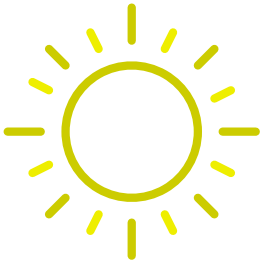
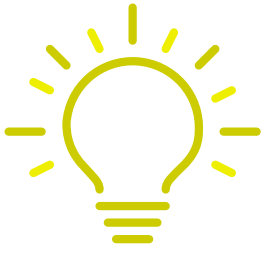
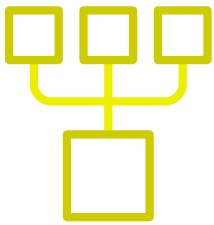
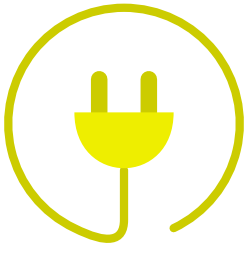
SMITH & SAUNDERS
ELECTRICAL LIMITED

Ricky Chadwick

Project Name: Ricky Chadwick

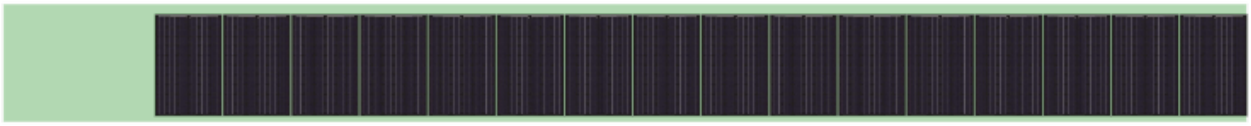
Date Created: 27th February 2023

Designer: Daniel Saunders

Roof Layout

Roof 1



Component list

Item	Quantity
 *HIB* Longi HiMo5 405W All Black Mono solar panel	16
 Solis 5kw Hybrid inverter	1
 **NET** Emlite Bi-directional Meter ECA2.nv	1
 Label sheet	1
 AC isolator - KN 25A 3-pole	2
 Puredrive 5kw battery	2
Pair of MC4 connectors	4
100m reel of 6mm2 solar cable	1
 50m reel of 10mm2 solar cable	2

Inverter checks

Solis 5kw Hybrid

Panels			
PV power	**6240**	Rated AC output	**5000**

Input 1: 8 Trina Vertex S 390W All Black Mono solar panels in 1 strings

Panels		Inverter	
PV power	**3120 W**		
Open circuit voltage at -10° C	**356 V**	Max DC voltage	**520 V**
V_{mpp} at 40° C	**260 V**	V_{mpp} lower limit	**90 V**
V_{mpp} at -10° C	**295 V**	V_{mpp} upper limit	**520 V**
I_{mpp} at 40° C	**12 A**	Max DC input current	**17.2 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 Trina Vertex S 390W All Black Mono solar panels in 1 strings

Panels		**Inverter**	
PV power	**3120 W**		
Open circuit voltage at -10° C	**356 V**	Max DC voltage	**520 V**
V_{mpp} at 40° C	**260 V**	V_{mpp} lower limit	**90 V**
V_{mpp} at -10° C	**295 V**	V_{mpp} upper limit	**520 V**
I_{mpp} at 40° C	**12 A**	Max DC input current	**17.2 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

Solis 5kw Hybrid

AC Isolator

A AC isolator - KN 25A 3-pole has been specified for this input

Current

The rated isolator current (25A) is greater than the rated inverter current (23A)

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 6mm2 solar cable has been specified

Voltage drop

Voltage drop at maximum power point at 40°C will be around **2.09 V (0.80 percent)**

Input 2

DC Isolator

Integrated isolator

This inverter contains an integrated DC Isolator.

