



Easy PV

Solar design made simple

Alex Manion Jones

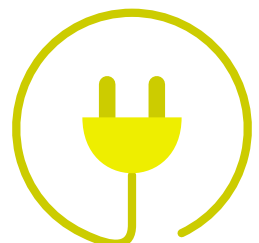
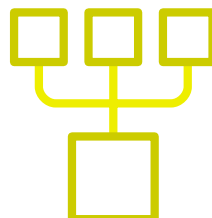
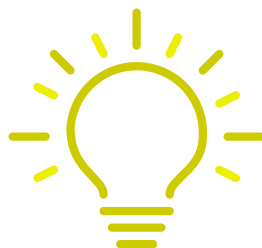
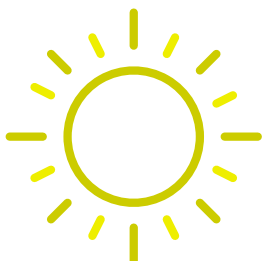
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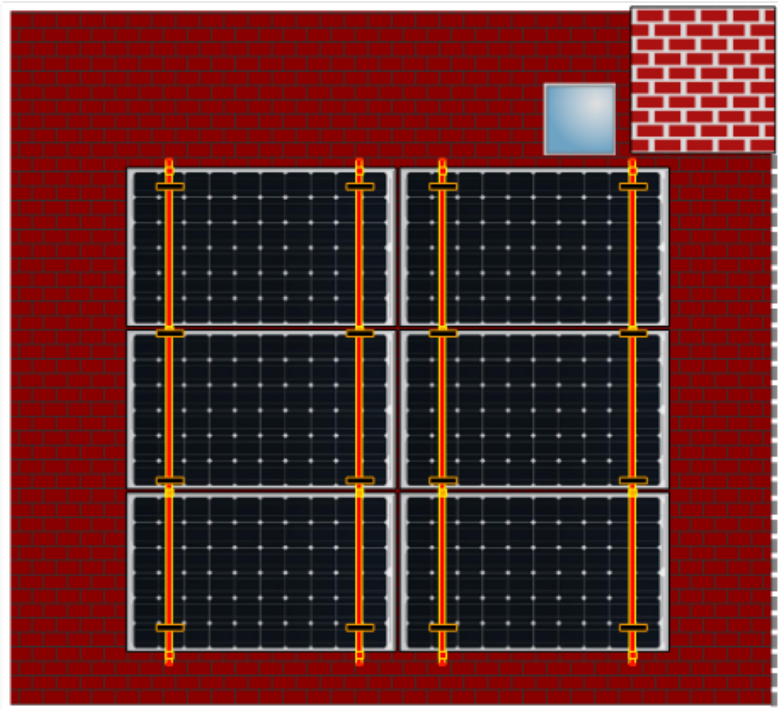
Date Created: 24th March 2022

Designer: Andy Barrow



Roof Layout

Roof 1



Component list

Qty	Part No	Description
6	<u>JAM60S-17-330-MR-AB-MC4</u>	JA Solar 330W Mono MBB Percium Half-Cell All Black MC4
1	<u>SOL-2.0-MINI-S6-DC</u>	Solis 2.0kW Mini S6 Single Tracker with DC isolator
8	<u>REN-420081-B</u>	End Clamp+ 30 - 50mm Black
8	<u>REN-420082-B</u>	Middle Clamp+ 30 - 50mm Black
2	<u>REN-900318-21</u>	Wood screw pan head 6 x 80 SIT30 Single (900318) (Pack of 21)
16	<u>REN-420181</u>	Roof hook UK Plain tiles/slates (without wood screw)
8	<u>REN-900246</u>	VarioSole + End Cap 41X35 rail Single - Grey
4	<u>REN-400524</u>	VarioSole+ Mounting rail 41 x 35 x 3300 mm
2	<u>MC4-CONN14-2-PACK</u>	MC4 Connector Twin Pack (Kit 1) 0014/0015
1	<u>CABLE4-1-25</u>	4mm2 single-core DC cable 25m - Black
1	<u>KG20-T203-GBA294</u>	K&N Single Phase AC Switch Disconnecter 25A
1	<u>EM-ECA2</u>	Emlite 1-ph generation meter 100A (1000 pulse/kWh) incl. Cover
1	<u>SOL-DLS-W</u>	Solis Data Logging Stick - WiFi
1	<u>BOHAZARD-SET</u>	PV on Roof and Hazard Labels Pack



