Solar PV FAQs

Frequently asked questions about choosing a solar photovoltaic system for your home

This set of FAQs has been produced by Ambleside Action for a Future, with the support of Cumbria Action for Sustainability and Carbon Co-op as part of the Solar Made Easy project.

If you're considering installing solar photovoltaic panels on your property, you're likely to have a raft of questions. We hope that these FAQs will answer a lot of those and will both help in your decision making, and in your assessments of any quotes you might receive from installers.

In the questions about financial return, we have given indicative answers with a bit more detail at the end that shows you how you might make a calculation for the system you are looking at. These are based on prices in autumn 2022 and actual quotes received by Ambleside properties in mid 2022.

Contents:

Further Information

If you'd like to find out more try the solar PV and battery guides from the Energy Saving Trust. They also have a Solar Energy Calculator where you can put in details about your roof and the size of the system you are interested in to get an estimate of fuel savings. Money Saving Expert has also recently published an article that weighs up the cost of solar PV.

An electronic version of this document can be found at cafs.org.uk/solar-pv-faqs/with hyperlinks to the other information sources.

With thanks to our funders:

Solar PV panels

Why should I consider installing solar panels?

Installing solar panels can cut your carbon footprint and so that you can make a personal contribution to reducing global warming. Also, it can save money in the long term and shield against dramatic energy price rises

How much will they cost?

This depends on the size of the system and how easy the panels are to install. It also depends on whether you add a battery, which is becoming much more common. Further information on batteries is provided below.

A typical cost is about £12,000 for a system of twelve panels rated at 370Wp per panel (4.44kWp in total), including a battery. This is the size of system that would be suitable for an average family home. We'll assume this is the system you have in the examples below. Of the £12,000, about £3,000 relates to the cost of scaffolding, electrical infrastructure and installation, about £3,000 for the panels themselves, and about £6,000 for a 10kWh battery.

What do you mean by 370Wp?

The p stands for "peak" and 370W is the power of the panel in standardised laboratory tests. It is useful as a comparison between different panels (higher rated panels may be a little more expensive, but you'll need fewer of them), but what you need to know is the total amount of electricity in kWh that your system will generate in a year.

How much electricity can I expect to generate in a year?

This depends on where you live and the orientation of your roof. There is standard data table for the UK that provides one single factor for Cumbria. Installers have to use this factor, which will result in an estimate that a 4.44kWp system on a south-facing roof in the north-west will produce 3,890kWh per year.

However, there is a variance across Cumbria since some places are sunnier or cloudier than average. So be mindful that the quote you receive might be an over- or under-estimate of what your system will produce. You can explore the differences across Cumbria on this map.

I have east and west-facing roofs. Does this make a difference?

Yes. For the same total number of panels you will get about 15% less energy over the year from an east-west facing roof, compared to a south-facing one. For other orientations you will get a different percentage, e.g. for a south-west facing roof you will get about 5% less.

However, in summer you will get more electricity from an east-west facing roof early in the morning or late in the evening and you could well find this an advantage. Also, east-west oriented houses (assuming they have a simple pitched roof) have twice the viable roof space of a comparable north-south oriented house.

What about the type of roof I have – does that make a difference?

Solar panels can be fitted on a variety of different roof coverings. Newer systems can actually replace your tiles or slates and be in-line with the rest of your roof.

It's important to think about your roof condition before you install solar. It needs to be able to take the weight of the panels, and you need to be confident that you won't have to remove the panels after a few years to maintain or replace your roof covering. You can seek an independent roof survey or ask your installer for advice.

Also do consider whether you have a sufficiently clear space on your roof. If you have lots of dormer windows or chimneys or other features, they can cast shadows and reduce the amount of space available for the panels. An average panel is approximately 1.7m long by 1m wide (although a variety of different sized panels is emerging) and you need to be able install enough in one area to make it worth the cost of scaffolding.

I use about 3,000kWh of electricity per year so if I produce more than that does this mean I won't need any electricity from the grid?

Unfortunately not. Solar panels produce most of their electricity in summer and much less in winter, whereas most homes use more electricity in winter and less in summer. On a sunny day in summer your panels could produce 30kWh and not many houses use this amount in a single day. On a dull winter's day they may produce less than 1kWh.

So what happens to the extra electricity I produce in summer?

Any excess, over and above what you are using at any time gets automatically exported to the national electricity grid. Conversely, if your panels are not producing enough electricity to power your home the extra needed comes automatically from the grid. You only have to pay for what you take from the grid.

How does my meter cope with this?

