Advice on getting solar panels installed

If you've got the money, getting solar panels is an excellent way of reducing carbon pollution.

These tiles are solar panels, ideal for new-builds but not considered herein.

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Appendices

1. Local companies who install solar panels

We are not able to recommend a particular company, but any reputable solar installer should have certain accreditations. Appendix 1 lists the accreditations and some local installers who have them. Working with local companies helps to keep carbon associated with buying and installation as low as possible.

Also, talking to local people, who've had installations done, may help to find installers, e.g. ask friends or people in your neighbourhood who already have solar panels or look on a local Facebook group such as the Stratford Climate Action group.

Companies with a lot of good reviews on Google or Trustpilot might also be a good bet (though sometimes such reviews are faked). Some companies show that the business has passed certain checks, like Which? Trusted Trader, or the government's Trustmark scheme. The accreditations and checks mean it is unlikely such businesses are scammers, though they can't completely guarantee something won't go wrong (even trustworthy businesses go bankrupt or have crises sometimes and we can't vouch for how effective these schemes are).

We strongly recommend you get **at least three quotations** before you buy solar panels or any other green tech. We can review the quotes if you'd like us to do that.

We would also recommend that you ask installers questions before committing to buy:

1. What length of guarantees do they offer for the panels and inverter and what exactly is covered? Note however that these guarantees often require return of suspect items to the manufacturer for testing so check to see if this is the case. If it is, the cost of having a panel removed and returned will likely be greater than than the cost of a panel or just accepting that performance is reduced. Note also that panels are, in general, very reliable. Inverters (described later) usually have much shorter warranties than PV panels. Extended warranties on inverters are a possibility at additional cost so it's worth asking about this.
2. What happens to your guarantee if the company folds? (i.e. is installation independently guaranteed often by insurance?)
3. Ask if they subcontract the roof work to a roofing company. It's preferable that the company's own employees do the roof work.

2. Choice of panels

Generally there is not a lot of difference in performance between photovoltaic (PV) solar panels from different manufacturers.

Efficiency

It may surprise you to learn that the efficiency of panels is not that important because, if for example, you are supplied with 400 Watt panels, they are what it says i.e. 400 Watts each. Less efficient 400 Watt panels are still 400 Watts but will be larger than more efficient 400 Watt panels. If space is a constraint on system size, there may be occasions where more efficient panels allow a slightly more powerful system to be installed. A good way to look at the benefit or otherwise of high efficiency is to compare the price per kW installed for different offerings from installers. Usually panels with high efficiency work out more expensive per kW but will allow a slightly larger system within a given space.

Most manufacturers offer different panel ratings within the same frame size so if you are offered a lower power rating version of a panel, it will have lower efficiency but will be cheaper. The reason they offer a range is that during manufacture, solar cells do not all turn out with identical performance. Each cell is tested and graded. The lower efficiency cells are used to produce lower rated panels. It's quite common to see 5 variants of a given size of panel with the least having efficiency 4 or 5 % down on the best. Some examples are provided in Appendix 2 which includes other technical details of solar panels. Notice that for panels of similar power in the table in Appendix 2, the efficiency difference is mostly small corresponding to 3 to 4%. The one panel with noticeably higher efficiency is usually very expensive.

In the end, panel choice depends on what installers offer. Some will supply a particular panel others may offer a choice but not necessarily always the top power/efficiency of a given model. The size and dimensions of the roof can also affect choice. Sometimes, a greater number of smaller panels fit best.

Panels connected together (known as strings) must all point in the same direction & slope. If you have panels on different directions or slopes of roofs, each group must be in a separate string and requires an inverter (see later) which can accept multiple inputs.

