

EXPLORING THE OPPORTUNITIES

LOCAL CASE STUDY 3: 19th century barn converted 1994



- PROPERTY** Farm barn built about 1840. Architect designed conversion 1995. Unusual window shapes. 171 m2. EPC E52. Energy use per year 301 kWh/m2.
- OCCUPIERS/USE** Retired couple
- OBJECTIVE** To reduce carbon emissions
- INSTALLATIONS** 2021 Solar voltaic panels (SVP) 4 pkW, estimated 3,740 kWh/year. Battery 6.3 kWh
2022 Air source heat pump 12kW (ASHP) – Daikin
- OTHER WORKS** Roof space insulation 2015. Ordinary windows double glazed. Solid walls need insulating, but impossible outside because of planning constraints, and inside would require a complete reworking of the interior. Really needs double or triple glazing everywhere, but would be very expensive for architectural windows.

The existing space heating system was one of underfloor heating on the ground floor and radiators upstairs. The circulation temperature is not known but would have been about 75 °C, mixed down to about 45 °C for the UFH.

The air source heat pump replaced a gas boiler. There is no backup heating system although gas is retained for a gas Aga, which also provides space heating in the kitchen. The domestic hot water system (DHW) is pressurised and a new well-insulated 250L cylinder has been fitted.

The existing space heating system is retained. None of the radiators have been changed, having been assessed as sufficiently large despite the lower circulation temperature. The UFH operates as before.

The ASHP system is split. That means the fan and compressor unit sits outside next to the front wall. It is very inconspicuous in its setting. The heat exchanger is in the loft, with R32 heat exchange fluid circulating between the two. The hot water cylinder is in a cupboard below the loft. Fitting the DHW system into the space available was a challenge.

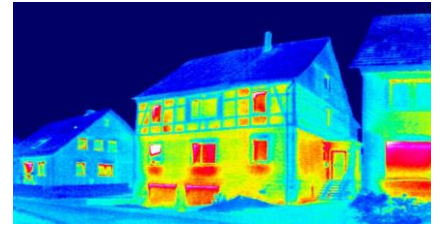
EPC after fitting solar voltaic panels D64.

Some statistics:

ANNUAL DEMAND	Heating and DHW	29,400 kWh	Other electrical	4,000 kWh
ORIGINAL SYSTEM				
	75% boiler efficiency	39,200 kWh gas	4,000 kWh electricity	
	unit cost April 2022 price cap	0.07 £/unit	0.29 £/unit	
	cost without standing charges	£2,744 per year	£1,160 per year	£3,904 Total
NEW SYSTEM				
	3.44 SCOP*	Heating and DHW	8,500 kWh electricity	
		Other electrical demand	4,000 kWh electricity	
		Solar PV supplied	-3,400 kWh electricity	
		Total	9,100 kWh per year	£2,639 Total
	*Seasonal Coefficient of Performance		Saving	£1,265 per year
CAPITAL COST - renewables				
	ASHP	£14,170	Solar	£8,481
			Builder	n/a
			Grant	-£15,000
			Net	£7,651
CARBON EMISSIONS				
	Gas	0.185 kge/kWh	Electricity (notionally 100% renewable)	0.1 kge/kWh
	Original system	7.7 tonnes/year	New system	0.91 t/year
			Saving	88%

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PHOTOS



Architectural glass



In-roof solar panels

Outside unit is here →



ASHP outside unit