Is your property suitable for PV electricity generation?

In the UK the optimal PV panel orientation is facing due south and with a tilt or inclination (i.e. roof slope) of between 30 and 40 degrees. However, any orientation between south-west and south-east and a tilt / inclination between 10 and 60 degrees can give acceptable investment returns for installations in the Chepstow area.

The old but still valid Table below gives typical UK figures for % of yearly solar output available for various orientations and tilts, as a % of the maximum. It is included because it is thought to assist accurate understanding. Note that tilts of less than 10° are generally not recommended as they cannot be relied upon to be self-cleansing (e.g. regarding rain and bird droppings).

Inclination / Tilt from Horizontal	Orientation - compass bearing (degrees) measured clockwise from North												
	West			**SW**			**South**			**SE**			East
	270°	255°	240°	225°	210°	195°	180°	165°	150°	135°	120°	105°	90°
Horiz 0°	90	90	90	90	90	90	90	90	90	90	90	90	90
10°	89	91	92	94	95	95	96	95	95	94	93	91	90
20°	87	90	93	96	97	98	98	98	97	96	94	91	88
30°	86	89	93	96	98	99	100	100	98	96	94	90	86
40°	82	86	90	95	97	99	100	99	98	96	92	88	84
50°	78	84	88	92	95	96	97	97	96	93	89	85	80
60°	74	79	84	87	90	91	93	93	92	89	86	81	76
70°	69	74	78	82	85	86	87	87	86	84	80	76	70
80°	63	68	72	75	77	79	80	80	79	77	74	69	65
Vert 90°	56	60	64	67	69	71	71	71	71	69	65	62	58

Source: Photovoltaics in Buildings - Guide to the installation of PV systems, 2nd edition, DTi/Pub URN 06/1972

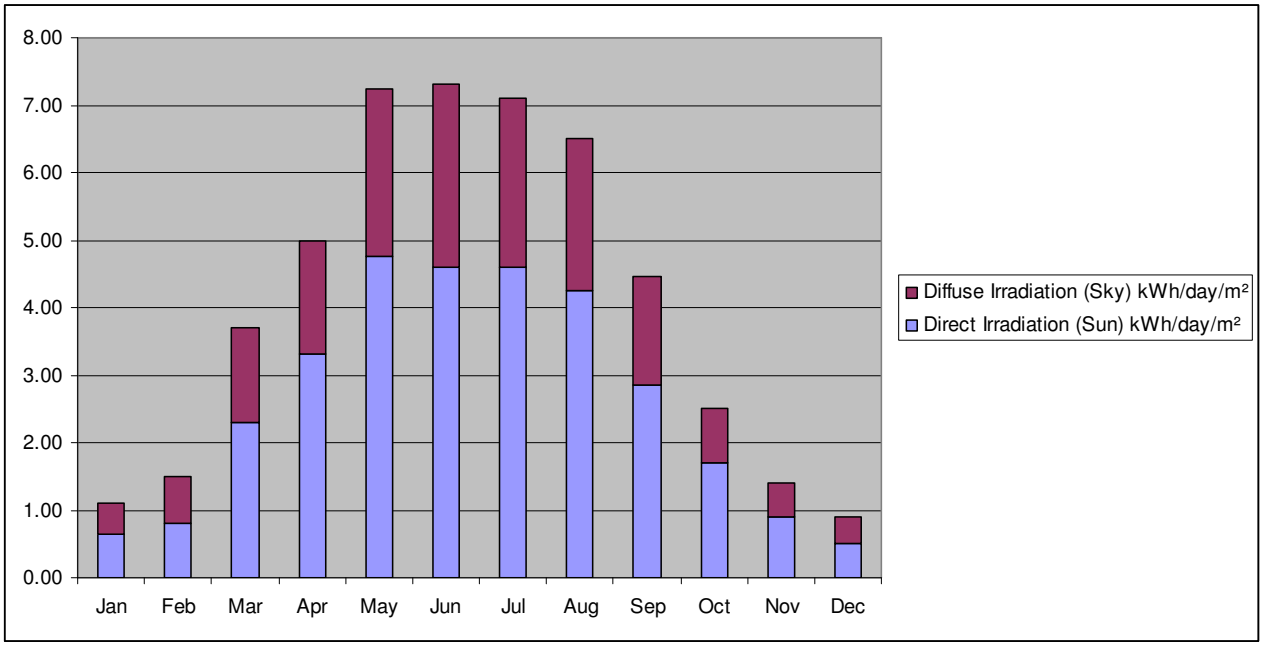
The UK map below shows how much solar energy is available each year (Annual Irradiation) in kWh/m² for optimally-inclined PV panels (i.e. 100% in the table above). By increasing your computer screen zoom it can be seen that the Chepstow area typically receives about 1150kWh/m² of irradiation each year (very similar to most of London).

