



Solar Panel Battery and Hybrid Heat Pump Solution Cost-Analysis

Technical/Costings

By Dave Green

Solar panels (first group)

Sharp system fitted 15 June, 2012	Cost £ ex VAT
9 Sharp ND 250W solar panels total 2.25 kWh peak	2142
Power One 2000 inverter	864
Materials and installation including scaffolding	2941
South facing 45 degree angle) expected output 1900 kWh/year. Actual output was 2470kWh/yr over 8 years	
FIT at 21p/kWh + own consumption saving over grid (19p/kWh for 100% renewable day rate) and 50% deemed export = £700/yr Payback period about 9 years	
Total cost ex VAT	5947
VAT@5%	297
	Total 6244
Comments: Estimated CO2 saving is 1000kg/yr although I'm on a genuine 100% renewable tariff so could argue no saving but helping the grid's renewable mix.	

Solar panels (second group)

JA + Solar Edge system fitted 30 October, 2020	Cost £ ex VAT
8 JA 345W solar panels total 2.76 kWh peak	800
Solar Edge inverter	1070
Materials and installation including scaffolding	2888
South facing (30 degree angle), expected output 2104 kWh/year	
<p>No FIT payments. A year worth of data from the panels is required to get a better estimate.</p> <p>Expect half of the solar output to be used directly to power the house (over the last quarter it was about 47%) gives a saving of $0.5 \times 2104 \times 0.19 = \text{£}200$. Add the export revenue at 5p per kWh (say 50% of the summer that generate 2/3 of the total but the house only consumes about 1/3 of the total power needed and little exported in the winter) = $0.05 \times 1409 = \text{£}70$</p> <p>Payback period about 18 years.</p>	
Total cost ex VAT	4758
VAT @5%	238
	Total 4996
Comments: Estimated CO2 saving is 900kg/yr	

Battery storage

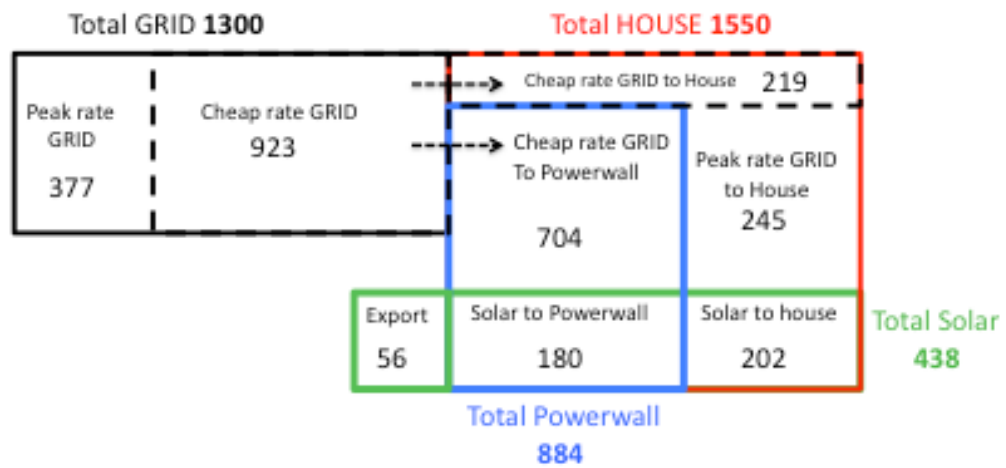
Tesla Powerwall 2 Battery System	Cost £ ex VAT
Tesla 13.5kWh battery + intelligent gateway box. Max discharge rate of 5kW. Can run independent of the grid with separate earth installed.	
<p>Battery can store free solar power to be used later so saving grid price per kWh and can also be partially (or fully) filled up on cheap rate (Economy 7) night-time power (load shifting) dependent on estimate of next day's solar output. First quarter usage in this mode (storing about 60% free from solar and 40% cheap rate) gives an estimated saving due to the battery of about £120. Later quarter savings are expected to be similar as, although less house consumption there will be more solar to store for night time and heavy use periods. Total yearly saving estimated at £500 but a years worth of data needed to confirm!</p> <p>Payback period about 15 years.</p>	
Total cost ex VAT	7131
VAT @ 5%	356
	Total 7487

Air Source Heat Pump (ASHP)

I have an air-air heat pump as a hybrid system (I still have my 2 year old condensing gas boiler). The heat pump can output 6kW to heat the two main downstairs rooms via wall mounted air blowers (very quiet!) so I can delay putting on the gas fired central heating until later in the evening thus saving gas and reducing my carbon footprint.

Air-air Heat pump for downstairs heating and cooling	Cost £ ex VAT
Fujitsu 2-way Multi system AOYG18LAC2 with 3.5kW ASYG12LMCE in living room and 2.5kW ASYG12LMCE in dining room	
Total cost ex VAT	2475
VAT@5%	123
	Total 2598
<p>Analysis of Nov/Dec/Jan use of operations last in 2019/20 without the pump and this year with the pump + battery system shows around a 40% drop in gas consumption due to the heat pump use for day and early evening heating. Electricity consumption went up to power the heat pump. 2250kWh saved on gas and 627kWh increase in electricity gives broadly similar costs (£107 saved on gas, £90 increase in electricity helped by cheap rate power stored in the battery system). Assuming broadly equivalent saving on gas in the Feb/Mar/Apr quarter would save around 3250kWh representing about 600kg of CO2 saved per year (government figure of 0.184kg per kWh)</p>	
<p>Comments: The payback on the heat pump is very long but was bought primarily to stop burning as much fossil fuel (gas). It also gives cooling on hot summer days that is likely to get more common as global warming intensifies.</p>	

Power flows for the 5kW PV + 13.5kWh Tesla battery system:



Estimated Power Flows for Nov, Dec, Jan with 5kW PV and Tesla Powerwall in 'Cost Saving' mode.
 Data from Tesla App and Electricity meter readings for peak and cheap rates.
 Numbers are **kWh** (1 kWh represents 1 'unit' of energy)