

# What Is Solar Energy, and How Does It Work? The Layman's Guide To Solar Power

[Knowledge Base](#) / [By Aaron](#)

We all hear about solar energy all the time. Solar [panels](#), solar [generators](#), solar flashlights and [lanterns](#), [cellphone chargers](#), and more.

But if you're not totally sure what solar energy is, how solar power works, and whether or not it could be a decent option for your home, RV, or hunting cabin, you need to know the nitty-gritty of what it's all about.

That's what we're here for: providing you with solar energy information. So, if you've ever asked "what do solar panels do," you've come to the right place.

Below, we address the basics of:

- Solar energy and what it is,
- Solar panels and how they work,
- How full solar panel systems work, and
- What it's good for and where you can best use it.

Let's begin with a brief history of solar power.

**Page Contents** [ [show](#) ]



# The History of Solar Power

[Solar cells](#) first came into being back in 1876 (yep, that far back!) when William Grylls Adams with his student Richard Day, discovered that selenium, when exposed to light, produces electricity. The selenium wasn't efficient, but it did prove that light, without moving parts or heat, could be converted into electricity.

Of course, advancements took many years, and it wasn't until 1953 when Calvin Fuller, Daryl Chapin, and Gerald Pearson discovered the silicon solar cell. This cell produced enough efficient energy to run a small electrical device.

A few years later, in 1956, the first solar cells became available commercially. The cost was significantly more than was practical for use, however, since 1-watt of solar cell was about \$300. Solar cells started showing up in toys and radios that year, though.

In the late 50s and early 60s, the U.S. and Soviet Union both used solar-powered satellites in the space race, and solar power was the basic standard for powering space-bound satellites by the late 60s.

By the early 1970s, lower cost production for solar cells was discovered, which brought the price of solar cells way down from \$100 per watt to about \$20 per watt. Exxon spearheaded this research for use in off-shore oil rigs.

From the 1970s to the 1990s, a huge boom in solar-powered options came. Railroad crossings, microwave towers in Australia, telecommunication technologies, and remote homes without easier access to electricity started all using this renewable energy source.

And today, of course, solar power is much more affordable, easier to access, less expensive, and greener to produce than ever before.

## A Quick Definition of Solar Energy

The literal definition of solar energy is: radiant energy emitted by the sun. This is another term for solar power.

A very basic overview of solar energy is that something called [photovoltaic cells](#) – combined together into what we know as solar panels – draw in energy from sunlight.

This can be done either through direct sunlight – the most effective and efficient way – or through daylight, meaning even cloudy days produce solar energy.

The solar panels use this drawn solar energy as a source to convert into usable electricity. This electricity is then transmitted into your electronics and appliances to run them as traditional electrical energy would.

## What is a Solar Panel, and How Does it Work?

A solar panel is a sheet of photovoltaic cells – as mentioned before – that are put into a metal frame.

These cells work together to collect solar energy.

Once the free, renewable energy is collected – i.e. sourced – from the sunlight, the internal wiring works in conjunction with the cells to convert the solar energy into usable energy that can run electronics and appliances.



# What Are Solar Panels Made Of?

Solar panels are made of a frame – usually metal, such as aluminum – and the photovoltaic cells which are placed together in the frame. The cells are covered with glass and the panels have a backsheet on the rear for protection and insulation. These backsheets are typically made of a polymer material.

As to the solar cells themselves, the construction depends on the type of solar panel you're looking at. There are [two primary types](#) you'll find on the market.

## Crystalline Solar Panels

Crystalline solar panels, either mono or poly, are made of crystalline silicon – c-Si – and are the more common of the two general types of panels. These are the panels that look like blue or black rectangular grids made up of smaller squares. The small squares are the actual cells linked together in a series, forming a circuit.

Crystalline panels are generally grouped in 60-cell or 72-cell panels.

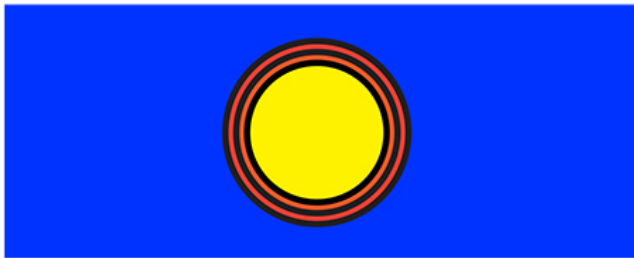
These solar panels are generally covered in durable glass giving them a greater weather, heat, and [water resistance](#).