Old style meters don't, they run backwards if you are exporting to the grid. While this may sound good for you, your electricity supplier will detect this as soon as one of your meter readings is less than the previous one. If you are planning to install solar PV and don't have an operational Smart Meter you should let your supplier know and they will change it. Smart Meters only record electricity coming into the house from the grid. See advice from Which?.

So how much of the electricity produced by my solar panels will I be able to use?

That depends on your lifestyle and what you use electricity for. If you use gas for heating and hot water and are out all day you may only use about 30%, averaged over the year. You can increase this by using devices like a washing machine on a sunny day if possible, or if you have an electric vehicle that you plug in during the day. If you use gas for heating hot water you can fairly easily divert excess electricity to do some of this. You can improve it even further by using a battery to store excess electricity generated (see section on 'Electrical battery storage and other complementary technologies' below).

I heard that I could sell my excess electricity back to the grid. Is this true?

Yes. The way to sell your electricity back to the grid is via the Smart Export Guarantee Scheme (SEG) which you can arrange with an electricity supplier, who decide the price they will pay you for your electricity. As of summer 2022 best rates are around 5p per kWh. You do not have to sign up for SEG from your current supplier. You can find SEG rates for different electricity suppliers here.

So how long will it take to pay back my outlay?

Some installers will calculate this for you, but the answer depends on the assumptions they make. If you use only about 30% of the electricity you produce it could be 17 years. This would reduce to about 12 years if you heat water with excess electricity, or if you secured a reasonable SEG payment, and would reduce further if you did both. If you also install a battery and maximise the benefits of storing your generated electricity and off-peak grid electricity, this could drop to 10 years. This is based on electricity prices and solar PV prices in autumn 2022 – changes in these prices affect the payback period. Large expected increases in the cost of electricity could greatly reduce these pay back times. More info in the financial calculations below.

What about maintenance costs?

You may well have to replace the inverter (the box that converts direct current from the panels mains alternating current) after 10 – 15 years at a cost of perhaps £800 at 2022 prices. The panels themselves should still produce at least 80% of initial power after 25 years.

There seems to be a difference of opinion on whether it is necessary to clean panels and you can find advocates for annual cleaning (this could cost £100 - £200) while others say that this isn't needed in UK conditions (but check more carefully if pigeons roost nearby!). Investigate further before getting this done or trying to do it yourself.

Do I need to insure my panels?

They should be covered by your buildings insurance, but we recommend that you contact your insurer to confirm this.

Do I need planning permission?

Generally speaking, no. Installing solar panels is considered to be permitted development (as long as the installation doesn't extend beyond certain limits).

However, for domestic properties, you will need planning permission if *"in the case of land within a conservation area or which is a World Heritage Site, the solar PV or solar thermal equipment would be installed* ***on a wall*** *which fronts a highway"*, or if *"the solar PV or solar thermal equipment would be installed on a building within the curtilage of the dwellinghouse or block of flats if the dwellinghouse or block of flats is a listed building".*

For non-domestic properties you will need planning permission if *"in the case of a building on article 2(3) land* (i.e. land within a conservation area or which is a World Heritage Site)*, the solar PV or solar thermal equipment would be installed* ***on a roof slope*** *which fronts a highway"*, or if *"the solar PV or solar thermal equipment would be installed on a listed building or on a building within the curtilage of a listed building".*

See here for more details (see Class A for domestic and Class J for non-domestic).

There are numerous conservation areas in Cumbria and the Lake District National Park is a World Heritage Site. If you are in doubt, please check the planning advice page on your local planning authority's website – some also provide a phone number you can ring for advice. Cumbria County Council provides a summary of the contacts and weblinks for each authority.

Are there any other legal considerations?

The other consideration is whether you have any birds nesting in your walls or eaves. It is illegal to disturb them, so you should ensure that there aren't any before installing panels or erecting scaffolding. Whilst house martins and house sparrows are usually obvious, swifts may not be. If they are present, the work should not be carried out - or scaffolding erected - between mid-April and mid-August.

Do I need permission to have my system connected to the national grid?

If you are installing a large system (your inverter has an output greater than 3.6kW) , you need to apply to connect to the national grid (via Electricity North West). This is to ensure that if you are exporting 100% of your electricity at any particular time, the network in your local area can cope with the additional electricity. Your installer should be able to apply on your behalf. Unfortunately, there is often a wait of several weeks before permissions are granted. There is a possibility that you may be charged for any upgrade works to the grid that are required to enable your electricity to be exported.

If you have a small system with an inverter with output 3.6kW or less, you do not need permission in advance, but you should notify Electricity North West once the installation is complete. Again, your installer should do this on your behalf.

Will my solar panels work in a power cut?

