CC Solar

Solar • Storage • EV Charging

YOUR LOCAL INSTALLER

Ray Freeland

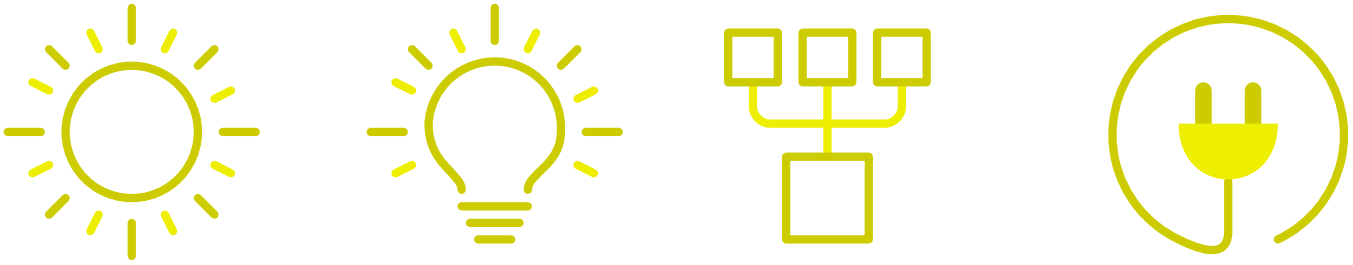
Project Name: Ray Freeland Solar and Battery

Phone: 07842805127

Address: 9 The Old Canal Caravan Site, Lidsey Road, PO22 9PN

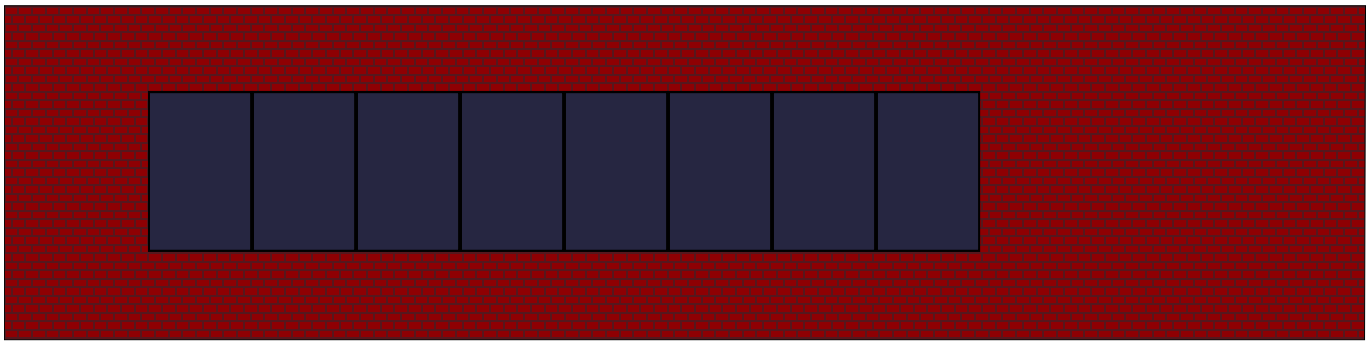
Date Created: 16th September 2025

Designer: Liam Waller

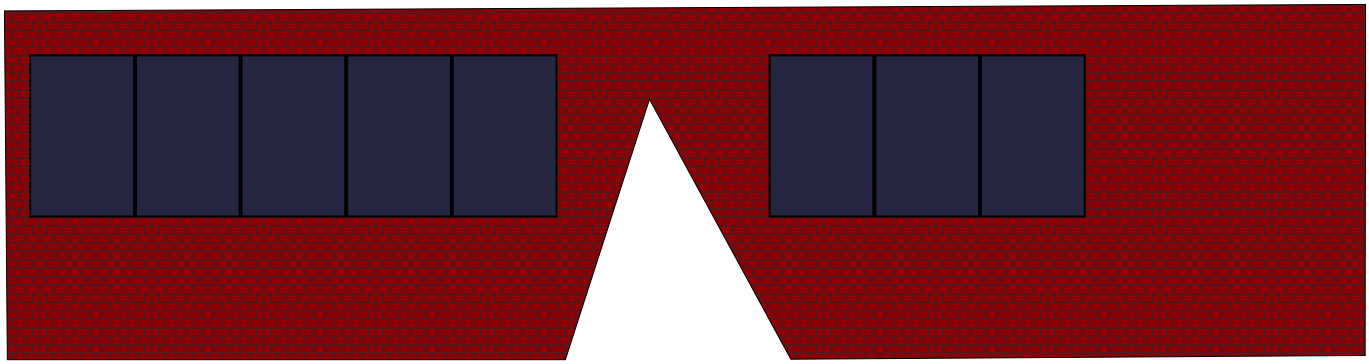


Roof Layout

Roof 1



Roof 2



Component list

Item	Quantity
Eurener Nexa 475W All Black TOPCon Mono solar panel	16
Renusol black universal end clamp	12
Renusol black universal mid clamp	26
Renusol black end cap	12
Renusol portrait UK HL (420184) roof hook (with fixings)	38
Renusol rail splice	6
BB125evo Reinforced BirdBlocker (30m)	2
Renusol silver rail 3600mm	12
Fox ESS H1 G2 6.0kW 1ph Hybrid inverter	1
Fox ESS EP12 Plus 11.52kWh Li-ion Battery w/ heating function	1
AC isolator - IMO - 32A 4-pole	2
IMO 25A DC Isolator 4-pole 2-string	2
MC4 4mm Connector Pair	4
50m reel of 4mm2 solar cable	1
NET Emlite Bi-directional Meter ECA2.n*	1

Label sheet	1
Battery Hazard Warning Label Pack	1

Inverter checks

Fox ESS H1 G2 6.0kW 1ph Hybrid

Panels			
PV power	**7600**	Rated AC output	**6000**

Input 1: 8 Eurener Nexa 475W All Black TOPCon Mono solar panels in 1 strings

Panels		Inverter	
PV power	**3800 W**		
Open circuit voltage at -10° C	**323 V**	Max DC voltage	**550 V**
V_{mpp} at 40° C	**243 V**	V_{mpp} lower limit	**80 V**
V_{mpp} at -10° C	**275 V**	V_{mpp} upper limit	**550 V**
I_{mpp} at 40° C	**15 A**	Max DC input current	**16 A**

Max voltage

The open circuit voltage of the solar panels never exceeds the voltage limit of the inverter.

✓

Max power point range

The maximum power point voltage of the solar panels is always above the lower limit of the inverter MPPT tracker. The maximum power point voltage of the solar panels is always below the upper limit of the inverter MPPT tracker.

✓

Max Current

The maximum power point current of the solar panels is always below the maximum current for the inverter MPPT tracker.

Input 2: 8 Eurener Nexa 475W All Black TOPCon Mono solar panels in 1 strings

Panels		**Inverter**	
PV power	**3800 W**		
Open circuit voltage at -10° C	**323 V**	Max DC voltage	**550 V**
V_{mpp} at 40° C	**243 V**	V_{mpp} lower limit	**80 V**
V_{mpp} at -10° C	**275 V**	V_{mpp} upper limit	**550 V**
I_{mpp} at 40° C	**15 A**	Max DC input current	**16 A**

Max voltage

The open circuit voltage of the solar panels never exceeds the voltage limit of the inverter.

Max power point range

The maximum power point voltage of the solar panels is always above the lower limit of the inverter MPPT tracker. The maximum power point voltage of the solar panels is always below the upper limit of the inverter MPPT tracker.

Max Current

The maximum power point current of the solar panels is always below the maximum current for the inverter MPPT tracker.

Electrical

Fox ESS H1 G2 6.0kW 1ph Hybrid

AC Isolator

A AC isolator - IMO - 32A 4-pole has been specified for this input

Current

The rated isolator current (32A) is greater than the rated inverter current (30.0A)

Phases

The isolator is suitable for use on a single phase inverter.

