# 1970s Home Updated for Modern Living

**Property Overview**
Year built: 1975
Location: Linton, Cambridgeshire
Property type: Detached
Timeline: Aug 2023 - May 2024

## Meet your hosts: Tim & Janice

We bought our present house about 3½ years ago. It was chosen for its location and garden size but we knew it needed a lot of work. We had done a major extension and remodelling on our previous house, so we had a good idea of what could be done and the costs. Most of the work was to make the house nicer to live in and more suited to our needs, but as the heating system needed replacing, we decided to go for a heat pump for 'eco' reasons.

## The Renovations

We made changes to the building structure to enable insulation to be added. The ground floor already had 70mm of foam cavity wall insulation which was put in when the house was built in the 1970s. On the first floor, we kept the celcon blocks and added 75mm thick PIR (e.g. Celotex) external insulation.

We chose solar PV for its eco benefits, but we are also benefitting financially. The battery was added as it seemed the 'right thing to do' though were not sure its cost would be justified. The solar PV has a very useful app for users to work out how to manage energy better.

Both my heat modelling and the survey undertaken suggested we might manage with a 5kW heat pump but the installer and I agreed to go for the next size up in case we had got the modelling wrong. Subsequent experience suggests that 5kW would have been OK, which is surprising given the size of the house. We needed to replace the whole heating system and realised it was worth taking a lot of care to design a system with a heat pump. Radiators are sized according to the MCS survey, and some are surprisingly small (defying the idea that 'heat pumps always need bigger radiators'). Most radiator valves are left at maximum and the flow adjuster is used to balance the temperature drop across the radiators. Temperature regulation is done entirely by temperature compensation i.e. automatically varying feed temperature to compensate for external temperature. It is uncannily effective. We did consider a mechanical ventilation and heat recovery system but decided it wasn't worth it. The windows have trickle vents and we sometimes resort to 'quick air changes' in winter. We have no problems with condensation.

External wall insulation & solar PV

## At a Glance

### Challenges

- The house needed a lot of work
- Co-ordinating the builders with other contractors so all the works lined up well

### Benefits

- Achieved 'A' on EPC
- 20% heat loss reduction
- Better than expected running cost savings
- Net electricity cost reduced to £200 p.a.
- Lighter, warmer, practical home

Works in progress

## Finances

The whole project was very expensive mainly because of the number of issues with the property that we wanted to address. The 'eco' related items include:

- solar PV & battery £13.5k
- Heat Pump, new plumbing & radiators £14.5k
- triple glazing £30k.

Cost was important to us but most of the 'eco' items were chosen because of our conviction. We did calculate the payback period for the solar PV: its performance has exceeded estimates. The project was self-financed except for the £7.5k BUS heat pump grant. I am an engineer and ended up doing the project management and sourcing of the 'eco' aspects. We hired someone who is basically an architect's 'assistant' who came up with lots of good ideas, did all the plans we needed and was a lot cheaper than a 'fully qualified' architect.

## Energy Consumption

The original EPC rating was 'D', though this was wrong as it assumed the walls were not insulated. We had to get a new EPC for the heat pump grant and the house is now rated 'A' . I did a lot of heat loss calculations using a spreadsheet I had developed which allowed me to specify wall structure, window areas etc. The results of this were within about 20% of the 'official' MCS survey results.

| Energy Consumption | Energy kWh/m²/pa | | | Carbon kg CO²e/pa | |
|---|---|---|---|---|---|
| | Gas | Electricity | Total | /m² | /person |
| Before Renovation | 84.2 | 17.1 | 101 | 18.4 | 1750 |
| After Renovation | None | 34.7 | 35 | 6.1 | 584 |

## Performance

Insulation and the triple glazing have reduced heat loss by ~ 20% and has helped to keep the house cool during recent heat waves. Using Time Of Day and Export electricity tariffs has reduced the net annual electricity cost to about £200. The performance of both the heat pump and solar PV have exceeded our expectations.

## Conclusions

We have a much nicer and more comfortable house and have reduced energy utility costs by about 90%. The house is lighter, warmer and more practical. While it needs some thought to manage the systems for cost effectivenes, all we have to do really is change the battery charge and discharge schedules with the seasons.

## Future Plans

We might try to add more solar PV panels when we get an EV. We intend to increase rainwater harvesting capacity to 3000 litres, which we are doing ourselves.


Vaillant Air Source Heat Pump

## Key Features

- 100mm external wall insulation to 1st floor
- New triple-glazed larger windows
- 6.4 kW solar PV array on SW facing roof
- SolaX 2 x 5kWh battery & hybrid inverter
- 7kW Vaillant aroTHERM plus Air Source Heat Pump with standard controls
- Low energy lighting
- Rainwater harvesting (in progress)

## TOP TIPS

- Improve insulation if possible & don't overheat the house
- Solar PV – go as big as you can! It is most effective if you use a lot of it yourself
- Learn how to manage systems for greatest efficiency

## Professional Contacts

Tofts building, plumbing & heating, Furneux Pelham
Architectural Designer: Neil Warder
Velfac Windows