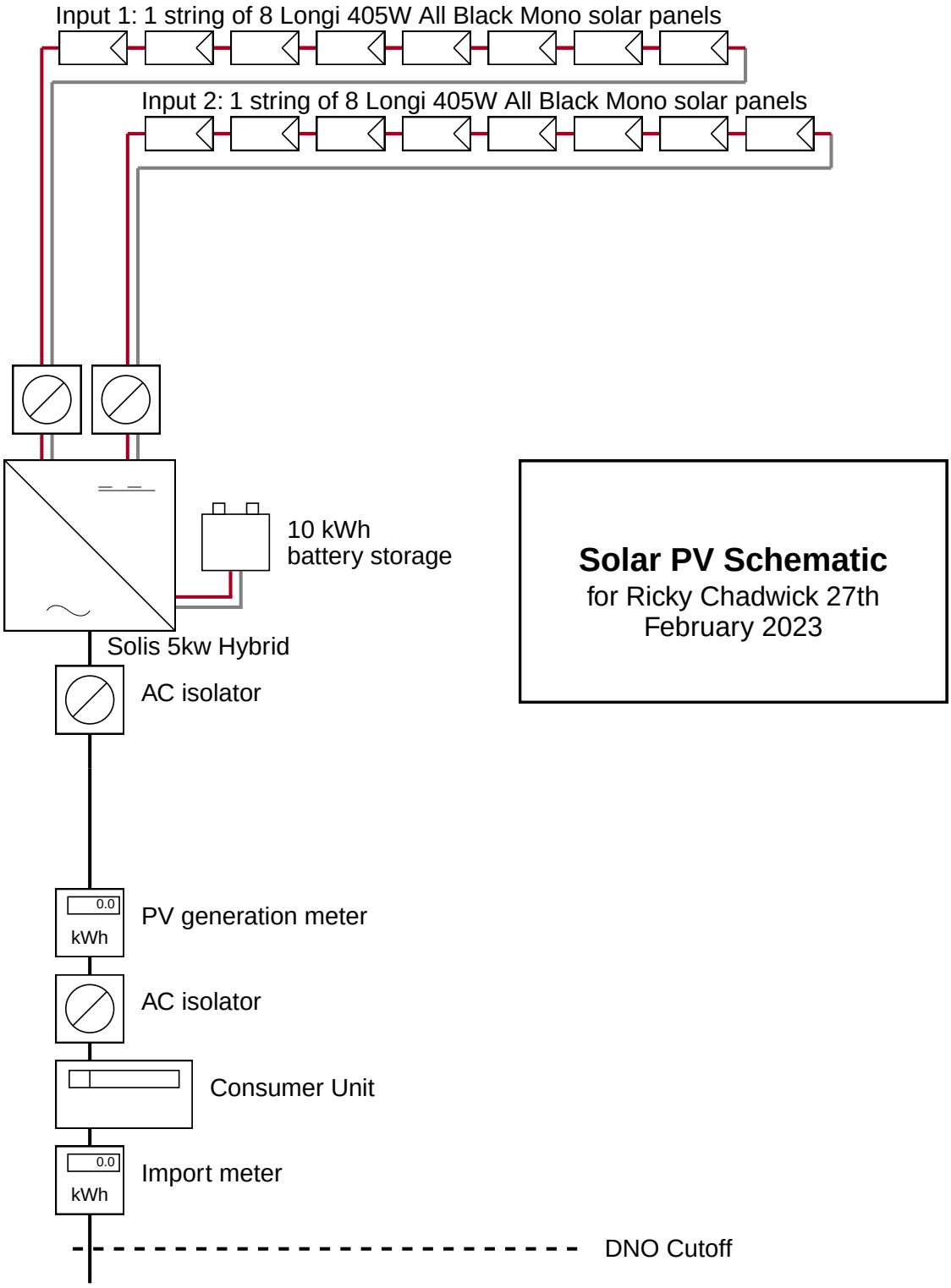
Cable

40m of 10mm2 solar cable has been specified

Voltage drop

Voltage drop at maximum power point at 40°C will be around **1.76 V (0.68 percent)**