Input 01

DC Isolator

A IMO 25A DC Isolator 4-pole 2-string has been specified for this input

Current

The isolator is rated for a current of 23A, which is more than the expected maximum current of 20.13A.

Voltage

At 23A the isolator is rated for a voltage of 700V, which is more than the expected maximum voltage of 355.01V.

Cable

10m of 4mm2 solar cable has been specified

Voltage drop

Voltage drop at maximum power point at 40°C will be around **1.38 V (0.57 percent)**

Input 11

DC Isolator

A IMO 25A DC Isolator 4-pole 2-string has been specified for this input

Current

The isolator is rated for a current of 23A, which is more than the expected maximum current of 20.13A.

Voltage

At 23A the isolator is rated for a voltage of 700V, which is more than the expected maximum voltage of 355.01V.

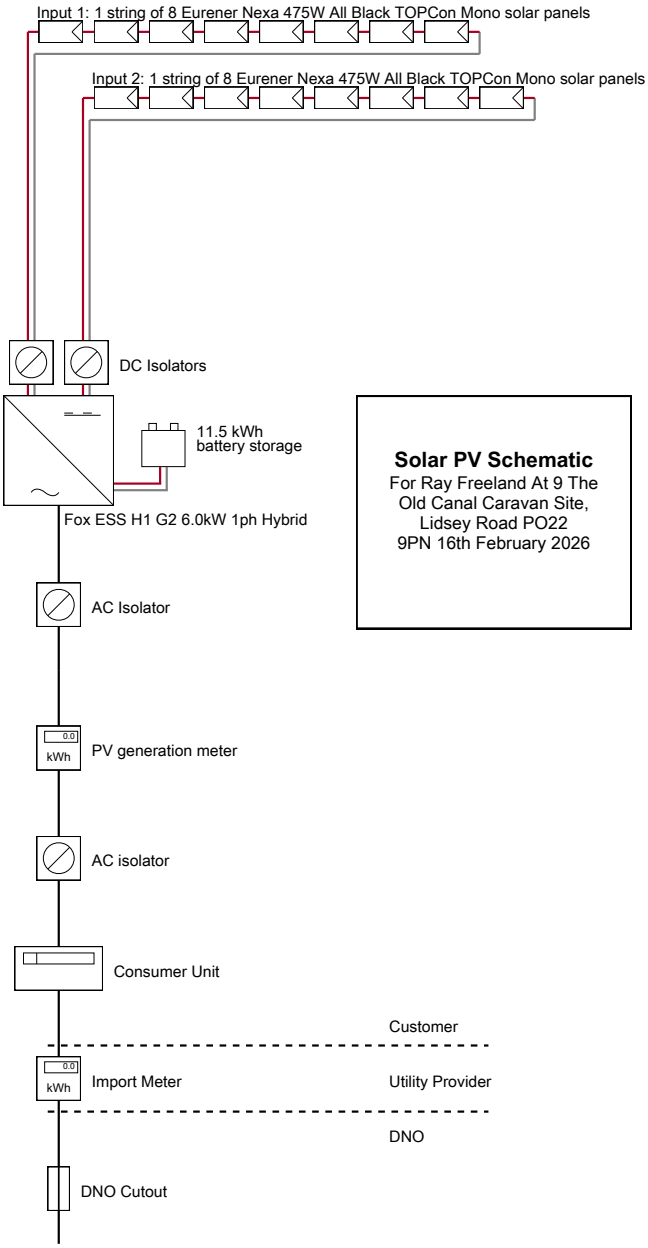
Cable

10m of 4mm2 solar cable has been specified

Voltage drop

Voltage drop at maximum power point at 40°C will be around **1.38 V (0.57 percent)**

Schematic diagram



Performance Estimate

Site details

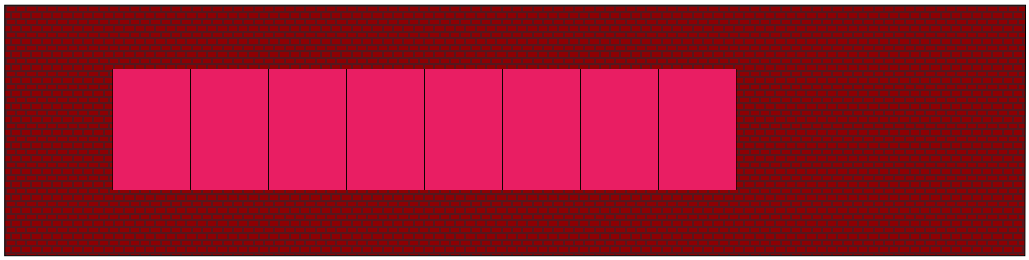
Client	Ray Freeland
Address	9 The Old Canal Caravan Site, Lidsey Road

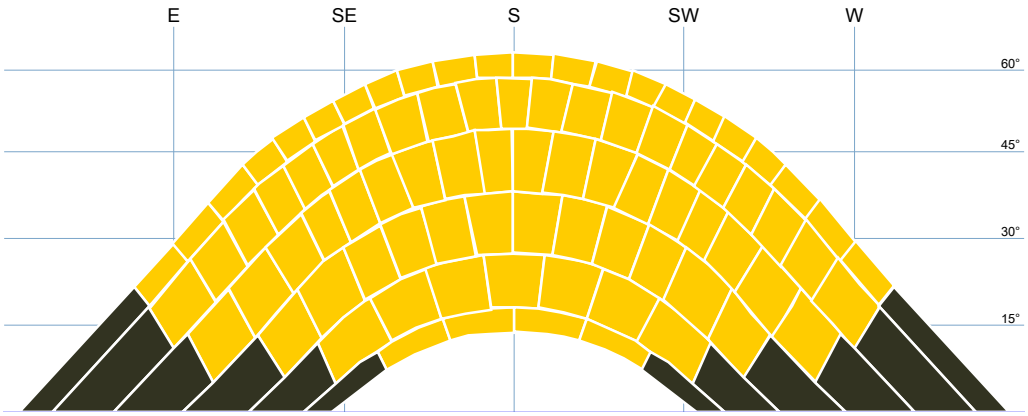
The sunpath diagram shows the arcs of the sky that the sun passes through at different times of the day and year as yellow blocks. The shaded area indicates the horizon as seen from the location of the solar array. Where objects on the horizon are within 10m of the array, an added semi-circle is drawn to represent the increased shading. Blocks of the sky that are shaded by objects on the horizon are coloured red, and a shading factor is calculated from the number of red blocks. The performance of the solar array is calculated by multiplying the size of the array (kWp) by the shading factor (sf) and a site correction factor (kk), taken from tables which take account of the geographical location, orientation and inclination of the array.

