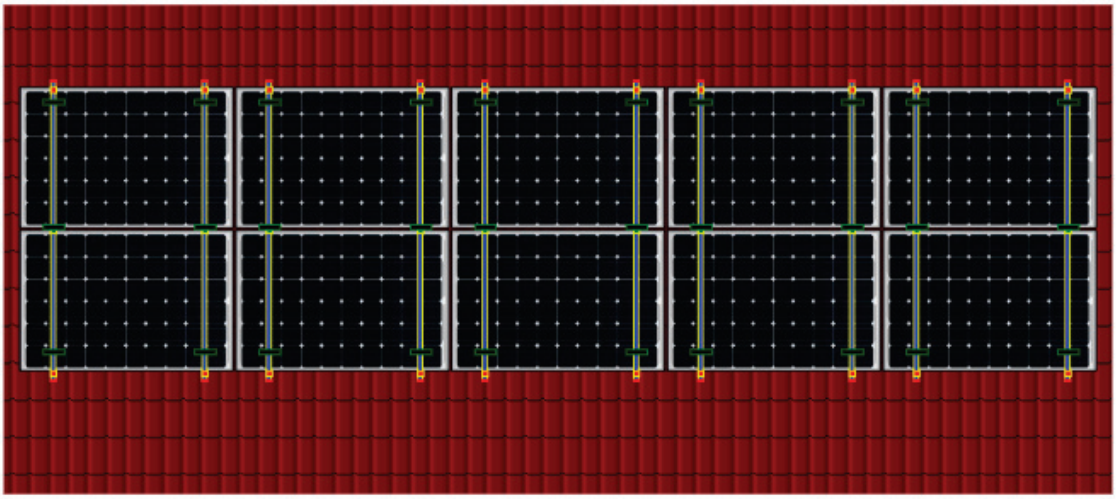
Roof Layout

South Aspect



Component list

Item	Quantity
Canadian Solar 405w solar panel	10
Solis 3600 Dual 5G with DC inverter	1
 **NET** Emlite Bi-directional Meter ECA2.nv	1
 Label sheet	1
 iBoost +	1
 AC isolator - KN 25A 3-pole	2
Pair of MC4 connectors	4
50m reel of 4mm2 solar cable	1
Renusol end clamp (black)	20
Renusol mid clamp (black)	10
Renusol end cap (black)	20
Renusol landscape pan tile roof hook	30
Renusol rail 3.3m silver	10

Inverter checks

Solis 3600 Dual 5G with DC

Panels			
PV power	**4050**	Rated AC output	**4200**

Input 1: 5 Canadian Solar 405w solar panels in 1 strings

Panels		Inverter	
PV power	**2025 W**		
Open circuit voltage at -10° C	**203 V**	Max DC voltage	**600 V**
V_{mpp} at 40° C	**149 V**	V_{mpp} lower limit	**90 V**
V_{mpp} at -10° C	**170 V**	V_{mpp} upper limit	**520 V**
I_{mpp} at 40° C	**13 A**	Max DC input current	**12.5 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: 5 Canadian Solar 405w solar panels in 1 strings

Panels		**Inverter**	
PV power	**2025 W**		
Open circuit voltage at -10° C	**203 V**	Max DC voltage	**600 V**
V_{mpp} at 40° C	**149 V**	V_{mpp} lower limit	**90 V**
V_{mpp} at -10° C	**170 V**	V_{mpp} upper limit	**520 V**
I_{mpp} at 40° C	**13 A**	Max DC input current	**12.5 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

Solis 3600 Dual 5G with DC

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 (25A)

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 **1.10 V (0.74 percent)**

Input 2

DC Isolator

Integrated isolator

This inverter contains an integrated DC Isolator.