## Thin-Film Solar Panels

The other most common type of solar panel is a thin-film panel. These are typically used in large scale installations. These are also covered in glass, and use a couple different materials, depending on the exact type of panel.

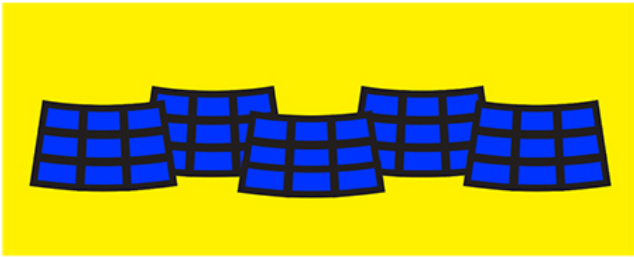
Amorphous panels – best for low light conditions – are made of amorphous silicon – a-Si – but there are also cadmium telluride and copper indium gallium selenide cells. Unless you're going utility-grade, you're most likely to only deal with amorphous panels.

# How Does Solar Energy Work?



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In this step by step process, you'll see how solar energy works.



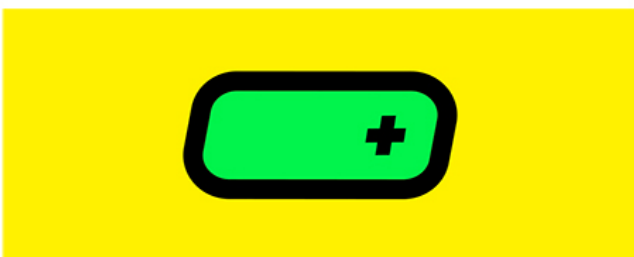
**1.** Solar panels absorb sunlight and daylight. This light is solar radiation, in three forms: ultra violet light, infrared, and visible light. These different forms of light are absorbed at different levels, some more effectively than others.



**2.** When the sunlight interacts with the silicon solar cells, the electrons begin to move.



**3.** These moving electrons create the flow of electrical current, which is captured by nodes and wiring in the solar panel.



**4.** The wires then feed this DC (direct current) electricity into a solar inverter.



**5.** The solar inverter then converts the current into AC (alternating current) electricity that is useable by appliances and electronics, such as those provided by Eco Powerup!