Inverter 1

Fox ESS H1 G2 6.0kW 1ph Hybrid

Input 1

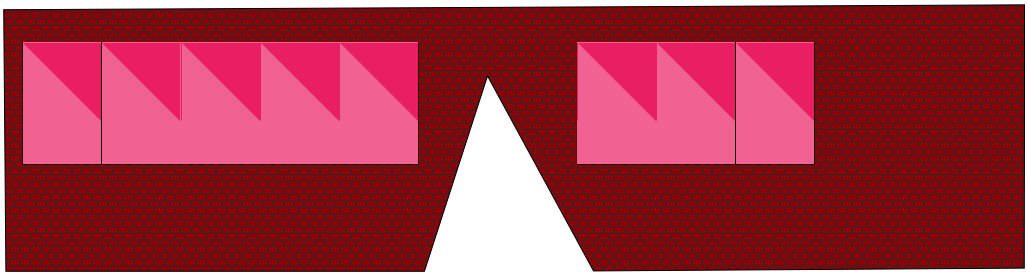


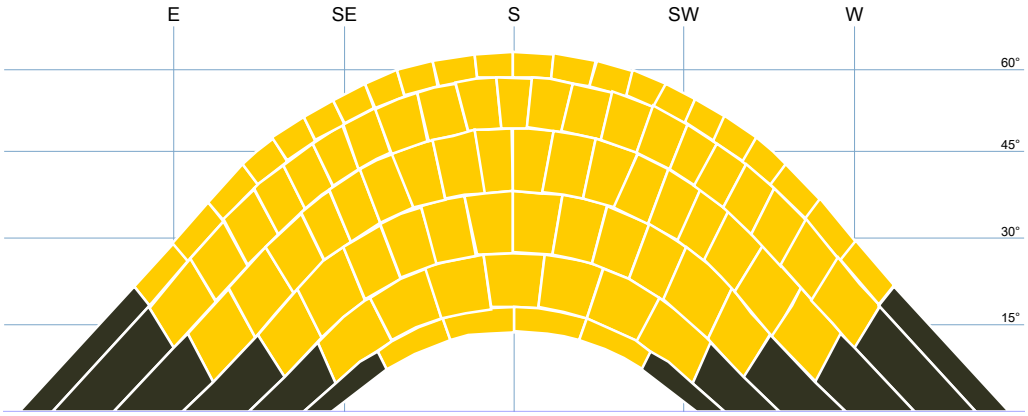


A. Installation data		
Installed capacity of PV system – kWp (stc)	**3.800**	kWp
Orientation of the PV system – degrees from South	**-78**	°
Inclination of system – degrees from horizontal	**30**	°
Postcode region	**2**	

B. Performance calculations		
kWh/kWp (Kk)	**937**	kWh/kWp
Shade factor (SF)	**1.00**	
Estimated output (kWp × Kk × SF)	**3561**	kWh

Input 2





A. Installation data		
Installed capacity of PV system – kWp (stc)	**3.800**	kWp
Orientation of the PV system – degrees from South	**101**	°
Inclination of system – degrees from horizontal	**30**	°
Postcode region	**2**	

B. Performance calculations		
kWh/kWp (Kk)	**853**	kWh/kWp
Shade factor (SF)	**1.00**	
Estimated output (kWp × Kk × SF)	**3241**	kWh

Performance Summary

A. Installation data		
Installed capacity of PV system – kWp (stc)	**7.600**	kWp
Orientation of the PV system – degrees from South	**See individual inputs**	
Inclination of system – degrees from horizontal	**See individual inputs**	
Postcode region	**2**	
B. Performance calculations		
kWh/kWp (Kk)	**See individual inputs**	
Shade factor (SF)	**See individual inputs**	
Estimated output (kWp × Kk × SF)	**6802**	kWh

Self consumption

We model here the performance of a solar PV system with battery storage over the course of a year, using high resolution minute-by-minute generation data for a typical PV system and consumption data for a typical house, and calculating the flow of energy from the solar panels to the house and the battery during the day, and from the storage battery back to the house at night – or from the grid to the house when the battery is empty or loads exceed the discharge capacity of the system.

We provide yearly profiles of generation, consumption, import / export and battery utilisation, along with detailed profiles for a typical spring day.

Battery system specification

Fox ESS H1 G2 6.0kW 1ph Hybrid Inverter with a Fox ESS EP12 Plus 11.52kWh Li-ion Battery w/ heating function

Charge rate is directly taken from the inverter specification; this value can be less depending on the type of battery connected.

Charge rate	**5820 W**
Inverter charge efficiency	**96 %**
Inverter discharge efficiency	**96 %**
Battery efficiency	**95 %**
Round trip efficiency	**88 %**
Battery bank capacity	**12 kWh**
Max discharge depth	**90 %**
Usable capacity	**10 kWh**

Consumption

Electricity consumed in the property each year

4500 kWh

Generation

Electricity generated by the PV array each year

3529 kWh

Self consumption

Proportion of PV generation used in the property

94 %

Independence

Proportion of electricity consumption provided by PV

74 %

Import / Export

Electricity import / export each year from the property

1176 kWh / 0.00 kWh

Utilisation

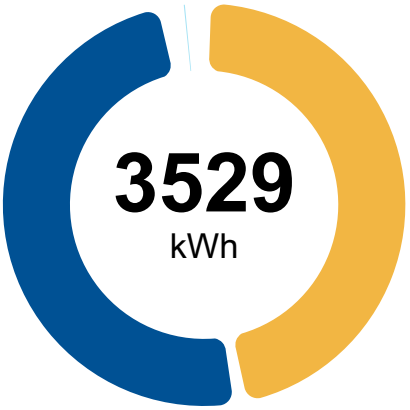
Average daily utilisation of the storage battery

46 %

Yearly generation

The solar PV array is expected to generate a maximum of 3529 kWh over a typical year. The graph shows whether the generated energy is used directly in the house, used to charge the storage battery, or exported to the grid.

47% (1662 kWh) of the electricity generated is expected to be used directly in the property. 53% (1867 kWh) is directed to the battery for later use, although 111 kWh of this is lost during battery charging, leaving 1756 kWh for use in the property. The remaining generation (0 kWh, or 0% of the total) is exported to the grid.

