Geoffrey Peacock

Project Name: IP144LXMALLARDS updated

Phone: 07718988213

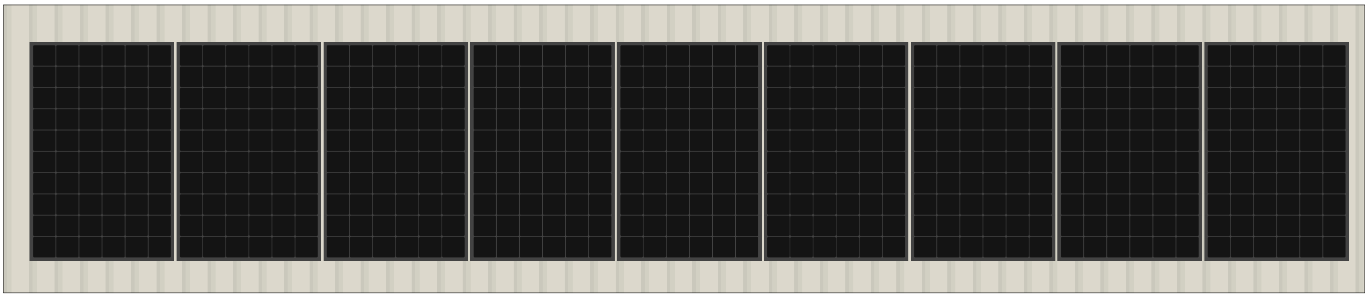
Address: MALLARDS STOWMARKET SUFFOLK, IP144LX

Date Created: 23rd June 2023

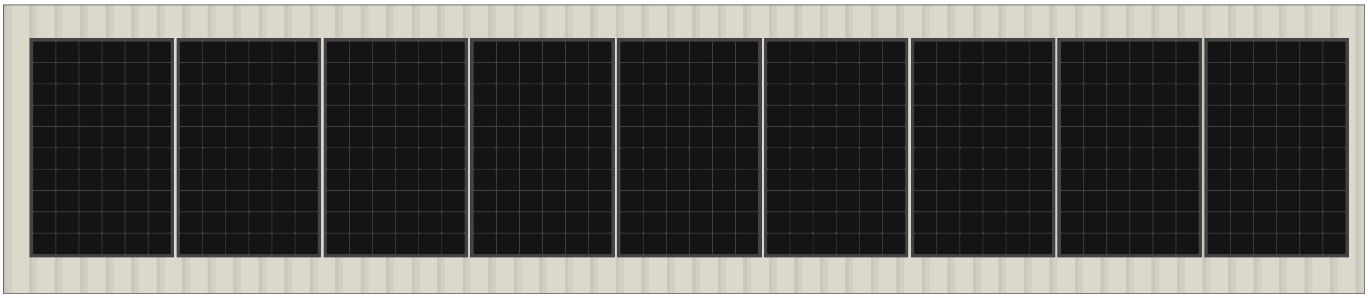
Designer: Liam Minter

Roof Layout

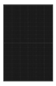
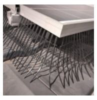
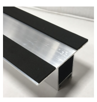
Roof 1



Roof 2



Component list

	Item	Quantity
	Longi 54c HiMo5 410W Black Mono solar panel	18
	Sofar HYD 6000 hybrid inverter	1
	**NET** Emlite Bi-directional Meter ECA2.nv	1
	Label sheet	1
	Reinforced BirdBlocker for Solar Panels	1
	Tigo Optimisers	18
	AC isolator - Projoy - 32A 3-pole	2
	Pylon 3.5kWh US3000 C Li-ion Battery	3
	IMO DC isolator 16A 2p 1string	2
	Pair of MC4 connectors	4
	50m reel of 4mm2 solar cable	1
	Metasole flat channel (portrait)	40
	Renusol end clamp (black)	8
	Renusol mid clamp (black)	32
	Renusol Metasole+ screw (box of 100)	2

Inverter checks

Sofar HYD 6000 hybrid

Panels

PV power	**7380**	Rated AC output	**6000**

Input 1: 9 Longi 54c HiMo5 410W Black Mono solar panels in 1 strings

Panels		**Inverter**	
PV power	**3690 W**		
Open circuit voltage at -10° C	**366 V**	Max DC voltage	**600 V**
V_{mpp} at 40° C	**272 V**	V_{mpp} lower limit	**90 V**
V_{mpp} at -10° C	**310 V**	V_{mpp} upper limit	**580 V**
I_{mpp} at 40° C	**13 A**	Max DC input current	**15 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: 9 Longi 54c HiMo5 410W Black Mono solar panels in 1 strings

Panels		**Inverter**	
PV power	**3690 W**		
Open circuit voltage at -10° C	**366 V**	Max DC voltage	**600 V**
V_{mpp} at 40° C	**272 V**	V_{mpp} lower limit	**90 V**
V_{mpp} at -10° C	**310 V**	V_{mpp} upper limit	**580 V**
I_{mpp} at 40° C	**13 A**	Max DC input current	**15 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

Sofar HYD 6000 hybrid

AC Isolator

A AC isolator - Projoy - 32A 3-pole has been specified for this input

Current

The rated isolator current (32A) is greater than the rated inverter current (27.3A)

✓

Phases

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

✓

Input 1

DC Isolator

A IMO DC isolator 16A 2p 1string has been specified for this input

Current

The isolator is rated for a current of 16A, which is more than the expected maximum current of 14A.

✓

Voltage

At 16A the isolator is rated for a voltage of 600V, which is more than the expected maximum voltage of 366V.

✓

Cable

10m of 4mm2 solar cable has been specified

Voltage drop

Voltage drop at maximum power point at 40°C will be around **1.10 V (0.40 percent)**

✓

Input 2

DC Isolator

A IMO DC isolator 16A 2p 1string has been specified for this input

Current

The isolator is rated for a current of 16A, which is more than the expected maximum current of 14A.

✓

Voltage

At 16A the isolator is rated for a voltage of 600V, which is more than the expected maximum voltage of 366V.