3. Payback time

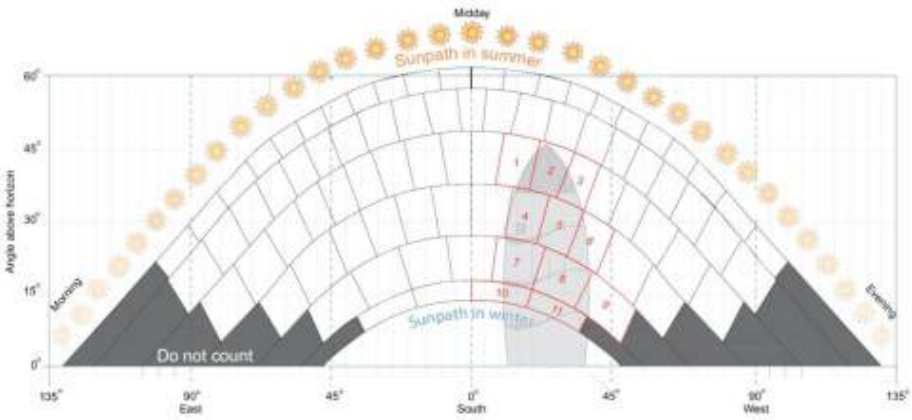
Although the best reason for investing in solar panels is to reduce carbon pollution, you may like to know how long it takes for savings in electricity bills to repay the cost of the

system (payback time). Unfortunately, payback calculations offered by installers nearly always include an assumed rate of inflation. This typically gives a shorter payback time by several years than is really the case. If you would like an explanation of why this is so, see Appendix 3. It's worth noting also that for many other things you might buy such as a new kitchen (which creates rather than saves carbon pollution), consideration of payback time isn't really possible. So, perhaps contributing to creating a better future by buying solar panels means that consideration of their payback time isn't that important.

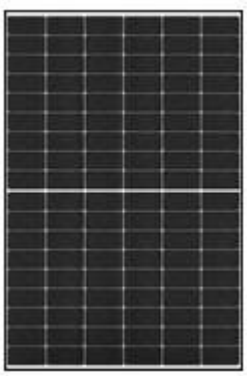
4. Panel appearance

Originally, PV panels had silver coloured frames but it is now possible to get panels which are all black or at least with black frames and these usually look less prominent on a roof. There is a slight downside to black panels in that they have very slightly lower annual yields than their silver framed equivalents because they run slightly hotter (see Appendix 2). For new-builds, solar tiles are an option as shown on the front page. There are various styles.

5. Shadows and shading



Depending on their shape and the time of year and time of day when they happen, shadows can cause big reductions in annual output. There are techniques for estimating shading factors so, if your roof has shading, the installer should provide an estimate of the shading factor and apply it to the unshaded estimated annual output. An example of a shading diagram for the effect of a tree is shown above. If you have shading but this isn't mentioned in the quote, ask the installer to do a shading assessment. Dormer windows, chimneys , vent pipes and other roof features can cast shadows on panels. It is sometimes beneficial to have fewer panels and keep panels out of shaded areas.



In shading situations, so called half cell panels offer some advantage over square celled panels.

Panels contain bypass diodes. They protect the panel from damage when parts of it are shaded. Shading just one row of cells (in the short direction of the panel) will turn a panel off completely. Shading one row in the long

direction or shading just one cell turns off one third of a square cell panel but only one sixth of a half cell panel. Diodes allow unshaded panels to continue working largely unaffected by the loss of power from shaded panels. Effects of shading, where significant, can be reduced by including optimisers (see below).