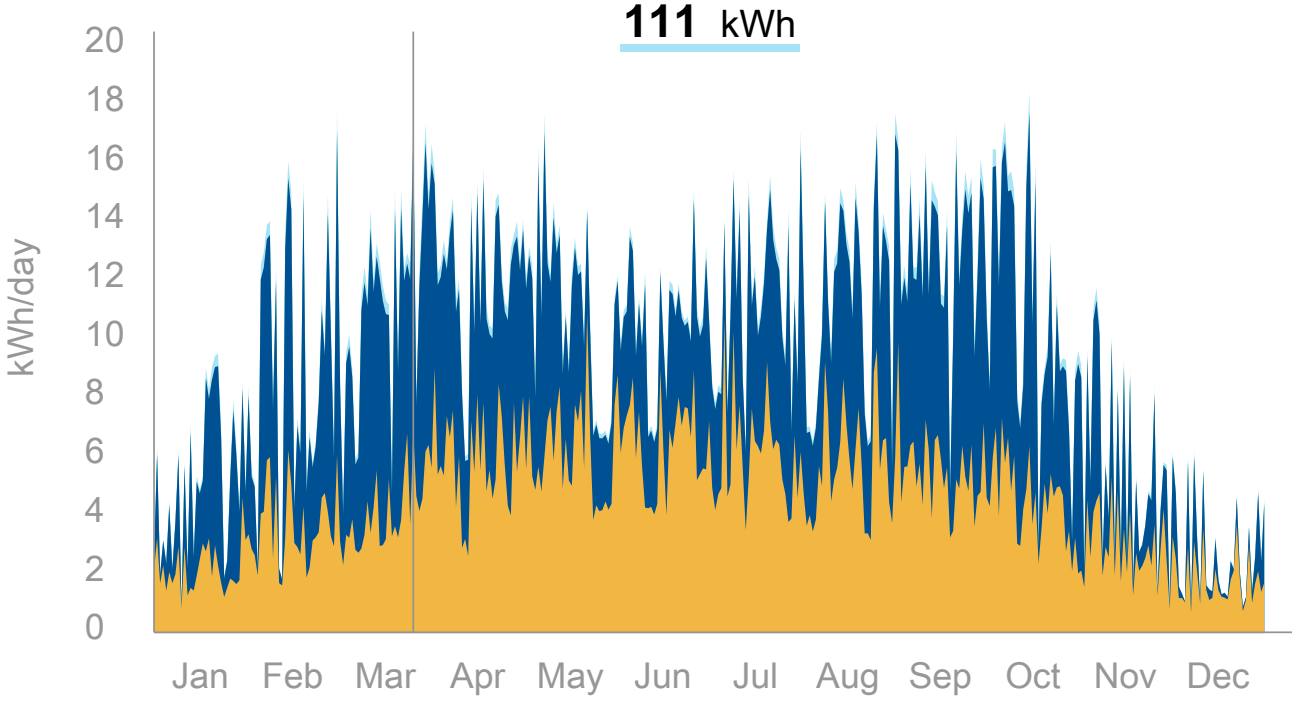


Direct use
1662 kWh

Via battery
1756 kWh

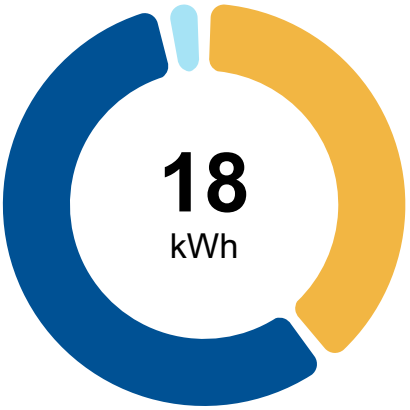
To grid
0.00 kWh

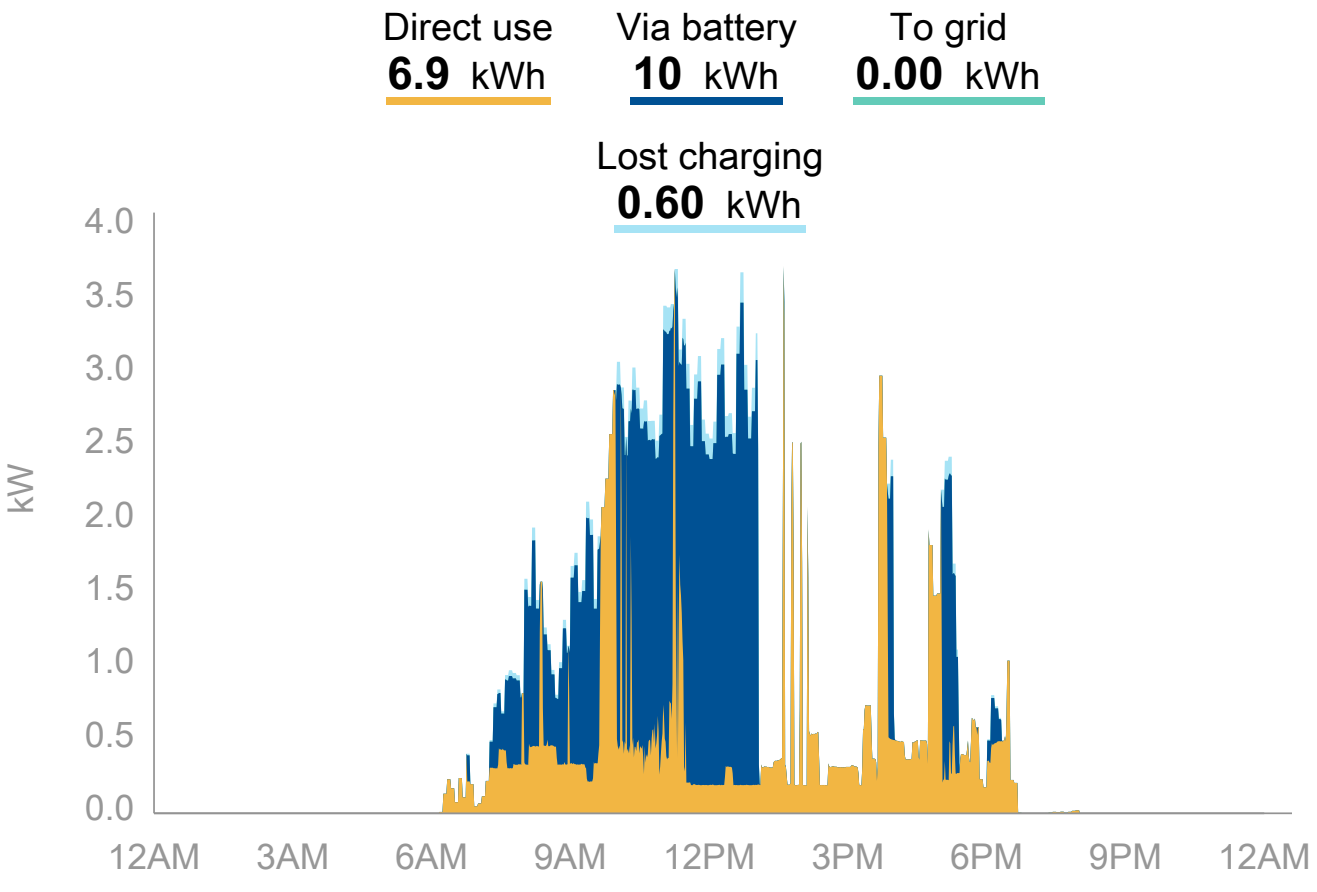
Lost charging
111 kWh



Daily generation

This graph shows the modelled profile of electricity generated by the PV array on a selected day (March 27th). On this day the PV system is expected to generate 17.5 kWh. Of this, 6.9 kWh (39%) is used directly in the property, 10 kWh (57%) is stored in the battery for later re-use, and 0 kWh (0%) is exported to the grid.

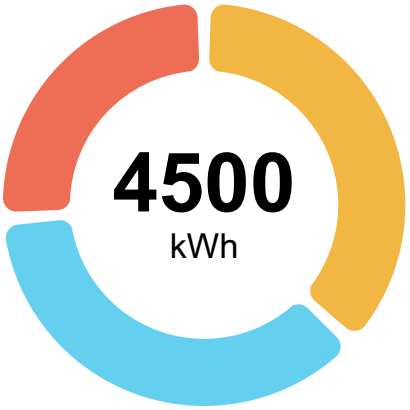




Yearly consumption

The property is expected to consume 4500 kWh of electricity each year. Around 37% of this (1662 kWh) is expected to be supplied directly by the solar array. Another 37% (1662 kWh) is supplied via the storage battery. The remaining 26% (1176 kWh) is supplied directly from the grid.

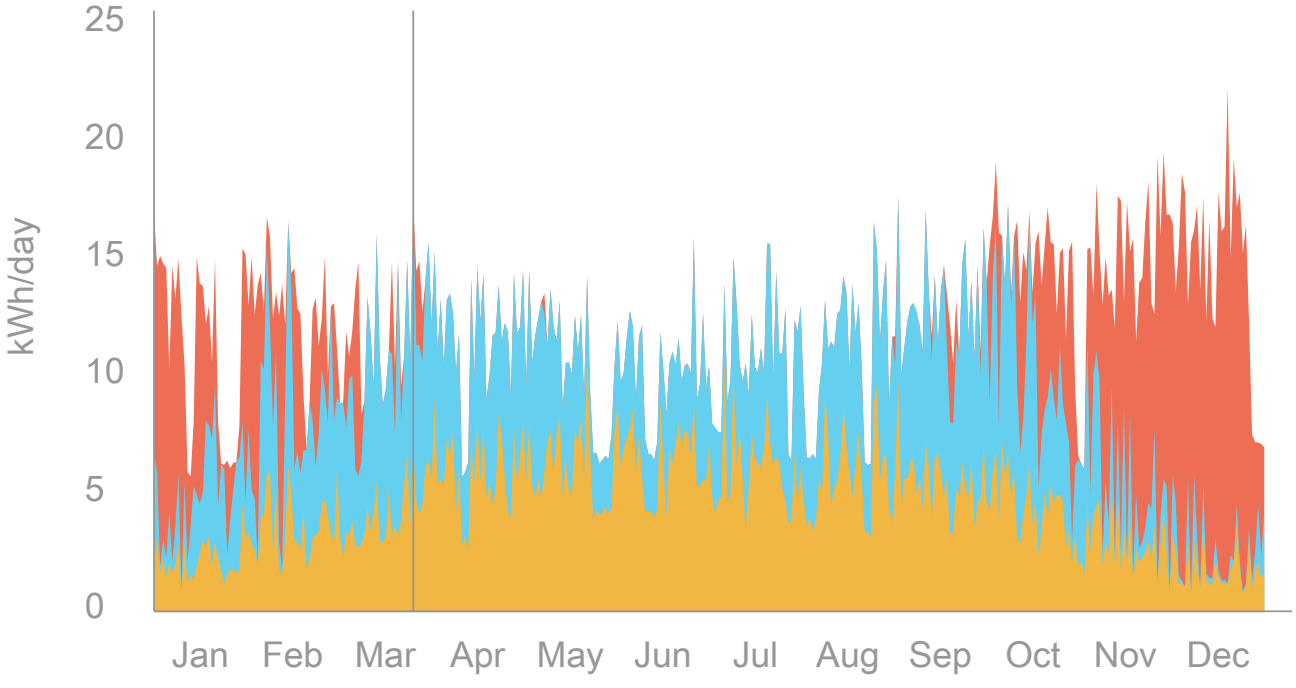
Overall, 74% (3324 kWh) of the electricity used in the property is expected to be supplied by the solar array and battery storage system. Without battery storage it would be 37% (1662 kWh).