✓

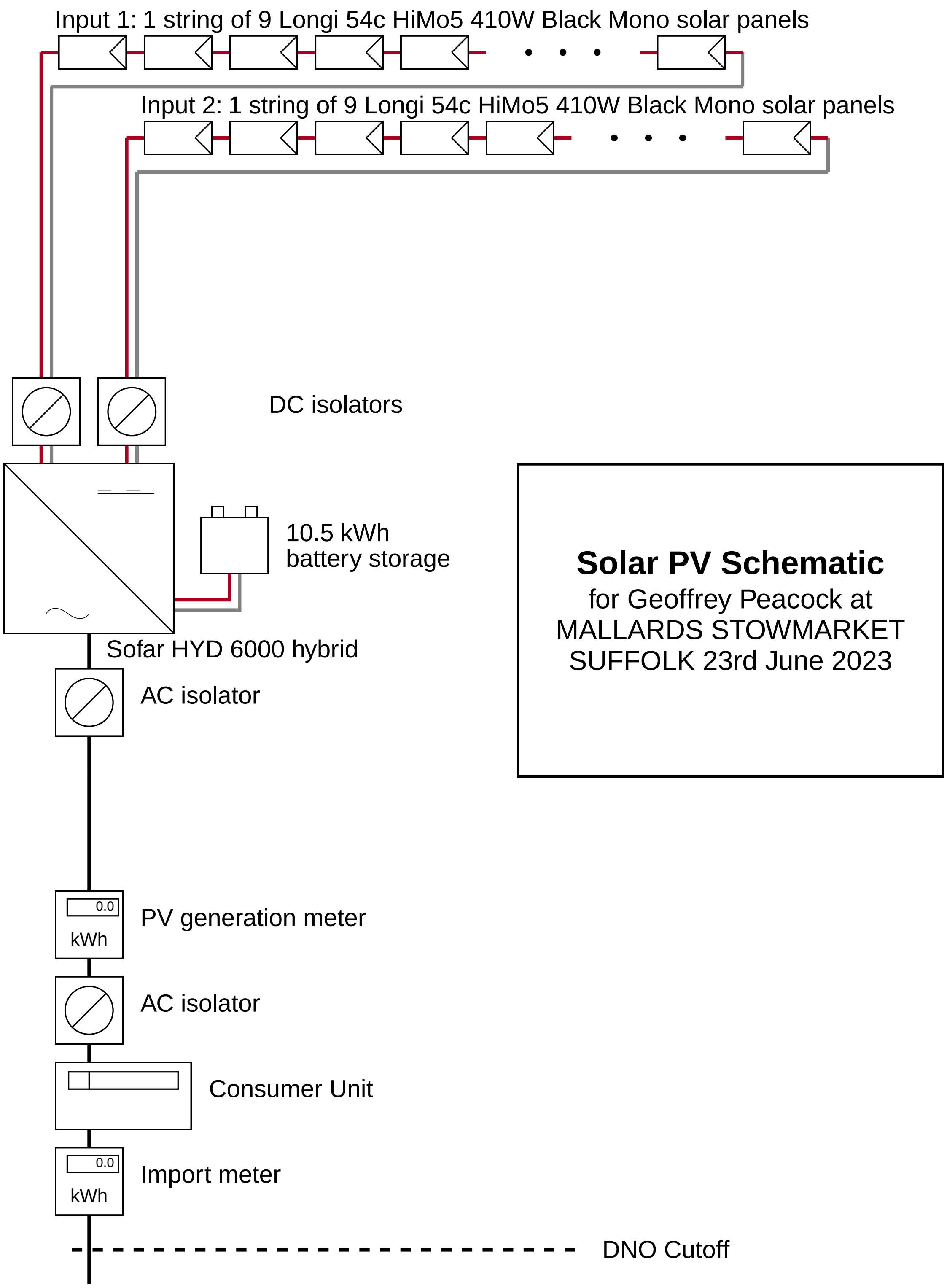
Cable

10m of 4mm2 solar cable has been specified

Voltage drop

Voltage drop at maximum power point at 40°C will be around
1.10 V (0.40 percent)

Schematic diagram



Performance Estimate

Site details

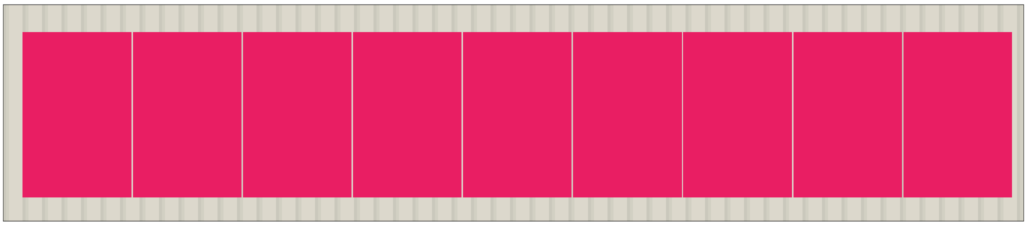
Client	Geoffrey Peacock
Address	MALLARDS STOWMARKET SUFFOLK

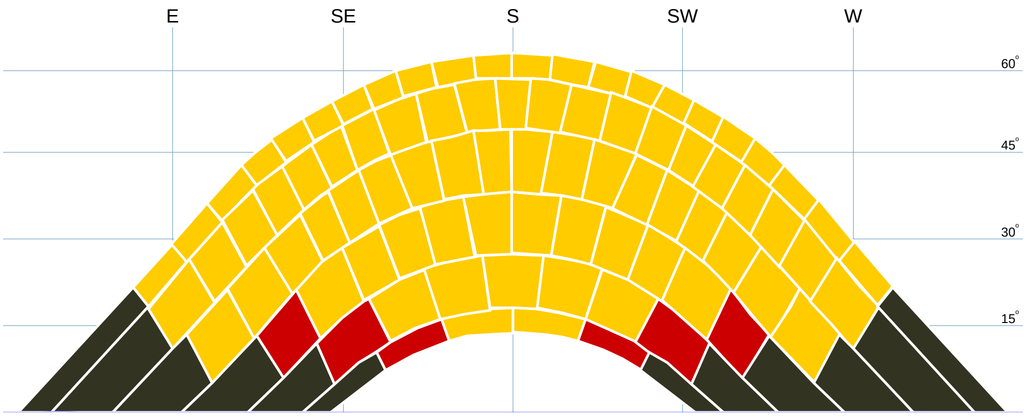
The sunpath diagram shows the arcs of the sky that the sun passes through at different times of the day and year as yellow blocks. The shaded area indicates the horizon as seen from the location of the solar array. Where objects on the horizon are within 10m of the array, an added semi-circle is drawn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