Generally speaking, no. As your solar system is connected to the grid it needs to be shut off in a power cut, so it doesn't feed live electricity into the power lines while workers make repairs. However, if you have a solar battery with a backup function you will be able to use your solar energy during a power cut. These have a relay (a switch) which will automatically disconnect your electricity supply from the grid when it detects a power cut. You can read more about this in these articles: Solar Back-up Batteries & Power Cuts and Do Solar Panels Work During a Power Cut?

What about the environmental impact of producing the panels?

The major components of panels that are mined and processed are quartz, copper and aluminium. Various attempts to calculate how much greenhouse gas is produced in the mining of these materials and the manufacture of panels suggest that this is recovered by production of carbon-free electricity in about two years. This is regarded as a good return on investment, particularly as panels are expected to be used for well over 25 years. So from a global warming perspective they have a positive environmental impact.

However, there can be negative social and environmental impacts from the mining process, which depend upon where the minerals are sourced and how well the mines are managed. Panels made from ethically sourced materials do exist, so it is worth asking your supplier about this (even if just to get them thinking about it). Ethical Consumer rank different panel manufacturers, but you do need to subscribe to them to access the rationale behind their scoring. Recycling at the end of their lifetime is yet to be fully solved, but once well-established, this should reduce the need for new raw materials.

Can you recommend any installers?

Through our Solar Made Easy project we are seeking partner installers who we can confidently introduce to clusters of homeowners in different communities. Since starting work on the project we have found that the energy price escalation has had a huge impact on the solar market. Demand has soared and the good installers are inundated with enquiries. We hope that our cluster approach will make it easier for installers to respond to demand.

If you wish to proceed independently, we would recommend that you look out for the following when you seek quotes :

- Are they MCS (Microgeneration Certification Scheme) accredited? You can search for installers in Cumbria here.
- Are they a member of the Renewable Energy Consumer Code?
- Do they have good reviews?

Check their quote includes:

- A realistic estimation of electricity generation and percentage of electricity that is likely to be used.
- A financial assessment of savings over time and estimated payback period.
- Technical information on the system they are proposing for you.
- Warranty information.

Installers may not visit your home initially and may not provide complete information until they are more confident that the job might go ahead. If this is the case, check that this will be done at the next stage before you place the order with them.

Electrical battery storage and other complementary technologies

Should I get an electrical battery as well to store electricity for overnight use?

Installers often encourage you to buy a battery to store electricity, but you should know that the environmental and financial aspects are rather different to those for solar panels. Treat the purchase of a storage battery as a separate decision with different considerations.

Whilst a battery does not save additional carbon in itself, it does mean that the carbon savings from the solar PV are maximised. At times of national peak electricity demand, the UK grid relies more heavily on electricity generated by fossil fuels. The more renewable electricity that can be stored during times of peak renewable energy generation, the less demand there is for grid electricity at peak usage times. As well as storing excess electricity that your solar panels generate during the day, you can store electricity at night from the grid, when demand is lower, and the electricity mix is greener.

These FAQs assume that your building is connected to the national electricity grid. If it is not, then your inability to import and export electricity should be taken into consideration as part of your decision-making.

How long can I expect an electrical battery to last?

Many manufacturers provide a warranty for their battery of perhaps 10 years or some number of cycles (filling and emptying the battery), whichever is the smaller, with some level of degradation, for example 20%. However, it’s too early to know what the lifetime of batteries will be in practice.

So, is the major benefit financial?

The addition of a battery to your system can greatly increase the amount of solar power you can use and hence reduce the amount you need to buy from the grid. Some electricity suppliers also allow you to charge your battery overnight at an off-peak rate and this can produce reductions in your electricity bill in winter.

However, you should consider how big a battery to buy and financial return. Obtain a separate quote from installers for a battery rather than let it be rolled

into a quote for panels plus battery. If you do get a quote, it could be about £6,000 for a 10kWh battery.

So what financial return can I expect from a battery?

This is not straightforward and depends significantly on how much you pay to charge your battery overnight in winter: your present supplier may well not have an appropriate low night-time rate.

If you have a battery of about 10kWh and store enough electricity from your panels to keep your house running overnight (and all day during dull winter days) you may not have to buy much electricity at daytime rates. In this case the payback time could be around ten years, similar to the reasonable expectation for battery life – see below for the calculation

Will this improve as electricity prices increase?

It's difficult to be certain, but probably yes. Part of the calculation depends on the difference between peak and off-peak rates, but with electricity prices expected to rise it could well improve.

So is it worth it then?

Currently it is worth it in relation to supporting the grid to smooth out national peak renewable energy generation to better meet peak demand, and, with some careful attention, is likely to pay itself back over time.

