

1960s DIY-led Retrofit: Our All-Electric Home



Property Overview

Property age: 1963
Project timescale: 2000 - present (ongoing)
Type: Detached
Wall type: Cavity wall
Floor area: 120m²
Cost of renovations: £35k (mostly DIY)
Occupants: 3-4 adults, 1 child

Meet your hosts, Rob & Anne:

I'm a Research Engineer and my wife is a Scientist. We bought our house in 2000. Small eco upgrades started shortly after, but have ramped up in scope in later years. Our house is primarily a safe haven for our family, and DIY renovations generally don't interfere with that, but are a fun addition!

I was spurred into making eco renovations by Jonathon Porritt's book, "**Where on Earth are we going?**" that I was given 30 years ago. I have since thought that stopping the use of fossil fuels is so difficult for our addicted society which demands instant results from any fuel saving innovations; projects are judged on their "cost effectiveness", ignoring the CO2 implications, even though we could and can afford them as a society. As a family, we try our best to make good eco choices and I think that "eco anxiety" is relieved by practical things that reduce our impact on global warming.

Design, Financing & Construction

When we started on the renovations, our aim was to both reduce energy use and reduce our CO2 footprint. The MVHR that was later installed was primarily to improve indoor air quality, as was changing from gas to electric cooking and heating. The majority of the work done is DIY, which not only makes it less expensive overall, but also makes us feel more in tune with the end result, and generally avoids the "payback" issue, which would be like asking what the payback is for any other hobby! We set about implementing the renovations slowly, as our knowledge and understanding of eco strategies (EWI, MVHR) improved and more technologies (GSHP, EVs) have become mainstream.

Our cavity walls were professionally insulated 18 years ago. Since then, we've DIY insulated the loft, (Celotex overhead; glasswool, XPS, Celotex & boarding underfoot), the perimeter wall (EWI, but below ground), and added 150mm of [platinum EPS](#) (EWI) to all our walls which were then professionally finished in render.

Keeping the existing window frames, we DIY upgraded the glass in our upvc windows to U=1.1W/m²/°C (Planitherm) with warm edge double glazing.

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Preparing the groundworks



Self built porch with solar PV roof tiles

Our top tips:

- Start logging your energy meters – think kWh, not £, as prices are so volatile
- Find somebody knowledgeable who can offer ideas & help
- If you improve something, do it to a good enough standard so that it is not repeated soon afterwards.



Our ground source heat pump (GSHP) was also installed DIY. The heat pump was made using a second-hand fridge compressor, and a small amount of R290 Propane. The heat pump is located outside for extra safety, but in an insulated box so that it has a stable temperature, making the design simpler and more efficient. The rest of the indoor wet system is unchanged. Due to the extra insulation around the house, the radiators from 1963 are big enough to dissipate the small amount of heat we require. The downstairs radiators are in one circuit (there is no zoning) which forces them all to stay on as a good thermal sink, keeping flow temperatures low when the heat pump is on, keeping the coefficient of performance high, and also avoiding the need for a buffer tank. The simple GSHP on/off function allows the original Honeywell controls to be used. Our radiators tend to run at 32°C when on, which feels barely lukewarm, but is warm enough to heat the house to 21°C when it is continuously below 0°C outside, and heat the domestic hot water (DHW) overnight.

Our heat pump is a tiny 2.4kW so it struggles to heat DHW when there are parasitic pipe or radiator losses to contend with, which our old 16kW gas boiler did effortlessly. The installation was quite an involved project: we hired a trencher to do the bulk of the groundwork as it could dig a 900mm deep, 100mm wide trench 20m long in an hour – I had to hold the “dead man's handle” on it, and adjust things every 10 minutes, all while holding a cup of tea! The trencher could not turn corners though, so the corners were constructed from sequential 90 degree cuts, with lots of manual dirt removal. Thankfully, my whole family pitched in to help. In general, an air source heat pump (ASHP) would be a simpler installation as it does not involve groundworks, but would require planning permission for DIY installation due to noise concerns.

We also DIY fitted solar thermal panels on the garage - these are at a very low angle, so they are mostly useful in the summer and provide just over half of our DHW use: far too much in a summer heatwave, but nothing useful from November to March. I would now recommend a larger PV array with a solar diverter instead of solar thermal. The solar thermal has required periodic topping up, and one year early on, it overheated; in contrast, no maintenance has been required for the PV at all.

We had solar PV installed on the house almost 10 years ago, and this “just works”. We have an Eco-eye energy monitor on it, which I recommend – the data is logged to an SD card which I found to be initially useful and interesting, and eventually produces predictable results, so it is now ignored.

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Key Specifications

Energy Consumption	Energy kWh/m ² /pa			Carbon kgCO ₂ e/pa	
	Gas	Electricity	Total	/m ²	/person
Before Renovation	175	33.3	208.3	37.9	911
After Renovation	None	37.5	37.5*	7.3	174

**Electricity use: 1,500 kWh/pa of the total 4,500 kWh/pa supplies the GSHP for heating & DHW*

Insulation & Glazing

- DIY Insulated loft
- DIY EWI to perimeter wall, below ground
- DIY EWI to cavity walls (150mm Platinum EPS), professionally rendered
- DIY Upgraded glazing (U value = 1.1) to existing window frames

Heating & Energy

- DIY 2.4kW GSHP
- Continued use of 1963 radiators
- DIY Solar thermal on garage roof
- DIY MVHR
- DIY Solar PV roof tiles on self built porch
- 4kW Solar PV array produces 3,500kWh/pa
- Rarely used woodburning stove
- Nissan Leaf EV with V2G charging (Ovo trial)

Water, Garden & Natural Systems

- Rainwater harvesting tank in back garden
- Grey water toilet (supplied by showers)
- Mains water use 110m³/pa reduced to 60m³/pa

Key Contacts, Products & Advice:

EWI materials & 1 day training: [EWI Store](#) (£5k)

EWI Scaffolding: [Summit Scaffolding](#) (2 stages: £900 each)

Rendering on EWI: [Defined Plastering](#)

Groundworks Contractor: Gary Smith, [EKS construction](#)

GSHP trencher: [Newmarket Plant Hire](#) (£700)

MVHR: [Ventaxia Sentinel Kinetic Plus B](#) (£1.5k) + pipes (£1k)

Our new self built porch uses 2 PV panels as roof tiles. These were DIY fitted with bespoke metalwork for rainwater diversion. At present, the panels are just used for charging small, lower powered devices such as batteries and lights.

Performance

We are very happy with the improvements to our home. The MVHR saves energy, while providing plenty of fresh air, our heavily insulated house is now much quieter and very comfortable at a constant 21°C year round, and our energy bills are negative.

