# CASE STUDY

**Beechwood Avenue – 3 Bed 1930's Semi**





This case study can be found online here

- Low-cost improvements
- 'Big' insulation works
- Glazing
- Lighting systems & electricals appliances
- Renewables: heat
- Renewables: electricity
- Water management
- Sustainable building materials
- Lifestyle change

Mike has lived in this 1930's 3-bedroom semi-detached house for 12 years. Previous occupiers had built a kitchen extension, but a poorly insulated roof, unfilled cavity walls and an uninsulated concrete floor meant this was the coldest part of the house. The main house cavity walls had not been insulated, and an attic conversion (done in the 1990's) had an unknown level of insulation. The house had double glazed windows throughout, but there were draughts between the wooden floorboards in the living room from the void below the suspended floor. The house was heated by a Gas fire in the living room a 16 year old gas boiler.

The renovations and improvements were mostly motivated by a desire to improve efficiency and so reduce emissions because of Climate Change. Mike was a Green Party Member and eventually a Mendip & then Somerset Councillor, and felt it was important that he didn't just 'talk the talk' but also 'walked the walk'. Reducing bills and saving money was also an important consideration.

Mike already had some basic knowledge about how to reduce heat loss and improve energy efficiency from his volunteering as a Home Energy Advisor for the Centre for Sustainable Energy (CSE). His colleagues at CSE gave some advice, and he did his own research on the best options.

**Energy Efficiency Measures**

**Cavity Walls:** Cavity wall insulation was one of the first improvements made, and was done under a Government grant. I paid a little bit extra for 'Graphite Beads'. A couple of years later I discovered that I had problems with mould under the stairs and complained. A warranty investigation found that the bottom 500mm of the cavity was full of rubble - this should have been spotted in the original survey and so the insulation and rubble were removed and damaged floor joists, floorboards and plasterwork (up to 1 metre on outside wall) were repaired at no cost. I did have to pay to re-fill the cavity with insulation. The surrounds of the 1930's bay windows were also insulated as part of the cavity walls, instead the outside tiles had to be removed insulation added manually and the tiles replaced. (This cost about £800 and the original tiles were reused).

**Floors:** Suspended timber floor was insulated fairly easily as a DIY job because lots of the floorboards had previously been lifted to treat woodworm. Silver reflective bubble plastic (bought online) stapled between joists supports about 100mm of Rockwool insulation. Celotex type insulation would have been more efficient, but a lot more of the boards would need to be removed to allow that to be fitted.

**Kitchen Extension:** Fully refurbished, including cavity wall insulation and increased insulation in the new roof, as well as new insulation on top of the concrete floor. Additional insulation was also added to the walls – mostly on the exterior of the brick walls (Celotex type with British Cedar timber cladding) but one wall couldn't be accessed from the outside and so was insulated internally.

**Draught proofing & Airtightness:** Existing windows & doors were not too draughty and insulating under the living room floor helped stop drafts in that area.

**Ventilation:** Trickle vents in the glazing are always left open as this helps prevent mould growth.

**Secondary Heating:** The first thing I did was to remove the gas heater in the living room and replace it with an over 80% efficient wood burner. The chimney was in good condition, so I fitted the stove myself (saving about £1,000). I salvage untreated wood so have not bought any for over 10 years, I have a fire most evenings in the winter.

**Air source heat pump:** 8kW Vaillant aroTherm heat pump replaced the 16 year old gas boiler. Most radiators had to be changed for larger double thickness ones, and a new 150L hot water

tank was added (taking over the larder). Installed in 2022 for about £7,500 (after the £5,000 Boiler Upgrade Scheme grant).

