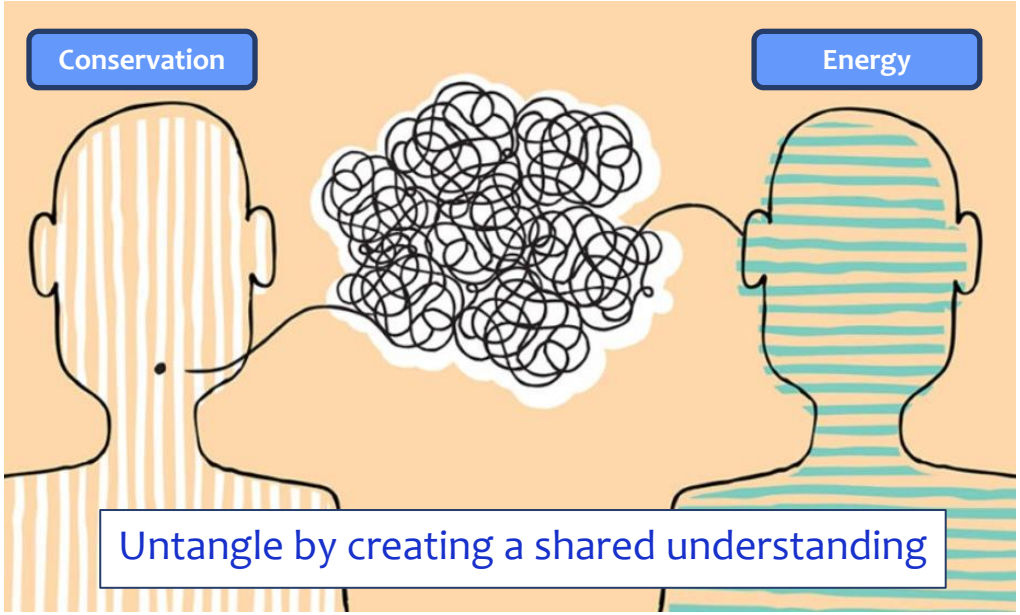
South West NET ZERO HUB

Project to include:

- Enhanced content for energy assessments
- Embodied carbon inclusion in assessments
- Face-to-face advice, events, surgeries
- Specialist trainings and videos
- Engagement with landlords of listed properties
- New pre-application process to be piloted

‘Green Heritage Homes’ project

“Increasing the rate of sensitive retrofitting of historic buildings by growing knowledge and confidence among householders and professionals”



GREEN HERITAGE HOMES

South West NET ZERO HUB

Listed Building Champion Surveys

Deep discounts available:

- Futureproof Surveys on listed buildings
- in return for being a **'listed building champion'**
- this means being in a case study & taking an active role in sharing & promoting
- prices start from **£100+VAT**
- you'll also receive early stage advice on what's likely to be consented

GREEN HERITAGE HOMES

South West NET ZERO HUB

Partners – Green Heritage Homes

Bath & North East Somerset Council

Improving People's Lives

centre for sustainable energy

South West NET ZERO HUB

BATH PRESERVATION TRUST

PEOPLE POWERED RETROFIT

UNIVERSITY OF BATH

Retrofit West – Free Advice Line

Retrofit West

WEST OF ENGLAND Combined Authority

Advice Line: 0800 038 6733

Email: advice@retrofitwest.co.uk

www.retrofitwest.co.uk

B&NES Council – Energy at Home

Bath & North East Somerset Council

Improving People's Lives

energy at home

- **Grants available:**
  - Bright Green Homes – for homes without gas heating
  - Affordable Warmth Grant
  - Park Homes Insulation Grant
- **www.energyathome.org.uk**

B&NES Council – Energy at Home

Bath & North East Somerset Council

Improving People's Lives

energy at home

- **Also other support:**
  - We Care – home improvement for people >60 and disabled
  - Lendology – low cost loans of 4.2% for energy measures
- **www.energyathome.org.uk**

B&NES Council – Energy at Home

centre for sustainable energy

energy at home

- **Fuel poverty advice for those over 65 or disabled:**
  - Call specialist advisor on 0800 082 2234
  - Or email them at home.energy@cse.org.uk
- **www.energyathome.org.uk**

B&NES Council – Solar Together

Solar Together

energy at home

- **Solar Together:**
  - Group-buying for solar PV and battery storage systems
- **www.energyathome.org.uk**
- **www.solartogether.co.uk**

