

# CFBOA Case Study 6



## 1 The House

### 1.1 Construction

- The house is two-story, detached and was built in 1968.
- We bought and moved into the property in 1997 and are the 3<sup>rd</sup> owners.
- The walls are of cavity-wall construction with reconstituted stone block outer skin, a 50mm cavity and foamed concrete block inner skin.
- The cavity was originally un-insulated but foam insulation was installed at some stage.
- The roof is a split pitch design, finished in concrete tiles. Both pitches are at 15°. The smaller pitch and vertical 1.5m wall between the 2 ridges face SE and the larger pitch faces NW.
- There was 13mm of rockwool type insulation bonded to the inner face of the roofing felt.

### 1.2 Heating

- The house has warm-air central heating, with warm air ducted to each room from a central, fan-blown heat exchanger.
- The heat source was originally 3 phase electricity but the heating was converted to mains gas early in the life of the house.
- The gas Warm-Air-Unit (WAU) was replaced in 2018 by a high efficiency, mains gas powered condensing boiler, with a water to air heat exchanger to heat the circulating warm air.
- Hot water is provided by the WAU, with a back-up single element electric immersion heater.

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## 2 Energy Efficiency Projects

### 2.1 1999 – Double Glazing

- By 1999 the original single glazed, timber framed windows and doors needed attention.
- We replaced all except the front door with double glazed, aluminium-framed units, using (for the time) energy efficient glass.

### 2.2 2018 – Draught Proofed Front Door

- The original single-glazed timber front door has two leaves and was quite draughty.
- We installed routed-in, permanent draught seal and double-glazed glass panels.

### 2.3 2020 – Insulation, PV and MVHR

#### 2.3.1 Background

- For most of the roof there is no loft space, with the 1<sup>st</sup> floor ceiling being fixed directly to the underside of the rafters. This precludes a simple loft insulation upgrade, requiring removal of the ceiling or removal of the roof surface to install any insulation.
- By the end of 2019 we felt that the age of the roof (particularly the roofing felt) justified embarking on roof renovation, including installation of a modern level of insulation.
- We initially sought guidance from Futureproof ([www.futureproof.uk.net](http://www.futureproof.uk.net)). This is an initiative managed by Centre for Sustainable Energy (CSE) a Bristol based charity.
- Futureproof arranged for us to have an Energy Efficiency Report produced for our house by Mike Andrews of Energy Saving Experts ([www.energy-saving-experts.com](http://www.energy-saving-experts.com)). This report provided an assessment of the house in its current state and a prioritised set of recommendations for actions that would improve the energy efficiency of the house.
- This Energy Efficiency Report guided our upgrade project
- Since 2019 Futureproof have expanded the services they provide to include much more comprehensive support for new-build and retrofit projects such as ours.

#### 2.3.2 The Upgrade Project

- Given the relatively complex nature of the roof replacement we engaged Nick Matthews as Surveyor (<http://www.nickmatthewssurveying.co.uk/>) to produce the design and manage the execution of the work.
- We selected Oliver Norton ([olivernorton@gmail.com](mailto:olivernorton@gmail.com)) as main contractor for the project.
- All the work primarily related to improving the insulation, including removal and replacement of the roof was 5% rated for VAT.

##### 2.3.2.1 Insulation

- In replacing the roof surface we installed 210mm of rigid foam insulation; 150mm between the rafters and 60mm on top of the rafters.
- In the internal garage we installed insulation on the ceiling and walls for all surfaces that interfaced to the rest of the house.
- Attention was paid to achieve airtightness in the roof insulation replacement work

##### 2.3.2.2 Solar Electricity Generation

- We selected Sungift ([www.sungiftenergy.co.uk](http://www.sungiftenergy.co.uk)) to install our solar generation systems

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- 11 PV panels were installed in the SE facing pitch and 6 panels on the NW pitch, totalling 6.04 kW generating capacity.
- A 5kW Inverter was installed. To permit connection to the Grid required approval from the DNO, Scottish and Southern Electricity Networks.
- A Tesla Powerwall 2 battery and gateway were installed, storing 13.5kWh of usable energy.

## **2.3.2.3 Mechanical Ventilation with Heat Recovery**

- Improving the airtightness of the roof could have resulted in poor internal air quality.
- To address this in an energy efficient way we self-installed a Zehnder Q350 MVHR unit and associated ducting to control ventilation to the 1<sup>st</sup> floor rooms, the ground floor being inaccessible to ducting without intrusive work.

## **2.3.3 The Results**

- Following completion of the work we engaged Mike Andrews to produce a new EPC for the property. This new EPC certificate showed we had achieved a rating of B (86), compared to the original D (59) rating before the work, all of which seems to validate the effort (and to some extent the cost) and is very pleasing.
- We have definitely felt increased heat retention of the house from the improved insulation.
- The PV has generated just over 5.1MW of electricity in the last 12 months. This exceeds the domestic consumption and contributes towards the charging of our electric vehicle.

Please contact [cfboaenergy@gmail.com](mailto:cfboaenergy@gmail.com) if you would like to more information about this case study.