

**Retrofit** – work on an existing building to make it more energy efficient.

**Example 4 Three-bedroom detached house**



## **Background / Planning / Concept**

We are all familiar with the effects of Global Warming and every day the news bring us reports of its impact on the environment. It was not until the summer of 2022 when we had that extraordinarily hot summer, that we decided to offset some of our contributions to the global Co2 warming effect and create our own 'Eco Green House.' The UK generates approximately 43% of our electricity needs by burning fossil fuel. There is an old saying that you need money to make money, and our bank account would have been decidedly healthier, if we had not gone down the route of implementing the improvements to our house, but that was missing the point. To opt-out of our responsibilities to the environment and carry on paying the higher cost of energy bills was not something we were prepared to do, even though we could have afforded it. Those who cannot afford to, have no choice but to accept the increased costs and try to save money by being more frugal in their use of electricity and gas. Now there is nothing wrong with that, but if everyone could at least do one of the improvements mentioned in my report. Then we can all reduce our impact on the environment and maybe save a little money at the same time.

If the government had done more to encourage more widespread microgeneration in the home, given all the years they have been in power. Then the impact on the national grid and the reduction of imported fossil fuels would have been much reduced and in turn could have provided more grid capacity for public electric car charging. To be fair the government does have a green policy in subsidising the installation of solar panels and heat pumps and are gradually phasing out gas boilers by 2030, but as usual it is too little and too late.

## **Micro Generation**

I started to think about this in April 2022 when we had obtained the deeds for our new home. It is a detached three-bedroom house built in the mid 1980's when energy was cheap and electricity was produced by coal fired power stations. It faces east-west so does not benefit from natural solar heating, it had no loft insulation or double glazing and was centrally heated by an inefficient gas boiler.

Over the years successive owners have added the own improvements more out of comfort than economy and when we bought the house in 2022, it had double glazing, some loft insulation, cavity wall insulation and a hopefully a more efficient gas combi boiler. But the living room had secondary heating in the form of a solid fuel burner with a gigantic chimney, which protruded out of the side of the house, this was the first thing to go.

I decided to carry out the improvement in stages on a scale of increasing cost;

- Additional loft and cavity wall insulation to 30cm and a loft ladder with partial floor boarding to loft area.
- Installation of new outside doors with more efficient insulation
- Installation of an intelligent hot water immersion tank fed by a power diverter
- Installation of an induction hob and electric cooker

- Installation of a 'Zappi' car charger (to enable us to obtain split charge tariffs from our utility provider)
- Installation of a 13.5kw battery for energy storage (no vat payable on this at present)
- Installation of 7.5kw of solar panels and a 6kw inverter (no vat payable on this either)
- We plan to remove the old gas boiler and replace it with an air sourced heat pump. The 5k funding toward costs will be awarded by the governments green policy on phasing out gas boilers)

I also plan to replace the house appliances with more efficient ones. I have already replaced the spin drier with one fitted with an integral heat exchanger, this made a definite reduction in power demand. All the lighting is now provided by low power LED lights. The house internal mains supply was isolated from the national grid by a special control box in the event of a national grid failure. This is required by law to prevent grid maintenance staff from being electrocuted by house generated mains power.

(Split tariff is a means whereby you can have two charge rates per kilowatt hour for your electricity, one peak rate and one cheaper off-peak rate. You need to own an electric car and provide proof of ownership and you also need to have a 'smart meter' installed in your home).

A recent Energy Performance Inspection resulted in an 'A' class energy rating being awarded, up from a previous 'D' classification. The average home produces around 6 tons of CO2 annually. Whereas ours has now been reduced to an estimated 0.6 tons. A 10x reduction in energy demand and consequent reduced impact on the environment.

To carry out the tasks of home improvement, I acquired the services of the following companies;

**Steve Duckworth Electrical** - Solar Panel and battery storage [steve@steve-duckworth-electrical.co.uk](mailto:steve@steve-duckworth-electrical.co.uk)

**Mixergy Energy** - supplier of Intelligent water tank and controller [mixergi.com](http://mixergi.com)

**Myenergi** - Eddie power divertor and Zappi car charger [myenergi.com](http://myenergi.com)

**Hipro Heating** - Mike Broadbent Fowler - installer of Mixergy tank and Eddie power divertor. [email@hiproheating.co.uk](mailto:email@hiproheating.co.uk)

**Solar Panels** - Installed over a period of two days after hiring and erecting the scaffolding. The battery and grid isolator were installed on a separate day. This required access to the loft and I may add that solar panels seem to attract birds so make sure there is netting to deter them.

**Mixergy Water Tank** - This was installed in a day by Mike Broadbent Fowler who is a self-employed contactor working for Hipro heating of Wakefield. The electrical work was connected to the home grid along with an Eddie energy divertor provided by Myenergi. These devices communicated by wireless to a central hub connected to our own wifi hub by a usb cable. This along with a number of electrical sensors on each of the cables connected to our energy devices, monitor the surplus solar energy available during the day and divert the power to a water tank immersion heater, and an oil heater in the Airing cupboard. It also prevented the over discharge of the home battery when it was not charged by the solar inverter.

**The home battery** - installed by Steve Duckworth electrical has a capacity of 13.5kw and provides 5kw constant supply and 7kw peak demand. For the six months since it was installed in the spring of 2023, we have not needed to draw any electricity from the national grid.

**Usage Statistics** - At the time of writing I have not had the usage results over the winter period, nor have I been able to generate the annual use in the home as we only moved into the property in June 2023.

**Cost (including installation work and vat where applicable)**

8.5kw Solar Panels and 6kw solar inverter - £10,346

House Battery and grid isolation switch - £9,400

Mixergy Slim Line Smart Water Tank (150ltr) + PV switch + delivery- £1,813.42 including Vat

Installation of above £1509.60

Loft Insulation - £360

Upgrade to low power lighting - £60

Installation of Heat Pump (TBA) -

Total £23,165.02

This initial cost is to be spread out over 25 years which is the average usage of this setup.

This works out at approximately £926.60 per year.