Alps electrical

Solar & Electrical Solutions

Your Solar Proposal

SCAN HERE

01642 790 489

NAPIT

MCS CERTIFIED

PART P Electrical Safety Registered Installer

TRUSTMARK Government Endorsed Quality

Checkatrade

Why Choose Us?

Solar and Battery

10 Verified Review

Great work from this family business, very professional and communicated well throughout. The work was completed promptly, and very tidy. Would recommend.

Solar Panel, Battery Storage Install, Garage Rewire

10 Verified Review

Absolutely faultless service from start to finish from Alps Electrical. From the moment I made the first call I knew I had made the right decision. Punctual, efficient with fantastic communication throughout the whole project. I have no hesitation in recommending Alps Electrical. Thank you so much Andy, Bella and Leo!

Solar panels and battery storage system

10 Verified Review

Excellent service from start to finish. Very knowledgeable about the system being installed. Helped me with advice on what I needed to get the best from the system. When completed the system was set up on the app and online. All rubbish removed from the job afterwards. Highly recommend Alps Electrical.

Replacing solar panels inverter.

10 Verified Review

I chose Alps because they had such good reviews on check a trade and I was not disappointed! The service has been excellent From start to finish. Andy and Leo arrived on time, completed the job and left everything very tidy. I would happily recommend this company for any electrical work.

Installation of roof solar and battery

10 Verified Review

From 1st contact through to completion the customer service, advice and quality of install has been excellent. Not 1 complaint I can think of and everything works exactly as expected. It was a good experience and very helpful with advice on what to get and after support with app and usage.

Solar Panels and Battery installation

10 Verified Review

Excellent, professional and friendly service. I had 8 solar panels and 4 batteries installed all in a day. I knew I wanted solars - but hadn't got a clue how to go about it. Scottish Power (my previous supplier) were hopeless at advising me. So with Alps, the planning, fitting and aftercare service was faultless - including negotiating the specialist energy contract with Octopus Energy. I felt very safe and reassured by the whole process. If you are thinking of solar panels - with or without battery storage - don't hesitate to contact Alps Electrical. Great service at a reasonable price.

Replacement of old night storage heaters for new night storage heaters

10 Verified Review

I started to search for a good electrician for my mother, to replace her night storage heaters with new ones. I got the contact of Andy and his son from checkatrade and also done some research into their reviews and decided to get a quotation. We had already got quotations from other companies, but my mother and I were very impressed with the communication, advice and quotatiin provided by Alps. Andy and his son did a fantastic job, completed within the day, cleaned everything, took the old system away to dispose. My mother said they are very professional and I would recommend to all.

Solar and battery installation

10 Verified Review

Couldn't be happier with the service we received from Alps electrical. From the initial meeting with Andy I was convinced that they were a company that were committed to providing a faultless service. Andy's knowledge regarding the size and install of the system filled me with confidence, and this coupled with Isabella's communication and admin skills made the early stages seamless. The installation was again without issue and it was completed to the highest standards. I received the MCS certification next day.I have no issue with using Alps again and I would highly recommend their services

Solar panels and battery storage

10 Verified Review

Great service from start to finish. Installed Solar panels with battery storage. Advised on size of system to suit my needs including number of panels and batteries. Excellent workmanship throughout the job. Arrived early and worked late and none stop until job was completed. All set up and working including app and walked through system with me. Highly recommend these guys

Install of Solar Panels

10 Verified Review

Fantastic service from start to finish. Great advise and fully informed throughout from Andy. The scaffold was only up a few day too. I am over the moon with the install and am so impressed with my savings so far. The solar panels have been up and running, and I am extremely happy. We have had the washer on, dryer on, TV etc and all powered by the sun and using no electric from the grid!! The battery is great too as any power we do not use is stored for when the sun is not out. Great stuff. Would recommend.

EV charger installation and installation of garage electrics

10 Verified Review

Finding a local electrician to complete the work I required was proving very difficult indeed. Alps Electrical were completely different, responding quickly to my initial enquiry and agreeing to come along to do an on-site survey in a timely and convenient manner. Andy and his wife make a great team and they helped ensure everything went to plan. The quotation for the work carried out was consistent and competitive with on-line quotations I had already received. Andy and the team at Alps Electrical did a great job with very little fuss and very little mess. Highly recommended by me.

Smart EV charger and Solar system install.

10 Verified Review

Andy has installed my smart EV charger and solar system/battery system at my property. I cannot recommend Alps Electrical highly enough. They gave good detailed advice prior to carrying out any work, the install s were both completed on time, in a very professional manner and with zero mess left behind. Andy has been happy to answer/assist with any questions I have had post install, making the whole process stress free. Don't hesitate to use Alps electrical.

Renewing of fuse board

10 Verified Review

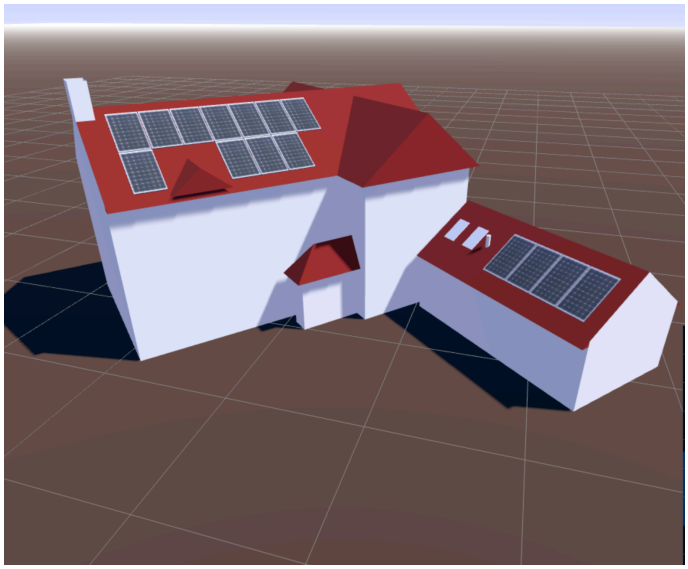
Andy and his team done work for my mother a few months ago installing night storage heaters, so it was a no brainer that we used Andy again due to his professional approach and high quality workmanship. My mother is very pleased once again, and Andy went above and beyond from start to finish, amazing team couldnt recommend them enough. Thanks Andy yours Maria and Richie

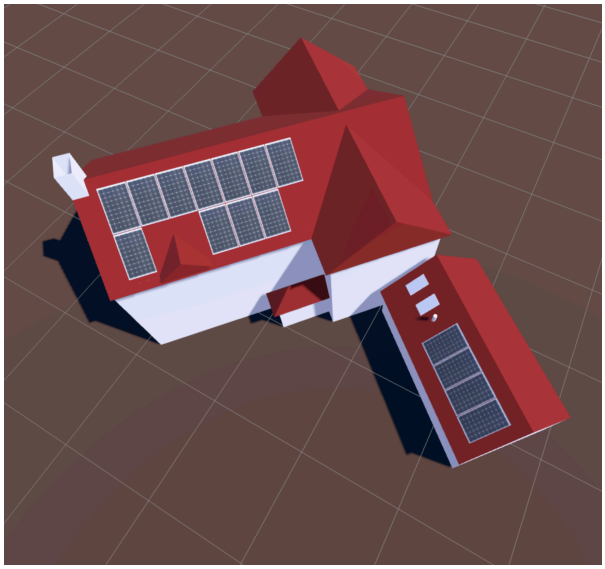
These are just a handful of over 270 amazing reviews we have received on Checkatrade

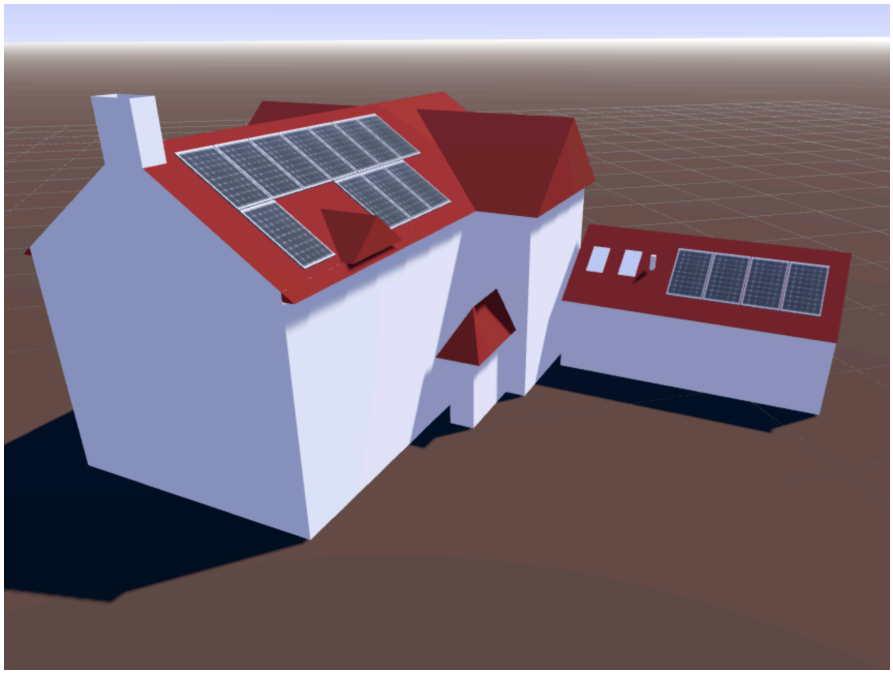
When we say we provide a **5 star service** we really do mean it. If you choose **ALPS Electrical** you are **guaranteed** a first class experience from start to finish.

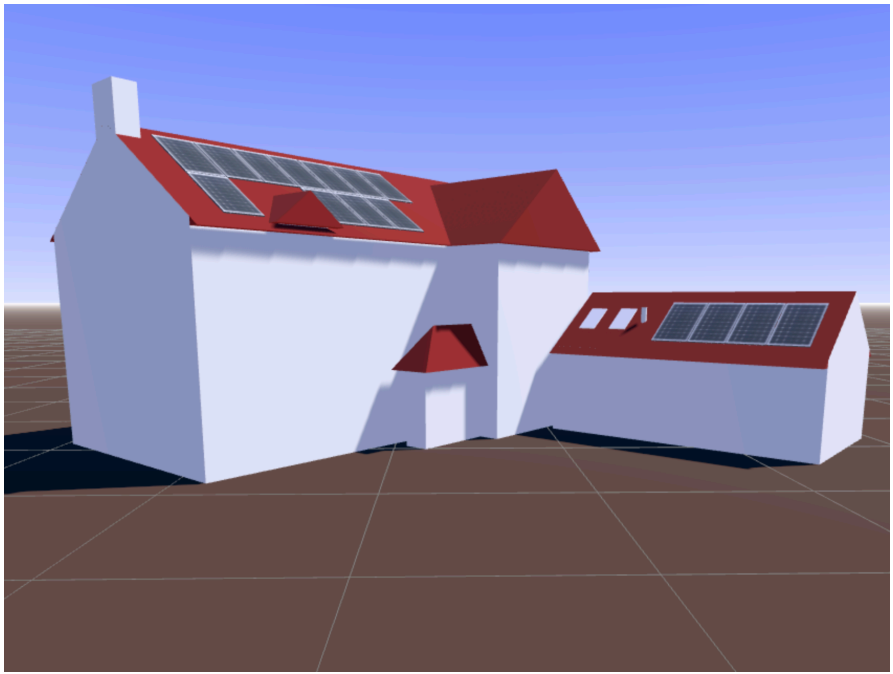
Choose **quality**, choose **reliability**, choose **Alps**.