From solar **1662** kWh

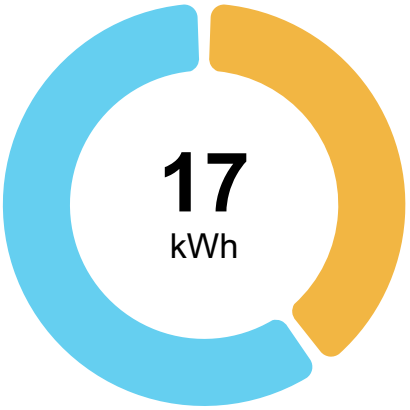
From battery **1662** kWh

From grid **1176** kWh



Daily consumption

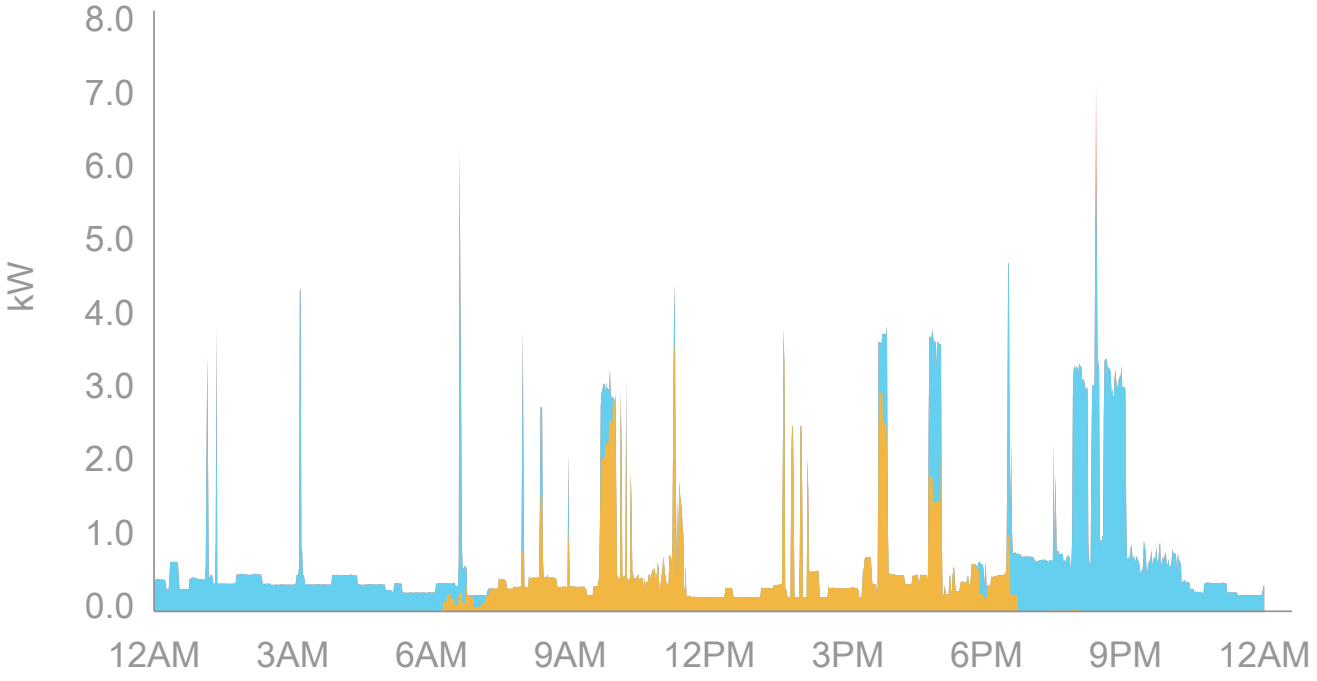
This graph shows modelled consumption data over the course of the selected day (March 27th). Total electricity consumption on this day was 17.3 kWh, of which 6.9 kWh (40%) is expected to be supplied directly by the solar array, and a further 10.4 kWh (60%) drawn from the battery storage system. The remaining 0 kWh (0%) is imported directly from the grid.



From solar **6.9** kWh

From battery **10** kWh

From grid **0.00** kWh



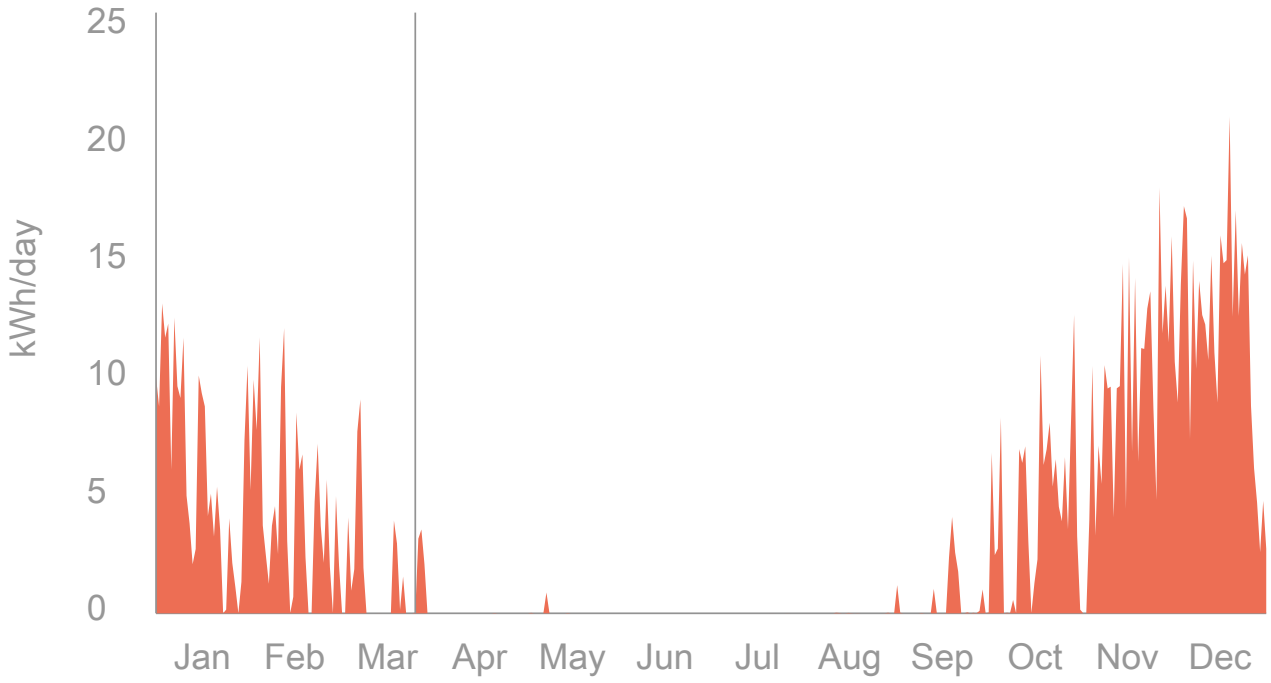
Yearly import and export

This graph shows modelled profiles of electricity imported and exported to and from the grid over the course of a year. The area above the horizontal axis represents imported electricity, and the area beneath the axis exported electricity.