Inverter checks

Solis 2.0kW Mini 6S

Panels

PV power 1980 Rated AC output 2200

Input 1: 6 Ja Solar 330 solar panels in 1 strings

Panels

Inverter

PV power	1980 W		
Open circuit voltage at -10° C	271 V	Max DC voltage	600 V
V _{mpp} at 40° C	197 V	V _{mpp} lower limit	80 V
V _{mpp} at -10° C	226 V	V _{mpp} upper limit	500 V
I _{mpp} at 40° C	10 A	Max DC input current	22 A

Max voltage

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



Max power point range

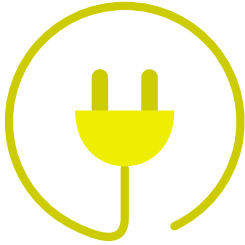
The maximum power point voltage of the solar panels is always above the lower limit of the inverter MPPT tracker. The maximum power point voltage of the solar panels is always below the upper limit of the inverter MPPT tracker.



Max Current

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





Electrical

Solis 2.0kW Mini 6S



AC Isolator

A AC isolator - KN Newbury 20A 4-pole has been specified for this input

Current

The rated isolator current (20A) is greater than the rated inverter current (10.5A)



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.





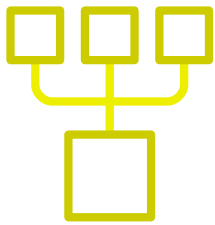
Cable

10m of 4mm² solar cable has been specified

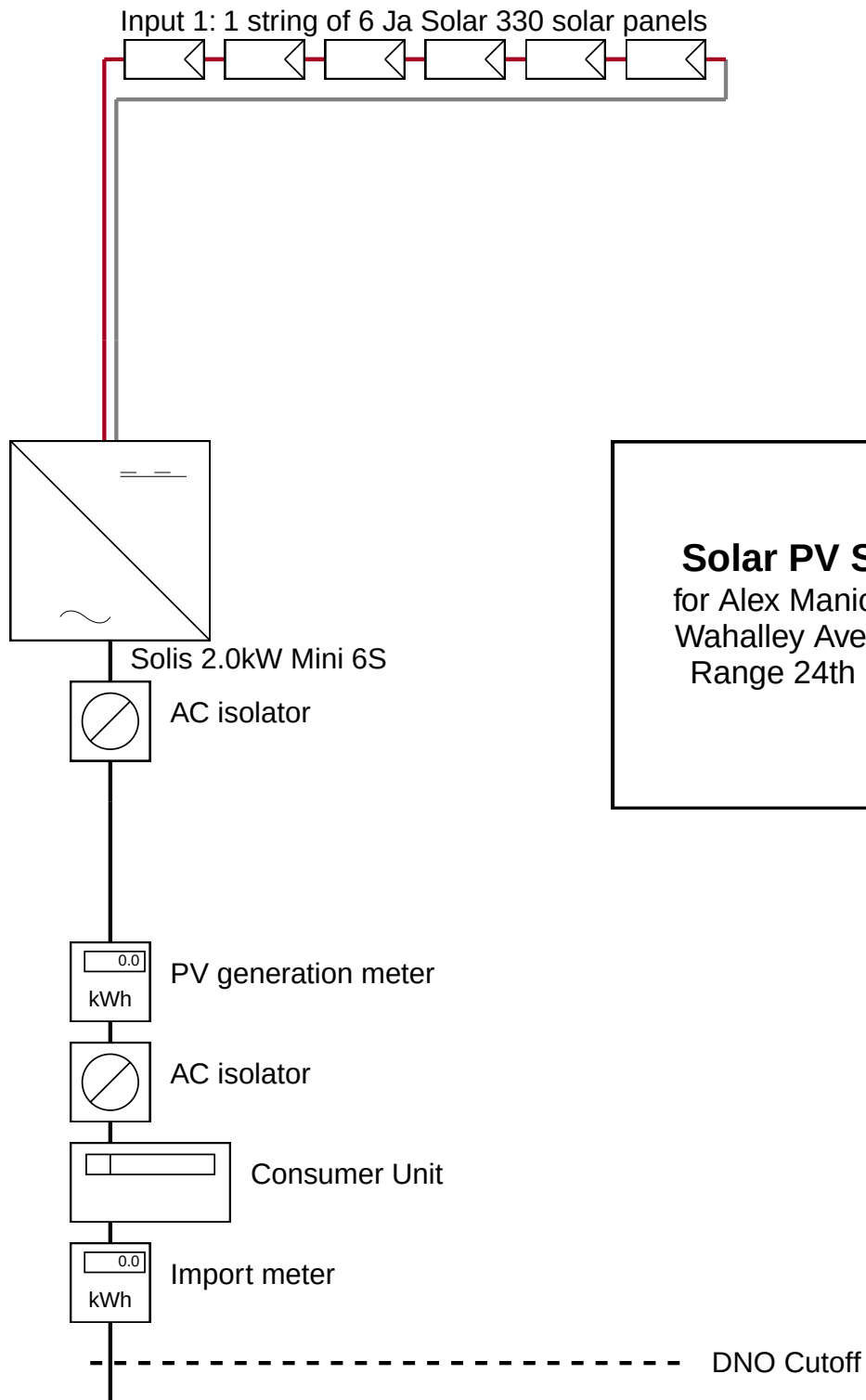
Voltage drop

Voltage drop at maximum power point at 40°C will be around
0.85 V (0.43 percent)

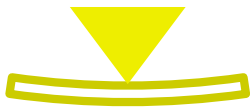




Schematic diagram



Solar PV Schematic
for Alex Manion Jones at 9
Wahalley Avenue, Whalley
Range 24th March 2022



Structural calculations

Weight loading calculations

For a traditional cut roof with rafters and purlins we recommend also using our rafter calculator to check the load-bearing capacity of the rafters. Even if the increase in loading is more than 15% the rafters may well be able to take the additional weight.

