

Solar Energy - the closest thing to Free Power....



What most people want to know first

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Types of Solar Panels

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How do they Work and How to Install Them?

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If you're curious about solar energy, want to know about the background and some of the practicalities of solar power, then this manual is written for you. I hope you find it useful.

What do most people want to know first?

First, I thought it would be good to go over the most common questions people have when they first start looking at solar energy. If you've got any questions after, feel free to contact us at info@solarstarter.org

Qu. 1: How Much Do Solar Panels Cost?

Here is where most people would like a cut-and-dried answer. However, it's a bit like buying a house. The price varies. The cost depends on the size of the system and the type. To use the house analogy – 2 bedroom houses usually cost less than 4 bedroom houses. However, if you've got a larger family, the 4 bedroom house investment might be worth it.

The cost of solar panels has been falling every year. The usual method for evaluating the cost is in \$/watt.

To explain – electricity output is measured in watts. If you leave a 100 watt light bulb on for 10 hours, then that's one kW, or 1000 watts.

Solar panel systems are measured in the same way. So if you buy a 1kW system, that should be able to power ten 100 watt light bulbs an hour - as long as the sun is shining. Make sense?

Solar panel systems come in different sizes. These sizes describe how much energy they make per hour, in optimal conditions. The common sizes are 1kW, 1.5kW, 2kW, 3kW, etc. A 1kW system puts out 1kW an hour in prime conditions.

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A 2kW system would put out 2kW an hour. There are slight power losses caused by other parts of the system. This means that a 1kW system will actually supply your house with approximately 0.8kW per hour in sunny weather.

At the moment, the installed cost of solar panels is about \$8/watt. So a 1kW system (1000 watts) costs about \$8000. Of course, you may get a very good deal, or your state may pay some of the cost.

However the important thing is to treat solar panels like a long term investment. Once you know what size system you want to buy, you can calculate how much this will save you in electricity bills, and how much value it will add to your house.

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Qu. 2: What are the Different Types of Solar Panels?

For residential homes, the most common systems are Photovoltaic and Solar Hot Water.

Simply put, Photovoltaic solar systems use sunlight to make electricity. Solar Hot Water uses sunlight to heat your water.

Photovoltaic systems have a slightly longer payback time the photovoltaic. The advantage of photovoltaic systems is that you can sell your electricity back to the grid.

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Qu. 3: What are the Different Types of Solar Panel Systems?

There are several types of solar panel systems. Each type is good for a different situation. For example, if you live in an area where you can easily connect to the electricity grid, a grid-tied would be a good option. Grid-tied systems allow you to sell your excess solar power back to the grid. They also cost less, because they don't need batteries.

For instance, with a **GRID TIED** system, you produce solar power while the sun is shining. This usually happens in the middle of the day, when most people are away from home. So this is when the energy will probably get sold straight back into the grid, making you a profit. You can actually watch your power meter run backwards.

However, when you don't have any batteries to store your solar energy, if the grid goes down, you will only have power while your solar panels are making it – ie. when it's sunny.

You can actually watch your power meter **run backwards**

OFF GRID solar panel systems were the original solar panel systems. For people who lived far away from the electricity grid, it was very expensive to connect. The cables to connect to the grid often cost more than the price of a large solar panel system.

It's a logical choice – why pay for cables to connect to power that you then have to pay for, year after year. Instead, many people living off the grid buy solar panel systems. They then get the solar power for free. Off grid solar power requires batteries to store energy produced by the solar panels. This to supply power during the night and on rainy days.

Often off-grid power systems require a back-up power source. Sometimes this is only used once a year to

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recharge the batteries. This depends on the climate. If you live somewhere that rains for many days in a row, then you may require a backup system.

Qu. 4: How do Solar Panels Work?

We're going to focus on the two main types for residential homes. There are quite a few other types of solar panels, including solar thermal and dye-sensitive solar. These are used more commonly for big applications like power plants. New technologies are being developed all the time, and may be available for residential use in the future.

SOLAR HOT WATER works by heating a fluid. Either it directly heats your hot water by circulating it through tubes on your roof. Some systems also circulate another fluid, and indirectly heat your water with this fluid. This system usually lasts better.

PHOTOVOLTAIC panels work by a reaction between silicon and photons (sun energy.) Silicon is spliced with minute impurities – usually boron. When sunlight strikes the silicon compound, a reaction is set up. This reaction causes a flow of electrons. This flow of electrons (also known as electricity) then goes to supply your house with electricity.