Over the course of the year, a total of 1176 kWh is expected to be imported by the property, and 0 kWh exported back to the grid.

Importing
1176 kWh

Exporting
0.00 kWh

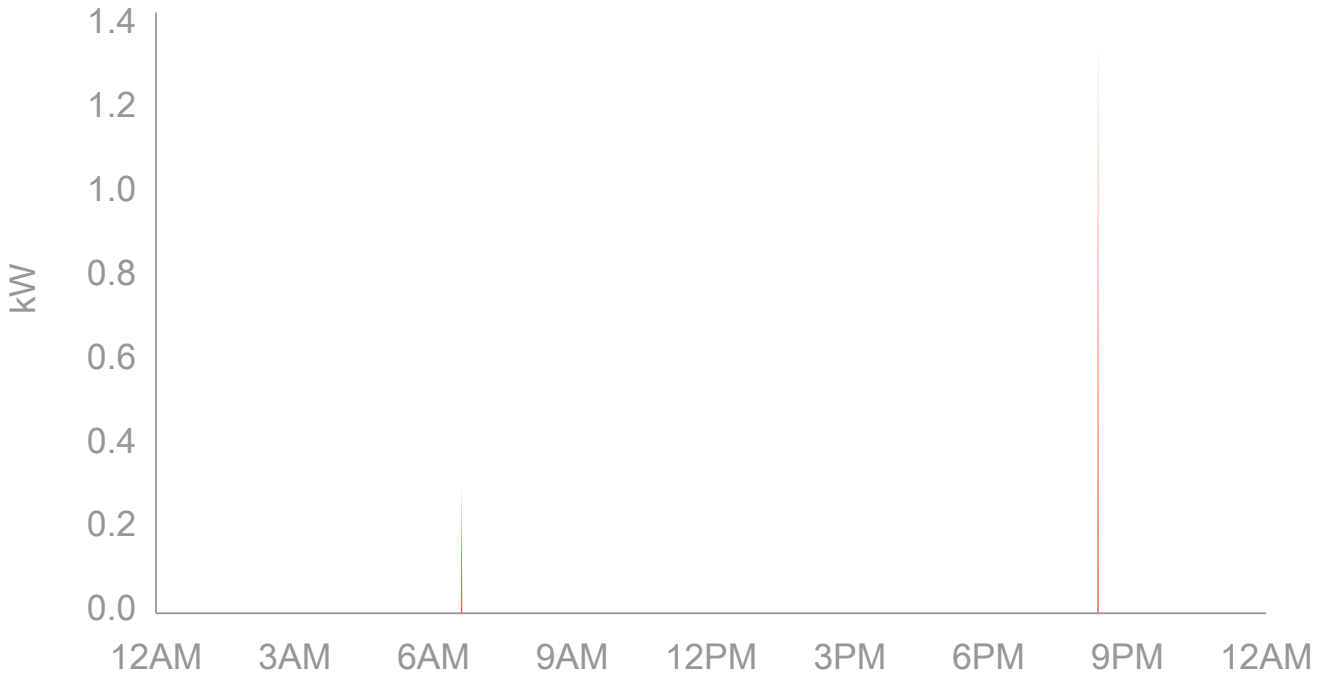


Daily import and export

This graph shows the modelled import and export of electricity over a selected day (March 27th). On this day 0 kWh is expected to be imported from the grid, and 0 kWh exported. At times when no import or export is shown the battery storage system is charging or discharging.

Importing
0.00 kWh

Exporting
0.00 kWh



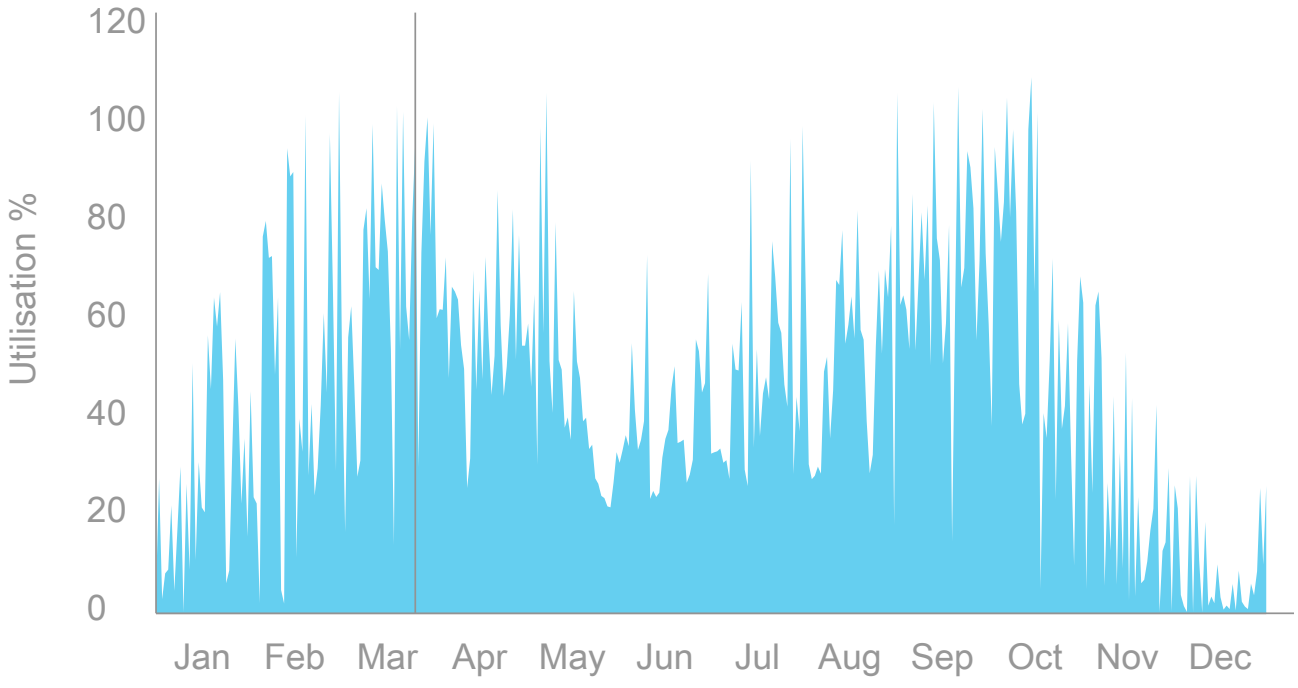
Yearly battery utilisation

The graph shows the modelled utilisation of the battery over the course of the year – the fraction of the available battery capacity that is actually charged and discharged each day. Utilisation of over 100% is possible at times where a battery is charged and discharged more than once during a day.

Low battery utilisation can be due to either insufficient spare PV generation to charge the battery (often the case in winter, or on cloudy days), or because loads are small overnight and the battery does not fully discharge.

