

1940s semi-detached Cotswolds

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Case study 13

£204

Saving
on fuel bills

23%

Reduction
in carbon
emissions

Measures installed	Total cost	Annual CO ₂ saving (tonnes)	Annual fuel bill saving
Sloping ceiling insulation	£4,195	0.14	£25
Replacement boiler and controls	£3,026	0.30	£52
Solar hot water	£3,627	0.22	£34
Solar PV (2.2 kWp)	£9,429	0.52	£93
Total package	£20,277	1.18	£204
Plus income from PV Feed-In Tariff (FIT)			£794

The home

This semi-detached house was built in 1948 on the edge of Moreton-in-Marsh, in the Cotswolds Area of Outstanding Natural Beauty.

The current owners have lived there since 1996, during which time they have made improvements such as insulating the cavity walls, updating the gas central heating to include radiators to the first floor, and installing a wood burning stove to replace a gas fire. The gas boiler was replaced with a 'combi' in 1997, avoiding the need to replace the old hot water tank, which was full of limescale.

What they did

The owners wanted to improve insulation, where possible, and to incorporate the use of renewable energy, potentially making use of the south facing rear roof for solar panels. This would fulfil a long standing interest in

solar power and provide the opportunity to promote renewable energy and, in the householders' own words "show others the benefits both to themselves and the planet".

After receiving their Target 2050 report, they went ahead and installed both solar thermal hot water and photovoltaic panels, as well as implementing the two other key measures the report highlighted: improving the loft insulation and replacing the old gas boiler. This also provided the opportunity to upgrade the heating controls.

"The improvements have enabled us to benefit greatly from the lower energy costs, as well as knowing that we are making a small contribution towards combating global warming."

£794

Income
from Feed-In
Tariff (FIT)



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SevernWye
energy agency



COTSWOLD
DISTRICT COUNCIL

Loft insulation

The loft is used for storage but the family may convert it to living space in the future. To keep that option open, they opted for a polyurethane spray foam insulation applied between and over the rafters to a depth of 100mm, rated as being as effective as a 270mm layer of mineral fibre insulation, the standard method of insulating a loft. Spray foam insulation is installed by a specialist contractor, and this had to be co-ordinated with other work on the roof and loft.

The same method was used to insulate the side walls and roof of the dormer window in the bathroom. To facilitate this, the householder removed the internal plasterboard lining, which was cheaper than providing scaffolding and removing the exterior cladding. This has proved extremely effective – on occasion the loft access hatch has been left open with no noticeable heat loss, which bodes well for the future conversion. The total cost of the insulation was just over £4,000.

Replacing the boiler

The combi boiler was 14 years old and becoming unreliable. Replacing it provided the household with further opportunities to save energy: upgrading heating controls and installing solar water heating. The new controls included thermostatic radiator valves, a room thermostat, and a weather compensator, which takes into account the outside temperature and reduces the heat output from the boiler accordingly.

Solar hot water

To make the most of solar water heating it is necessary to store hot water for later use, so a twin-coil hot water cylinder was installed. This is heated primarily by the solar panels and only topped up with heat from the boiler at pre-set times, and if not already up to temperature.

The panels are a 2m² evacuated tube system mounted on the west facing roof at the side of the property, with the tubes rotated slightly towards south. The larger south facing roof



Photovoltaic panels on south facing rear roof

was kept for the PV array. The cost of installing the new boiler, cylinder, solar tubes and all associated works was around £6,300.

Solar electricity

The 2.2kWp photovoltaic panels installed were sized to maximise use of the roof area and budget available. This cost just over £9,000, and is anticipated to be recouped in approximately 10 years.

To prepare for installation, moss had to be removed and several cracked tiles replaced. The old electrical consumer unit also had to be replaced.

Next steps

Future plans for the house may include the addition of a south facing conservatory to heighten solar gains, and possibly installing insulation for their concrete slab floor. Improvements to exterior lighting include trying out solar powered LEDs.

Energy consumption	Total (kWh)	Per m ² floor area
Before improvement (2007)	23,046	259
After improvement (2010)	18,595	209
With all possible measures	11,902	134
UK average (2011)	19,800 ¹	217 ⁴

CO ₂ emissions	Total (tonnes)	Kg per m ² floor area
Before improvement (2007)	5.14	58
After improvement (2010)	3.96	44
With all possible measures	2.76	31
UK average (2011)	6.00 ²	66 ⁴

Running costs	Total	Per m ² floor area
Before improvement (2007)	£1,268	£14.23
After improvement (2010) - excl FIT income	£1,064	£11.94
With all possible measures	£830	£9.32
UK average (2011)	£1,032 ³	£11.34 ⁴

Possible next steps	Annual CO ₂ saving (tonnes)	Annual fuel bill saving
Insulation to solid concrete floors	0.32	£62

¹Ofgem 2011

²English Housing Condition Survey 2011

³Ofgem 2011

⁴Based on 91m² from English Housing Condition Survey 2011