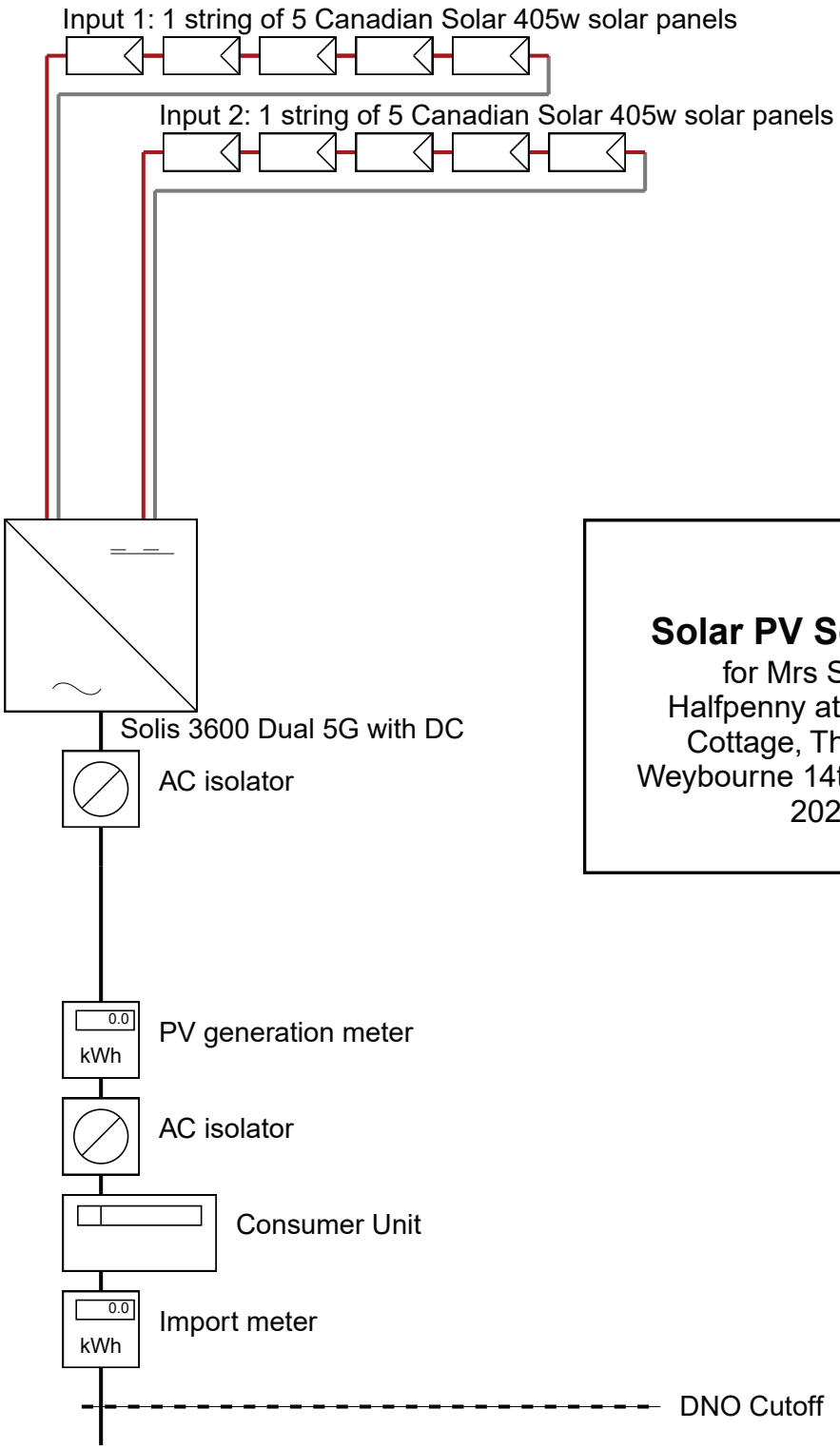
Cable

10m of 4mm2 solar cable has been specified

Voltage drop

Voltage drop at maximum power point at 40°C will be around **1.10 V (0.74 percent)**

Schematic diagram



Solar PV Schematic

for Mrs Sharen
Halfpenny at Appletree
Cottage, The Street,
Weybourne 14th November
2022

