

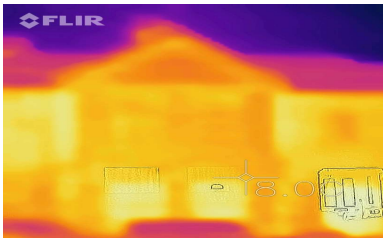


Home Energy Case Study

Retrofitting a mid-terrace family home within the conservation area of central Berkhamsted

About the home

An 1890s terraced house with solid brick walls in the central Berkhamsted conservation area. Renovation work to reduce the family carbon footprint began in 2017.



What motivated the retrofit?

Improving home comfort and reducing the carbon footprint for the family were key drivers from the beginning - warmer in the winter and cooler in the summer. Using a thermal heat camera in winter quickly showed where heat was being lost. Solid brick walls, original wooden sash windows and draughty doors plus suspended wooden floors all added up to a draughty old house. However, keeping the intrinsic character of the home and budget limits also meant retrofit steps had to work with the building rather than demolish it and start again.



What measures were installed?

Retrofit activities have been spread over a number of years, to spread the cost, and included measures on

- energy conservation,
- improving energy efficiency
- adding renewable energy

Lower Cost Steps

- replacing all light bulbs with LED
- draught excluders around doors / loft hatch
- adding more water butts in garden to collect rainwater
- switched to smart tariff for electricity

Medium Cost Steps

- adding smart controls for the central heating
- insulate the attic to 270 mm with raised loft boarding
- suspended wooden floor insulation
- improved ventilation system
- internal wall insulation
- upgraded to type 22 radiators
- secondary glazing
- fitting electric induction hob

Higher Cost Steps

- Sash window renovations
- Solar PV and home batteries
- Rewire of entire house and move to three phase supply

Smart heating controls

To heat each room as needed plus geo fencing and open window detection



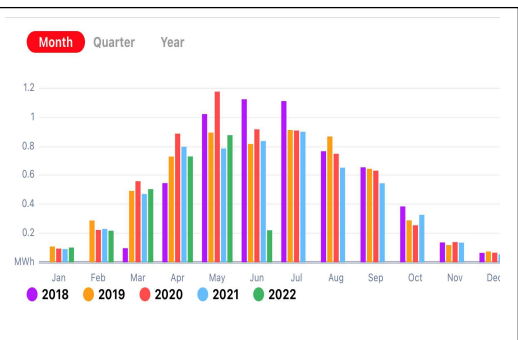
Attic insulation improvements

To keep some storage space, the 'Loft Zone' product was used to raise the loft boards by 300 mm, allowing for full 270 mm layer of insulation [plus air gap]. The loft hatch was also insulated and draught edging fitted.



Solar and home batteries

Installation of a 7.56 kWh solar panel array combined with 40.5 kWh home storage batteries and PV diverter for hot water. System has generated 50 kWh in just over 9 years on less than perfect position.



Window renovations

Renovating and replacing the traditional wooden sash windows with double glazed wooden sash windows to cut down on draughts and heat loss. Additional draught proofing around front and rear doors was also added. Sheep's wool chimney draught blockers helped further reduce heat loss.



Adding secondary glazing using made to measure light weight removeable magnetic acrylic panels has further improved temperature loss in winter months and cooler in summer.

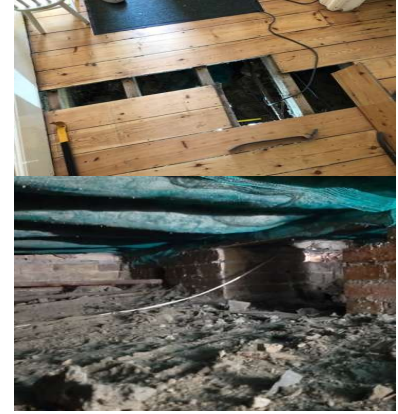
Internal wall insulation

Internal wall insulation on the solid brick north / west facing external bedroom walls only



Underfloor insulation

After improvements to automatic humidity ventilation extractors, the suspended wooden floors were insulated. A reversable solution was chosen specifically mindful of the age of the house and that it is not intended to be air tight. This requires monitoring of humidity levels over winter months.



What impact has the retrofit made?

A key objective, to improve levels of comfort in both hot and cold weather has been achieved in addition to the desire to reduce CO2 emissions. The house uses less energy to warm up and keeps that heat for longer. In summer the house, especially upstairs is cooler.

It is the combination of measures, to reduce the amount of energy needed to be comfortable plus adding the means to generate and store that energy which have significantly reduced the ongoing carbon footprint. A follow up EPC survey saw the rating move from F to B. The financial benefits of using less energy to heat and cool the house have also become apparent. Installing solar and home batteries has been very helpful in load shifting to cheaper tariffs and exporting excess energy in summer months.

Over the winter of 2025 /26 we ran outgoing the boiler flow temp at 45 degrees (to mimic possible target heat pump design) and set all rooms to 20 degrees with offset to 17 degrees from 10 pm until 5.30 am. The result was less gas used but a warmer house even when temperatures down to minus 5 /6) outside. Hot water supported by electric heating via home batteries to a higher temperature daily.

The next step in 2026 will be finally switching from a gas boiler to a heat pump and that will complete the transition to a fully electrified home with much lower carbon emissions, just 9 years after the journey started!

At a glance...

60 %

Estimated savings on energy and home fuel bills after retrofit so far

9500 tonnes

Of CO2 emissions saved to date, just from solar

EPC B

The home went from EPC F to EPC B after retrofit

Get started with your home energy transformation