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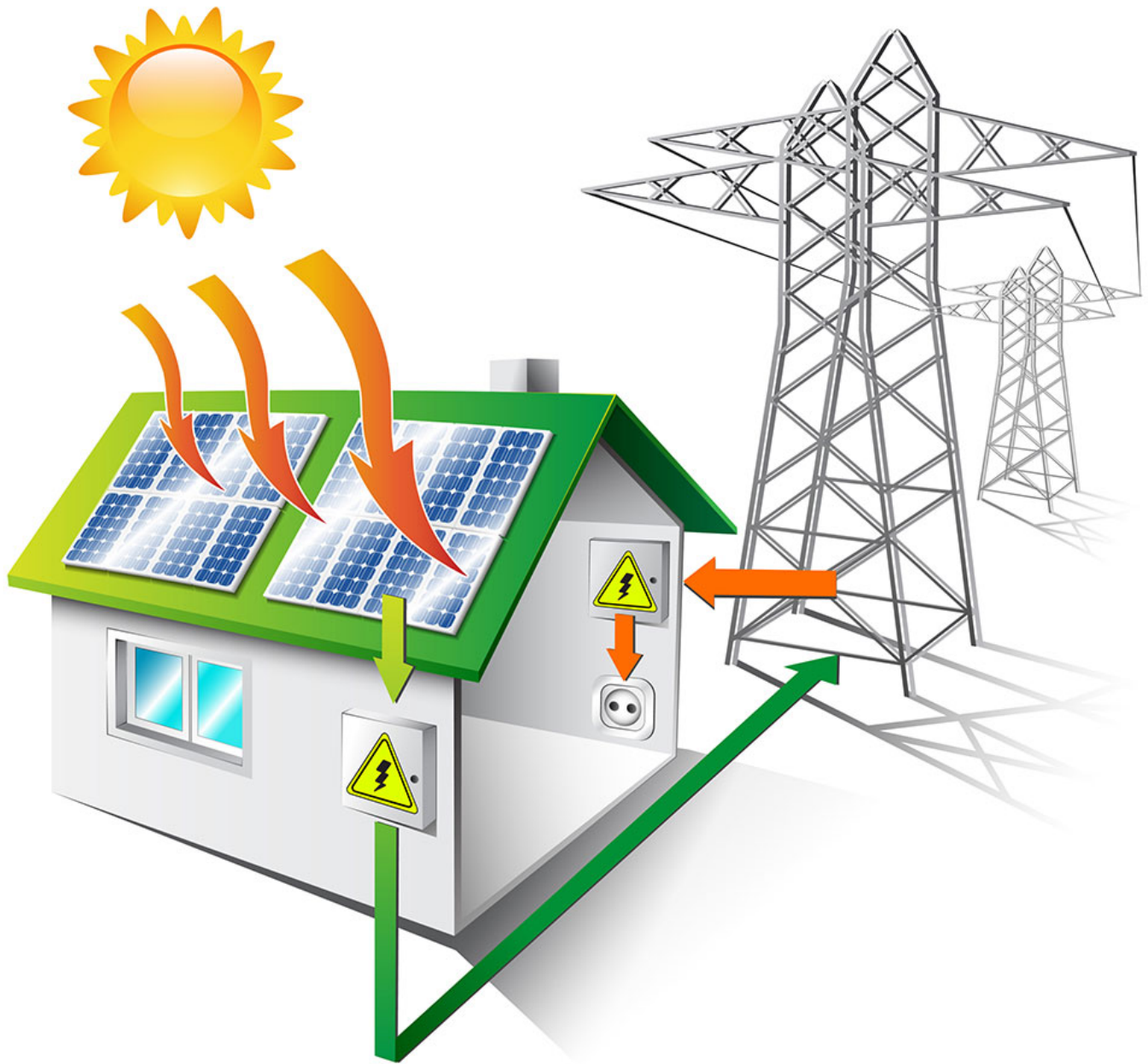
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4. The wires then feed this DC – direct current – electricity into a solar inverter.
5. The solar inverter then converts the current into AC – alternating current – electricity that is useable by appliances and electronics.

Now, to make this energy useful for your home, the process looks a bit like this.

1. Solar panels absorb the sunlight, as mentioned above.
2. The panels convert the sunlight energy into DC electricity.
3. The solar inverter does its thing by converting the DC electricity into usable AC electricity. This is the form of electricity used by most of your home appliances.
4. If you're using a solar generator or batteries, the electricity will then flow through your home – or RV or cabin, et cetera – powering your electronics and appliances.
5. The excess electricity produced by your solar panels is fed back into the electric grid, or stored in your battery or generator.





# How Do Solar Panels Generate Electricity?

For those of you who're looking for the more technical, "deeper" answer on how solar panels generate, electricity, here's the technical rundown.

Light consists of a variety of colors, both visible and invisible to the naked eye. If a prism or shard of glass catches light at just the right angle, you can see this in the

rainbow of colors that splashes across the room.

The different colors come from different photons of light.

The photons carry differing degrees of energy, which is why there are color differences.

For example, blue light photons carry more energy than red. Ultraviolet light and infrared light are both forms of invisible light that either give us that warming tan – or burn if you're my spouse – while infrared light just gives us "heat."

Solar cells respond differently to the different light photons, just like we do.

These photons have characteristics of both waves and particles, and [Quantum Mechanics goes pretty deep into](#) it. We're interested in the solar energy aspects, however, so we'll stick to this: red light has a different wavelength than blue light.

The sun produces a wide range of colors – that glorious spectrum of sparkling color we get after rain comes to mind! – and each color has a different intensity. Solar panels read these different color intensities and converts them into different levels of energy.

Those differing lightwaves are absorbed by the photovoltaic cells – named this because of the meanings. Photo relates to light. Voltaic refers to electricity – think volts.