Compared to square cell panels, half cell panels are slightly more expensive by about 1% but they are more efficient by several percent so overall they are worth the extra cost. https://solarmagazine.com/solar-panels/half-cut-solar-panels/

6. Inverters.

These are an essential part of a PV system because they convert the high voltage direct current output of PV panels into alternating current electricity at mains voltage. Inverters also continuously adjust the demand on the panels so that they work at their maximum power for whatever the prevailing conditions of brightness and temperature allow. This is called Maximum Power Point Tracking or MPPT. Some inverters have two or more MPPT inputs. This allows groups of panels facing in different directions or slopes to be connected. Inverters must be sized to match the capacity of the panels. Typically, a 3.68 kW inverter will be optimum with a 4kW set of panels (eg 10 panels of 400 watts each = 4000 Watts). Smaller systems will require smaller inverters. Panel power can be oversized relative to the inverter without significant downside; eg 5kW or 5.5kW of panels is OK with a 3.68kW inverter but further over-sizing probably requires a more powerful inverter. Over-sizing the panels relative to the inverter increases the annual energy yield but the system becomes slightly less efficient relative to an optimally sized inverter. **It is important that the inverter power is not larger than the panel power because this will decrease the overall system efficiency and annual yield**.

The reason that 3.68kW is mentioned above is because this is the largest size that can be connected to your electricity supply without special permission. If a larger inverter is required, permission must be obtained from the district network operator (DNO). Your installer will apply for this on your behalf but will charge possibly £250 to do this. There is no absolute certainty that permission will be granted. The permitted 3.68 kW is covered by a G98 connection. For larger connections it's G99, see:- https://connections.nationalgrid.co.uk/generation-g99/

Installers like to put inverters in the loft but this is not a good place for them because it can get very hot in summer and heat is the enemy of electronic devices. Heat shortens their life and in some cases it causes them to restrict output to protect themselves against the hot

conditions. Its best to **insist** that the inverter is put in a downstairs room that is cool in summer. A downstairs toilet is a possibility or a utility room or maybe a garage. The wall space required is typically less than 500 mm by 500mm. A space of about 150mm above and below is also required to allow cooling air to circulate. Inverters emit some noise particularly when running at high power. The noise levels are similar or possibly slightly louder than a fridge or freezer. In planning a solar system its normally assumed that a replacement inverter will be needed during the life of the panels. The latter is typically assumed to be at least 30 years and it is likely that panels will last considerably longer.

7. Panel Optimisers and Micro inverters

Firstly, note that there are devices called voltage optimisers which should not be confused with **panel optimisers and micro inverters**. Voltage optimisers might be appropriate if your electricity supply voltage is significantly higher than 230 volts e.g. 250 volts or above but this would be very unusual. If you discover that you have high mains voltage, speak to your electricity supplier. They should be able to get it reduced; which will save a little on bills.

Installers like to include solar panel optimisers or micro inverters in their proposals but these devices rarely achieve performance increases that justify the extra cost. Optimisers work with a conventional inverter. Micro inverters are instead of a basic inverter. The latter is known as a string inverter. Within a set of panels, there will be small variations in power from panel to panel. Without optimisers, the performance of a group of panels will be limited by that of the weakest panel. Optimisers allow each panel to perform at its best so the overall output is higher. The question to consider is whether the amount of extra power justifies the extra cost of the optimisers or micro inverters. The answer is usually not. Unshaded, the increase in power will usually be less than 1.5%, often much less.

Optimisers or micro inverters may make sense if the panels are subject to significant shading. Some types allow monitoring of the output of individual panels so if a panel develops a fault, this can be detected but as already mentioned, panels are very reliable. If you like the idea of being able to check that all panels are performing correctly and do not mind the extra cost, then there's no problem in having them except perhaps that there are more components in the system so more possibilities for faults. Some makes of these devices offer very long warranties and cover the cost of gaining access to fix any problem. More info at https://nakedsolar.co.uk/solar-pv/inverters/

8. Heating hot water by diverting solar electricity to heat a hot water tank

A Solar Power Diverter or Immersion Diverter (iboost is a common make) diverts surplus Solar electricity from your Solar PV system into heating water in your hot water tank (if you have one). Perhaps surprisingly, this increases rather than reduces carbon pollution. The

grid has to burn more gas to replace the electricity no longer being exported from your panels. Gas fired power on the UK grid is about 50% efficient, so to produce a kilowatt hour (kWh) of electricity, about 2kWh of gas has to be burned. If the water is heated by a gas boiler which is 85% efficient (or higher, as most gas boilers are), only about 1.2 kWh of gas will be burned. The situation is much the same if your water is normally heated by electricity.

