

1980s detached house Stroud

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Case study 1



£828

**Saving
on fuel bills**

74%

**Reduction
in carbon
emissions**

Measures installed	Total cost	Annual CO ₂ saving (tonnes)	Annual fuel bill saving
Pellet boiler	£10,669	6.66	£694
Solar hot water	£5,328	0.44	£46
Solar PV (1.26 kWp)	£8,381	0.42	£88
Total package	£24,378	7.52	£828
Plus income from PV Feed-In Tariff (FIT)			£574

The home

This detached farmhouse was built in a south facing location on the owner's farm in 1983. The cavity walls were insulated as they were built and the house has had a loft conversion with 150mm of insulation throughout and double glazed windows. The house was heated by an old F-rated oil boiler with an open fire in the living room.

What they did

In spite of living in a relatively modern house, with reasonable levels of insulation, this family has found a number of ways to reduce their carbon emissions and become more self-sufficient. Replacing the old boiler was the obvious first step. With oil prices increasing and no access to mains gas, the householders decided to install a wood pellet boiler and solar water heating. This gives them the continued benefits of an automated

and well-controlled central heating system, but with a low carbon fuel. They also replaced the open fire with a wood burning stove, for improved efficiency.

Later they added solar photovoltaic panels to generate electricity, benefitting from the introduction of the Feed-In Tariff. Future plans include a 10kW wind turbine – subject to planning permission.

This practical and innovative household has taken further steps to reducing its dependency on fossil fuel by producing bio-diesel from waste oil for use in the farm vehicles.

"Insulation is the most important thing. The pellet boiler is great for the environment but it was a big investment so we can't afford to be leaking heat."

£574

**Income
from Feed-In
Tariff (FIT)**



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Wood pellet boiler

Wood pellets are made of compressed waste sawdust, so although some energy is required to make and transport them, they are a very low carbon fuel.

When this boiler was installed in 2008 it was slightly more expensive to heat with wood pellets than with oil, but oil prices were rising and it was anticipated that pellet prices would fall as the market expanded. The oil boiler had been in use for 25 years so the householders felt it was wise to take a long-term view. As a farming family, they have plenty of storage space which means they can purchase pellets in bulk whenever the price is low.

The key advantage of using wood pellets instead of logs or waste wood is that the system can be controlled by a conventional thermostat and timer. The pellets have to be manually loaded into the storage hopper, but once that has been done they are fed into the boiler automatically when the controls indicate more heat is required. This means that inside the home, the system works exactly like the old oil central heating.

Wood burning stove

The open fire in the living room was replaced with a wood burning stove, which has reduced the amount of wood being burnt for secondary heating, but the householders report that this still uses far too much wood for the amount of heat it produces.

Solar water heating

A solar water heating system was installed at the same time as the pellet boiler. Both feed into a large 300 litre cylinder, so if the solar panels are providing enough heat for the hot water demand, the thermostat prevents the boiler firing up. The householders find that they get free hot water virtually all summer, and that the large, well-insulated cylinder means one sunny day can provide up to two days' worth of hot water.



Wood pellet boiler and hopper

The combined effect of these measures has made the household virtually fossil fuel-free when it comes to meeting their space and water heating needs. The boiler and solar panels were installed by Windhager UK of Chippenham, Wiltshire for a cost of £10,670.

Solar electricity

In 2009 the household decided to invest in solar photovoltaic panels to generate electricity. A relatively small system with a peak output of 1.26 kilowatts was installed, but this is sufficient to produce a quarter of the electricity required for the home. It is eligible for Feed-In Tariff payments, which has brought in enough income to pay all their electricity bills for the last year.

Energy consumption	Total (kWh)	Per m ² floor area
Before improvement (2007)	37,200	175
After improvement (2010)	26,626	125
With all possible measures	21,792	102
UK average (2010)	19,800 ¹	243 ⁴

Running costs	Total	Per m ² floor area
Before improvement (2007)	£1,677	£7.87
After improvement (2010) - excl FIT income	£849	£3.99
With all possible measures	£791	£3.71
UK average (2010)	£1,032 ³	£12.15 ⁴

¹ Energy Saving Trust, 2010

² English House Condition Survey, 2007 (private sector housing only)

CO ₂ emissions	Total (tonnes)	Kg per m ² floor area
Before improvement (2007)	10.18	48
After improvement (2010)	2.61	12
With all possible measures	2.69	13
UK average (2010)	7.10 ²	72 ⁴

Possible next steps	Annual CO ₂ saving (tonnes)	Annual fuel bill saving
Insulation to solid concrete floors	0.90	£120
Sloping ceiling insulation	0.21	£28
Total	1.11	148

³ U Switch, March 2010

⁴ Based on 98m² from English House Condition Survey, 2007 (private sector housing only)