

Appendix G

Energy output and storage estimate from renewable generation

The following figures show average annual weather statistics for Ystalyfera

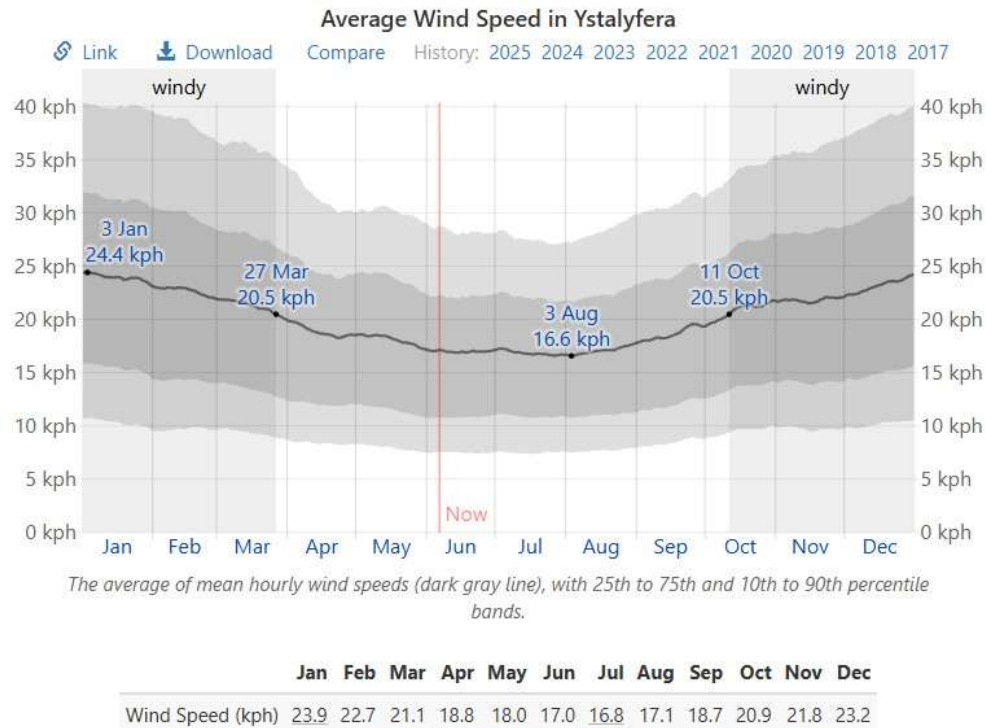


Figure 1 Average windspeed

This shows an average of 22.26 kph (6.5mps) over the six month from October-March