Currently, a kWh of gas costs about 6.2p (https://www.moneysavingexpert.com/news/2024/08/martin-lewis-new-energy-price-cap-announced-for-october/) and is effectively 7.3p after allowing for boiler efficiency of 85%. The price you get for metered electricity exports under Smart Export Guarantee varies considerably depending on your supplier. The current rate from British Gas is 6.4p/kWh so the saving achieved from a solar diverter is very small at 0.9p/kWh. Other smart export guarantee prices range from 1p to 40p (https://www.which.co.uk/news/article/smart-export-guarantee-rates-the-best-and-worst-seg-tariffs-for-solar-panel-owners-azICP0i78MD8) so savings could be greater than 0.9p/kWh but could be a large cost up to 32p/kWh. Heating a hot water tank electrically costs about 24.5p/kWh so opportunities for saving money are greater but it is still the case that diverting solar power to heat hot water causes an increase in carbon pollution.

9. Batteries

Installers are very keen to offer batteries with the PV systems they sell but batteries are not always a good investment and contrary to popular belief they do not reduce carbon pollution. The financial benefit depends very much on how much electricity you use when you use it and the size of the battery. The savings on the reduced cost of electricity imports should be compared with the cost of the battery. An example is given in Appendix 4. Note also that at the moment and for many years to come, batteries will have little or no effect on carbon pollution. This is due to the way the grid works. At the moment, gas fired power runs 24/7 to balance supply with demand. Exporting solar electricity to the grid reduces some gas fired power demand and saves Carbon. When solar power is diverted to a battery, the grid must supply more gas fired power with its associated carbon. Conversely, when power is being supplied from the battery, the grid has to supply less gas fired power with its associated carbon. The effect of a battery is therefore to alter the time of day when the grid burns gas so net carbon is unchanged or if changed, only marginally so. The carbon footprint of the battery probably negates any small carbon savings if indeed there are any and note that the example in appendix 4 shows a 19 year payback time. Try this online calculator if your usage differs from the example in Appendix 4.
https://great-home.co.uk/solar-export-guarantee-seg-calculator/

There are two different ways of adding batteries to PV systems. They are known as DC and AC coupled. The AC system allows imports of electricity from the grid when electricity is cheap (but not necessarily low carbon) and this affects the payback time. AC systems are generally more expensive than DC systems. Some pros and cons of DC vs AC arrangements can be found in appendix 5 and in https://www.which.co.uk/reviews/solar-panels/article/solar-panels/solar-panel-battery-storage-a2AfJ0s5tCyT and in https://www.checkatrade.com/blog/cost-guides/solar-battery-storage-system-cost/ . If you are considering a battery, its worth checking with Act on Energy (https://www.actonenergy.org.uk/area/warwickshire) that the proposed specification of the battery and its inverter (in AC connected batteries) are adequate for your needs.

With AC coupled batteries, savings on electricity bills are maximised if you can charge the battery on a cheap overnight tariff (especially easy to get of you have an electric car). Some AC batteries allow you to seamlessly take part in National Grid's 'demand flexibility service' (https://www.axle.energy/blog/analysis/demand-flexibility-service). At times of peak demand, the grid notifies participants that it would like a reduction in demand and or to actually take power from a battery. Those participants who agree get paid. So if you combine a cheap tariff with helping the grid you're saving money and doing something good but probably not reducing carbon pollution.