46%

Avg Battery Utilisation

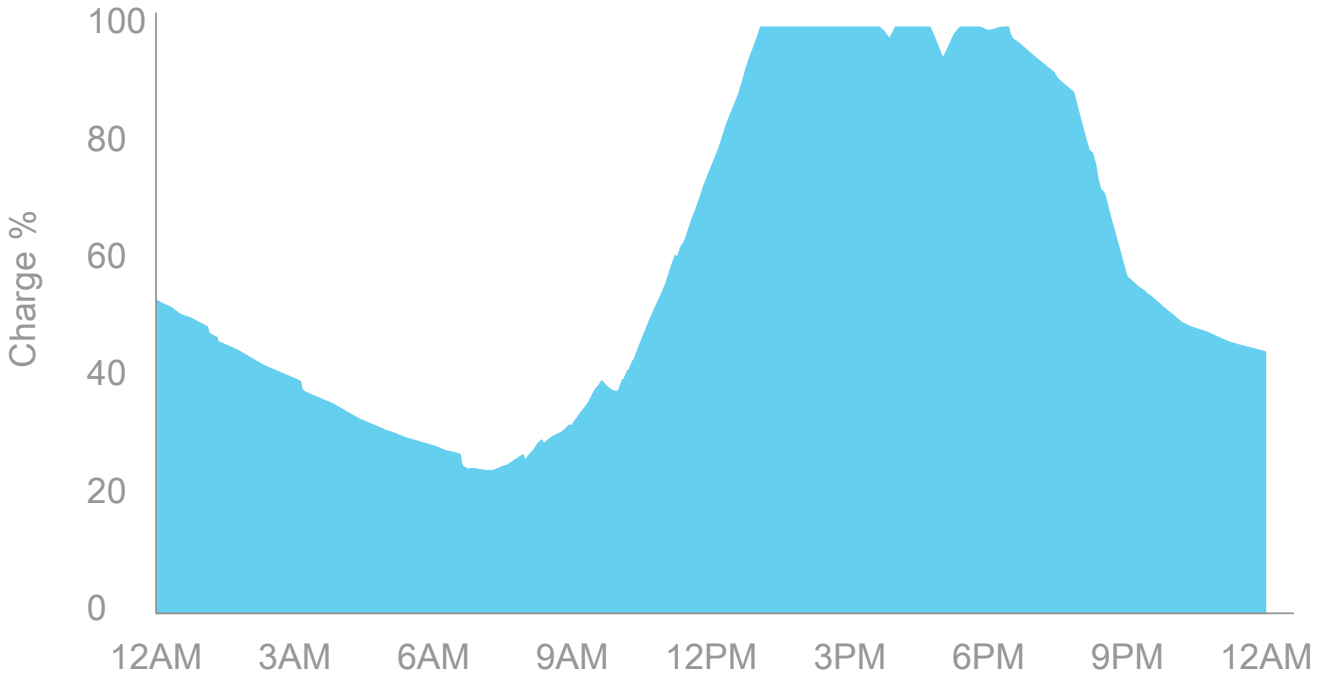


Daily battery utilisation

The state of charge of the battery over a selected day (March 27th) is shown in the graph below. The battery discharges overnight or when there is heavy demand during the day, and charges when there is excess solar PV generation during the day. On this day, 96.6% of the battery capacity was utilised.

97%

Avg Battery Utilisation



Equipment and Services

Equipment Costs
16 x Eurener Nexa 475W All Black TOPCon Mono solar panel
12 x Renusol black universal end clamp
26 x Renusol black universal mid clamp
12 x Renusol black end cap
38 x Renusol flat tile roof hook
6 x Renusol rail splice
2 x BB125evo Reinforced BirdBlocker (30m)
2 x Renusol pan head screw M6x80 (box of 100)
12 x Renusol silver rail 3600mm
Fox ESS H1 G2 6.0kW 1ph Hybrid inverter
Fox ESS EP12 Plus 11.52kWh Li-ion Battery w/ heating function
2 x AC isolator - IMO - 32A 4-pole
2 x IMO 25A DC Isolator 4-pole 2-string
4 x MC4 4mm Connector Pair
50m reel of 4mm2 solar cable
NET Emlite Bi-directional Meter ECA2.n*
Label sheet
Battery Hazard Warning Label Pack

Services Costs
Installation charge including fuseboard and other electrical accessories

Totals

Total before tax	**£9,100.75**
VAT at 0%	**£0.00**
Total including tax	**£9,100.75**

Financial

Generation

The system is expected to generate 6802 kWh per year initially, decreasing gradually as the solar cells degrade. Over the 27 year term of this financial projection the total generation is expected to be 183406 kwh, of which 89717 kWh will be consumed on site and 0 kWh exported.

183 MWh

Payback

After adjusting projected costs and benefits for inflation, and applying a discount rate of 4%, the initial system cost of £9,100.00 is expected to be recouped after 14 years.

14 years

Net Present Value

The total present value of future benefits and costs, using a discount rate of 4% per year, is £15,463.26. The cost of the PV system is £9,100.00. The net present value of the project is therefore £5,234.05. A positive net present value is a good indication that the project is financially worthwhile.

£5,234.05

IRR

The Internal Rate of Return is a useful measure for comparing the relative profitability of investments.

8.4 %

Disclaimer

Our financial model calculates the benefits of a solar PV installation (such as savings in electricity, or payments for exported electricity) and costs (the initial purchase cost, and any future maintenance costs if entered), over the projected lifespan of the system. Values are corrected for inflation, system degradation, and discount rate - a measure that accounts for the fact that a promise of a monetary sum in the distant future is usually considered less valuable than the promise of the same sum in the near future.

A model is only as accurate as the assumptions it makes. You should consider whether the values chosen are appropriate for your situation. There are many variables that dictate the financial return of a solar installation and we cannot forecast how they may change in the future. This financial projection shows a likely scenario for future financial returns. Actual returns may vary significantly from this forecast.

Assumptions

Inflation rate	**0.08%**
Cost of electricity increases at 0.06% above inflation per year	**28.00 p/kWh**
System size degrades at 0.01% per year	**7.6 kWp**
Discount rate	**4%**
Projection length	**27 years**

Income and savings

The projected income from the system over the project lifetime in payments for generated and exported electricity, along with electricity savings, are shown in the table and graph below.

These figures assume an inflation rate of 0.08 percent.

	Export payments	Electricity savings	**Total**
Year 1	0	931	**931**
Year 2	0	933	**933**
Year 3	0	934	**934**
Year 4	0	935	**935**
Year 5	0	937	**937**
Year 6	0	938	**938**
Year 7	0	939	**939**
Year 8	0	940	**940**
Year 9	0	942	**942**
Year 10	0	943	**943**
Year 11	0	944	**944**
Year 12	0	946	**946**
Year 13	0	947	**947**
Year 14	0	948	**948**
Year 15	0	949	**949**
Year 16	0	951	**951**
Year 17	0	952	**952**
Year 18	0	953	**953**
Year 19	0	955	**955**
Year 20	0	956	**956**
Year 21	0	957	**957**
Year 22	0	959	**959**
Year 23	0	960	**960**
Year 24	0	961	**961**
Year 25	0	963	**963**
Year 26	0	964	**964**
Year 27	0	965	**965**