3D MODEL - 9 DANESBROOK









YOUR SOLAR QUOTE

Hi Gareth.

Thanks for choosing us to provide a design for a solar PV system at 9 Danesbrook, TS17 0QX.

We're delighted to supply the attached proposal for a 7.2 kW solar array.

We expect your system to generate 5,684 kWh of clean electricity every year, and save 1,207 kg CO_2 of carbon.

There are full details on the following pages. We hope you enjoy the read!

Kind regards,

Andy Pemberton

ALPS ELECTRICAL LTD

7.20 kW PV System

11 x 480W & 4 x 480W panels,
1 x FOX H1 6KW

£14,300 inc VAT

Expected payback 9 years. Estimated first year savings £1,338

5,684 kWh/yr

Annual CO2 savings of 1,207 kg

System Overview

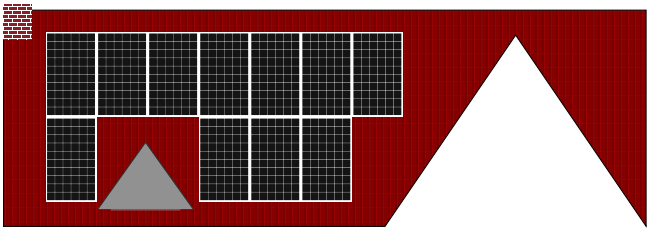
Your system comprises **15 Jinko All Black 480W solar panels** to collect sunlight and turn it into DC electricity.

The panels will be connected to **1 FOX H1 6KW inverter**, which converts the DC electricity into mains (AC) electricity.

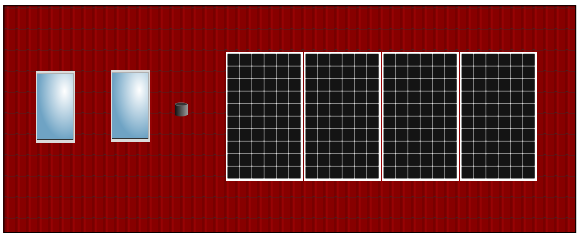
A Tesla Powerwall battery storage system will allow you to store excess energy from sunny days, so that you can use your generated electricity at night too.

We include all the isolators, wiring and meters needed to connect the system safely to your electrical system. Your system will be installed and certified by our trained installation team.

Roof South West



Roof North West



Solar Panels: Jinko All Black 480W x 15

Jinko All Black 480W

Model	JKM480N-60HL4-V-BF-JK03M
Power	480 watts
Dimensions	1134 x 1903mm

Inverter: FOX H1 6KW

FOX ESS 6KW INVERTER

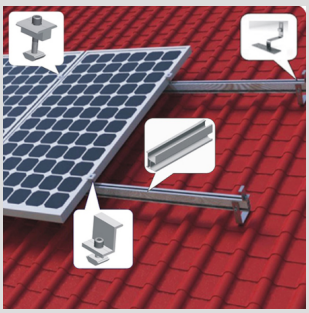
AC Power	7800 watts
Trackers	2

System components

Battery: Tesla Powerwall

Powerwall 2

Capacity	13.500 kWh
Quantity	1



Mounting: Fastensol pitched roof mounting system

Fastensol are an excellent value, fully MCS accredited choice for pitched roof mounting systems, suitable for the majority of roof types.

Designed for	Concrete Tile roofs
Colour	Not specified

System Performance

We have made an estimate of the annual energy generation of your system. This takes into account the following factors that affect the output of a solar array.

The location of the system

Sunlight is weaker near the poles than near the equator. We use data from a meteorological model of the intensity of sunlight over the course of the year in different locations all over the world.

The orientation of the system

Solar panels that face south receive a little more sunlight than panels that face east or west. However, in diffuse light the orientation of the panels makes little difference, so the effect is less marked than many people imagine.

The degree of shading

If you have trees, neighbouring buildings or nearby high ground that will shade your PV array, the output of the system will be reduced. We have used a 'sunpath diagram' that estimates how often sunlight will be blocked from reaching the panels.

We expect your system to generate

5,684 kWh per year

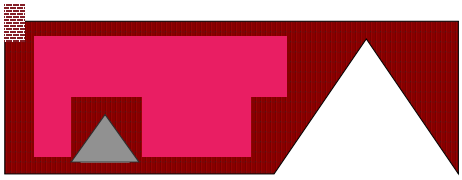
Installation data

Installation capacity of PV system – kWp (stc)	7 kWp
Orientation of the PV system – degrees from South	See roof diagrams
Inclination of system (pitch) – degrees from horizontal	See roof diagrams
Postcode region	Zone 10

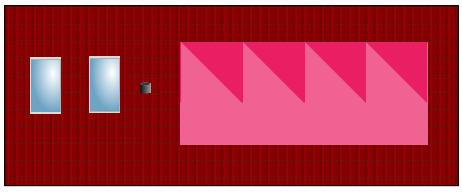
Performance Calculations

kWh/kWp (Kk)	See sunpath diagrams
Shade Factor (SF)	See sunpath diagrams
Estimated output (kWp x Kk x SF)	5684 kWh

Roof diagrams

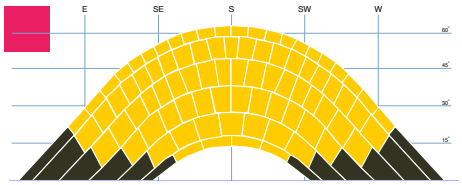


Roof South West Orientation: 41° Pitch: 34°

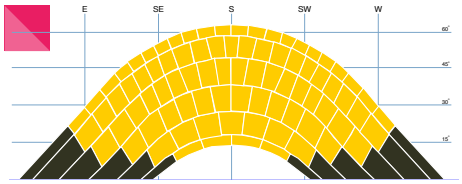


Roof North West Orientation: 131° Pitch: 36°

Sunpath diagrams



Shade factor: 1.00 Kk: 869



Shade factor: 1.00 Kk: 571

Important note: The performance of solar PV systems is impossible to predict with certainty due to the variability in the amount of sunlight from location to location and from year to year. This estimate is based upon a model that takes account of meteorological data at your location and makes an allowance for losses due to shading of the panels. This is a complex calculation however, and no model can be 100% accurate. It should not be considered a guarantee of performance.

If shading is present on your system that will reduce its output to the factor stated. This factor was calculated using industry standard shading methodology and we believe that this will yield results within 10% of the actual energy estimate stated for most systems.

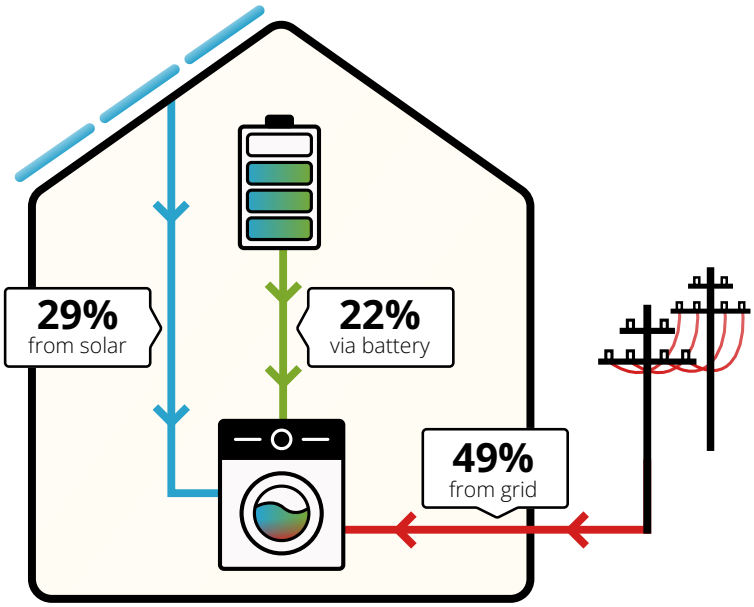
Battery Storage

We have included a 13.5 kWh battery storage unit in this proposal. On sunny days, when your PV array is producing more electricity than you are using in the property, you will be able to store the spare energy and use it at night.

Battery storage systems increase the proportion of electricity generated by a solar PV array that is consumed in the property rather than exported to the grid. Excess solar energy that is not needed during the day can be stored and subsequently used overnight

This leads to financial savings, as you replace expensive imported electricity (at 31p per kWh) with free electricity generated by your solar panels.

Where will your power come from?



Annual Power Requirement: 5684 kWh

How battery storage reduces your grid dependence

Including battery storage will reduce your grid dependence by an extra 22% compared with a PV-only system. You should only need to buy around 49% of your power from the grid.

51%
total reduction of grid dependence with battery

Estimated PV self-consumption – PV only	
Assumed occupancy archetype	in half the day
Assumed annual domestic electricity consumption	8500 kWh
Expected solar PV self-consumption (PV Only)	2432 kWh
Grid electricity independence / Self-sufficiency (PV Only)	29%
Estimated PV self-consumption – with EESS	
Assumed usable capacity of electrical energy storage device, which is used for self-consumption	13.1 kWh
Expected solar PV self-consumption (with EESS)	4316 kWh
Grid electricity independence / Self-sufficiency (with EESS)	51%

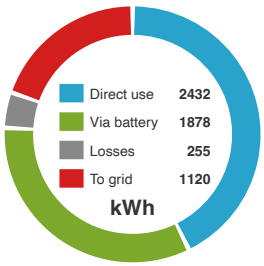
Important note: Rather than using the MCS calculation model we have used an alternative calculation system provided by Easy PV to determine the likely self consumption of your property. This may be because the estimated system output for this solar PV system is over 6000 kWh annually, or has a battery capacity of over 15.1 kWh, or there are other factors that mean this calculation system will be more accurate for your specific solar PV system. We have assumed that your annual electricity consumption is 8500 kWh.

The energy performance and benefits of EESS is impossible to predict with certainty due to the numerous functions a system can be programmed to perform. This estimate is given as guidance only. It should not be considered as a guarantee of performance.

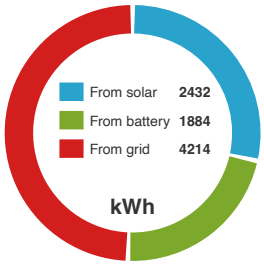
Your energy explained

In addition to the MCS calculation of system output we have run a more detailed model of your system to estimate how much of the electricity generated by the system you are likely to use yourself and how much will go to the grid.