10. Maintenance of Solar panels

Ideally, solar panels should be cleaned every now and then but in most cases this is easier said than done because of difficulty of access. The rate at which dirt accumulates is very variable. 5 years without cleaning might be Ok with only 1 to 2% performance loss, but after as little as a year, performance could be down by the same amount. Steeply pitched roofs (25 degrees and above) tend to keep the panels cleaner than shallow pitches. If you decide to clean panels, make sure you work safely on ladders or better still on a scaffolding. Cleaning is by means of cold water and a soft mop with a long handle. Cleaning should be carried out on a cool cloudy day, ideally when rain is coming to avoid the tap water evaporating on the panels and leaving residues. Some window cleaners will clean panels with distilled water. As before, cleaning should avoid times of bright sunshine when the panels will be hot.

Its worth keeping a record of each years generation to check that the system is functioning correctly. Annual variations due to weather are typically within +/- 3% about the mean and very occasionally within +/- 6%. So from one year to the next a difference of up to 6% might occur and occasionally rather more.

11. Summary

1 There's not usually a lot of performance difference between different makes of solar panels. Differences in degradation rates (covered in Appendix 2) produce only small differences in output even after 30 years.

2. Panel efficiency isn't usually an important consideration. It might make a difference if the installation space is limited. Panels with higher efficiencies are usually more expensive.

3. Payback times quoted by installers usually underestimate the true payback time by a few years because they add up money in £ devalued by inflation.

4. Black panels generally look better than silver framed panels. If appearance is unimportant to you, silver framed panels will, other things being equal, provide slightly more output.

5. If trees, other buildings or parts of your roof will cast shadows where panels are planned, ask the installer to provide a shading assessment. Half cell panels help to minimise shading loss and, although a little more expensive, their enhanced efficiency justifies the extra cost.

6. Panels require an inverter to convert their output to mains electricity. Inverters contain maximum power point trackers (MPPT). If groups of panels face in different directions or slopes, the inverter needs two or more MPPTs. The panel power should be greater than the inverter power but if greater by more than about 50 %, a bigger inverter is preferable. 3.68kW is the maximum size that can be connected to the grid without requiring special permission.

7. Voltage optimisers are unnecessary unless the mains supply to your home is exceptionally deviant from the 230 volt standard. If you have 250 volts or more ask your supplier to fix it. Panel optimisers or micro-inverters are intended to minimise shading losses. They also improve output for unshaded installations but the % extra output will be less than the % extra cost. They allow the output of each panel to be seen so can make fault location easier but panels are very reliable. They do however increase the complexity of the system.

8. Immersion diverters can automatically divert spare solar power to heat water in a tank. Depending on your smart export guarantee price, they may or may not save you money. Savings are more likely if you normally heat water electrically. However, with either electricity or gas heating the water, a diverter increases carbon pollution by a factor of about 70%.

9. Batteries do not reduce carbon pollution and tend to have very long payback periods. They are expected to need replacing during the lifetime of the panels. There are two systems known as AC and DC. AC systems allow additional savings on bills by import of cheap night time electricity but will be more expensive to install. DC batteries will reduce feed in tariff income if added to an existing system which is eligible for feed in tariff.

10. Ideally, panels need occasional cleaning but usually are not easily accessible. Panels on low pitched roofs need more frequent cleaning than steeper panels. Cleaning should be done with a soft mop using tap water on a cool cloudy day, ideally when rain is expected.

11. If you have any questions about quotes you've obtained you can ask us and we'll do our best to answer. Buying solar panels is a great way of investing in a better future for civilisation as we know it.

Appendix 1 Solar installers Close to Stratford on Avon

We are not able to recommend any particular installer but any reputable solar installer should have certain accreditations. These accreditations and their logos are below, and will usually be displayed on an installers website. The installers in the list which follows have the following accreditations.

The most important is the **Microgeneration Certification Scheme (MCS) .** It sets the Standards for low-carbon energy technology products, contractors and their installations. (https://mcscertified.com/). Separate MCS certification is needed for each technology (eg solar panels, batteries, heat pumps, etc). The battery certification is relatively new (late 2021) and some obviously experienced installers may not have it yet.

HIES or **RECC** specify rules of practice for renewables and offer an avenue for dispute resolution in case things go wrong. www.hiesscheme.org.uk or www.recc.org.uk .