Schematic diagram



Performance Estimate

Site details

Client Ricky Chadwick

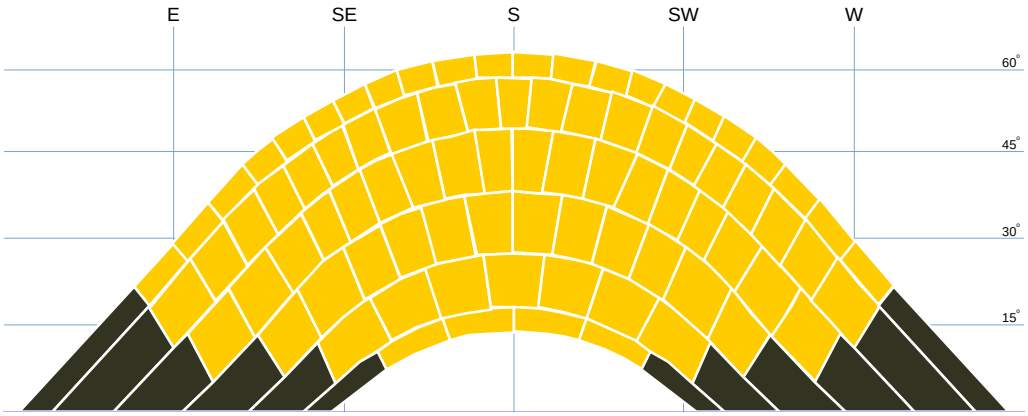
Address

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

Solis 5kw Hybrid

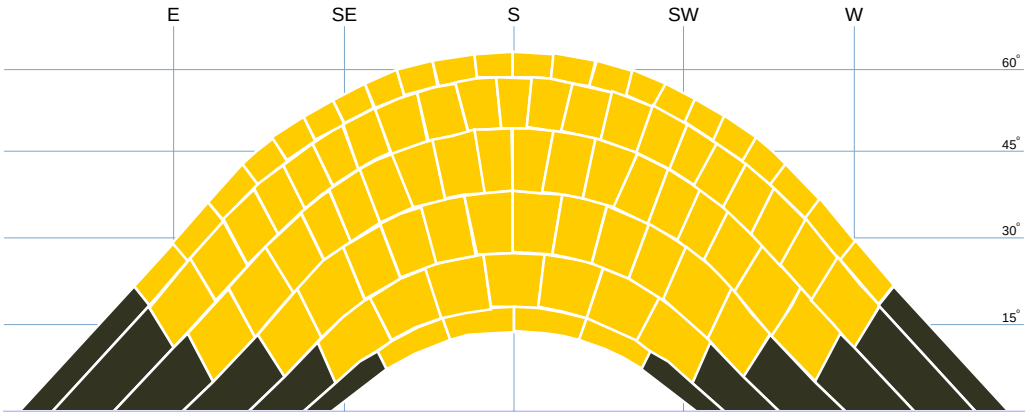
Input 1



A. Installation data		
Installed capacity of PV system - kWp (stc)	**3.120**	kWp
Orientation of the PV system - degrees from South	**0**	°
Inclination of system - degrees from horizontal	**30**	°
Postcode region	**12**	

B. Performance calculations		
kWh/kWp (Kk)	**953**	kWh/kWp
Shade factor (SF)	**1.00**	
Estimated output (kWp x Kk x SF)	**2973**	kWh

Input 2



A. Installation data		
Installed capacity of PV system - kWp (stc)	**3.120**	kWp
Orientation of the PV system - degrees from South	**0**	°
Inclination of system - degrees from horizontal	**30**	°
Postcode region	**12**	

B. Performance calculations		
kWh/kWp (Kk)	**953**	kWh/kWp
Shade factor (SF)	**1.00**	
Estimated output (kWp x Kk x SF)	**2973**	kWh

Performance Summary

A. Installation data		
Installed capacity of PV system - kWp (stc)	**6.24**	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)	**5946**	kWh
C. Estimated PV self-consumption - PV Only		
Assumed occupancy archetype	**home all day**	
Assumed annual electricity consumption, kWh	**3500**	kWh
Assumed annual electricity generation from solar PV system, kWh	**5946**	kWh
Expected solar PV self-consumption (PV Only)	**1367.58**	kWh
Grid electricity independence / Self-sufficiency (PV Only)	**39.07**	%
D. Estimated PV self-consumption - with EESS		
Assumed usable capacity of electrical energy storage device, which is used for self-consumption, kWh	**9**	kWh
Expected solar PV self-consumption (with EESS)	**3210.84**	kWh
Grid electricity independence / Self-sufficiency (with EESS)	**91.74**	%

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

Equipment and Services

Equipment Costs

16x *HIB* Longi HiMo5 405W All Black Mono solar panel	£3,380.00
Solis 5kw Hybrid inverter	£1,560.00
NET Emlite Bi-directional Meter ECA2.nv	£58.31
Label sheet	£3.28
2x AC isolator - KN 25A 3-pole	£63.23
2 x Puredrive 5kw battery	£5,500.00
4x Pair of MC4 connectors	£13.52
DC cabling to PV array including isolators	£354.90
Total equipment cost	**£10,933.23**

Services Costs

Installation of solar pv and electrical side at house	£2,200.00
Paperwork, mcs sign off etc	£500.00
Ground mount system rail and fixings for panels (not including ground works)	£2,550.00
Total services cost	**£5,250.00**

Totals

Total before tax	**£16,183.23**
VAT at 0%	**£0.00**
Total including tax	**£16,183.23**

Financial

Generation

The system is expected to generate 5946 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 144991 kwh, of which 130492 kWh will be consumed on site and 14499 kWh exported.

145 MWh

Payback

After adjusting projected costs and benefits for inflation, and applying a discount rate of 4%, the initial system cost of £16,183.23 is expected to be recouped after 10 years.

10 years

Net Present Value

The total present value of future benefits and costs, using a discount rate of 4% per year, is £35,610.63. The cost of the PV system is £16,183.23. The net present value of the project is therefore £19,427.40. A positive net present value is a good indication that the project is financially worthwhile.