£0

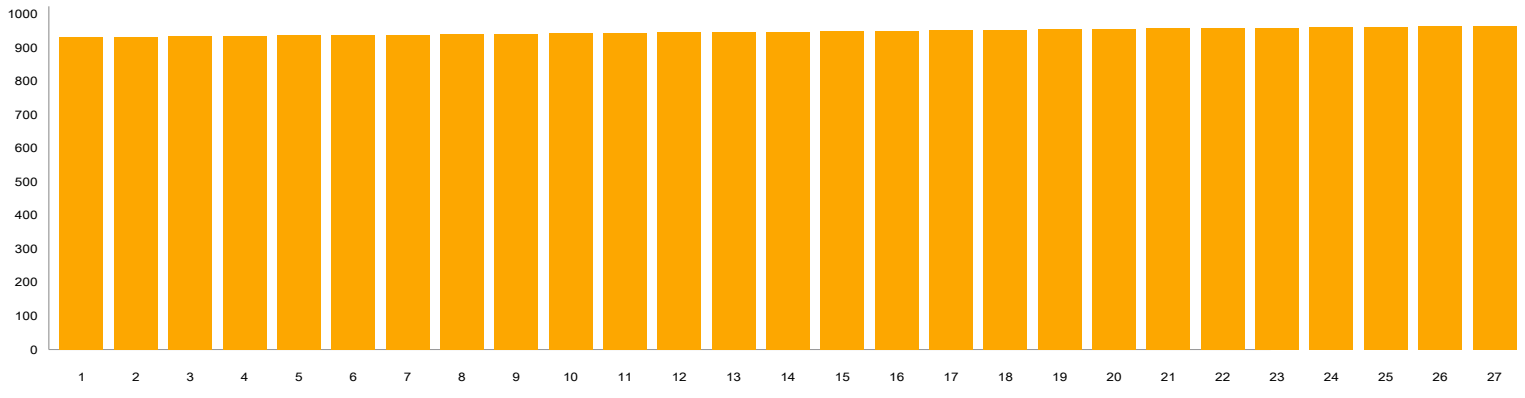
Total Export Payments

over 27 years

£25,601

Electricity savings

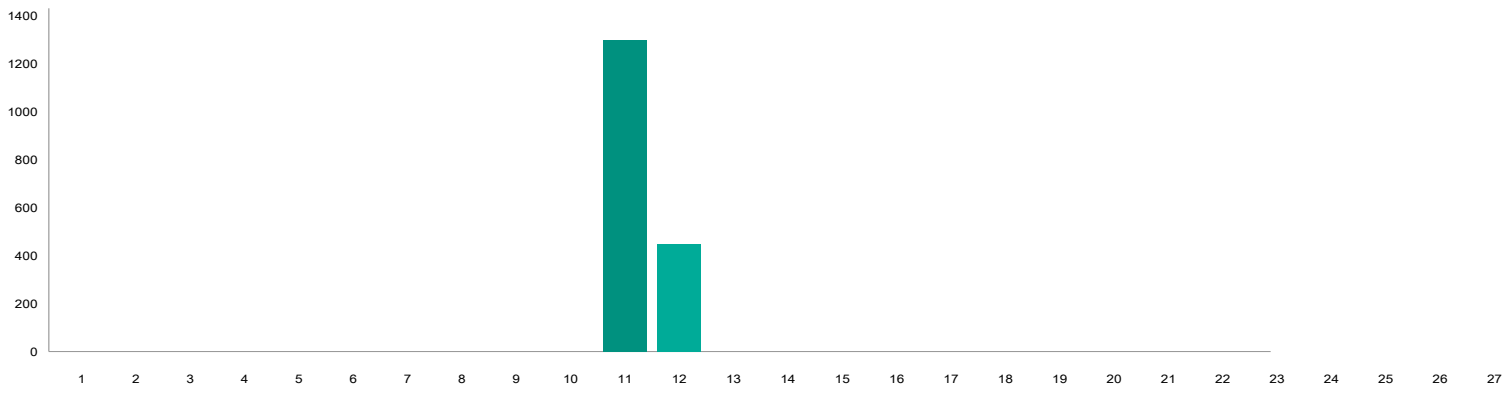
over 27 years



Running Costs

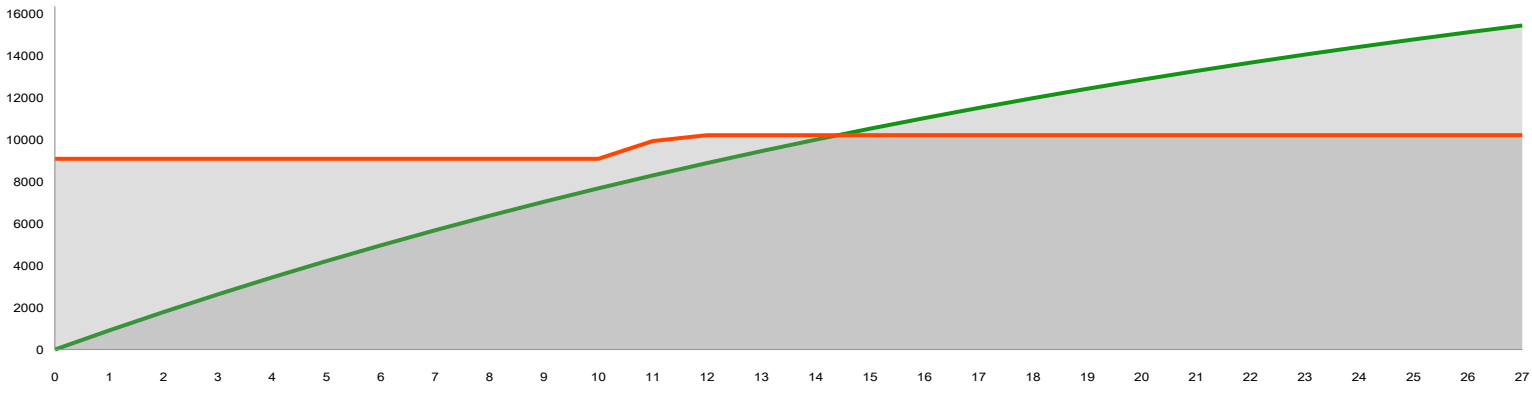
The table and graph below show estimated one-off and recurring costs. Where appropriate, these have been adjusted for inflation at the date that they are incurred.

	battery replacement	inverter replacement	**Total**
Year 1	0	0	**0**
Year 2	0	0	**0**
Year 3	0	0	**0**
Year 4	0	0	**0**
Year 5	0	0	**0**
Year 6	0	0	**0**
Year 7	0	0	**0**
Year 8	0	0	**0**
Year 9	0	0	**0**
Year 10	0	0	**0**
Year 11	1300	0	**1300**
Year 12	0	450	**450**
Year 13	0	0	**0**
Year 14	0	0	**0**
Year 15	0	0	**0**
Year 16	0	0	**0**
Year 17	0	0	**0**
Year 18	0	0	**0**
Year 19	0	0	**0**
Year 20	0	0	**0**
Year 21	0	0	**0**
Year 22	0	0	**0**
Year 23	0	0	**0**
Year 24	0	0	**0**
Year 25	0	0	**0**
Year 26	0	0	**0**
Year 27	0	0	**0**



The bottom line

The table and graph below show the discounted costs for the project (including the initial capital required for the installation), against the total discounted benefits from income and savings on electricity bills.

The system pays for itself in 14 years.

	Discounted benefits	Cumulative benefits	Discounted costs	Cumulative costs	**Cashflow**
Year 1	913	913	0	9101	**-8188**
Year 2	877	1790	0	9101	**-7310**
Year 3	844	2634	0	9101	**-6467**
Year 4	811	3445	0	9101	**-5656**
Year 5	780	4224	0	9101	**-4877**
Year 6	749	4974	0	9101	**-4127**
Year 7	720	5694	0	9101	**-3407**
Year 8	693	6387	0	9101	**-2714**
Year 9	666	7052	0	9101	**-2049**
Year 10	640	7692	0	9101	**-1409**
Year 11	615	8307	847	9948	**-1640**
Year 12	591	8899	281	10229	**-1330**
Year 13	569	9467	0	10229	**-762**
Year 14	547	10014	0	10229	**-215**
Year 15	525	10539	0	10229	**310**
Year 16	505	11044	0	10229	**815**
Year 17	486	11530	0	10229	**1301**
Year 18	467	11997	0	10229	**1767**
Year 19	449	12445	0	10229	**2216**
Year 20	431	12877	0	10229	**2647**
Year 21	415	13291	0	10229	**3062**
Year 22	399	13690	0	10229	**3461**
Year 23	383	14073	0	10229	**3844**
Year 24	368	14441	0	10229	**4212**
Year 25	354	14796	0	10229	**4566**
Year 26	340	15136	0	10229	**4907**
Year 27	327	15463	0	10229	**5234**