NAPIT (www.napit.org.uk) or **NICEIC** (https://niceic.com/) specify standards for electrical installations.

An installer should have **MCS** and either **HIES or RECC** plus either **NAPIT** or **NICEIC.**

Some installers in the list are signed up to the governments Trustmark scheme. It is based on the above accreditations but offers some additional protections.

These standards cannot be a guarantee of perfection but we recommend choosing installers who have them. Included in the listing is the score that each company achieves on www.google.co.uk/maps where you can read reviews about each company. Some also have reviews on https://uk.trustpilot.com and on https://www.yell.com . Other companies found on these sites may not have all the accreditations so do check.

The list on the next page contains the MCS installers located nearest to Stratford upon Avon and their scores on www.google.co.uk/maps, https://uk.trustpilot.com and https://www.yell.com . Review scores are prefixed by **Y-** for Yell, **T-** for trustpilot and **G-** for Google. You can read reviews on these sites.

Solar installers

Active renewables Evesham, WR11 9SN **G-4.4** (7 reviews)
MCS (solar & battery) RECC NAPPIT activerenewables.co.uk 01386719922

Alderminster electrics Shipston, CV36 4FF **G-3.8** (12 reviews)
MCS (solar battery & heat pump) RECC, NICEIC alderminstergroup.co.uk 01603850143

Aztec solar energy Wellesbourne, CV35 9EF **G-2.6** (5 reviews)
MCS (solar), RECC, NICEIC aztecsolarenergy .co.uk 08454675058

Electra Smart Energy Stratford, CV37 6RS **Y-** 5.0(8 ratings) **T**-5.0(3 reviews) **G-5.0** (30 reviews)
MCS (solar), RECC, NICEIC, Trustmark https://elektrasmartenergy.co.uk/ 01789 29841

Helios Xenergy Leamington Spa, CV32 5QL **G-5.0** (3 reviews)
MCS (solar), RECC, NICEIC, Trustmark heliosxenergy.co.uk 07930210110

KS ConneXions Leamington Spa, CV32 5LA **G-4.8** (55 reviews)
MCS (solar), RECC, NICEIC, Trustmark ksconnexions.co.uk 07916323736

Leaf Renewable Energy ltd Leamington Spa, CV32 7JD **G-5.0** (32 reviews)
MCS (solar & battery) RECC NAPPIT 07817712210

M J Solar Installations Leamington Spa CV31 1BD **G-5.0** (10 reviews)
MCS (solar & battery) RECC NAPPIT mjsolarinstallations .co.uk 01926 504129

NS Booth Electrical Contractors Warwick, CV34 6PU **G-5.0** (1 review)
MCS (solar), RECC, NICEIC nsboothelectricalcontractors.co.uk 01926 842671

Omega Electrical Contractors Evesham, WR11 7PB **G-5.0**(9 reviews)
MCS (solar & battery), RECC, NICEIC omega-electrical.com 01386 300686

Stratford Energy Solutions Ltd Stratford,CV37 6RS **Y-5.0**(1 rating) **T-3.7**(6 reviews) **G-4.9**(126 reviews)
MCS (solar), RECC, NICEIC, Trustmark https://www.stratfordenergy.co.uk/ 01789 262 411

Appendix 2 Some technicalities of solar panels.

Power Rating

States the power of a panel in watts under a specified brightness of incoming light with the cells at 25 deg C. Panels rarely operate under these conditions and under typical conditions output is usually less. See NOCT below.

Power Tolerance

Indicates by how much a panel's actual power might differ from its rated power. The important thing is to check that the **minimum deviation is 0%**. In other words, if a panel is rated at 420 watts, it will not be less than 420 watts. It is unlikely that a panel with the upper tolerance will be present in any of the panels in a set because the selective assembly used in production will have put the better cells into higher wattage panels. For example, a 420 watt panel with a plus 3% tolerance would be 432 watts but the family of panels will typically have panels of 425 watts and 430 watts so the higher rated cells would have been used to make these. See comparison table below.