By using your house orientation and roof slope in the above table you can identify the percentage of irradiation that was averaged between 2001 and 2008 and use this as an indication of the potentially available annual solar energy. It should be noted that the source of the map below was JRC, European Commission and that they this figure is then multiplied by 0.75 in order to calculate the Peak yearly electricity generated by a 1kW PV system. This multiplier is lower that the 0.8 figure used by the UK based Building Research Establishment (BRE) and is explained further in other supporting documentation. The BRE publish *The Government's Standard Assessment Procedure for Energy Rating of Dwellings* (SAP 2009) and this is the main reference document used by the UK based PV industry and is referred to extensively in the supplied detailed information.

Source: JRC, European Commission

Most types of PV panels work with both sunlight and daylight, i.e. the sun does not have to be shining for them to generate electricity. In the diagram below sunlight is referred to as *Direct Irradiation (Sun)* and daylight is referred to as *Diffused Irradiation (Sky)* and the latter includes light reflected off clouds and surroundings. The diagram below shows average daily light energy in London (very similar for Chepstow) for each month of a typical year assuming no shading.

Average Daily Light Energy Through Year (London)



Source: World Irradiation Database

Clearly it is desirable to site PV panels away from any shade, e.g. caused by nearby buildings and trees, since this will reduce the energy generated. Some shade in the first hour after dawn and the last hour before dusk (when the sun is very low in the sky) will have minimal effect since little energy is generated then.

Table H4 of *The Government's Standard Assessment Procedure for Energy Rating of Dwellings* (SAP 2009) provides the following 'Overshading Factors' to reduce the assumed energy generated by PV panels.

Overshading	% of sky blocked by obstacles.	Overshading Factor
Heavy	>80%	0.5
Significant	60% to 80%	0.65
Modest	20% to 60%	0.8
None	<20%	1.0

Table H4: Overshading Factor

Source: SAP 2009 published on behalf of DECC by The Building Research Establishment, Garston, Watford, WD25 9XX

It should be noted that there are sources of information that say that some PV panel types are prone to *very significant* reductions in energy generation when virtually *any* form of shading occurs. This is being further investigated and this website will be updated accordingly, if necessary. Websites reporting such problems include:
http://www.enviroharvest.ca/pv_shading.htm
http://www.kyocerasolar.com/learn/modules.html
http://www.renewableenergyworld.com/rea/news/article/2009/02/shade-happens-54551
http://www.solarguide.co.uk/solar-pv-and-shading

Partial and/or temporary shading of PV panels is probably the single greatest limiting factor affecting the financial attractions of the technology. The reason is that depending on the panel type and installation configuration, up to virtually all of the power generation capability can be lost while the shading occurs.

It is recommended that anyone considering installing PV panels should thoroughly question a potential supplier / installer and should request related performance predictions and assurances in writing.

Detailed analysis using the latest PV simulation programs should be provided by any competent company offering to supply and install PV panels. This analysis should clearly take full account of the exact location of the property (longitude and latitude), its orientation (PV panels preferably facing between south-east and south-west), the roof slope (tilt / inclination), any shading, the type of PV panels proposed, etc.

The Energy Saving Trust is a consistently good source on information on all aspects of PV panels and their website is recommended http://www.energysavingtrust.org.uk/Generate-your-own-energy/
They also have a worthwhile Solar Energy Calculator which based on information you supply about your property will generate figures for income, savings and payback times, see http://www.energysavingtrust.org.uk/Generate-your-own-energy/Solar-panels-PV/Solar-Energy-Calculator

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