£19427.4

IRR

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

11.8 %

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	**2%**
Cost of electricity	**£0.35 /kWh** increases with inflation
System size	**6.24 kWp** degrades at 0.2% per year
Discount rate	**4%**
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 2 percent.

	Export payments	Electricity savings	**Total**
Year 1	0	1890	**1890**
Year 2	0	1924	**1924**
Year 3	0	1958	**1958**
Year 4	0	1993	**1993**
Year 5	0	2029	**2029**
Year 6	0	2066	**2066**
Year 7	0	2103	**2103**
Year 8	0	2141	**2141**
Year 9	0	2179	**2179**
Year 10	0	2218	**2218**
Year 11	0	2258	**2258**
Year 12	0	2299	**2299**
Year 13	0	2340	**2340**
Year 14	0	2382	**2382**
Year 15	0	2425	**2425**
Year 16	0	2468	**2468**
Year 17	0	2513	**2513**
Year 18	0	2558	**2558**
Year 19	0	2604	**2604**
Year 20	0	2650	**2650**
Year 21	0	2698	**2698**
Year 22	0	2746	**2746**
Year 23	0	2796	**2796**
Year 24	0	2846	**2846**
Year 25	0	2897	**2897**

£0

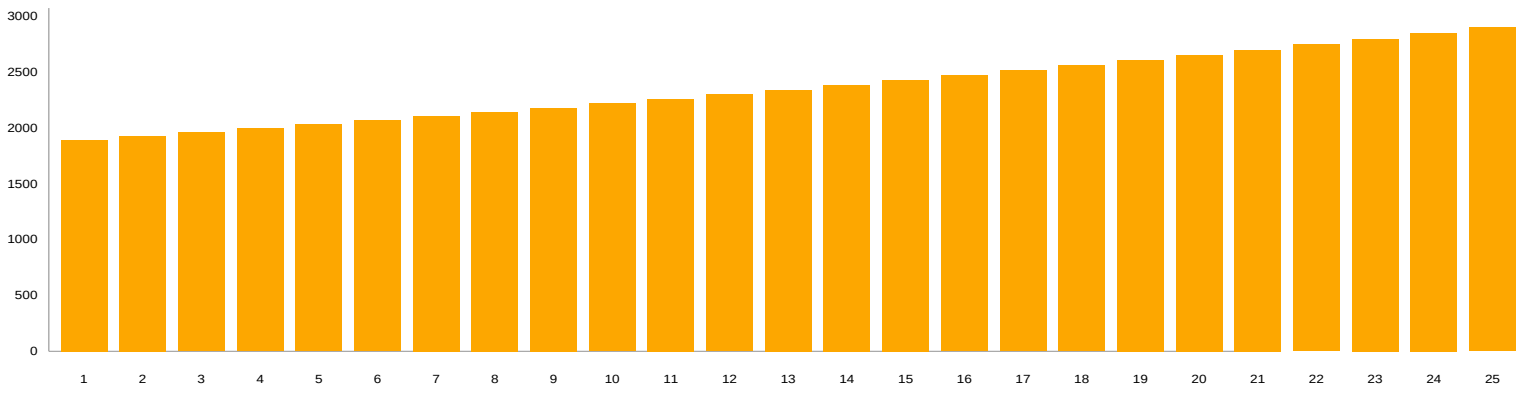
Total Export Payments

over 25 years

£58979

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 10 years.

	Discounted benefits	Cumulative benefits	Discounted costs	Cumulative costs	**Cashflow**
Year 1	1852	1852	0	16183	**-14331**
Year 2	1810	3662	0	16183	**-12521**
Year 3	1769	5431	0	16183	**-10753**
Year 4	1728	7159	0	16183	**-9024**
Year 5	1689	8848	0	16183	**-7335**
Year 6	1651	10499	0	16183	**-5684**
Year 7	1613	12112	0	16183	**-4071**
Year 8	1576	13688	0	16183	**-2495**
Year 9	1541	15229	0	16183	**-954**
Year 10	1505	16734	0	16183	**551**
Year 11	1471	18205	0	16183	**2022**
Year 12	1438	19643	0	16183	**3460**
Year 13	1405	21048	0	16183	**4865**
Year 14	1373	22421	0	16183	**6238**
Year 15	1342	23763	0	16183	**7580**
Year 16	1311	25074	0	16183	**8891**
Year 17	1281	26356	0	16183	**10172**
Year 18	1252	27608	0	16183	**11424**
Year 19	1224	28831	0	16183	**12648**
Year 20	1196	30027	0	16183	**13844**
Year 21	1169	31196	0	16183	**15013**
Year 22	1142	32338	0	16183	**16155**
Year 23	1116	33454	0	16183	**17271**
Year 24	1091	34545	0	16183	**18362**
Year 25	1066	35611	0	16183	**19427**