Temperature coefficient of power

Its worth looking at the coefficient of power loss with temperature. It is typically a small number like 0.3% per deg C but in strong light on calm days, panels can run very hot and when this happens, the rated power as declared at 25 deg C does drop quite a bit. eg a 0.3%/ deg C panel at 60 deg C looses 10.5 % of its rating. This is a temporary effect which recovers when the panel runs cooler. A panel with a low coefficient is preferable, other things being equal but differences between panels are usually small as can be seen in the table below. Because black surfaces absorb more heat from solar radiation, they run slightly hotter than non black. So overall, black panels yield **slightly** less power than a traditional silver framed panel of the same physical size.

NOCT

This indicates power output under specified but more realistic operating conditions and takes account of the temperature coefficient of power. It is perhaps the best indicator for comparing panels if it is quoted.

Degradation

Over time, panels are expected to slowly reduce in output. The rate of annual loss can be worked out from the performance warranty but again, the differences between different panels offered by installers is usually small. Panels with low degradation rates tend to be more expensive than higher degradation panels. Degradation is often expressed as no more than a certain percentage (eg 1%) in the first year followed by no more than so much per year (eg 0.4% per year) in the second year and beyond. Over 30 years, a panel with 1% loss in the 1st year followed by 0.4% thereafter, will deliver about 1.5% less energy compared to a panel with annual degradation of 0.3%. At year 30, the 0.3% panel delivers 90.3% of its rated power whilst the 0.4% panel delivers 87.4% so the panels are expected to still be delivering decent amounts of power after 30 years. Note that all these figures are worst case since they are based on the maximum expected rate of degradation.

Comparison of information on several makes of Solar panels

Make & Model	Rated Panel Power W	Power tolerance	Power at NOCT	Max yr 1 Degradation	Max annual Degradation	Power loss coeff % loss per degC	Efficiency	Warranty
Aiko								
A440	440		**331**				22.1%	
A445	445		**335**				22.3%	
A450	450	0 – 3%	**339**	1.00%	0.35%	-0.26%	22.6%	15-year product warranty
A455	455		**343**				22.8%	and 30-year power warranty
A460	460		**346**				23.1%	
Sharp								
NU JC 420B	420		**315.07**				21.50%	
NU JC 425B	425	0 – 5%	**318.55**	1.00%	-0.38%	-0.30%	21.76%	25yrs
NU JC 430B	430		**322.50**				22.02%	
NU JC 440*	440		**329.99**				22.53%	
* not a fully black panel								
Sunpower								
	440						21.7	
Performance 7	445						21.9	
	450	0 – 3%	Not Stated	1.00%	0.40%	0.29%	22.2	30-year product warranty
	455						22.4	And 30-year power warranty
	435						23.50%	
Maxeon 7	440	0 – 5%	Not Stated	2.00%	0.25%	0.27%	23.80%	40-year product warranty
	445						24.10%	and 40-year power warranty
	410						21.20%	
Maxeon 6 AC **	415	0 – 5%	Not Stated	2.00%	0.25%	−0.29%	21.50%	40-year product warranty
	420						22.00%	and 40-year power warranty
** Panels have integral micro inverters								
Jinko								
	420		**316**				21.02%	
	425		**320**				21.27%	
Tiger Neo N-type	430	0 – 3%	**323**	1.00%	0.40%	−0.29%	21.52%	25-year product warranty
54HL4R-B	435		**327**				21.77%	and 30-year power warranty
	440		**331**				22.02%	

Appendix 3 Inflation and payback time

To see why including inflation in the calculation matters, imagine you paid for the system in apples. What you probably would want to know is how long it takes to get back the original weight of apples. If apples suffered inflation over time by gradually becoming smaller (equivalent to shrinkage of the buying power of a £), you'd need more apples to pay back the original weight of apples. Calculating payback in £ subject to inflation is equivalent to ignoring that apples subject to inflation are getting smaller. If you would like to get a true picture look at the £ savings from the first year and see how many years at this rate it takes to recover the cost of the system. Treat the payback calculation provided by installers with a pinch of salt. Note also that payback calculations have to make assumptions about future prices of electricity so cannot be exact.