**Solar panels:** Originally fitted 4kW when Feed In Tariff was 12.47p/kW and have recently added another 2.4kW (& an 8.2kW GivEnergybattery). I now sell electric back to the grid through an Octopus Export Tarrif. A solar diverter maximises solar self consumption by using excess generated electricity to heat the hot water tank. I did build a cabin in my garden which was made in kit form in Estonia to my design, mainly to take the 4kW PV array. The 25 degree slope roof faces South and I obtained planning permission as the ridge is 4 metres high. Original 4kW system was installed in 2015, cost £7,000. Additional panels and battery installation cost £7,500 in 2024.

**Battery:** When I increased my Solar array I added an 8.2kW battery storage. This allows me to save energy from the solar panels to use in the house in the evenings and I can also top up the battery on a cheaper off-peak tariff.

**E bike:** I converted my hybrid bike with a Swytch kit which cost about £450.

**Water conservation:** I have 9 water butts, most of them 200L barrels discarded by dairy farmers and only £5 - £10 each. I have just installed two galvanised water troughs which total 700L as we ran out of water this summer.

**Natural or Low embodied carbon materials:** I make raised veg beds & wood stores etc. from salvaged wood and paths from rescued bricks, paving & tiles.

**Lifestyle/behaviour changes:** Our thermostat (in living room) is set to 19 degrees but we have a wood burner in the same room so when that is used the ASHP will turn off. We don't mind the bedrooms being cooler as a result. We try to use the washing machine when the Sun shines or the tariff is cheaper. We have an induction cooker hob, energy efficient fridge and cooker and have also invested in an Air Fryer which saves us putting the oven on for some meals. None of the house roof rainwater now flows into the drains so I have applied to Wessex Water for a small bill reduction.

**Shading:** We installed blinds on all our South facing windows to reduce overheating in hotter summers, but they also provide some extra insulation in winter.

**Learning:** We should have spent a bit more time trying to see if it was possible to fit underfloor heating when my kitchen was refurbished... I didn't know that I was getting an ASHP at that point, but it would have been a good idea.

**Energy Consumption:**

Estimated energy usage in 2022 was Gas: 2944 kWh, Electricity: 1218 kWh (with an old gas boiler, 4kW of Solar PV and a 5kW wood burner).

Estimated usage in 2024 was 2,200 kWh of electricity only (with an ASHP and gas disconnected, 4kW of Solar PV and a 5kW wood burner).

Usage in 2026 has been around 11kWh/day in Jan/Feb and 2kWh/day in July/August (with 6.4kW Solar PV & 8.2kWh battery, ASHP & 5kW wood burner). Switched to Octopus to get a solar export tariff. Monthly direct debit payments have gone down to £40, and about they also earn about £650/year in export payments pluse £650/year in FiT payments from the original Solar PV.

**EPC:** In 2015 it was a D (68) and would probably be a C now, but I haven't needed to have a new one.

**Architects/Designers, Builders and Installers:**

2015 4kW Solar PV - 1 World Solar Ltd (Bristol). Not sure they are still going but happy with their work.
2022 ASHP and associated work. Amber Heating Ltd. They did a very good job and still service my ASHP every year. There were problems with my existing heating plumbing, the 16 year old boiler did not seem to mind but Amber Heating had to replace some of the 15mm pipework with 22mm as it probably wasn't done according to the 'book' previously. Do remember to get it serviced in the 1st year, if you don't the warranty may be invalid! You may lose space to a hot tank, we lost most of our old larder cupboard.
2022 Insulation fitted behind tiles on 1930's bay windows. Tony Scovell tonyscovell1@gmail.com Cost about £800. Tony was able to remove & re-fit the original tiles without breaking any, impressive!
2024 2.4kW Solar PV with Inverter and 8.2kW Battery Storage. Dorset Energy Solutions. Did a good job but made some mistakes with fitting the PV optimisers and had to come back and change them. Also made a mistake somewhere in the electrics which they compensated me for and sent someone to fix it. No charge for both of course. Unfortunately, the battery company they used, GivEnergy, have gone into administration. Mine still works and I can still change some settings on the online portal, like select a nighttime period to charge the battery at a cheaper tariff.