Sofar HYD 6000 hybrid

Input 1

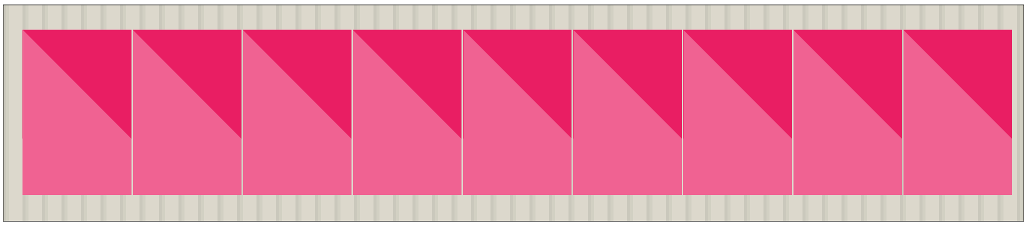


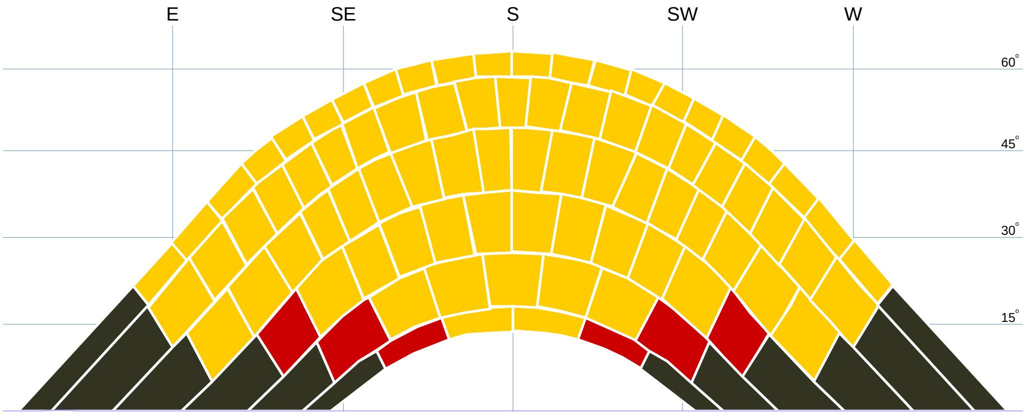


A. Installation data		
Installed capacity of PV system - kWp (stc)	3.690	kWp
Orientation of the PV system - degrees from South	-80	°
Inclination of system - degrees from horizontal	30	°
Postcode region	12	

B. Performance calculations		
kWh/kWp (Kk)	808	kWh/kWp
Shade factor (SF)	0.94	
Estimated output (kWp x Kk x SF)	2803	kWh

Input 2





A. Installation data		
Installed capacity of PV system - kWp (stc)	3.690	kWp
Orientation of the PV system - degrees from South	104	°
Inclination of system - degrees from horizontal	30	°
Postcode region	12	

B. Performance calculations		
kWh/kWp (Kk)	725	kWh/kWp
Shade factor (SF)	0.94	
Estimated output (kWp x Kk x SF)	2515	kWh

Performance Summary

A. Installation data		
Installed capacity of PV system - kWp (stc)	**7.38**	kWp
Orientation of the PV system - degrees from South	**See individual inputs**	
Inclination of system - degrees from horizontal	**See individual inputs**	
Postcode region	**12**	
B. Performance calculations		
kWh/kWp (Kk)	**See individual inputs**	
Shade factor (SF)	**See individual inputs**	
Estimated output (kWp x Kk x SF)	**5318**	kWh
C. Estimated PV self-consumption - PV Only		
Assumed occupancy archetype	**in half the day**	
Assumed annual electricity consumption, kWh	**4500**	kWh
Assumed annual electricity generation from solar PV system, kWh	**5318**	kWh
Expected solar PV self-consumption (PV Only)	**1276.32**	kWh
Grid electricity independence / Self-sufficiency (PV Only)	**28.36**	%
D. Estimated PV self-consumption - with EESS		
Assumed usable capacity of electrical energy storage device, which is used for self-consumption, kWh	**9.450000000000003**	kWh
Expected solar PV self-consumption (with EESS)	**3616.24**	kWh
Grid electricity independence / Self-sufficiency (with EESS)	**80.36**	%

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.

The solar PV self-consumption has been calculated in accordance with the most relevant methodology for your system. There are a number of external factors that can have a significant effect on the amount of energy that is self-consumed so this figure should not be considered as a guarantee of the amount of energy that will be self-consumed

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

This system performance calculation has been undertaken using estimated values for array orientation, inclination or shading. Actual performance may be significantly lower or higher if the characteristics of the installed system vary from the estimated values.

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

Sofar HYD 6000 hybrid with 3 Pylon 3.5kWh US3000 C Li-ion Battery batteries

Charge rate	**6000 W**
Inverter charge efficiency	**94.6 %**
Inverter discharge efficiency	**94.6 %**
Battery efficiency	**95.0 %**
Round trip efficiency	**85.0 %**
Battery bank capacity	**10.5 kWh**
Max discharge depth	**90 %**
Usable capacity	**9.450000000000001 kWh**