Structural calculations

Weight loading calculations

South Aspect

Weight of solar panels and mounting	259.7 kg
Area of solar array	19.5 m^2
Loading imposed by solar array	0.13 kN/m^2
Dead load from roof covering	0.44 kN/m^2
Total dead load of solar array, mounting and roof covering	**0.57 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 **0.57kN/m^2**. This is less than the permitted dead load for the roof of **0.785kN/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:

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

South Aspect

Q_p	819 Pa
in	From Fig 34 in Guide to the Installation of Photovoltaic Systems for a building 5 m high, windzone 2, in urban terrain, at a distance of less than 2km 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}	19.53m^2

F	Roof Centre	Roof edge
Uplift	**-20791N**	**-35185N**
Pressure	**15993N**	**17592N**

With 30 roof hooks we should allow for an uplift force per hook in the central zone of **693N**, rising to **1173N** at the edges. If 2 screws are used per roof hook, this equates to **347N**per fixing in the central zone, and **586N** at the edges.

Pan 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:

$$17.3 \times 1.25 \times 75 = \mathbf{1622N}$$

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

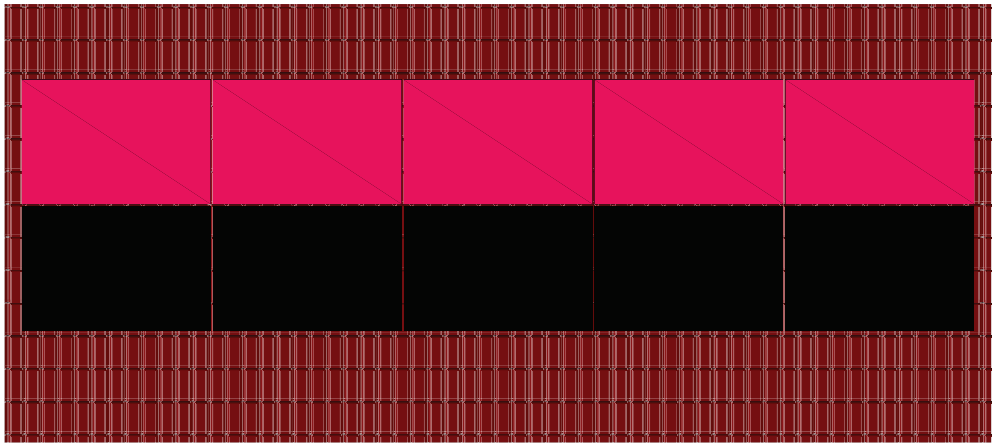
Client	Mrs Sharen Halfpenny
Address	Appletree Cottage, The Street, Weybourne

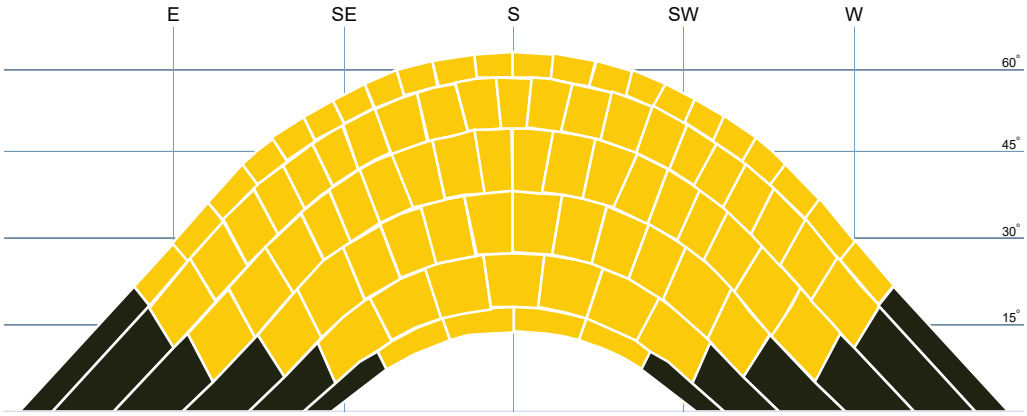
The sunpath diagram shows the arcs of the sky that the sun passes through at different times of the day and year as yellow blocks. The shaded area indicates the horizon as seen from the location of the solar array. Where objects on the horizon are within 10m of the array, an added semi-circle is drawn 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 3600 Dual 5G with DC