The photovoltaic cells then use the different components of the solar power system to convert this power into usable electricity that goes beyond the mere translation of light.

Sourced from [Solar Journey USA](#)

# What Does a Solar Inverter Do?

Simply put, [solar inverters](#) are a type of electrical converter.

They convert the variable DC electricity into the utility frequency alternating current – i.e. AC current which your electronics can handle.

Solar inverters have special functions that are adapted for this photovoltaic use, which includes [anti-islanding protection](#) for safety and maximum power point tracking, which maximizes the power extraction from the system.

Solar inverters are mandatory for a functioning solar power system. Without them, you would have unusable energy collected from the sun.

Solar inverters are usually placed in an extremely accessible part of the solar power system, as close to the modules as possible. For residential use, the inverter is often mounted on the exterior side wall of the house that's closest to the electrical main.

[The inverter](#), electricity net meter, and electricity production meter all work together so that the power produced by your system is first consumed by electrical loads in current operation.

The balance of the power passes through the electrical grid – as noted above – and your electricity utility meter will actually turn backward if you produce more solar energy than you're currently using in your house.



*Note: Solar inverters are a little noisy. Do not place them near sensitive areas like children's bedrooms.*

## Does it Matter Where Solar Panels are Placed?

It's important to note that most solar power systems for home use are placed on roofs. The panels are laid out along roofs for a couple of reasons, though.

Placement on roofs frees up space in the yard. Placement on the roof is also likely to eliminate many issues of shade and shadow that placement on the ground or lower surfaces would create.

This placement on the roof should be positioned so that the solar panels get as much direct sunlight as possible between 9 a.m. and 3 p.m., the peak solar hours.

South-facing installation is also recommended to take advantage of the efficient light direction. If, however, there are trees blocking – or tall buildings, et cetera – then other positions may be more efficient.

It is possible to have moving brackets that direct the panels toward the sun as it moves through the sky during the day for maximum power absorption.

## What is a Net Meter and How Does it Work?

equipment.

Your vacation home can keep up appearances of visitors and your business can be seen from a remote location if you have the right [solar-powered camera](#) or lights installed.

# Solar Energy and the Environment

Of course, one of the biggest questions anyone has about solar energy is the impact of solar energy on the environment.

As far as the actual use of solar energy, it is a green, [renewable energy alternative](#) to fossil fuel powered energy. It uses no resources and does not damage the environment in any way.

**On the manufacturing and disposal side of the equipment required for solar energy, however, there are some negative impacts on the environment.**

Admittedly, everything else that isn't 100% natural has similar impacts, however, so it's hard to compare the impact neutrally.

[Producing solar panels](#) requires resources like copper, cadmium, and nickel. Silicon and lithium are also required.

These demands outstrip supplies today and for the future.

However, the finite resource of these minerals isn't the only issue. The mining activities to produce the minerals impacts the environment negatively through the extraction methods and chemical separation processes.

Toxic waste from this process often is not responsibly taken care of. Soil erosion and mercury contamination also cause issues, while mining itself pollutes the water, air, and soil. These practices all harm local biodiversity and populations.

The positive in this, however, is that well-made solar panels and products will last 25+ years, which is significantly longer than most fossil fuel based products that breakdown more quickly.

This does reduce the waste and disposal rates at least, though not the manufacturing impact as more people desire solar energy use at home.

# The Benefits of Solar Energy

As stated above, the actual use of solar energy is a renewable, green energy source that doesn't burn fossil fuels or use other depleting resources. But there are other advantages and benefits to using solar energy in your home or workplace.

## Solar Power Saves You Money in the Long Run

Initially, setting up your solar power system can cost a pretty penny. Prices are going down on equipment and installation costs, however.

But in the long run, as you use solar energy, you'll [reduce your electricity bill significantly, if you're efficiently using your equipment](#). No more gas and electricity bills for the stove and fridge or A/C!

## Solar Power is Safe for Indoor Use

Solar power is safer than gas-powered energy. This means using a solar generator, for example, reduces your risk of fires when using this sort of generator for your home, lodge, boat, or backup power.

## Solar Energy is Much Quieter