Consumption

Electricity consumed in the property each year

4500 kWh

Generation

Electricity generated by the PV array each year

5337 kWh

Self consumption

Proportion of PV generation used in the property

57 %

Independence

Proportion of electricity consumption provided by PV

65 %

Import / Export

Electricity import / export each year from the property

1575 / 2175 kWh

Utilisation

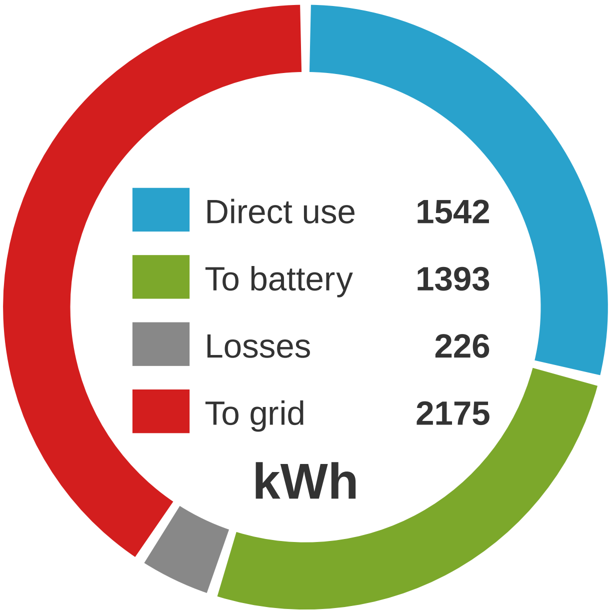
Average daily utilisation of the storage battery

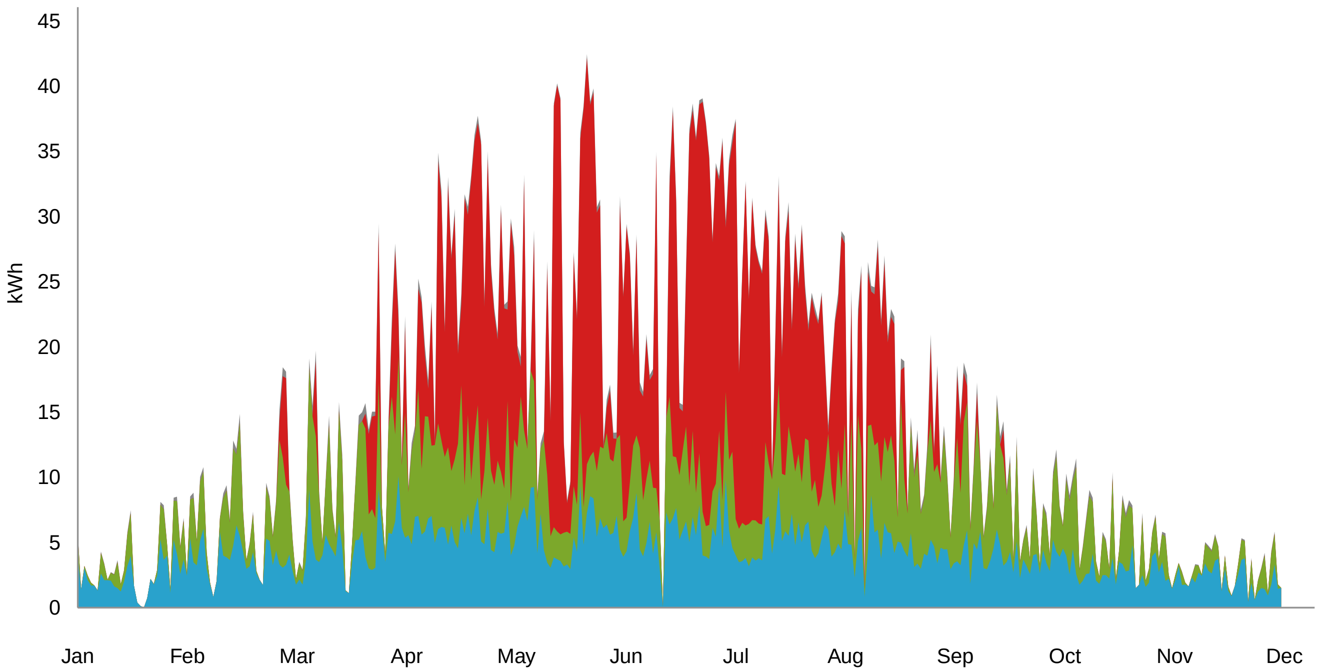
43 %

Yearly generation

The solar PV array is expected to generate 5337 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.

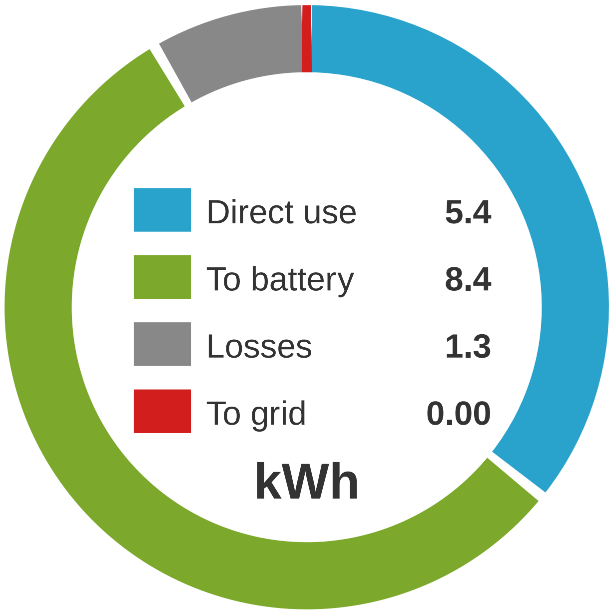
29% (1542 kWh) of the electricity generated is expected to be used directly in the property. 30% (1620 kWh) is directed to the battery for later use, although 226 kWh of this is lost during battery charging and discharging. The remaining generation (2175 kWh, or 41% of the total) is exported to the grid.