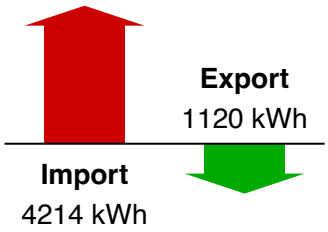
Annual Generation



Annual Consumption

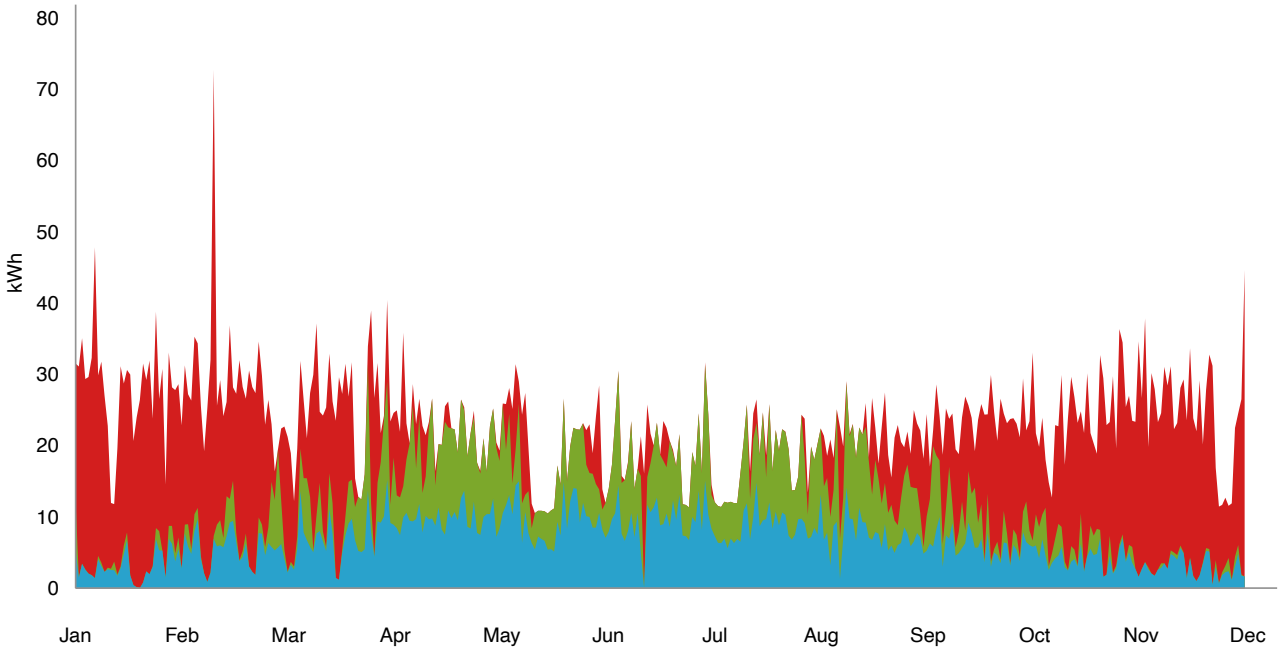


Annual Import/Export



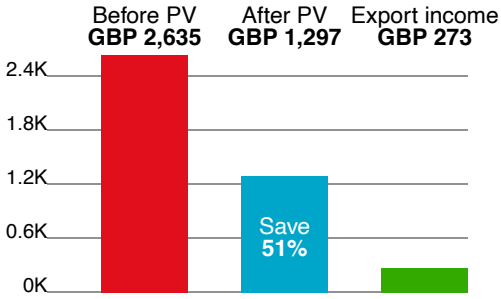
Where your electricity will come from in a typical year

Based on an electricity usage of 8,500 kWh per year, the graph below shows how much electricity used in the property is expected to come directly from the solar panels (blue) , how much is expected to come from battery storage (green), and how much is expected to be imported from the grid (red).



Financial Benefits

Based on our model we expect you to self consume 4,316 kWh of the 5,684 kWh of electricity the system should generate - providing 51% of the annual electricity consumption of 8,500 kWh in the property.



At an electricity tariff of £0.31/kWh, that's a saving of **£1,338** on your electricity bill - down from £2,635 at present! Your new bill could be **just £1,297 per year.**

1,365 kWh of excess solar energy will be exported to the grid. If you are paid by your supplier at £0.20 per kWh, **you will receive an additional £273 in income from them.**

Overall, your savings and benefits are expected to be around £1,611 in the first year after the system is installed.

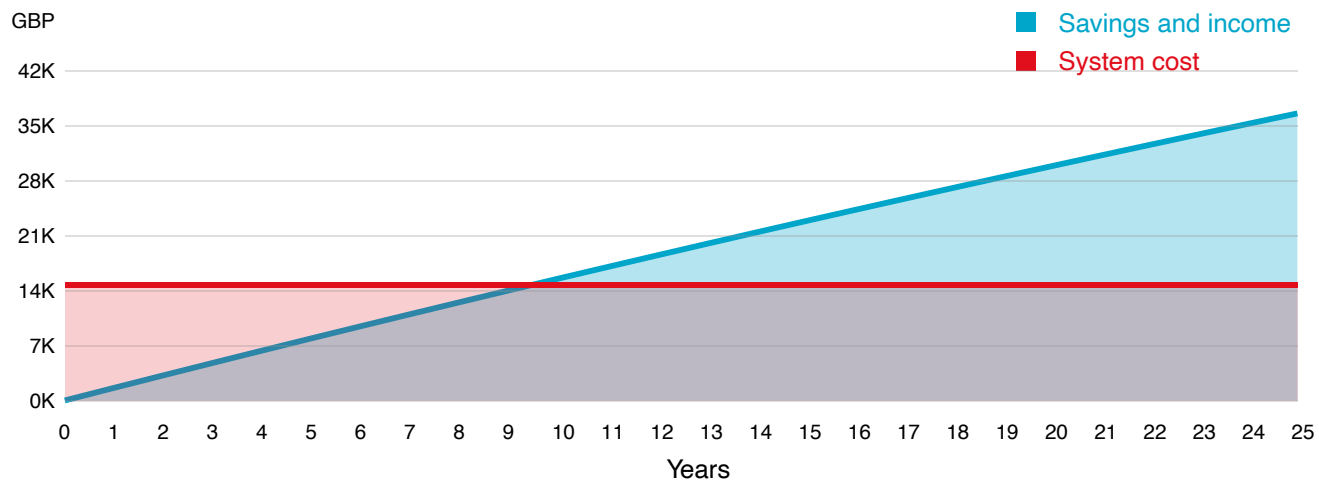
Payback

Using a more detailed model that also takes account of longer term factors such as inflation, gradual degradation in panel output over time and financial discount rates[1], **we expect the system to pay for itself in 9 years.**

Over a projected 25 year lifetime, we expect the system to have a **Net Present Value of £22,235.** A positive net present value is a good indication that an investment is financially worthwhile.

Disclaimer: Nothing in life is certain. Cloudy periods, growing trees, and even pigeon droppings can affect the output of your array. No-one really knows how electricity tariffs will change in the future, or what inflation will be in 10 years time. We have based our calculations on an inflation rate of 3%, electricity price that rises with inflation, a discount rate[1] of 3.2%, an import electricity tariff of 31p/kWh, and export payments of 20p/kWh. Returns are not guaranteed.

[1] Financial discounting is a method used to calculate the worth of future money in today's terms.



Environmental Benefits

Your new PV system will supply your property with clean, green electricity - and in sunny periods some will also be exported back to the grid.

Overall you'll be making a big contribution to reducing CO_2 not just by lowering the carbon intensity of your own electricity, but by putting low-carbon electricity back in the grid for others to use too.

Your current electricity supply produces

1,805 kg CO_2 each year

52% will be supplied by solar, saving

941 kg CO_2 each year

1,254 kWh will be exported, saving

266 kg CO_2 each year

Total savings

1,207 kg CO_2 each year

Your yearly CO_2 reduction of 1,207 kg is equal to...

a car ride of 4,310 miles

CO_2 absorbed by 55 trees

Disclaimer: We calculate and compare the likely annual CO_2 emissions for your home based on your generation and usage with the solar PV system detailed in this document versus estimates for a property like yours using energy from the grid. Your actual CO_2 emissions will depend on lots of factors, like how much energy your solar panels generate, how much of this energy you use directly and how much energy you continue to use from the grid. To calculate what these savings equate to in miles driven, we base this on the CO_2 emissions of an average sized diesel car as outlined in the UK government's 'Greenhouse gas reporting: conversion factors 2022' (https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2022). To calculate what these savings equate to as the average amount of CO_2 absorbed by trees, we base this on a rate of 25kg per tree per year. Trees absorbs anywhere between 10 and 40kg of CO_2 per year on average, depending on a whole host of factors including the species, location, planting density, and age.

Quote

Alps electrical
Solar & Electrical Solutions

Gareth
9 Danesbrook
TS17 0QX

Quote reference: 827559
Quote date: 03/04/2024
Quote by: Andy Pemberton

Description of goods and services	Price
Goods	
Total System Cost	£14,300.00
Total before VAT	£14,300.00
VAT at 0%	£0.00
Total including VAT	**£14,300.00**

Order form

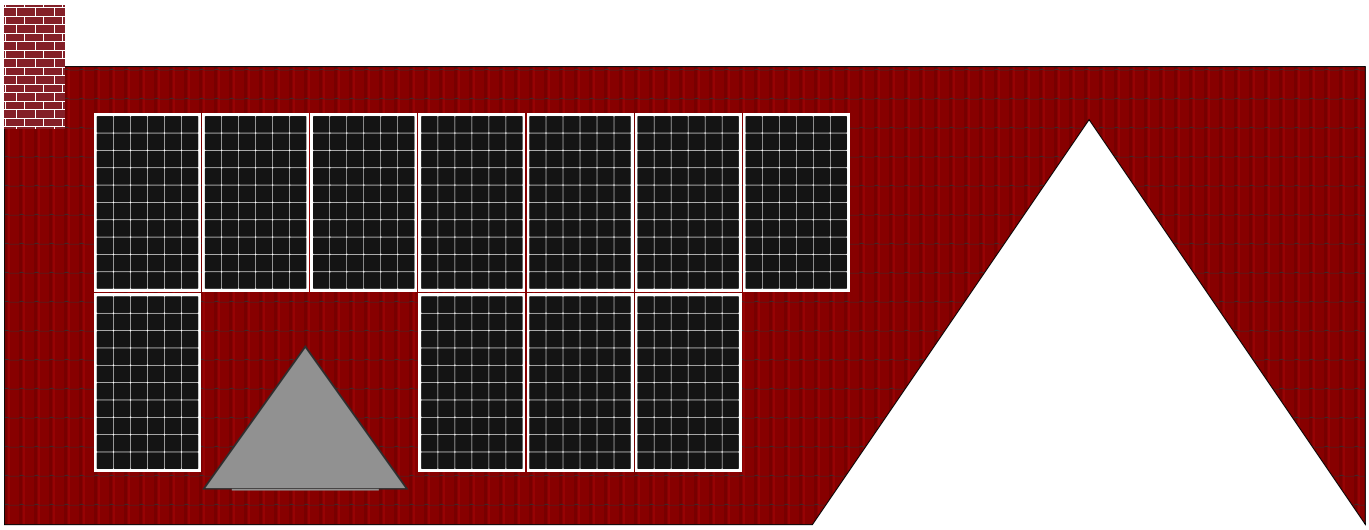
To proceed with this order please sign below to acknowledge that you have read and accept the information contained within this quote document and our terms and conditions.

