

Photovoltaic (Solar) Panels

“Photovoltaic” means electricity from light. Photovoltaic systems use daylight to power ordinary electrical equipment, for example, household appliances, computers and lighting. The photovoltaic (PV) process converts free solar energy - light - the most abundant energy source on the planet - directly into electricity. Note that this is different from solar thermal technology that is used for space heating and hot water.

A PV cell consists of two or more thin layers of semi-conducting material, most commonly silicon. When the silicon is exposed to light, electrical charges are generated and this can be conducted away by metal contacts as direct current (DC). An ‘inverter’ is used to convert this DC current into usable AC electricity, which can then be used to power appliances.

The electrical output from a single cell is small, so multiple cells are connected together and encapsulated (usually behind glass) to form a module (sometimes referred to as a "panel"). The PV module is the principal building block of a PV system and any number of modules can be connected together to give the desired scale of electrical output.

PV equipment has no moving parts and as a result requires minimal maintenance. It generates electricity without producing emissions of greenhouse or any other gases, and its operation is virtually silent.

Summary

- Photovoltaics (PV) require only daylight – not direct sunlight – to convert solar radiation into electricity. These systems are neat, unobtrusive and can be fitted on flat or sloping roofs or even mounted on the ground.
- There are three main types of solar cells: Monocrystalline, Polycrystalline and Thin Film. Individual cells are combined to form a module, and can be sized to meet users’ particular needs. Generally, PV modules will supply power to the building on which they are mounted. If built to a sufficiently large scale, electricity could also be sold to the grid.
- However, PV systems are relatively new and relatively expensive. Mass production would be necessary to drive down costs to a level where such systems could compete for electricity supply. When/if that happens, it may be possible to farm sunlight by having multiple banks of PV systems as free standing units.

Site requirements

PV panels should be positioned facing predominantly south, with a minimum size of approximately 10 square meters. The ideal pitch is 35-40 degrees or less; flat roofs can be used. Positioning should be carefully considered to avoid shading from trees, chimneys or other buildings.

Planning requirements

Planning Permission may be required, especially in conservation areas or on listed buildings. Always check at an early stage with your local authority.

Capital & Installation costs

Costs are very dependent on the size of the system to be installed. A typical domestic installation can cost around £4,000 - £9,000 per kWp (kilowatts peak) with most domestic installations being between 1.5 and 2 kWp.

Operation & Maintenance Costs

Grid-connected systems require very little maintenance, generally just cleaning and monitoring shade, which falls on the panels. Off-grid systems require maintenance of system components such as batteries.

Savings

A typical household system of 1.5 – 2 kWp would be expected to provide around half of an average family's annual power requirements (assuming gas is used for heating and that minimal energy efficiency savings are available).

If commercial scale systems become economic, earnings from Renewable Order Certificates (ROCs) would come into the reckoning.

Sources of Funding

Scottish Communities and Householder's Renewable Initiative:

The Energy Savings Trust (EST) and Highlands & Islands Community Energy Company run the Scottish Communities and Householder's Renewable Initiative (SCHRI). Householders can receive up to 30 per cent of the total cost of their project up to a limit of £4,000. Community schemes can receive a maximum grant of £10,000 for a feasibility study and a maximum grant of £100,000 for a capital project. Contact: www.est.org.uk/schri/ or call 0800 138 8858.

Loan Action Scotland:

Loan Action Scotland is funded by the Scottish Executive through the Scottish Energy Efficiency Office in support of Action Energy. Loans may be advanced against a range of energy saving measures to enable companies to take action to reduce their energy bills. It is primarily an energy efficiency scheme, but it may be worth discussing whether biomass heating equipment would be eligible.

The scheme provides interest free loans of £5,000 to £50,000. Loans can have a repayment period of up to five years. The loans are available to companies based in Scotland, with up to 250 employees. Companies must be able to demonstrate that the actions proposed will deliver the energy efficiency benefits claimed. See: www.energy-efficiency.org/howto/help/loan/index.html

Tax Incentive (to be confirmed)

Enhanced capital allowances (ECA) Scheme:

The aim is to encourage businesses to invest in low carbon technologies, and so reduce UK carbon emissions. Solar thermal panels are included as energy saving plant and machinery. Therefore, it may be presumed that PV panels should also qualify. The ECA scheme is an integral part of the Climate Change Levy Programme, and was introduced by the Finance Act of 2001. Sponsoring organisations are the Treasury, DEFRA and The Carbon Trust.

Enhanced Capital Allowances (ECAs) enable a business to claim 100% first-year capital allowances on their spending on qualifying plant and machinery. All businesses that are subject to UK taxation are eligible, regardless of size, industrial or commercial sector or location.

See: http://www.hmrc.gov.uk/capital_allowances/eca-guidance-pt1.htm

Advice

Energy Savings Trust (EST) business advisers can help small to medium sized businesses make best use of the many energy and resource efficiency schemes provided by the Trust and other government funded organisations. They can also help access tax incentives and interest free loans to help finance improvements.

EST advisers can help you access:

- Free and impartial information and advice.
- Free on-site energy, waste and water audits.
- Practical guides and best practice literature.
- Low carbon, clean fuel and renewable technologies.
- Relevant training and seminars.

Contact: **0845 458 5040**

The British Photovoltaic Association is another source of information. See:

<http://www.greenenergy.org.uk/pvuk2/technology/configuration.html>