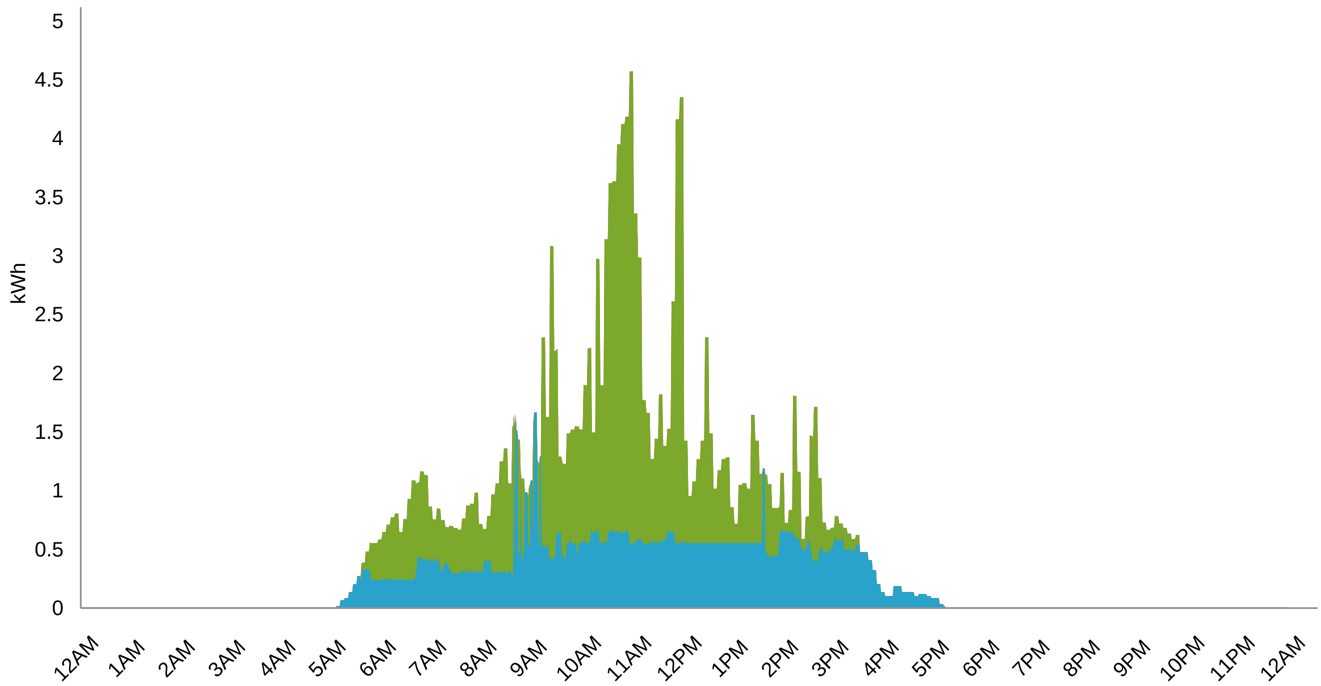




Daily generation

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 15.1 kWh. Of this, 5.4 kWh (36%) is used directly in the property, 9.7 kWh (64%) is stored in the battery for later re-use, and 0 kWh (0%) is exported to the grid.

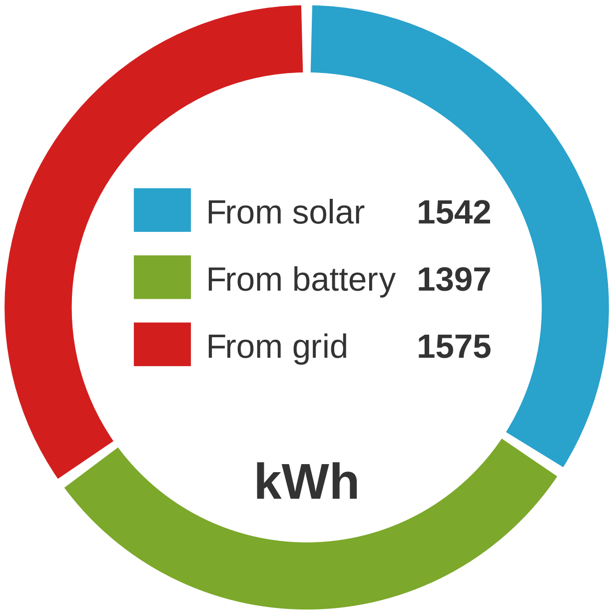


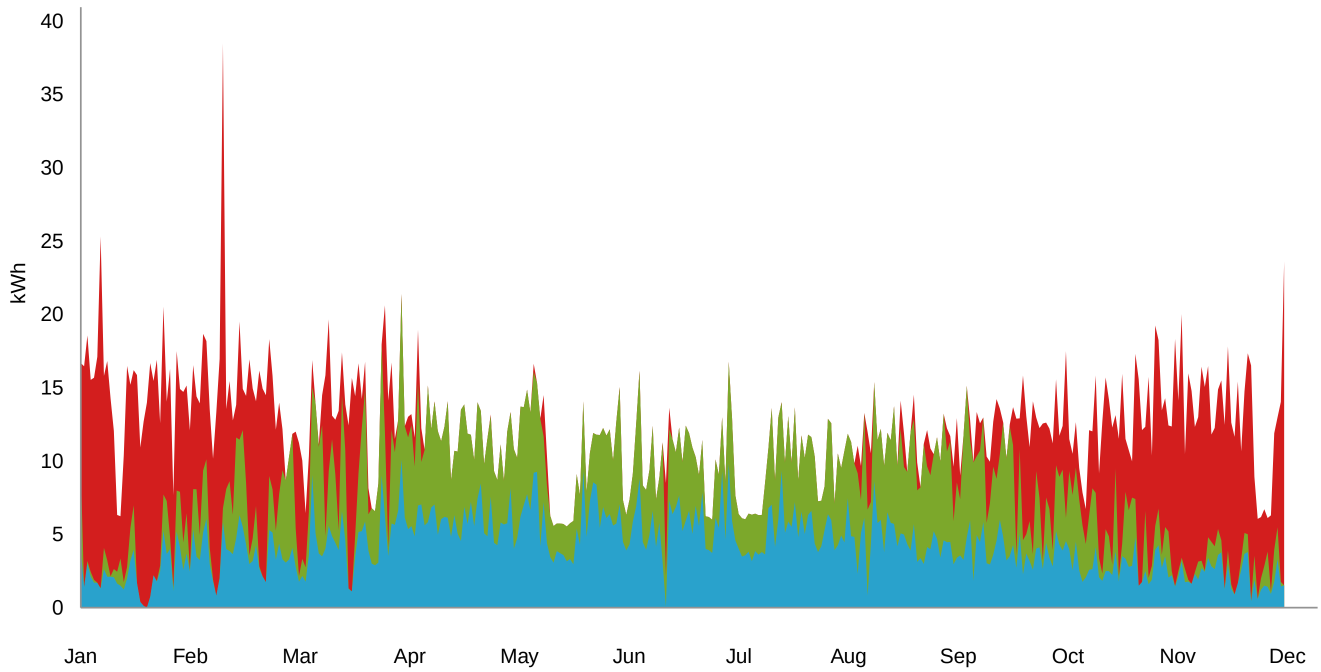


Yearly consumption

The property is expected to consume 4500kWh of electricity each year. Around 34% of this (1542 kWh) is expected to be supplied directly by the solar array. Another 31% (1397 kWh) is supplied from the storage battery. The remaining 35% (1575 kWh) is supplied from the grid.