Customer signature **Customer name** **Date**

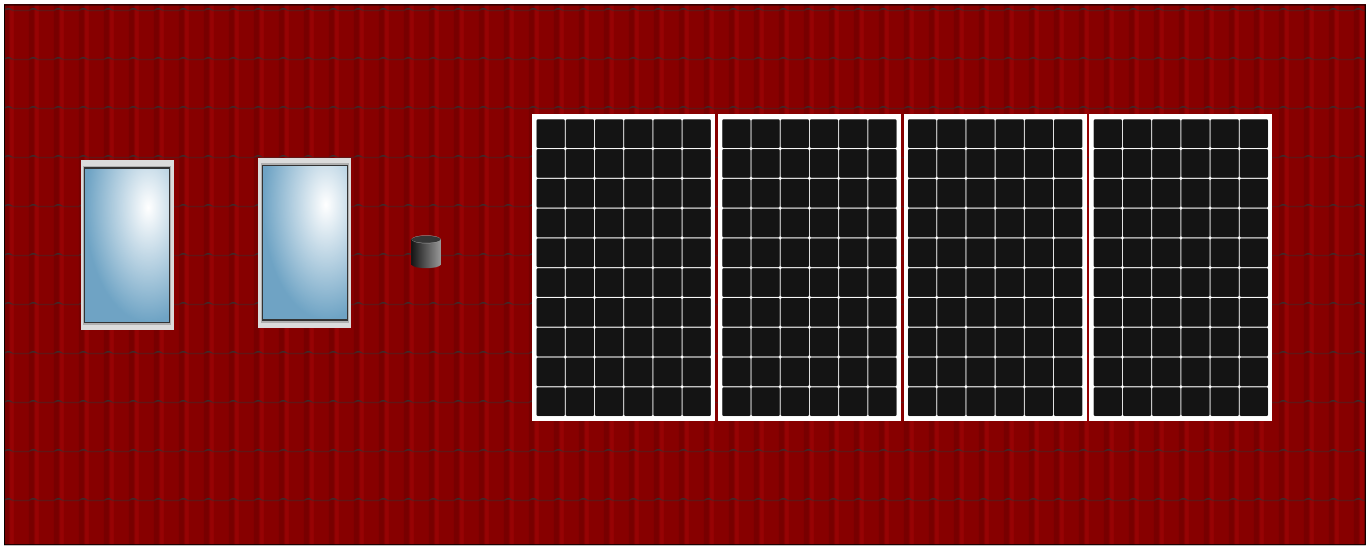
_____ _____ _____

Roof Layout

Roof South West



Roof North West



Component list

Item	Quantity
 Jinko All Black 480W solar panel	15
 FOX H1 6KW inverter	1
 **NET** Emlite Bi-directional Meter ECA2.n*	1
 Label sheet	1
 AC isolator - IMO - 63A 4-pole	2
 Tesla Powerwall	1
 MC4 4mm Connector Pair	4
 50m reel of 4mm2 solar cable	2
 Fastensol black universal clamp	38
 Fastensol black end cap	16
 Fastensol portrait concrete tile roof hook	38
 Fastensol rail splice	6
 Fastensol silver rail 3550mm	11

Inverter checks

FOX H1 6KW

Panels

PV power	**7200**	Rated AC output	**7800**

Input 1: 11 Jinko All Black 480W solar panels in 1 strings

Panels		**Inverter**	
PV power	**5280 W**		
Open circuit voltage at -10° C	**513 V**	Max DC voltage	**600 V**
V_{mpp} at 40° C	**375 V**	V_{mpp} lower limit	**80 V**
V_{mpp} at -10° C	**425 V**	V_{mpp} upper limit	**550 V**
I_{mpp} at 40° C	**14 A**	Max DC input current	**13 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

Input 2: 4 Jinko All Black 480W solar panels in 1 strings

Panels		**Inverter**	
PV power	**1920 W**		
Open circuit voltage at -10° C	**186 V**	Max DC voltage	**600 V**
V_{mpp} at 40° C	**136 V**	V_{mpp} lower limit	**80 V**
V_{mpp} at -10° C	**154 V**	V_{mpp} upper limit	**550 V**
I_{mpp} at 40° C	**14 A**	Max DC input current	**13 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

Electrical

FOX H1 6KW

AC Isolator

A AC isolator - IMO - 63A 4-pole has been specified for this input

Current

The rated isolator current (63A) is greater than the rated inverter current (54.5A)

Phases

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

Input 1

DC Isolator

Integrated isolator

This inverter contains an integrated DC Isolator.

Cable

30m of 4mm2 solar cable has been specified

Voltage drop

Voltage drop at maximum power point at 40°C will be around **3.57 V (0.95 percent)**

Input 2

DC Isolator

Integrated isolator

This inverter contains an integrated DC Isolator.

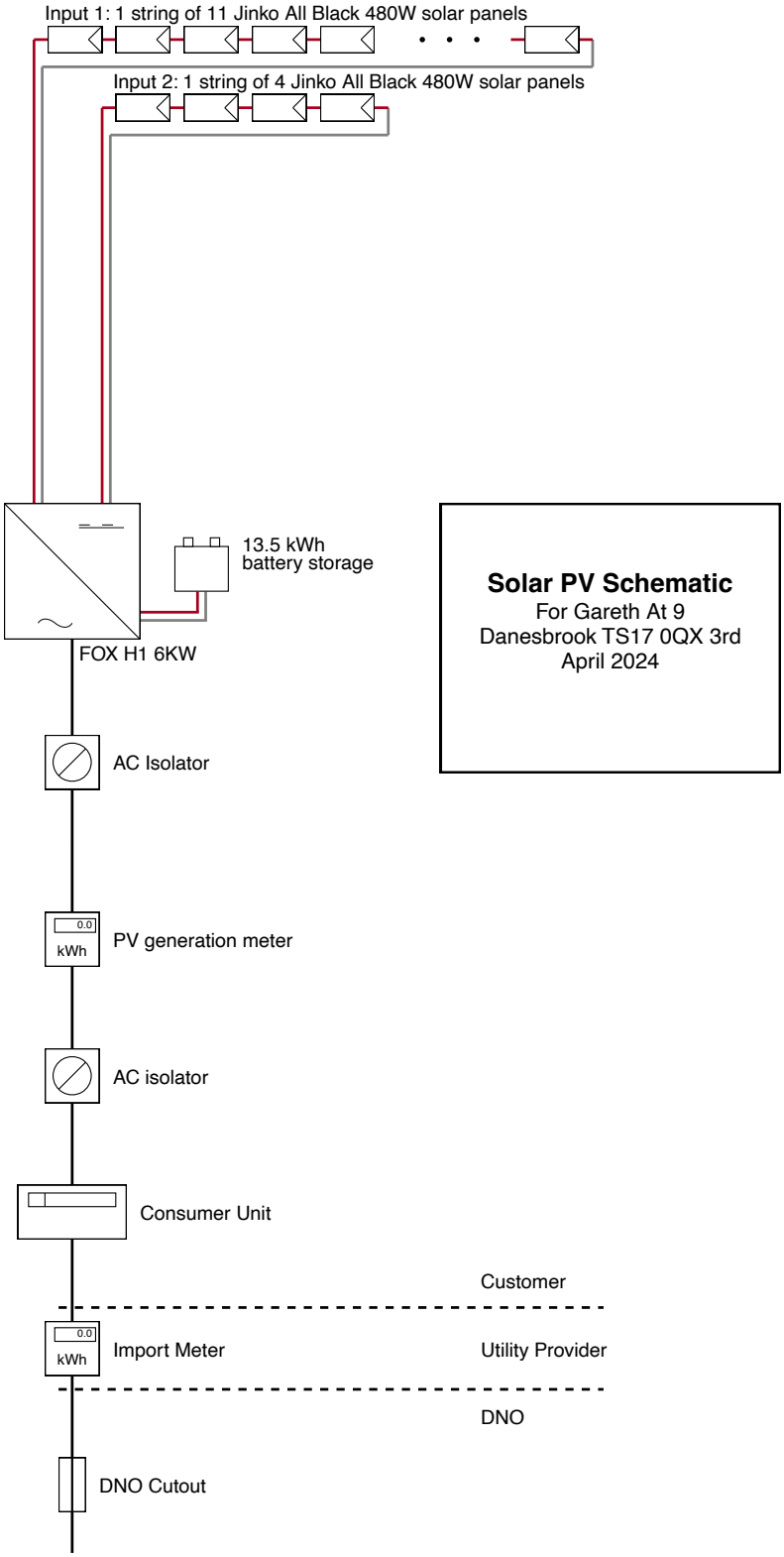
Cable

10m of 4mm2 solar cable has been specified

Voltage drop

Voltage drop at maximum power point at 40°C will be around **1.19 V (0.88 percent)**

Schematic diagram



Structural calculations

Weight loading calculations

Roof South West

Weight of solar panels and mounting	308.2 kg
Area of solar array	23.7 m^2
Loading imposed by solar array	0.13 kN/m^2
Dead load from roof covering	0.45 kN/m^2
Total dead load of solar array, mounting and roof covering	**0.58 kN/m^2**
Permitted dead load	**0.785 kN/m^2**

The solar array, mounting system, and roof covering are expected to impose a total dead load on the roof of **0.58kN/m^2**. This is less than the permitted dead load for the roof of **0.785kN/m^2**.

Snow Loading

Snow zone	4
Altitude	35
Roof pitch	34
Total imposed load of solar array, mounting and snow	**0.63 kN/m^2**
Permitted imposed load	**0.75 kN/m^2**

The maximum combined imposed loading from the solar array, mounting and snow is expected to be **0.63 kN/m^2**. This is less than the design imposed load for a truss roof of **0.75 kN/m^2**.

Roof North West

Weight of solar panels and mounting	112.2 kg
Area of solar array	8.6 m^2
Loading imposed by solar array	0.13 kN/m^2
Dead load from roof covering	0.45 kN/m^2
Total dead load of solar array, mounting and roof covering	**0.58 kN/m^2**
Permitted dead load	**0.785 kN/m^2**

The solar array, mounting system, and roof covering are expected to impose a total dead load on the roof of **0.58kN/m^2**. This is less than the permitted dead load for the roof of **0.785kN/m^2**.

Snow Loading

Snow zone	4
Altitude	35
Roof pitch	36
Total imposed load of solar array, mounting and snow	**0.59 kN/m^2**
Permitted imposed load	**0.75 kN/m^2**

The maximum combined imposed loading from the solar array, mounting and snow is expected to be **0.59 kN/m^2**. This is less than the design imposed load for a truss roof of **0.75 kN/m^2**.

Wind loading calculations

The maximum force acting on a solar array from wind loading is given by the following formula in BRE Digest 489:

$$F = q_p \times C_{p\,net} \times C_a \times C_t \times A_{ref}$$

Roof South West

Q_p	908 Pa
in	From Fig 34 in Guide to the Installation of Photovoltaic Systems for a building 10 m high, windzone 2, in urban terrain, at a distance of greater than 20km from the sea

$C_{p\,net}$	Roof Centre	Roof edge
Uplift	-1.3	-2.2
Pressure	1	1.1

C_a	1
At an altitude of 12m	

C_t	1
When there is no significant topography	

A_{ref}	23.74m^2

F	Roof Centre	Roof edge
Uplift	**-28020N**	**-47419N**
Pressure	**21554N**	**23710N**

With 28 roof hooks we should allow for an uplift force per hook in the central zone of **1001N**, rising to **1694N** at the edges. If 2 screws are used per roof hook, this equates to **500N**per fixing in the central zone, and **847N** at the edges.

Concrete tile roof hooks are fixed with screws that pass through the 5mm plate of the roof hook and are then buried fully into the rafter beneath. So there is approximately 65 mm of thread in the timber. The pull-out force in C16 timber is given by tables and formulae in BS5268 Part 2:

$$17.3 \times 1.25 \times 65 = \mathbf{1406N}$$

The pullout force on the fixings is more than the expected wind loading, even when the fixings are close to the edge of the roof.

