

EXPLORING THE OPPORTUNITIES

LOCAL CASE STUDY 1: 1960s retrofit



<b>PROPERTY</b>	Bungalow built in 1960, subsequently extended into the roof in 1997 and 2005. Two bedrooms, two/three reception, two bathrooms, kitchen, study. Block walls with cavity wall insulation retrofitted
<b>OCCUPIERS/USE</b>	Retired couple
<b>OBJECTIVE</b>	To reduce carbon emissions
<b>INSTALLATIONS</b>	2020 Solar voltaic panels 3kW 2020 Air source heat pump 8.5 kW (ASHP) – Mitsubishi Ecodan 2021 EV smart charging point (integrated with solar)
<b>OTHER WORKS</b>	Renovation and extension 2020: Partial installation of Under Floor Heating (UFH) Upgrading insulation in lofts Extension, built to current Building Regulation standards

The air source heat pump replaced a 28kW gas boiler. There is no backup heating system although gas is retained for cooking (hob). The domestic hot water system (DHW) is pressurised and a new well-insulated 250L cylinder was fitted. The system circulation temperature is 50 °C.

The UFH is designed for this temperature. The existing radiators, designed for 75 °C, were checked for sufficient heat output at 50 °C. They proved to be large enough except in the two bathrooms. DHW operates between 45 and 50 °C, except that the solar panels heat the water to 60 °C if there is excess energy (not required by other house demand). So the mode of operation is:

WINTER: ASHP on 19 °C , room temperatures set back at night. Solar tops up DHW to 60 °C

SUMMER: ASHP off. Water heated by solar, topped up with ASHP occasionally

The ASHP unit sits in the garden near to the back door, from which pipes run underground and then up the wall to a loft which contains the DHW cylinder, buffer tank and controls.

Some statistics:

<b>ANNUAL DEMAND</b>	Heating and DHW	14,000 kWh	Other electrical	4,000 kWh
<b>ORIGINAL SYSTEM</b>	75% boiler efficiency	18,700 kWh gas	4,000 kWh electricity	
	unit cost April 2022 price cap	0.07 £/unit	0.29 £/unit	
	cost without standing charges	£1,309 per year	£1,160 per year	£2,469 Total
<b>NEW SYSTEM</b>	3.6 SCOP*	Heating and DHW	3,900 kWh electricity	
		Other electrical demand	4,000 kWh electricity	
		Solar PV supplied	-1,700 kWh electricity	
		Total	6,200 kWh per year	£1,798 Total
	*Seasonal Coefficient of Performance		Saving	£671 per year
<b>CAPITAL COST - renewables (not EV charger)</b>	ASHP £12,810	Solar £8,715	Builder £2,000	Grant -£7,700
				Net £15,825
<b>CARBON EMISSIONS</b>	Gas 0.185 kge/kWh	Electricity (notionally 100% renewable)	0.1 kge/kWh	
	Original system	3.9 tonnes/year	New system	0.62 t/year
			Saving	84%