Please note that this method does not calculate the strength of the roof, and if a roof was badly constructed, does not meet existing building regulations, or is in poor condition then it may still not be appropriate to install an array.

Roof 1

Dead load from roof covering	0.73 kN/m ²
Imposed load	0.75 kN/m ²
Total loading without solar array	1.48 kN/m²
Weight of solar panels and mounting	130.2 kg
Area covered by solar array	10.1 m ²
Loading imposed by solar array	0.13 kN/m ²
Total loading with solar array	1.6 kN/m²

**Increase in loading
due to solar array:** 8.8%

An increase of less than 15% in the load imposed on a roof is not considered to be a significant change (The Building Regulations 2000, Approved Document A).



Span tables calculations

Roof 1

Total dead load of solar array, mounting and roof covering	0.85 kN/m ²
Roof pitch	30
Rafter depth	125
Rafter breadth	38
Maximum unsupported span	2
Maximum permitted span	2.47

For a dead load of between 0.75 and 1.00kN/m² and a roof pitch of 22.5 to 30 degrees, with roof timbers of 38 x 125 mm at 450 centers, the maximum permitted unsupported span according to Trada span tables is 2.47m.

The maximum unsupported length of the roof timbers is within the permitted span.



Wind loading calculations

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

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

Roof 1

Q_p	908 Pa	
From Fig 34 in Guide to the Installation of Photovoltaic Systems for a building 10 m high, in windzone 2, in urban terrain, at a distance of greater than 20km from the sea		
$C_{p \text{ net}}$	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}	10.09m ²	
F	Roof Centre	Roof edge
Uplift	-11914N	-20163N
Pressure	9165N	10081N

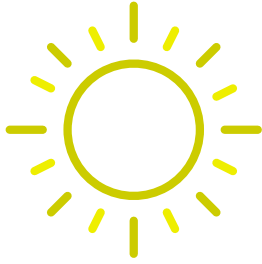
With 16 roof hooks we should allow for an uplift force per hook in the central zone of **745N**, rising to **1260N** at the edges. If 2 screws are used per roof hook, this equates to **372N** per fixing in the central zone, and **630N** at the edges.