Roof North West

Q_p	908 Pa
in	From Fig 34 in Guide to the Installation of Photovoltaic Systems for a building 10 m high, windzone 2, in urban terrain, at a distance of greater than 20km from the sea

$C_{p\ net}$	Roof Centre	Roof edge
Uplift	-1.3	-2.2
Pressure	1	1.1

C_a	1
At an altitude of 12m	

C_t	1
When there is no significant topography	

A_{ref}	$8.63m^2$

F	Roof Centre	Roof edge
Uplift	**-10189N**	**-17243N**
Pressure	**7838N**	**8622N**

With 10 roof hooks we should allow for an uplift force per hook in the central zone of **1019N**, rising to **1724N** at the edges. If 2 screws are used per roof hook, this equates to **509N**per fixing in the central zone, and **862N** at the edges.

Concrete tile roof hooks are fixed with screws that pass through the 5mm plate of the roof hook and are then buried fully into the rafter beneath. So there is approximately 65 mm of thread in the timber. The pull-out force in C16 timber is given by tables and formulae in BS5268 Part 2:

$$17.3 \times 1.25 \times 65 = \mathbf{1406N}$$

The pullout force on the fixings is more than the expected wind loading, even when the fixings are close to the edge of the roof.

Performance Estimate

Site details

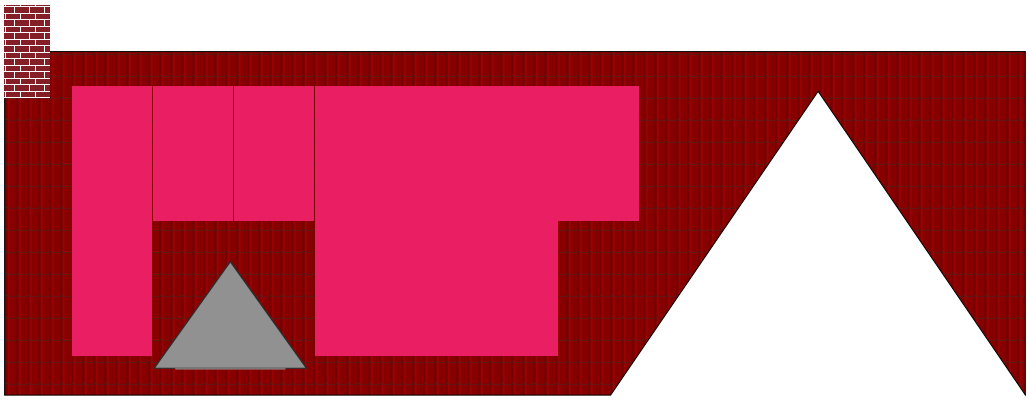
Client	Gareth
Address	9 Danesbrook

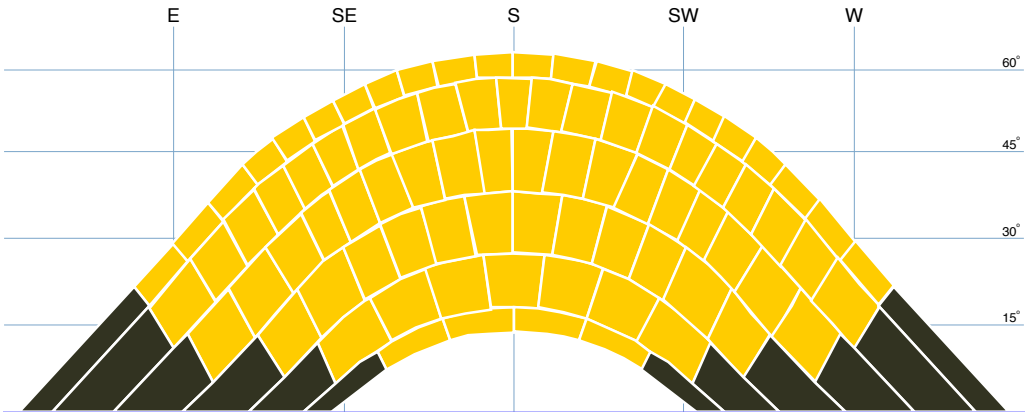
The sunpath diagram shows the arcs of the sky that the sun passes through at different times of the day and year as yellow blocks. The shaded area indicates the horizon as seen from the location of the solar array. Where objects on the horizon are within 10m of the array, an added semi-circle is drawn 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 H1 6KW

Input 1

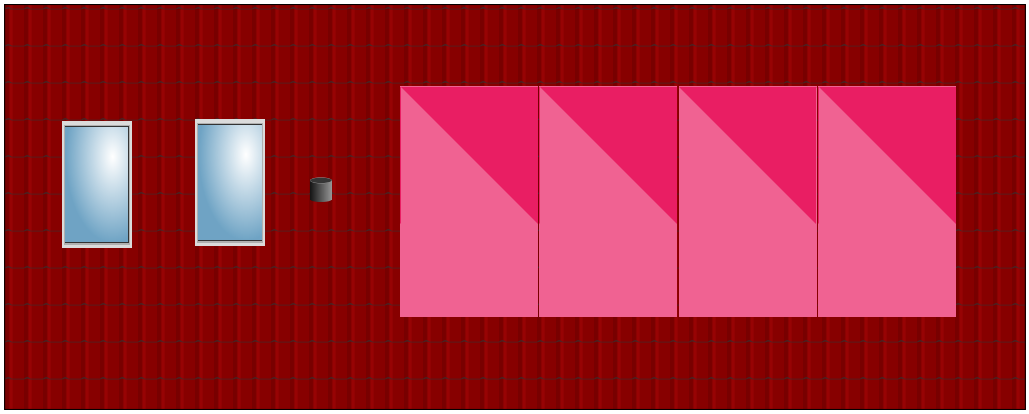


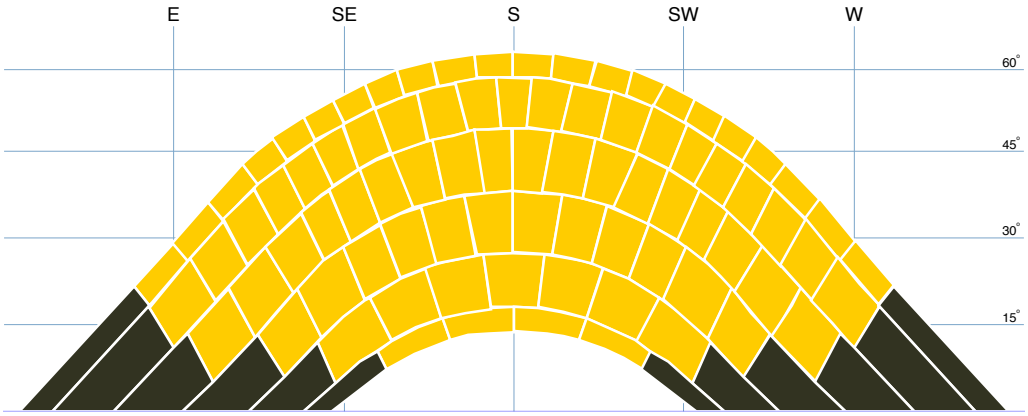


A. Installation data		
Installed capacity of PV system – kWp (stc)	**5.280**	kWp
Orientation of the PV system – degrees from South	**41**	°
Inclination of system – degrees from horizontal	**34**	°
Postcode region	**10**	

B. Performance calculations		
kWh/kWp (Kk)	**869**	kWh/kWp
Shade factor (SF)	**1.00**	
Estimated output (kWp x Kk x SF)	**4588**	kWh

Input 2





A. Installation data		
Installed capacity of PV system – kWp (stc)	**1.920**	kWp
Orientation of the PV system – degrees from South	**131**	°
Inclination of system – degrees from horizontal	**36**	°
Postcode region	**10**	

B. Performance calculations		
kWh/kWp (Kk)	**571**	kWh/kWp
Shade factor (SF)	**1.00**	
Estimated output (kWp x Kk x SF)	**1096**	kWh

Performance Summary

A. Installation data		
Installed capacity of PV system – kWp (stc)	**7.2**	kWp
Orientation of the PV system – degrees from South	**See individual inputs**	
Inclination of system – degrees from horizontal	**See individual inputs**	
Postcode region	**10**	
B. Performance calculations		
kWh/kWp (Kk)	**See individual inputs**	
Shade factor (SF)	**See individual inputs**	
Estimated output (kWp x Kk x SF)	**5684**	kWh

Important Note: The performance of solar PV systems is impossible to predict with certainty due to the variability in the amount of solar radiation (sunlight) from location to location and from year to year. This estimate is based upon the standard MCS procedure is given as guidence only for the first year of generation. It should not be considered as a guarantee of performance.

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 H1 6KW with a Tesla Powerwall battery

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

Charge rate	**7200 W**
Inverter charge efficiency	**98.5 %**
Inverter discharge efficiency	**98.5 %**
Battery efficiency	**90.0 %**
Round trip efficiency	**87.3 %**
Battery bank capacity	**13.5 kWh**
Max discharge depth	**97 %**
Usable capacity	**13.095 kWh**