Before investing, it is worth considering whether you are likely to be charging an electric vehicle in the near future. If so, technology is evolving to allow "bi-directional charging" which means that you can store electricity in your vehicle battery in the same way as a stand-alone battery and then use it in your house. That does however depend on when your vehicle is at home and plugged in. If plugged in during the day, it could store electricity generated by your solar panels. If plugged in at night, it could store lower carbon and potentially lower cost night-time grid electricity.

What are the environmental issues?

As with solar panels, there are social and environmental issues around the mining of the materials used in electrical batteries, and the issues are more serious because of the type of materials (mainly lithium, cobalt, nickel and manganese). Again, there is significant work to be done to set up systems and facilities for recycling these batteries.

What other complementary technologies are there?

There are technological developments around water heaters that have smart controls and can be directly connected to your solar PV electricity supply, as well as your other energy sources. Have a look at Mixergy and iBoost as examples, but note that we have no experience of actually using these products. Storing excess electricity as hot water is another way of maximising the electricity output from your panels. An example of a homeowner who has adopted lots of complementary technologies is presented in this video presentation.

There are also heat batteries. As explained by the Energy Saving Trust, these store either spare heat or electricity, often generated by renewable energy systems. Heat can be stored in a material when it changes phase from a solid to a liquid. These materials are called phase change materials' (PCM). Spare heat or electricity is used to charge the PCM inside the heat battery. When the heat is needed, the phase change material changes back into a solid with a release of heat, which is used to provide hot water.

Example financial calculations

We have provided example financial calculations to show you how you could tackle questions such as payback times on capital outlay. These issues require judgement on how much of the generated electricity you will be able to use, the future cost of electricity, as well as the cost and performance of any system you decide to buy. These are based on typical generation in Ambleside, and experience of one such system.

These calculations are based on an investment of £6,000 in a solar PV system, (a typical cost for a system of twelve panels rated at 370Wp per panel (4.44kWp in total)).

They also assume Typical prices for electricity in autumn 2022 – 34p per kWh (flexible tariff).

What is the payback on solar panels producing 3,400kWh pa without Smart Export Guarantee (SEG)?

Let's assume that you pay 34p per kWh for grid electricity and use 30% of what your panels produce, i.e. about 1,020kWh. Then you will save about £350 pa and your £6,000 will take 17 years to pay off. If you use 45% the payback period comes down to 12 years and for 60% it's 9 years.

Quotes from some installers will make assumptions about inflation rates and will get smaller payback periods. You have to make your own judgement on how much weight to give to this but there seems to be general agreement that electricity prices will continue to rise in the coming years. For every increase in the cost of electricity that happens, the payback period for your panels comes down.

What is the payback on solar panels producing 3,400kWh pa with SEG?

At 5p per exported unit and assuming you use 30% of what your panels produce, your excess of 2,380kWh pa will provide £118 income. Your total savings will now be about £460 pa and your payback time reduces to 13 years. If you use more than 30% in your home the time is less.

What if I add a battery to store excess solar electricity?

Experience suggests that with a 10kWh battery you may be able to use about 70% of the 3,400kWh you produce even if you use only 30% directly, i.e. an

extra 1,360kWh. Then, your battery will save you 1,360kWh at 34p, i.e. £460 pa. Assuming the battery costs £6,000 the payback time is about 13 years, longer than the currently expected lifetime of the battery. Taking the efficiency of the battery (about 90%) into account the saving reduces to about £420 and the payback time increases to about 14 years.

What about storing off-peak night-time electricity as well?

This is way to maximise the benefit of your battery – charging it during the night with cheaper off-peak electricity from the national grid and then using that cheaper electricity during the day. This is particularly useful in the winter months when there is much less solar energy.

The key to this is finding the right tariff. Economy 7 tariffs provide different day and night-time rates, but some suppliers are withdrawing them. The likely replacements are time of use tariffs, or TOUs. As opposed to a flat rate model, the TOUs charge a dynamic hourly price that is responsive to supply and demand of energy. You will need a smart meter to be able to access this kind of tariff. For more information, visit Time of use tariffs: all you need to know - Energy Saving Trust. This website lists some providers, but will need to do your own research into what tariffs are currently available.

Current Economy 7 prices seem to be about 39p for daytime use and 19p for night use. If you charge your battery at night, (mainly in winter), you should be able to save 15p per unit on the remaining 30% of grid electricity you need to use. (The 15p is the difference between 19p Economy 7 night-time rate and 35p day-time rate on a standard tariff). Taking the battery efficiency into account, your grid savings will be about 1020kWh x 90% x 15p = £138. This, added to the £420 savings described above, makes the total savings from the battery about £560 giving a payback time of just under 11 years.