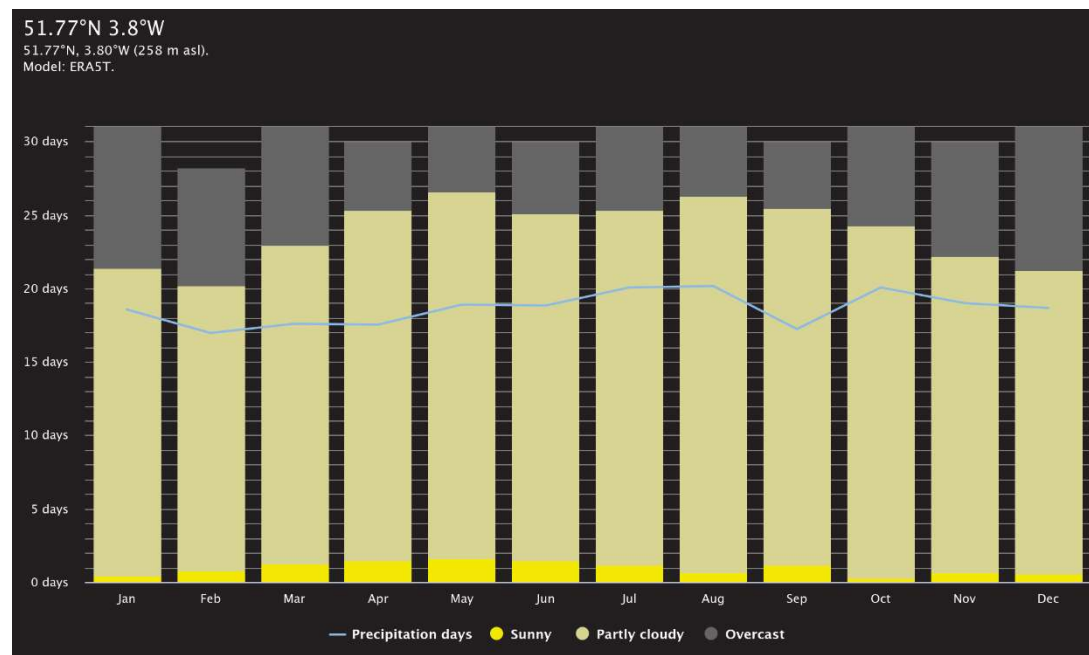


Figure 2 -Sunlight through year

The following page shows the PV output through the year based on proposed system.

Source PVGIS ©European Union, 2001-2025.

Performance of off-grid PV system

PVGIS-5 estimates of solar electricity generation

Provided inputs

Latitude/Longitude: 51.770,-3.798

Horizon: Calculated

Database used: PVGIS-SARAH3

PV installed: 6000 Wp

Battery capacity: 9840 Wh

Cutoff limit: 20 %

Consumption per day: 3000 Wh

Slope angle: 45 °

Azimuth angle: 0 °

Simulation outputs

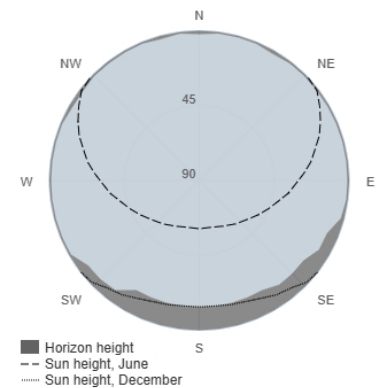
Percentage days with full battery: 78.07 %

Percentage days with empty battery: 7.47 %

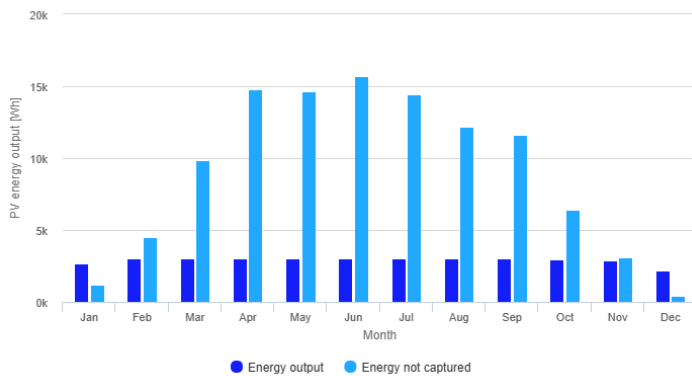
Average energy not captured: 11633.72 Wh

Average energy missing: 1328.39 Wh

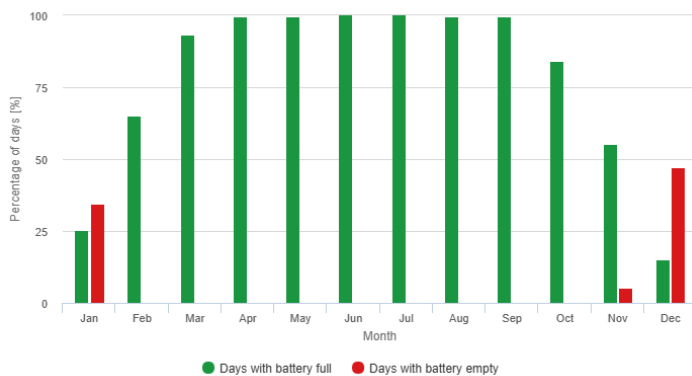
Outline of horizon at chosen location:



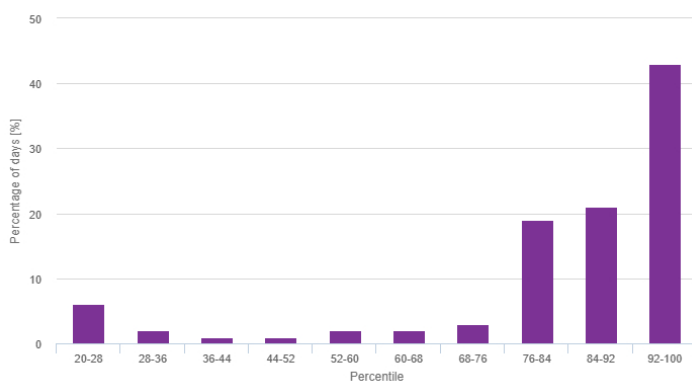
Power production estimate for off-grid PV:



Battery performance for off-grid PV system:



Probability of battery charge state at the end of the day:



Monthly average performance

Month	E_d	E_l	f_f	f_e
January	2669.9	1203.7	25.3	34.6
February	3051.7	4504.7	65.0	0.2
March	3008.8	9861.6	93.4	0.0
April	3000.2	14784.2	99.7	0.2
May	3000.8	14616.8	99.7	0.3
June	3000.7	15691.6	100.0	0.0
July	2999.6	14418.9	100.0	0.0
August	2997.0	12204.1	99.7	0.0
September	2997.4	11639.6	99.7	0.0
October	2983.2	6412.7	84.2	0.0
November	2903.9	3091.7	55.4	5.4
December	2209.3	451.1	15.3	47.2

E_d: Average energy production per day [Wh/day].

E_l: Average energy not captured per day [Wh/day].

f_f: Percentage of days when battery became full [%].

f_e: Percentage of days when battery became empty [%].

Cs	Cb
20-28	6.0
28-36	2.0
36-44	1.0
44-52	1.0
52-60	2.0
60-68	2.0
68-76	3.0
76-84	19.0
84-92	21.0
92-100	43.0

Cs: Charge state at the end of each day [%].

Cb: Percentage of days with this charge state [%].

This shows that the PV system plus battery can reliably provide all the energy need of the development and land based enterprise from March to October and that surplus electricity will be able to heat our hot water through most of the year. However through the darkest months we will utilise a small LE600 wind turbine to provide a top up to the batteries from the wind.

Wind generation from LE600

The figure below shows the output from the LE600

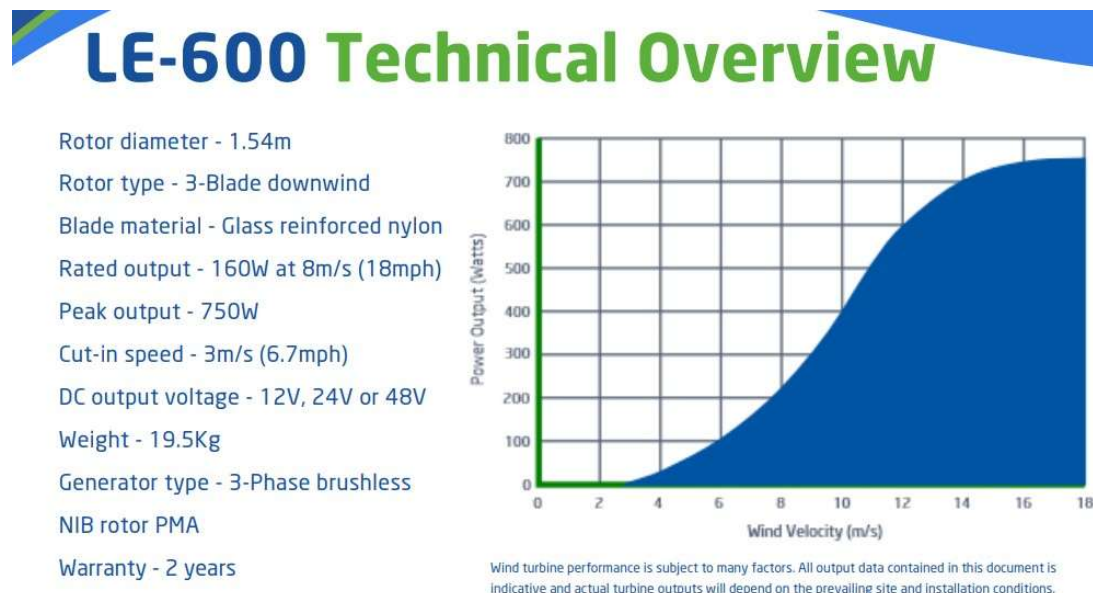


Figure 3 LE600 output vs wind speeds.

An average of 22.26 kph (6.5mps) over the six month from October-March will produce an output of $0.12 \times 24 = 2.88$ kWh per day, sufficient to ensure the batteries are topped up.

The batteries will provide 9.84kWh – sufficient to run for two days with no generation at all. The chances of this occurring are reasonably low. If we ex