

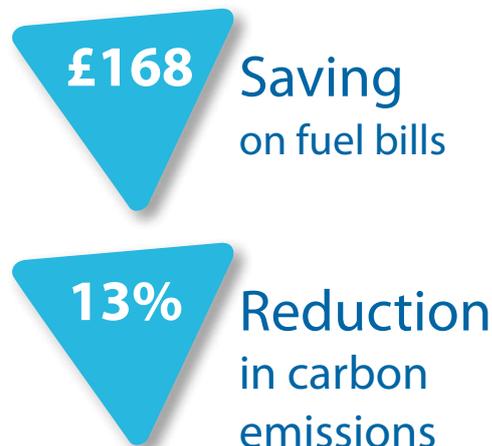
1960s detached house South Gloucestershire

This and many other case studies are also available online at www.linktoenergy.org.uk



connecting with local tradespeople

Case study 30



Measures installed	Total cost	Annual CO ₂ saving (tonnes)	Annual fuel bill saving
Solar hot water	£5,134	0.21	£32
Solar PV 1.5 kWp	£7,128	0.76	£136
Total package	£12,262	0.97	£168
Plus income from PV Feed-In Tariff (FIT)			£577

The home

This is a four bedroom detached house built in 1969. A rear extension was added in 1980. The family who live there are very energy aware and so had already made a number of energy efficiency improvements to the house. This included having the cavity walls insulated and topping up the loft insulation to 250mm. They were also keen to ensure that new appliances were 'A' rated for efficiency and had changed the majority of lighting to low energy bulbs. The house is double glazed throughout, and an efficient condensing combination boiler was installed around six years ago.

both suitable for solar panels. The householders were interested in looking at the feasibility of incorporating a solar thermal system to provide for some of their hot water requirements. As the house was heated using a combination boiler which is typically not suitable to receive heat from solar panels they had to investigate solutions that would provide a cost and energy efficient solution to this.

On completion of the solar thermal system, quotes were obtained for a solar photovoltaic array and a 1.5kwp system was installed on the south west facing roof area in 2011.

"Although we had a challenge to modify a combination boiler to be able to accept solar thermal, we have achieved our objective and are impressed with the system we have"

What they did

The householders were keen to incorporate renewable energy into their home and are fortunate that the rear roof areas of the house face south east and south west, which are



asiantaeth ynni
SevernWye
energy agency



A solar thermal solution

Solar thermal systems require a cylinder in which to store the heated water. This typically incorporates two heating coils: one supplying heat from the solar panels and one connected to the boiler which tops up the water temperature if there has not been sufficient heat from the sun. In this home there was a combination boiler which heats water on demand and therefore does not have a cylinder. As the boiler was only six years old the householders did not want to have to replace this and so sought expert opinion from installers for any alternative options.

Two main solutions were proposed, in both cases a hot water storage cylinder would be installed. The first solution involved the installation of a temperature-controlled diverter valve which would be able to sense whether the demand for hot water could be met by the water stored in the new solar-heated cylinder. If there was insufficient heat, then this water would have to be blended with cold water to be fed back to the boiler to be re-heated to the required temperature. This is due to the fact that this combi boiler does not accept a hot water feed. This was not considered to be the most energy efficient solution.

The second solution was to use the combi boiler as a traditional 'system' boiler, with a new twin coil cylinder that would accept heat from the solar panels, with top up heat provided by the boiler to the cylinder when required.

In both cases the solar panels become the primary source of hot water, with the boiler acting as a back-up. In larger homes the system needs to be able to cope with multiple demands for hot water at one time and it is much easier to achieve this with a pre-heated cylinder full of water than it is with a combi, which only heats water on demand. With of a family of four, hot water demand could be high at times for this household.

The second solution was chosen, with the added advantage of shorter pipe-runs.



PV and solar thermal panels mounted on south east and south west facing roofs

An important consideration prior to installation was to check that the boiler would continue to operate safely and effectively in the new set up. This was confirmed by the manufacturer, via the approved installer. Gregor Heating and Renewable Energy installed the two flat plate solar panels on the south east facing roof which are linked to a new 200 litre unvented cylinder.

Solar electricity

The solar PV panels were installed on the south west facing roof by the locally based company, Ecocetera. The system they have chosen has a peak output of 1.5 kW and comprises six hybrid panels. This is predicted to generate 1,287 units (kWh) of electricity annually and is eligible for the Feed-In Tariff payments.

Energy consumption	Total (kWh)	Per m ² floor area
Before improvement (2010)	31,240	174
After improvement (2011)	38,763	215
With all possible measures	23,177	129
UK average (2011)	19,800 ¹	217 ⁴

Running costs	Total	Per m ² floor area
Before improvement (2010)	£1,762	£9.79
After improvement (2011) - excl FIT income	£1,594	£8.86
With all possible measures	£1,390	£7.72
UK average (2011)	£1,032 ³	£11.34 ⁴

¹Ofgem 2011

²English Housing Condition Survey 2011

CO ₂ emissions	Total (tonnes)	Kg per m ² floor area
Before improvement (2010)	7.60	42
After improvement (2011)	6.63	37
With all possible measures	5.50	31
UK average (2011)	6.00 ²	66 ⁴

Possible next steps	Annual CO ₂ saving (tonnes)	Annual fuel bill saving
Flat roof insulation	0.22	£37

³Ofgem 2011

⁴Based on 91m² from English Housing Condition Survey 2011