Appendix 4 Cost benefit of adding a battery – an example

The following is from https://www.checkatrade.com/blog/cost-guides/solar-battery-storage-system-cost/ . It is for a household with slightly above average annual electricity consumption of 10kWh per day or 3650 kWh per year. Average annual use is a little under

3000 kWh per year. A low user is under 2000. A high user might need a bigger ie more expensive battery.

Payback for battery storage

The following case study provides a theoretical example of what savings could be achieved. This is based on information for a particular system and place and does not represent a 'typical' saving. In this example, we look at the economic benefits of installing a 4kWh battery storage unit with a 2kW inverter/charger and 90% efficiency. We have assumed that the household uses 10kWh a day, has a 4kWp solar PV system, and nobody is in during the morning.

Before installing the electric battery, the system operates in the following way:

Yearly PV electricity generation 3,400 kWh.

PV electricity used on-site 800 kWh

Electricity export to the grid (without battery storage) 2,600 kWh

After installing the electric battery, the results are as follows:

Yearly PV generation 3,400 kWh

PV electricity used on-site 800 kWh

Electricity stored in the battery system 950 kWh

Electricity export to the grid (with battery storage) 1,650 kWh

Assuming a standard 28.1p/kWh electricity tariff, for this situation, the battery storage system would reduce the electricity bills by about £267 a year.

This figure is based on simulation results and cannot be used as evidence for the actual economic benefits of a specific battery storage system. Any changes to the assumptions used here would lead to different results. Try this online calculator if your usage differs from the above example. https://great-home.co.uk/solar-export-guarantee-seg-calculator/

The payback time for installing a battery-storage system depends not only on the yearly savings of the electricity but also on the cost of the system over its lifetime, including any costs for replacing the batteries. Assuming that in the above situation, the cost of the 4kWh energy system is £5,000, in a simple payback model, the customer will repay their investment in just under 19 years (assuming that a battery replacement is not needed during in this time).

Note: The prices in the example are based on the April 2022 price cap.

Your motivation for installing a battery may not be purely financial. For instance, you may want to be protected from power cuts, in which case, make sure you buy a system that can do this and accept that you'll have to allocate a part of the storage for backup (typically, this part of the battery won't be used to save on your electricity bills so payback will be worse).

If your motivation is environmental, then think twice. Having a battery doesn't make you a greener household. Green electricity you export to the grid always gets used by someone else and replaces fossil fuels. All a battery does is allow you to keep some for yourself and save on electricity bills. And don't forget that there's the carbon footprint of making the batteries in the first place, so from a purely environmental point of view, home batteries may not add up.

Appendix 5. Summary of Pro's and Cons of batteries from "Which ?"

Pros

- Helps you use more of the electricity you generate.
- Cuts your electricity bill if you buy less from your energy supplier.
- Some energy tariffs pay you for allowing your battery to be used to store excess grid electricity.
- Could enable you to take advantage of cheap-rate electricity, for example from a smart time-of-use tariff.
- Requires little maintenance: 'Fit and forget', said one owner.
- You no longer have to pay VAT to add batteries to an existing solar PV system (until February 2024 it was 20%). Batteries installed at the same time as solar panels have always been subject to 0% VAT.

Cons

- Currently pricey, so payback time may be long.
- If you have an old feed-in tariff (FIT) contract, a DC system could reduce your payments.
- Batteries are likely to need replacing during the lifetime of a solar PV system.
- If retrofitted to existing solar PV, you may need a new inverter.

Notes