Consumption 8500 kWh

Electricity consumed in the property each year

Generation 5684 kWh

Electricity generated by the PV array each year

Self consumption 78 %

Proportion of PV generation used in the property

Independence 51 %

Proportion of electricity consumption provided by PV

Import / Export 4214 / 1120 kWh

Electricity import / export each year from the property

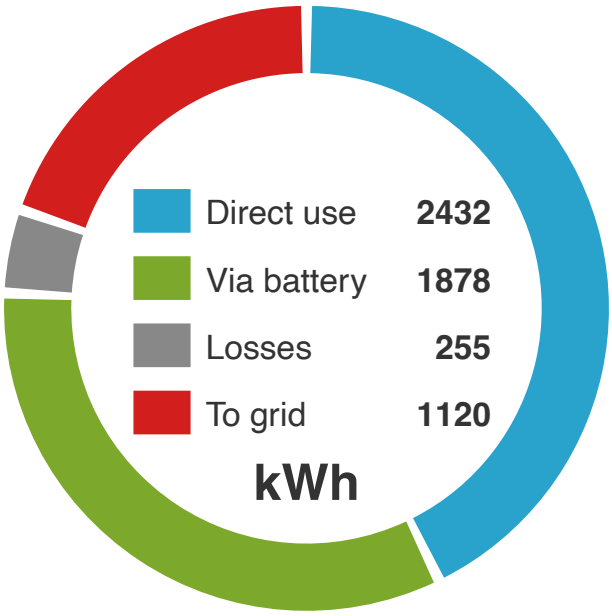
Utilisation 41 %

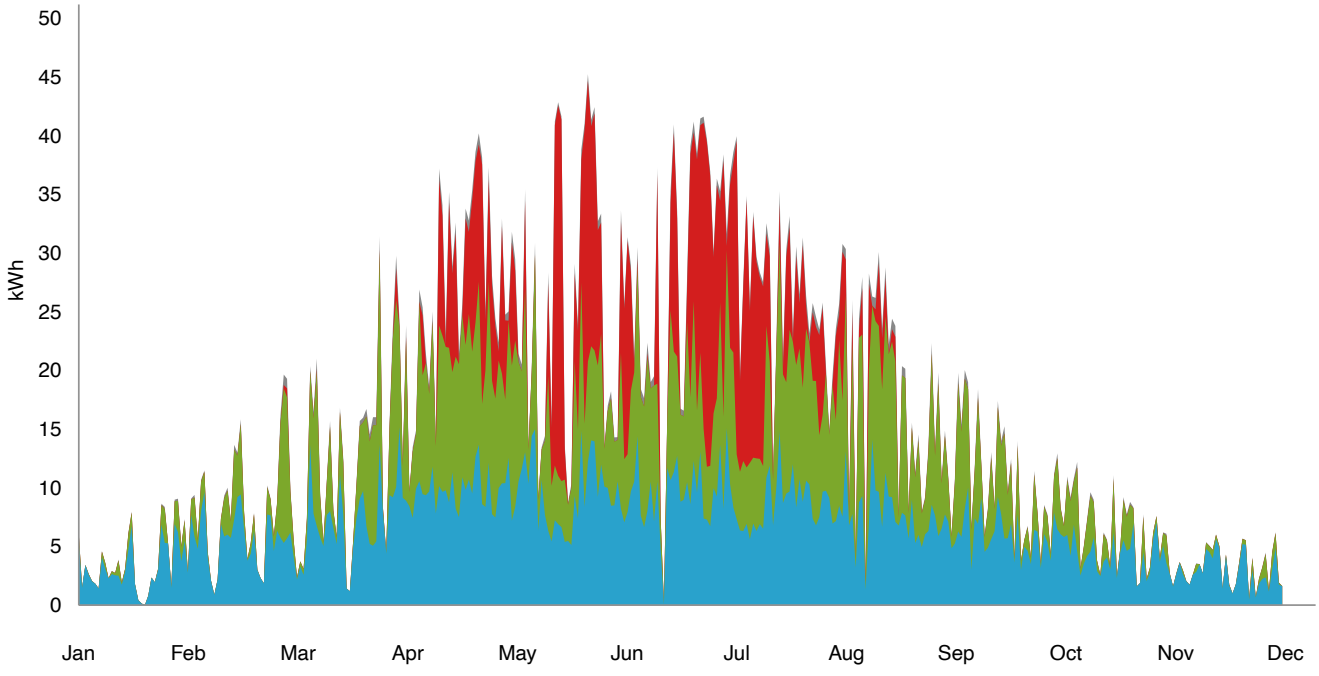
Average daily utilisation of the storage battery

Yearly generation

The solar PV array is expected to generate 5684 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.

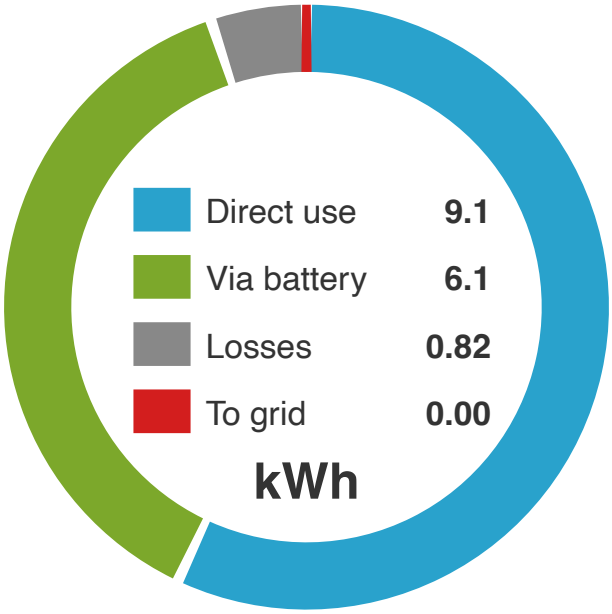
43% (2432 kWh) of the electricity generated is expected to be used directly in the property. 37% (2132 kWh) is directed to the battery for later use, although 255 kWh of this is lost during battery charging and discharging, leaving 1877 kWh for use in the property. The remaining generation (1120 kWh, or 20% of the total) is exported to the grid.

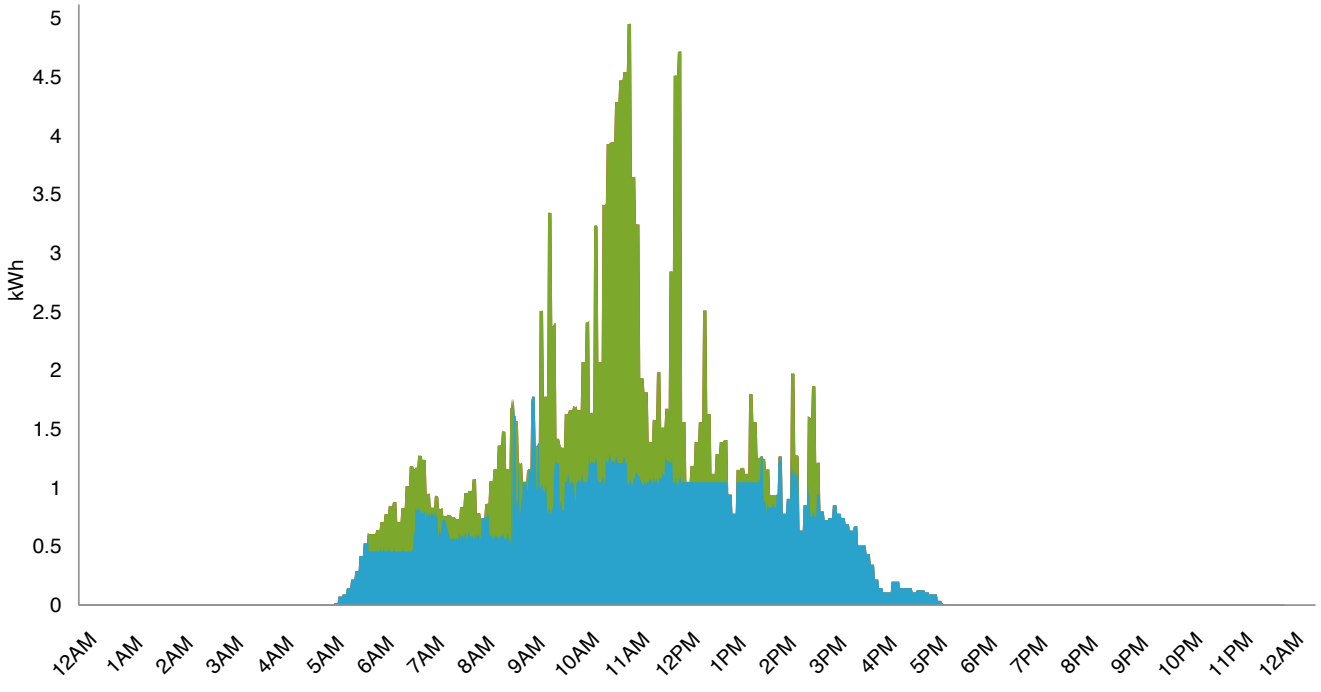




Daily generation

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 16 kWh. Of this, 9.1 kWh (57%) is used directly in the property, 6.9 kWh (43%) is stored in the battery for later re-use, and 0 kWh (0%) is exported to the grid.

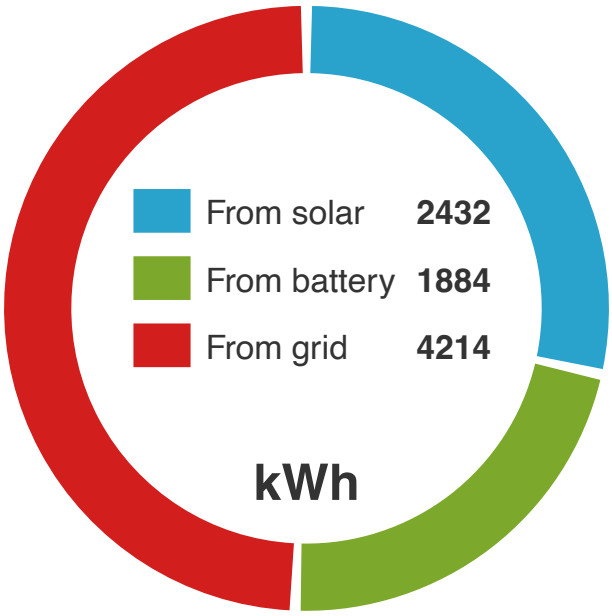


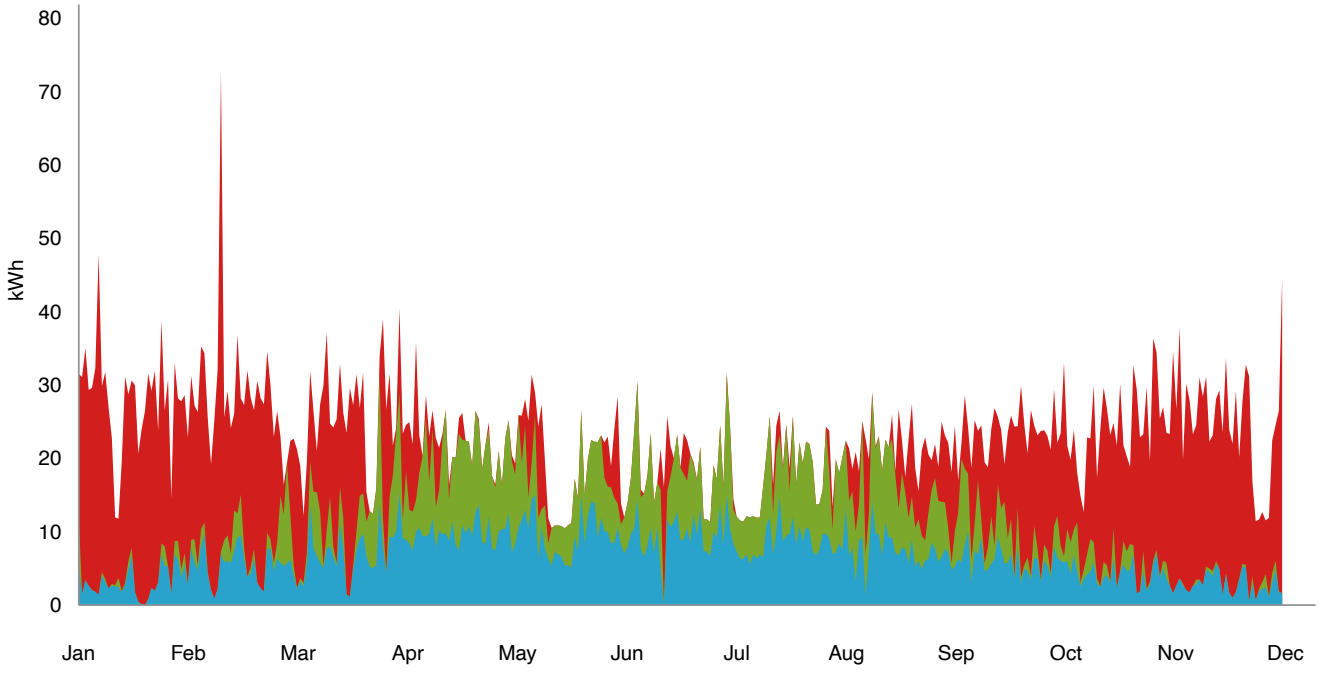


Yearly consumption

The property is expected to consume 8500kWh of electricity each year. Around 29% of this (2432 kWh) is expected to be supplied directly by the solar array. Another 22% (1884 kWh) is supplied from the storage battery. The remaining 49% (4214 kWh) is supplied from the grid.