Flat 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 75 mm of thread in the timber. The pull-out force in C16 timber is given by tables and formulae in BS5268 Part 2:

$$18.74 \times 1.25 \times 75 = 1757\text{N}$$

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





Performance Estimate

Site details

Client

Alex Manion Jones

Address

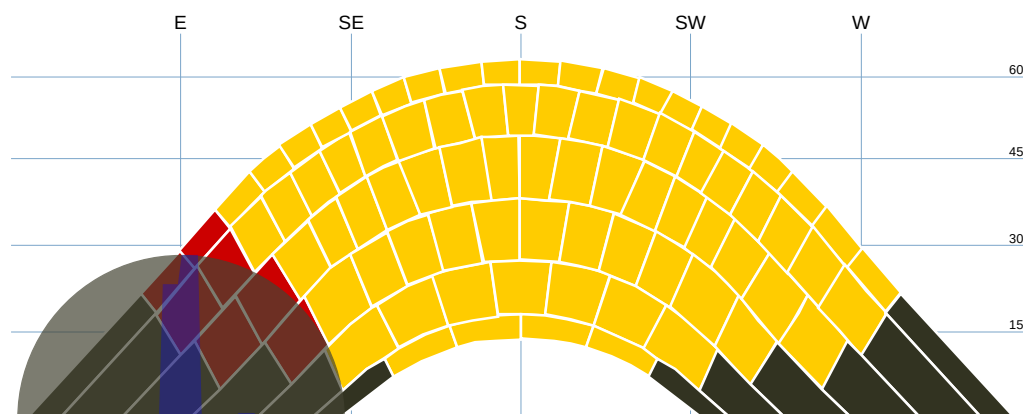
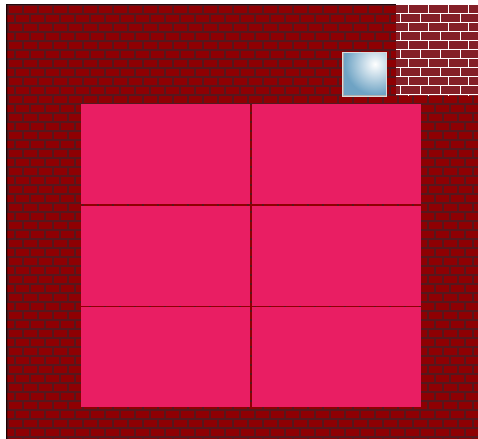
9 Whalley Avenue, Whalley Range

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 2.0kW Mini 6S

Input 1



A. Installation data

Installed capacity of PV system - kWp (stc)	1.980	kWp
Orientation of the PV system - degrees from South	-50	°
Inclination of system - degrees from horizontal	30	°
Postcode region	7E	



B. Performance calculations

kWh/kWp (Kk)	807	kWh/kWp
Shade factor (SF)	0.93	
Estimated output (kWp x Kk x SF)	1486	kWh

Performance Summary

A. Installation data		
Installed capacity of PV system - kWp (stc)	1.98	kWp
Orientation of the PV system - degrees from South	See individual inputs	
Inclination of system - degrees from horizontal	See individual inputs	
Postcode region	7E	
B. Performance calculations		
kWh/kWp (Kk)	See individual inputs	
Shade factor (SF)	See individual inputs	
Estimated output (kWp x Kk x SF)	1486	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 guidance only for the first year of generation. It should not be considered as a guarantee of performance.

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.

Solar PV will be installed on the front of this property. As the property is in a conservation area, a planning application will need to be submitted. Other houses locally have solar PV which gives residence for expected acceptance. Scaffolding will need a pavement permit and notification of the neighbours, as it is on a public highway. This will also require signs, barriers and a banksman. Parking is available on the street. There is no laydown area, equipment will be kept in the van until needed. The consumer unit has no spare ways and a sub consumer unit will be installed. Cabling will run down the front of the house. Rafters are not visible, due to room in the roof. The inverter will be sited near the consumer unit. Bonding is visible at the gas.