Qu. 5: How do I Install Solar Power?

Most states require a building permit to install solar panels. This is especially for photovoltaic panels, where electric work is required. However, quite a few states offer free or expedited permits for solar energy systems.

For most systems, the solar panels account for about half the cost of the system. The rest is made up by the components which usually include an inverter, a charge controller and net metering.

INVERTER This turns the DC electricity the panels produce into the AC electricity that your home uses.

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GROUNDING CIRCUIT This is safety feature is usually required as part of a system warranty. Grounding your system minimises risk of a shock and also protects against lightning strikes.

It can also disconnect your solar panel system from the grid. If your solar panel system is connected to the grid, it will continue to supply electricity if there is a blackout. So for the safety of the people working on the grid system, you need to be able to disconnect your solar electricity from the grid.

NET METERING is an arrangement where you sell your solar electricity back to the grid. This is the part where you can watch your meter turn backwards. Often you will need to install a special meter for this, or an attachment to your meter. This part depends on your power company, so it's best to discuss with them before getting solar panels installed.

Qu. 6: What Kind of State and Government Help is Available?

There are federal tax credits that are available for all of the USA. As well, all states have their own tax incentives and rebate programs. Some states offer a tax credit, other give straight cash, some give interest free loans, and some offer a combination of all these.

There are also rebates and cash incentives offered by power companies and counties. Some power companies also offer to buy the solar electricity you produce from you at a higher rate.

Another way you can profit from your solar power is REC's. REC stands for Renewable Energy Credits. These are credits created by the government to encourage renewable energy. Whenever you produce solar energy, you are also creating REC's that you own. And some corporations and power companies are happy to buy these from you. You see, they can use these to apply for rebates and benefits such as carbon offsets.

So there are many ways to make the most of the solar energy you produce. There is an extensive list of government incentives at [DSIREUSA](#)

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Qu. 8: How Long do Solar Panels last?

Solar photovoltaics were originally discovered in 1839 – so they're not exactly untried technology. They were majorly developed during the space race. The USA, Japan and Russia sent satellites up into orbit, powered by solar panels. In these situations, changing a panel that wasn't working properly was a major headache.

So, in general, photovoltaic panels last really well. They have no moving parts and most panels work well for 20-30 years. It's best practice to buy a panel that is warrantied for 20-25 years. Most solar panel companies can supply this. The other electrical parts of the system – inverter etc. can also usually be warrantied for 5-10 years.

Solar hot water panels usually have a shorter lifetime – usually 10-15 years, though some have lasted much longer. However, they are less expensive, and so the payback time is shorter.

Qu. 10: How Long is the Solar Panel Payback Time?

Let's use the analogy of a house again. Most people buy a house to live in. They pay it off themselves over the years, and it increases in value.

However, some people buy a house as an investment. These people buy the house and then rent it out. Over the years, they collect rent and use it to pay off the price of the house. By the time the house is paid off, they own the house, their rent is now pure profit, and the house has increased in value.

How does this apply to solar energy? Well, a solar panel system is really an investment. You buy a solar panel system, and each year it saves you some money off your power bill. You could use this money to pay for the cost of the solar panel. Once the solar panel system is paid off by the money it's saved you, you own it outright. All the power bill savings are pure profit, and the solar panel system has also increased the value of your house.

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So it's really a win-win situation.

For the eco-conscious, solar energy is also helping our environment. About 50% of our electricity comes from coal power stations. When we burn coal to make energy, it creates a by-product CO₂, and SO₂. CO₂ has been shown to cause climate change, and SO₂ causes acid rain.

Every kW of solar energy you produce saves about 10 pounds of CO₂ from being released into the atmosphere. Over 20 years, this really adds up.

Final Thoughts

Now, it's worth doing the maths on solar panels before investing in one. For many folks who live off the grid, solar panels are the best option. If your power bills are really expensive, or you live in a very sunny place, solar power may be for you.

Or you might feel strongly enough about CO₂ emissions that you don't mind that it being a few years before your solar panels begin to be profitable. Whatever your position, it's definitely worth keeping watch over the solar energy marketplace. The one certainty there is that it's evolving fast.

If you've found this content useful, I'll be posting more articles and reports at my [SolarTrading Post.com](http://SolarTradingPost.com) I'd be really interested to hear your comments.

Best Regards,
The team at Solar Trading Post LLC

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Sometimes the best strategy is to wait and see.

Sometimes it isn't.

The trick is knowing which is when....

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