Input 1

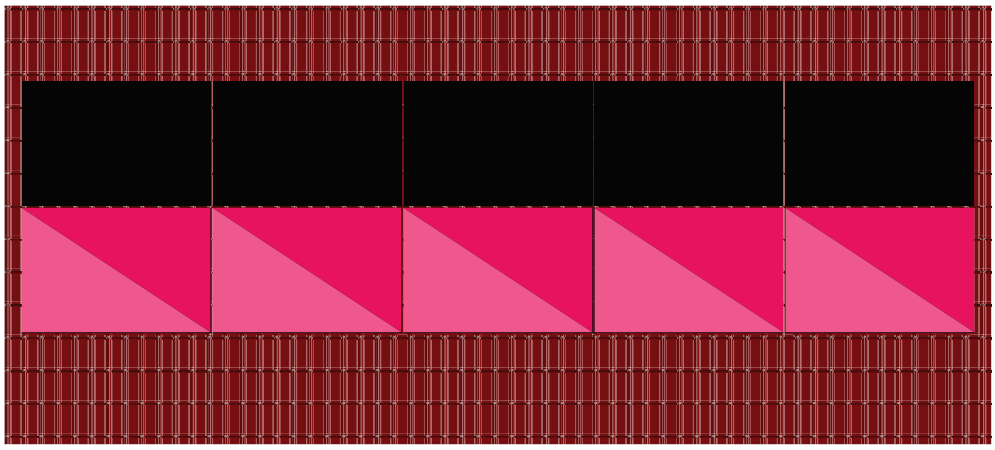


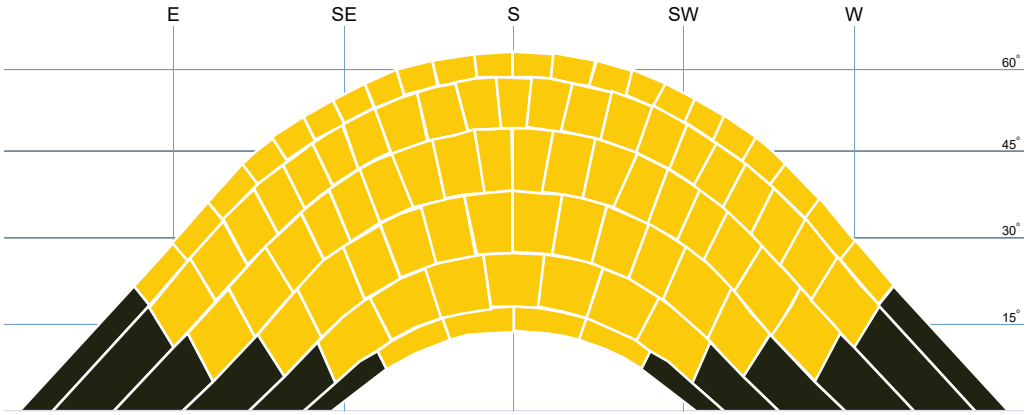


A. Installation data		
Installed capacity of PV system - kWp (stc)	**2.025**	kWp
Orientation of the PV system - degrees from South	**0**	°
Inclination of system - degrees from horizontal	**40**	°
Postcode region	**12**	

B. Performance calculations		
kWh/kWp (Kk)	**962**	kWh/kWp
Shade factor (SF)	**1.00**	
Estimated output (kWp x Kk x SF)	**1948**	kWh

Input 2





A. Installation data		
Installed capacity of PV system - kWp (stc)	**2.025**	kWp
Orientation of the PV system - degrees from South	**0**	°
Inclination of system - degrees from horizontal	**40**	°
Postcode region	**12**	

B. Performance calculations		
kWh/kWp (Kk)	**962**	kWh/kWp
Shade factor (SF)	**1.00**	
Estimated output (kWp x Kk x SF)	**1948**	kWh

Performance Summary

A. Installation data		
Installed capacity of PV system - kWp (stc)	**4.05**	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)	**3896**	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.