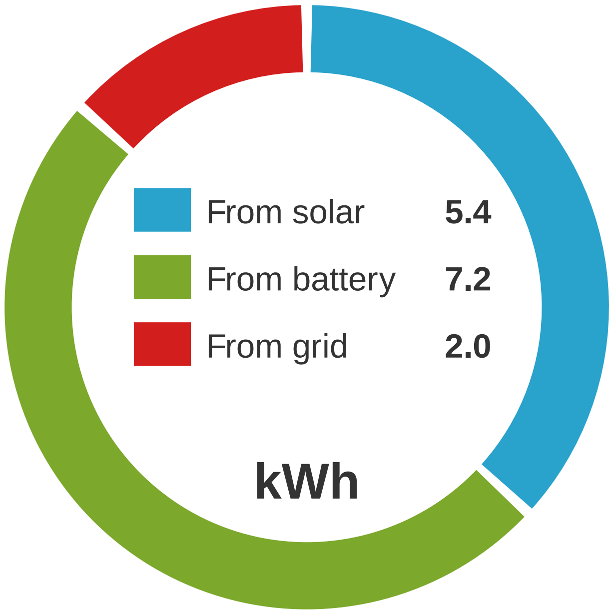
Overall, 65% (2939 kWh) of the electricity used in the property is expected to be supplied by the solar array and battery storage system. Without battery storage it would be 34% (1542 kWh).

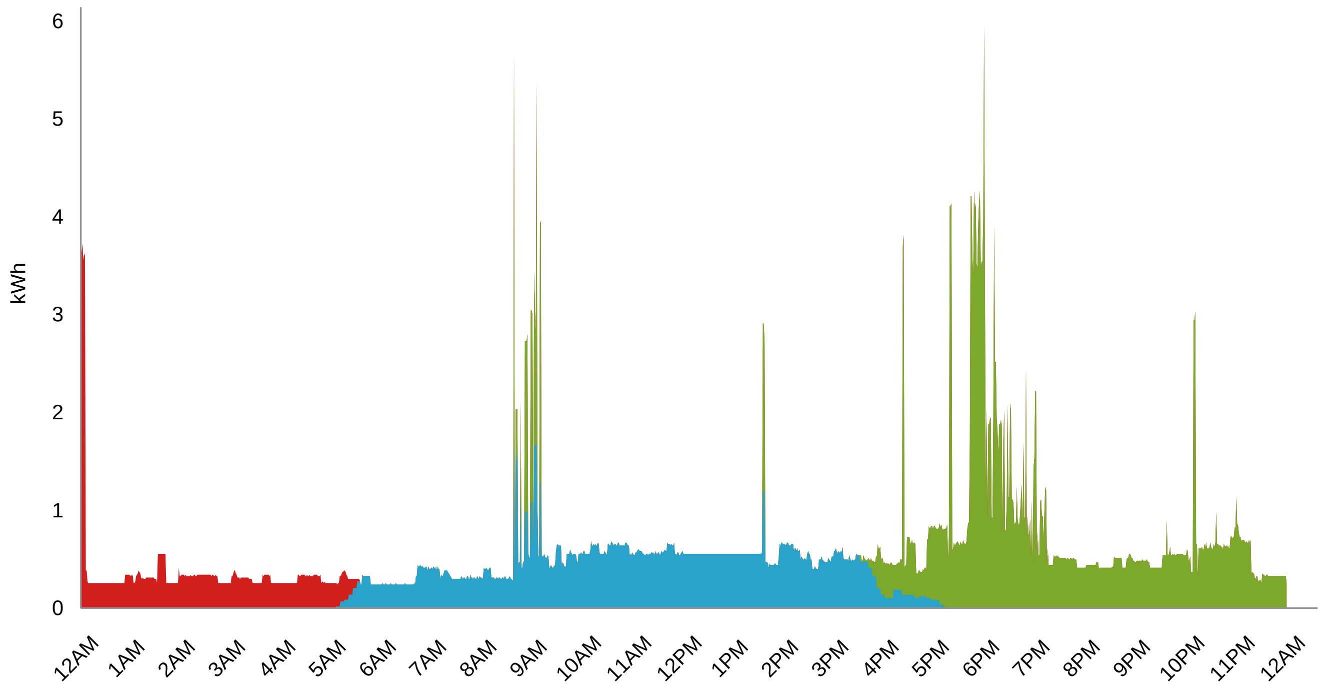




Daily consumption

This graph shows modelled consumption data over the course of the selected day (March 27th). Total electricity consumption on this day was 14.6 kWh, of which 5.4 kWh (37%) is expected to be supplied directly by the solar array, and a further 7.2 kWh (49%) drawn from the battery storage system. The remaining 2 kWh (14%) is imported from the grid.