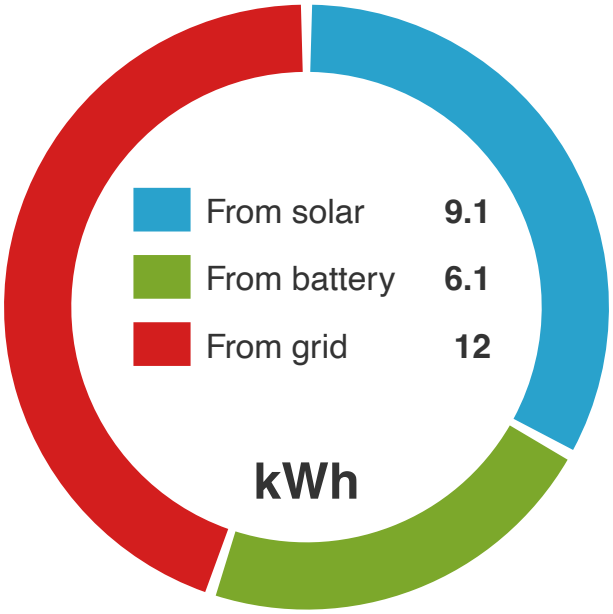
Overall, 51% (4316 kWh) of the electricity used in the property is expected to be supplied by the solar array and battery storage system. Without battery storage it would be 29% (2432 kWh).

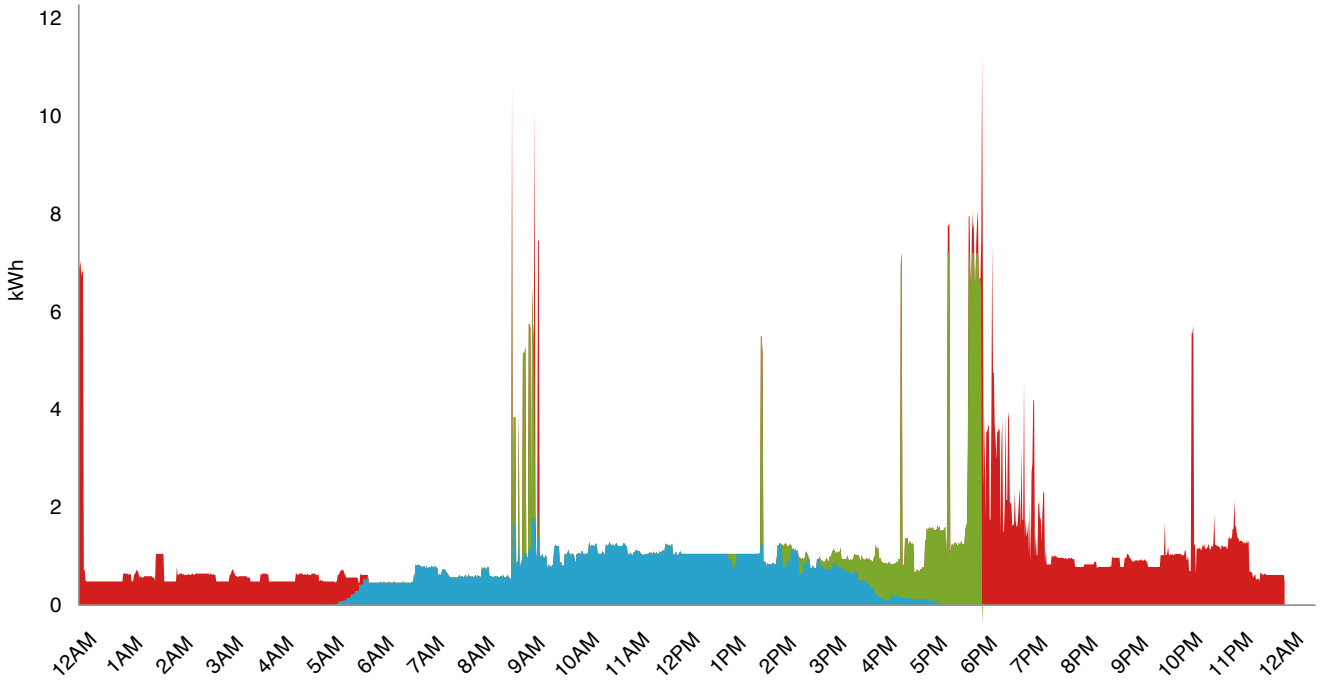




Daily consumption

This graph shows modelled consumption data over the course of the selected day (March 27th). Total electricity consumption on this day was 27.6 kWh, of which 9.1 kWh (33%) is expected to be supplied directly by the solar array, and a further 6.1 kWh (22%) drawn from the battery storage system. The remaining 12.4 kWh (45%) is imported from the grid.

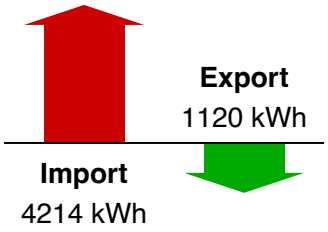


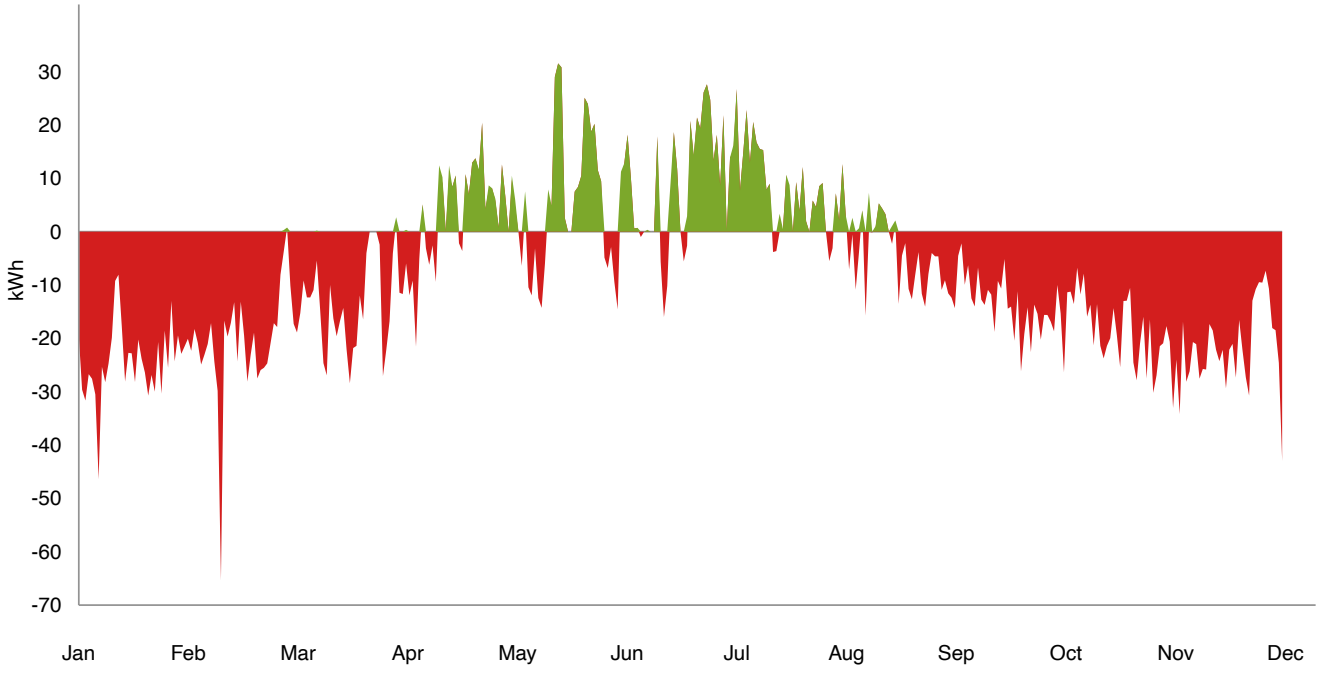


Yearly import and export

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

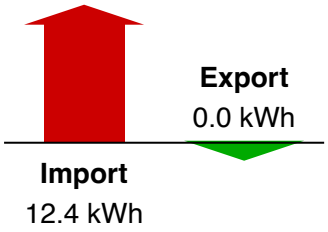
Over the course of the year, a total of 4214 kWh is expected to be imported by the property, and 1120 kWh exported back to the grid.

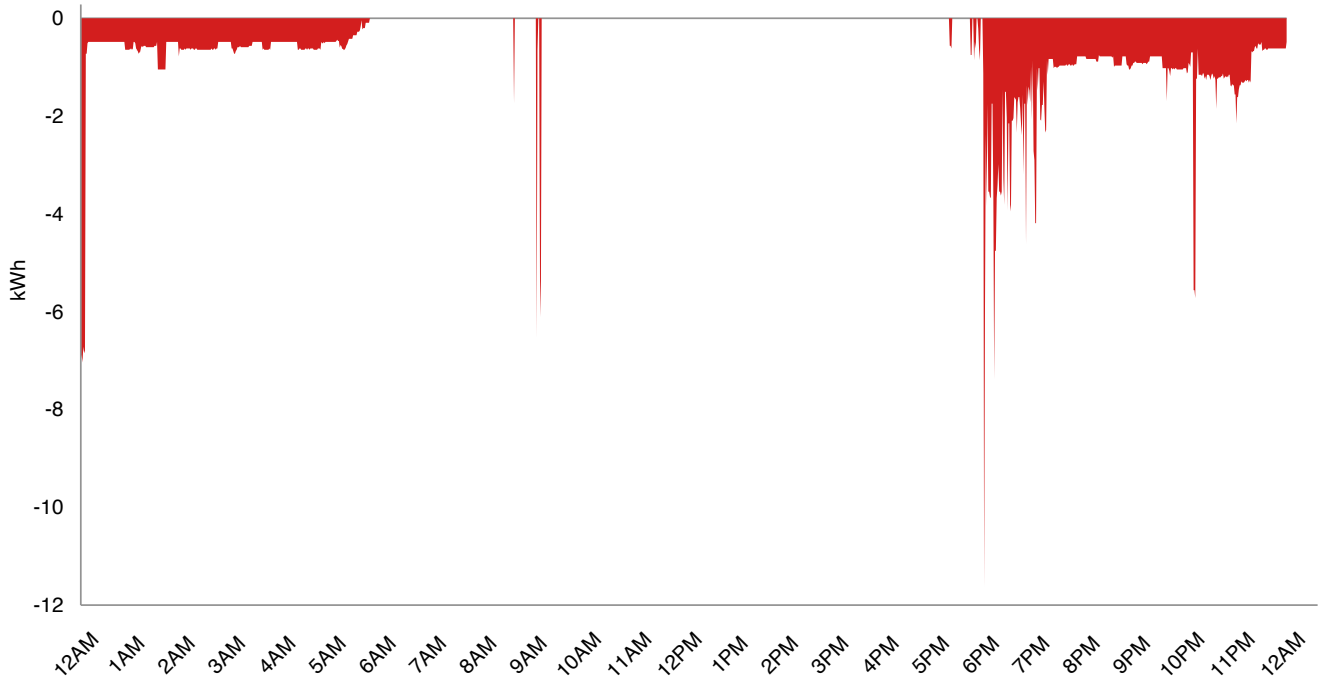




Daily import and export

This graph shows the modelled import and export of electricity over a selected day (March 27th). On this day 12.40 kWh is expected to be imported from the grid, and 0.0 kWh exported.At times when no import or export is shown the battery storage system is charging or discharging.





