

Solar Photovoltaics

Practical Guide

Solar power refers to energy derived from the sun in terms of either direct heat or daylight. The sun could easily provide all our power needs; the problem is capturing it.

Solar renewable systems can be divided into two types; Solar thermal, which relies on heat from the sun to provide heating and hot water, and solar photovoltaics (PV), which converts daylight into electricity.

With a reduction in government incentives, the goal for appropriately designed schemes is to make the best use of the generated power. Export tariffs, power purchase agreements and offsetting high onsite energy bills make solar an attractive option for many developers.

PV can bring savings on your electricity bill through using electricity generated by the PV cells rather than mains electricity. This works best where there is an on-site demand for the electricity produced that matches the yield profile of PV, for example, powering shed cooling fans that operate during summer days.

Solar power is a common occurrence on many farms across the country and can improve energy security, reduce reliance on fossil fuels and bring economic gains.

This Practical Guide concentrates on the opportunities for producing electricity from solar photovoltaics (PV) on farm, which can supplement on site electricity demand and reduce farm GHG emissions.

Economic payback

Consuming power generated by PV on site, to offset your energy bills, can provide a good return on investment. This is especially true at times of escalating energy costs and market volatility. Other economic payback opportunities can arise from export tariffs, such as Smart Export Guarantee (SEG), Power Purchase Agreements (PPA) or land rental opportunities, depending on the scale of development. The opening up of energy markets, smart metering, battery storage, electric vehicles, future proofing businesses and other emerging markets may all provide various opportunities for solar moving forward.

Top tips for every farm:

- ✓ Carry out an energy audit.
- ✓ Monitor and reduce energy use.
- ✓ Benchmark; how do you compare with others?
- ✓ Assess all opportunities for renewables; for example a mix of renewable technologies such as wind and solar may be best suited to your farm.
- ✓ Compare information from different reputable suppliers.



Our Practical Guides cover five useful topics:

1. Use energy and fuels efficiently
2. Renewable energy
3. Lock carbon into soils and vegetation
4. Making the best use of nutrients
5. Optimise livestock management

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Solar Heating & Hot Water

Solar panels for heating and hot water use different technology to solar PV. These systems rely on the heat in sunlight to warm water in special panels or tubes.

The system consists of a roof mounted collector plate, fixed to an unshaded south or near-south facing roof, a hot water storage tank and a pumped circulation system. The most common type of collector units are either a flat plate or evacuated tube design.

Typical supplementary systems can cost from £3,000 upwards and a correctly sized unit can provide 100% of domestic hot water during the summer months.

Is your site suitable?

- Are there any planning requirements? Most roof mounted schemes are classed as a permitted development, but exceptions exist so this should be checked with your local planning department.
- If opting for a large scale solar array at ground level, are you near to a load or grid connection; do you need permission to cross anyone else's land?
- If retrofitting to shed roofs, has your supplier taken into account the additional loading that panels could put on the building, especially taking into account the weight of heavy snowfall?
- Remember hours of daylight are not constant throughout the year, affecting generation potential.
- Assess current energy use. An energy audit will help you identify unnecessary losses and assess energy and heat needs. A carbon audit will also show where GHG savings can be made by installing renewables on farm.

Solar PV opportunities on farm

Solar PV cells convert daylight into electricity, the amount of energy they produce varies depending on the light falling upon them rather than on the air temperature. Solar PV panels can make good use of existing vacant farm roofs, so no additional space is needed to site equipment. Ground mounted schemes are usually much larger developments, with most developers currently looking for sites of over 100 acres and offering payback via land rental payments.

Solar PV systems are normally connected to the National Grid, so power can either be used during the day as it is generated, or sold back to an electricity utility company. Smart Export Guarantee (SEG) ensures that generators are paid something for power they export to the grid.

A mix of renewable technologies including solar PV can be particularly useful in off-grid situations, providing light and power to houses and farm buildings. Small solar PV panels are already in use to power pumps to supply water for livestock drinking troughs and to charge batteries used for electric fences.

Installation and maintenance

Siting is a key consideration to maximise output. Solar PV needs to be sited in a south or near-south facing direction. Panels can be retrofitted to building roofs, incorporated into the roof design as tiles in the external layer or, as seen in larger schemes, mounted at ground level in fields forming a bank of solar arrays.

There are a range of reputable solar companies in the market who can assist with multiple aspects of development. Getting quotes from several companies is recommended before proceeding, to ensure you get the best deal.

Ideally, a PV array should be connected to the National Grid with an inverter to change power from DC (direct current) to AC (alternating current). This can also allow two-way metering where power can be sold directly to the grid when a surplus of energy has been generated or buy in electricity when the demand exceeds the current level of generation.

Aside from making sure the panels are clean, maintenance requirements are low. Some manufacturers are claiming panel life spans in excess of 35 years if correctly maintained, but performance will gradually deteriorate over time. Inverters may need replacing during the life of the panels, at around 10 years.

Solar PV costs

Solar has seen an increase in efficiency coupled with a decrease in costs over recent years, making it an increasingly viable option without incentive payments. Although solar PV is most cost effective when installed as part of a new build, retrofitting existing roofs is a common occurrence.

Costs will vary depending on your site and size of scheme and PV in particular benefits from economics of scale. A modern commercial solar panel is typically rated at 300-450W and takes up about 1.6-2.0m² of space. As a rough indication, a 10kWp system cost in the region of £9,000-£12,000. Depending on geographic location, demand and how much electricity you generate and use on site, the payback benefits will vary.

Solar PV technology is improving quickly and new markets and opportunities are emerging which could help offset costs.