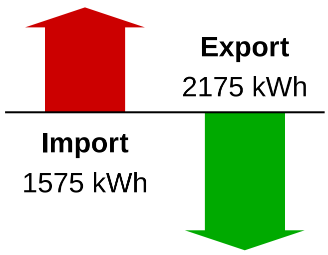


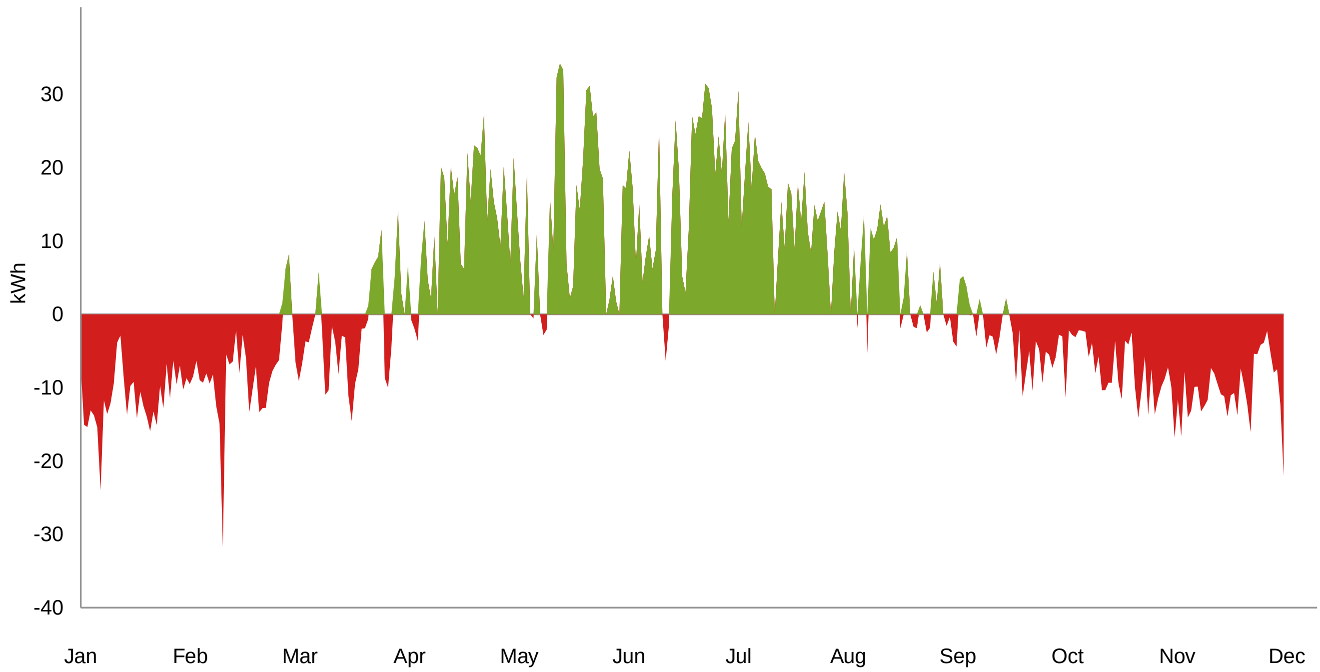


Yearly import and export

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.

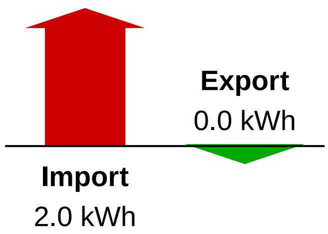
Over the course of the year, a total of 1575 kWh is expected to be imported by the property, and 2175 kWh exported back to the grid.

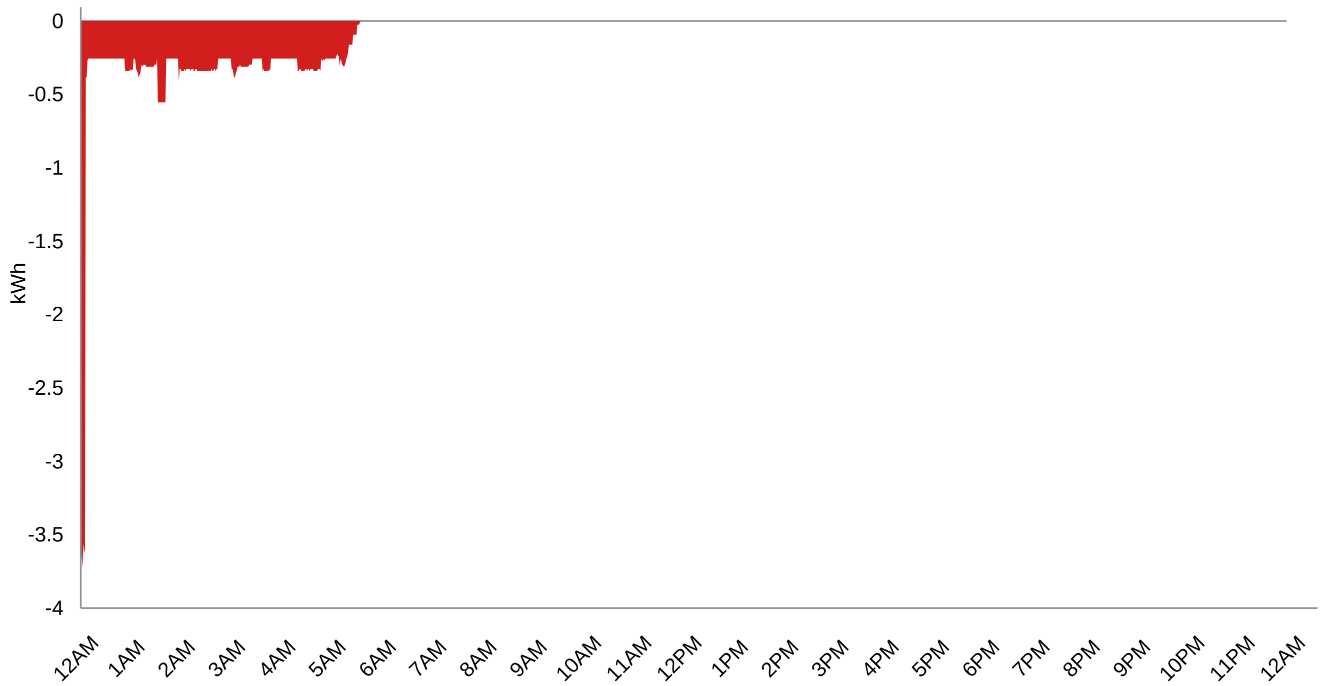




Daily import and export

This graph shows the modelled import and export of electricity over a selected day (March 27th). On this day 2.00 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.