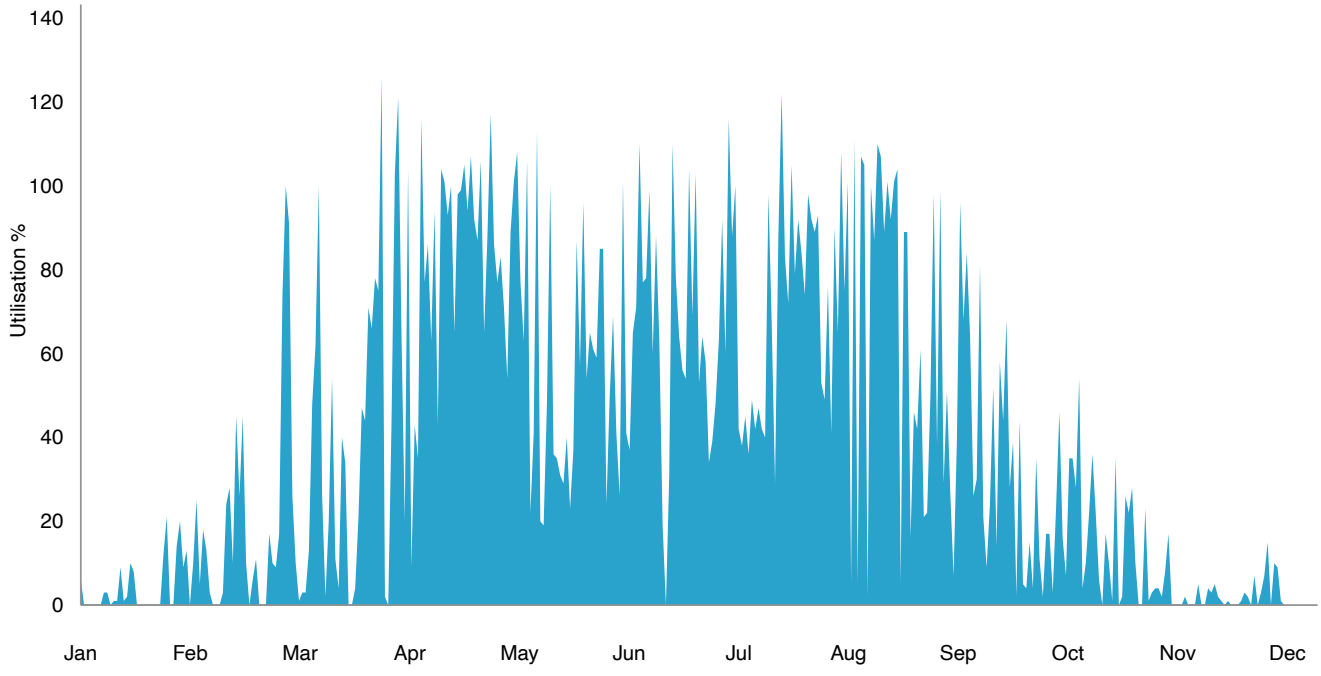
Yearly battery utilisation

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.

Average battery utilisation

41%

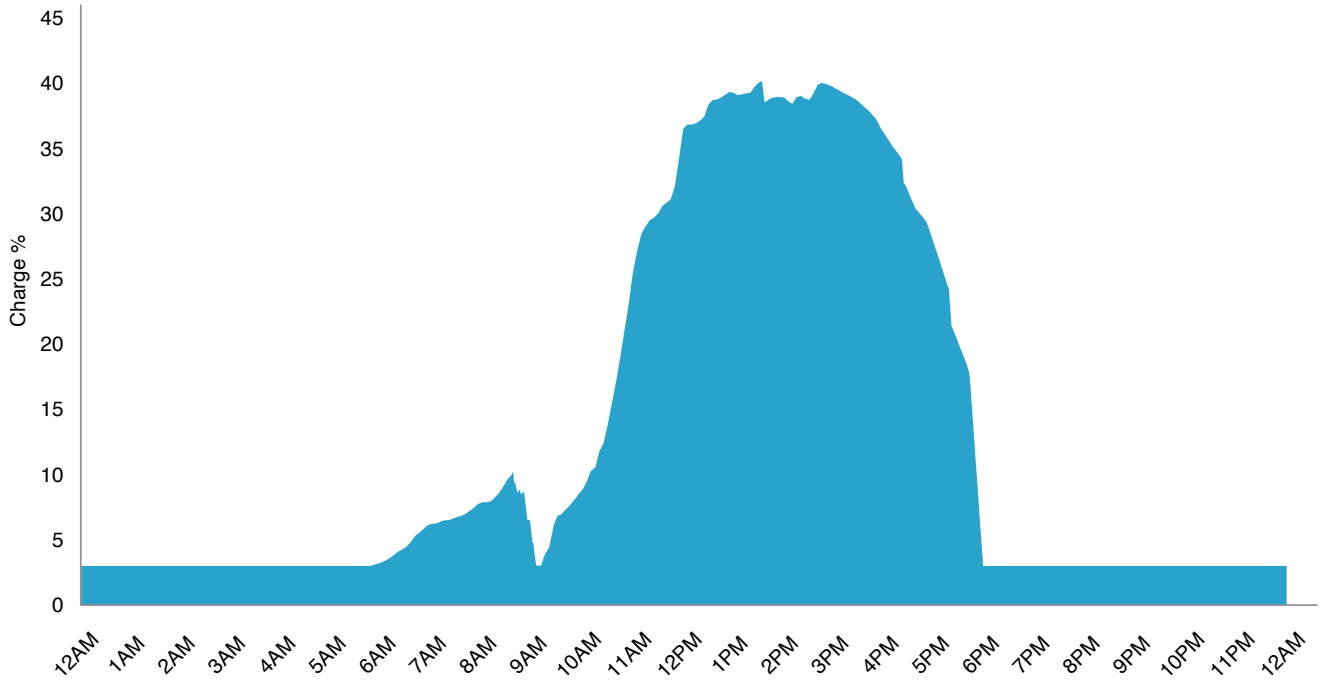


Daily battery utilisation

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, 49% of the battery capacity was utilised.

Average battery utilisation

49%



Equipment and Services

Equipment Costs

Total System Cost	£14,300.00
Total equipment cost	**£14,300.00**

Services Costs

Total services cost	**£0.00**

Totals

Total before tax	**£14,300.00**
VAT at 0%	**£0.00**
Total including tax	**£14,300.00**

Financial

Generation

The system is expected to generate 5684 kWh per year initially, decreasing gradually as the solar cells degrade. Over the 25 year term of this financial projection the total generation is expected to be 133557 kwh, of which 101413 kWh will be consumed on site and 32144 kWh exported.

134 MWh

Payback

After adjusting projected costs and benefits for inflation, and applying a discount rate of 3.2%, the initial system cost of £14,300.00 is expected to be recouped after 9 years.

9 years

Net Present Value

The total present value of future benefits and costs, using a discount rate of 3.2% per year, is £36,534.80. The cost of the PV system is £14,300.00. The net present value of the project is therefore £22,234.80. A positive net present value is a good indication that the project is financially worthwhile.

£22234.8

IRR

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

12.1 %

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	**3%**
Cost of electricity	**£0.31 /kWh** increases with inflation
System size	**7.2 kWp** degrades at 0.5% per year
Discount rate	**3.2%**
Projection length	**25 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 3 percent.

	Export payments	Electricity savings	**Total**
Year 1	277	1355	**1632**
Year 2	284	1388	**1672**
Year 3	291	1423	**1714**
Year 4	298	1458	**1756**
Year 5	306	1494	**1800**
Year 6	313	1532	**1845**
Year 7	321	1570	**1891**
Year 8	329	1609	**1938**
Year 9	337	1649	**1986**
Year 10	345	1690	**2035**
Year 11	354	1732	**2086**
Year 12	363	1775	**2137**
Year 13	372	1819	**2191**
Year 14	381	1864	**2245**
Year 15	391	1910	**2301**
Year 16	400	1958	**2358**
Year 17	410	2006	**2417**
Year 18	420	2056	**2477**
Year 19	431	2107	**2538**
Year 20	442	2160	**2601**
Year 21	453	2213	**2666**
Year 22	464	2268	**2732**
Year 23	475	2325	**2800**
Year 24	487	2382	**2870**
Year 25	499	2442	**2941**

£9443

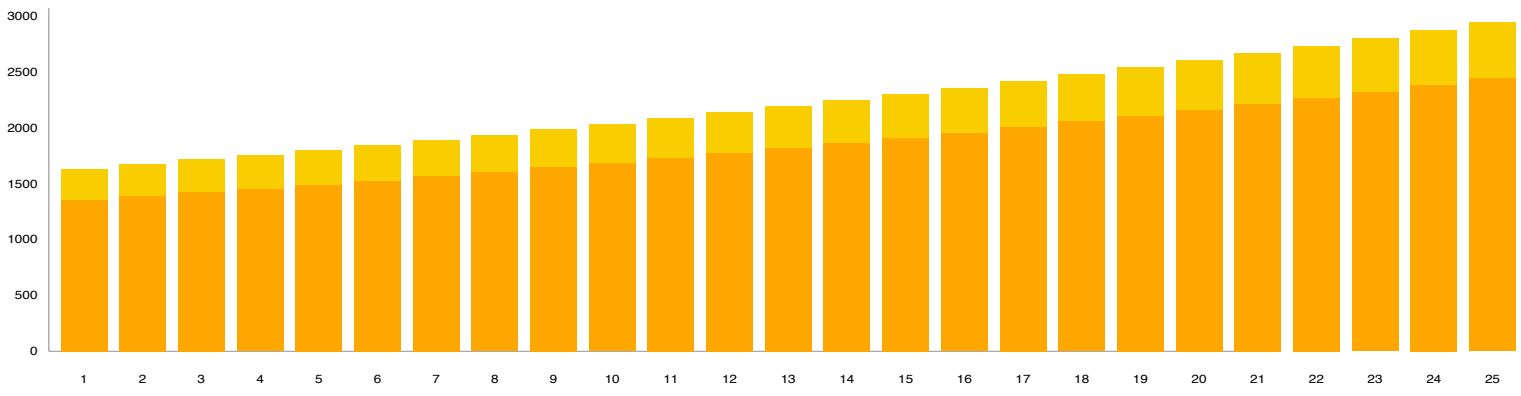
Total Export Payments

over 25 years

£46181

Electricity savings

over 25 years



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 9 years.

	Discounted benefits	Cumulative benefits	Discounted costs	Cumulative costs	**Cashflow**
Year 1	1606	1606	0	14300	**-12694**
Year 2	1593	3198	0	14300	**-11102**
Year 3	1580	4778	0	14300	**-9522**
Year 4	1568	6346	0	14300	**-7954**
Year 5	1555	7901	0	14300	**-6399**
Year 6	1543	9444	0	14300	**-4856**
Year 7	1531	10974	0	14300	**-3326**
Year 8	1518	12493	0	14300	**-1807**
Year 9	1506	13999	0	14300	**-301**
Year 10	1494	15493	0	14300	**1193**
Year 11	1482	16976	0	14300	**2676**
Year 12	1471	18446	0	14300	**4146**
Year 13	1459	19905	0	14300	**5605**
Year 14	1447	21353	0	14300	**7053**
Year 15	1436	22789	0	14300	**8489**
Year 16	1424	24213	0	14300	**9913**
Year 17	1413	25626	0	14300	**11326**
Year 18	1402	27028	0	14300	**12728**
Year 19	1391	28419	0	14300	**14119**
Year 20	1380	29799	0	14300	**15499**
Year 21	1369	31168	0	14300	**16868**
Year 22	1358	32525	0	14300	**18225**
Year 23	1347	33873	0	14300	**19573**
Year 24	1336	35209	0	14300	**20909**
Year 25	1326	36535	0	14300	**22235**