B&NES Council – Planning Portal

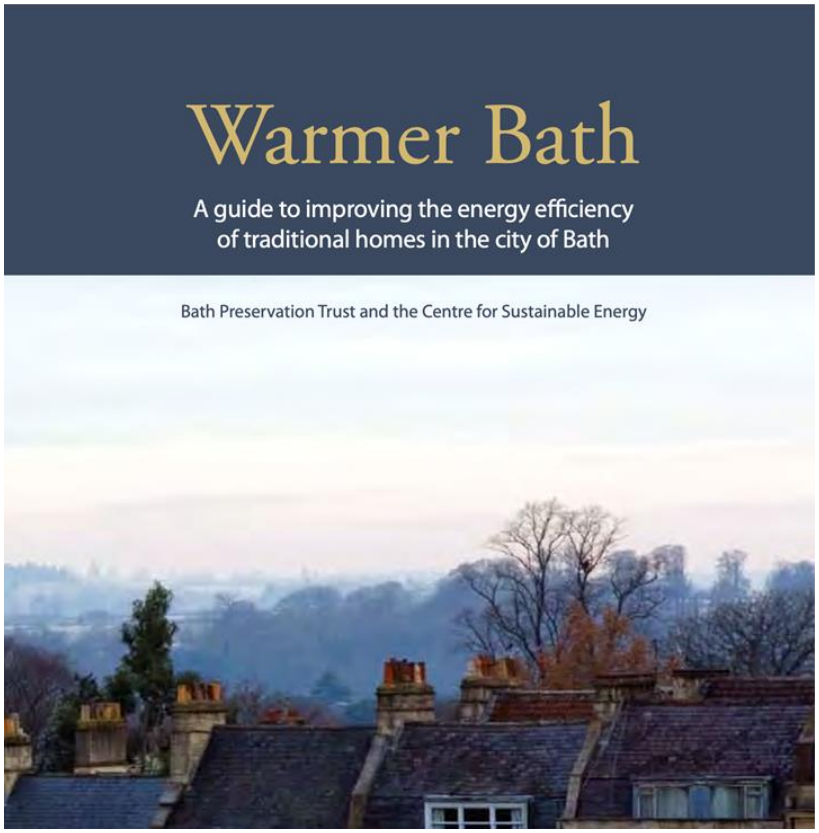
Bath & North East Somerset Council

Improving People's Lives

energy at home

- **Planning Portal:**
  - Support for consent process
  - Retrofitting and Sustainable Construction SPD
- **www.energyathome.org.uk/planning**

Bath Preservation Trust



- Warmer Bath Guide
- Quick Wins Guidance
- Making Changes Guidance
- Retrofit Case Studies
- www.bath-preservation-trust.org.uk

BATH PRESERVATION TRUST

Transition Bath – Heat Pump Advisory Service

- Free webinars
- Personalised advice on heat pumps
- Home visits and surveys
- www.transitionbath.org/heat-pump-advisory-service/

Transition Bath
climate · community · future

Green Register – List of construction professionals

THE Green REGISTER OF CONSTRUCTION PROFESSIONALS

- Online register of construction professionals who've received training in sustainable building practices
- www.greenregister.org.uk

Centre for Sustainable Energy

centre for sustainable energy

- Great resources on energy saving and retrofit measures
- www.cse.org.uk

FUTURE PROOF

- Futureproof Surveys for homes outside B&NES
- www.futureproof.uk.net

Government Boiler Upgrade Scheme

- Grants for heat pumps and biomass boilers
- £7500 for heat pumps
- £5000 for biomass boilers
- www.gov.uk/apply-boiler-upgrade-scheme

Other Resources

- **Historic England – Technical Guides for Retrofitting**
  - https://historicengland.org.uk/advice/technical-advice/retrofit-and-energy-efficiency-in-historic-buildings/
- **Ecological Building Systems**
  - www.ecologicalbuildingsystems.com
- **Back to Earth**
  - www.backtoearth.co.uk
- **Green Building Store**
  - www.greenbuildingstore.co.uk
- **Ecomerchant**
  - www.ecomerchant.co.uk
- **Earthwise**
  - www.earthwiseconstruction.co.uk
- **Ty Mawr Lime**
  - www.lime.org.uk

Next Steps

- **Sign up if you'd like further info**
  - on BWCE's Home Energy Service – including Futureproof Surveys & Listed Building Discounts
  - www.bwce.coop/home-energy
  - follow us @bwce_bath
- **Join us for Green Open Homes!**
  - www.greenopenhomes.org
- **Let us know your thoughts and ideas**
  - cathy.croziercole@bwce.coop
  - 07570 958869

Thanks for listening!