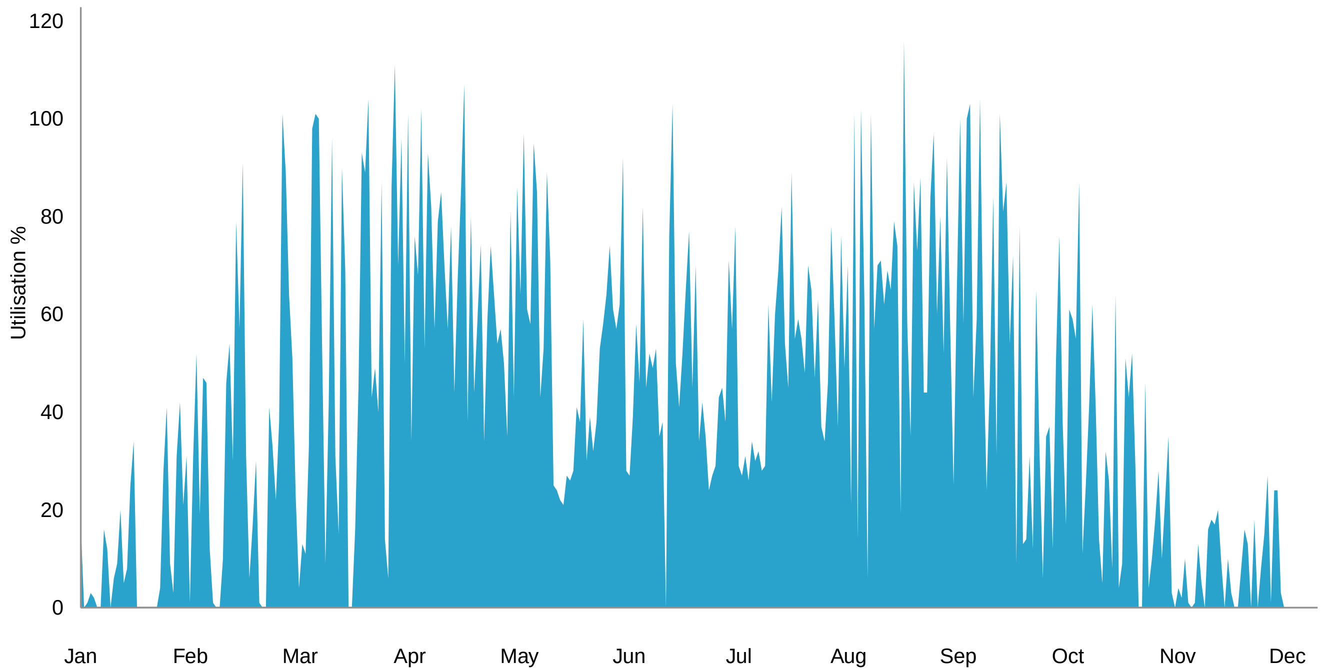
Yearly battery utilisation

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

43%

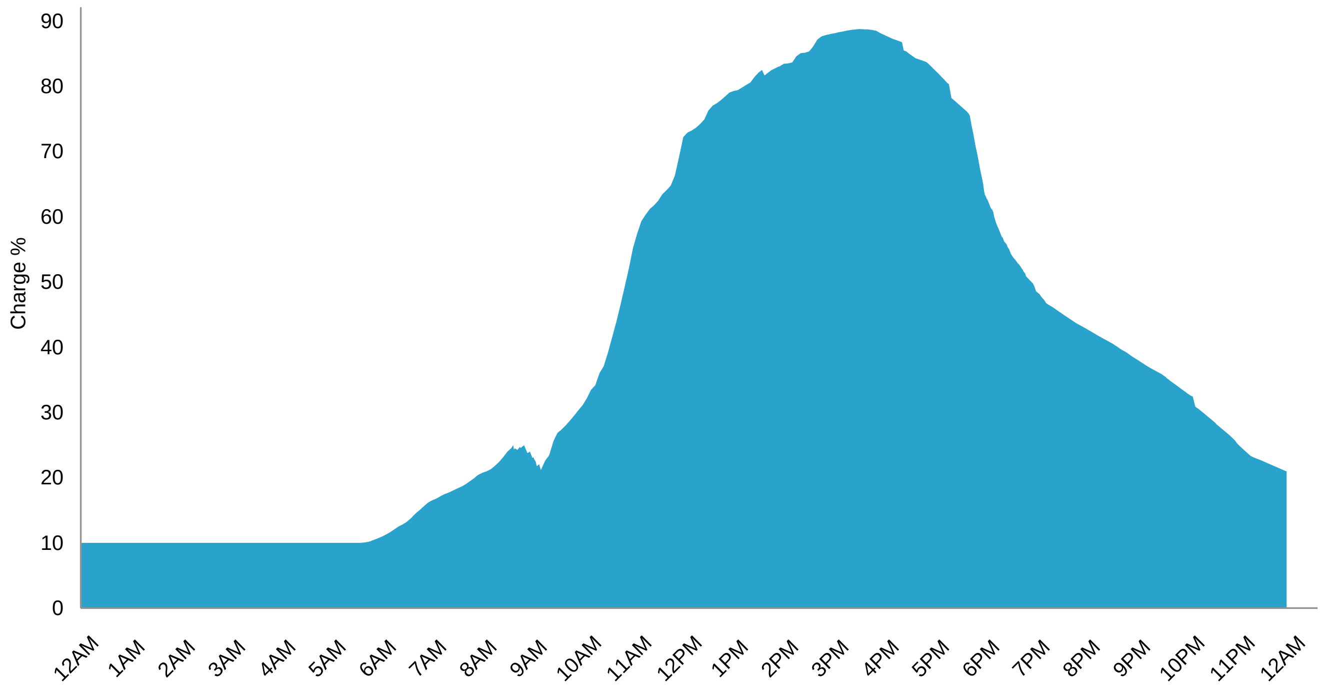


Daily battery utilisation

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, 94% of the battery capacity was utilised.

Average battery utilisation

94%



Equipment and Services

Equipment Costs	
18x Longi 54c HiMo5 410W Black Mono solar panel	£10,841.00
Reinforced BirdBlocker for Solar Panels	£600.00
18x Tigo Optimisers	£900.00
3x Pylon 3.5kWh US3000 C Li-ion Battery	£8,022.00
Total equipment cost	**£20,363.00**

Services Costs	
double lift scaffold	£500.00
Total services cost	**£500.00**

Totals	
Total before tax	**£20,863.00**
VAT at 0%	**£0.00**
Total including tax	**£20,863.00**