

Solar Panel Buyers Guide



 **EcoWatch**

FIRST EDITION

EcoWatch's Solar Panel Guide

This EcoWatch guide to solar panels is meant to help homeowners like you find a solar panel system that best fits their home, energy needs and energy goals.

According to the Solar Energy Industries Association (SEIA), the amount of solar power installed is currently enough to power 23 million homes — and the number of solar installations is only growing.

As more companies manufacture efficient solar panels and more brands enter the industry, solar panels are becoming more affordable than ever. There has never been a better time to go solar; so that you can save money on your monthly electric bill and do your part to create a more sustainable future.

Our dedicated team of solar experts has spent hours researching and collecting dozens of data points to help ensure that homeowners like you make the best choice for their energy needs. Our data is meant to empower you to make the right choice for your home.

In our research, we have looked at hundreds of solar installers and solar brands and provided unbiased reviews of each to make sure homeowners have all the information before they make a final decision.





How to use this guide

Whether you know next to nothing about solar panels or you are a solar expert, there's a lot to think about when choosing solar panels for your home. This guide is meant to be a comprehensive source for all of your solar questions:

- ▶ **What are solar panels?**
- ▶ **How do solar panels work?**
- ▶ **How do you choose the best solar panels for your home?**
- ▶ **How can you benefit from solar panels?**

Once you have finished this guide, you will be an expert in solar panels, too. If you are interested in being connected to a quality installer in your area, check out our EcoWatch solar panel reviews and guides.

For further information about the cost of solar panels for your home, make sure you look at our [solar panel calculator](#) for the most accurate estimates you can get without an in-person quote.

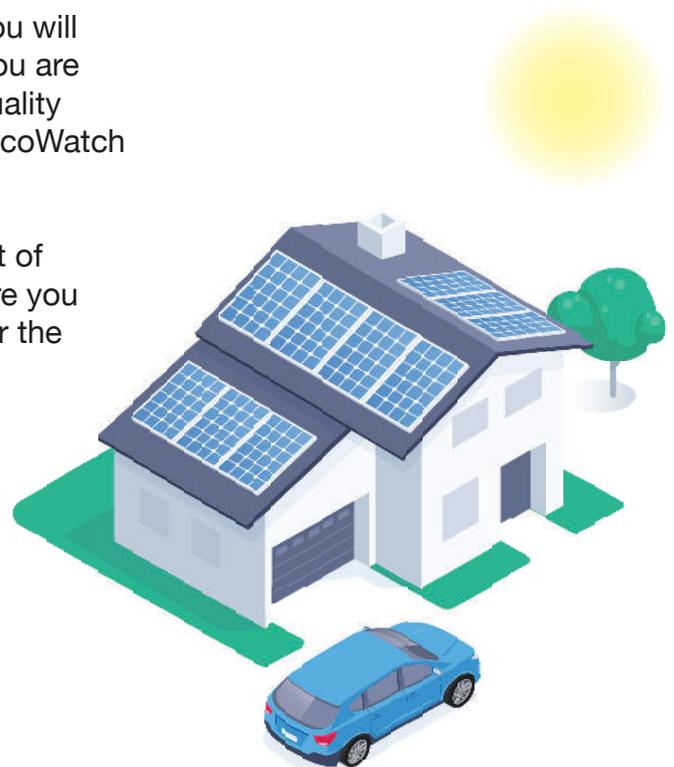


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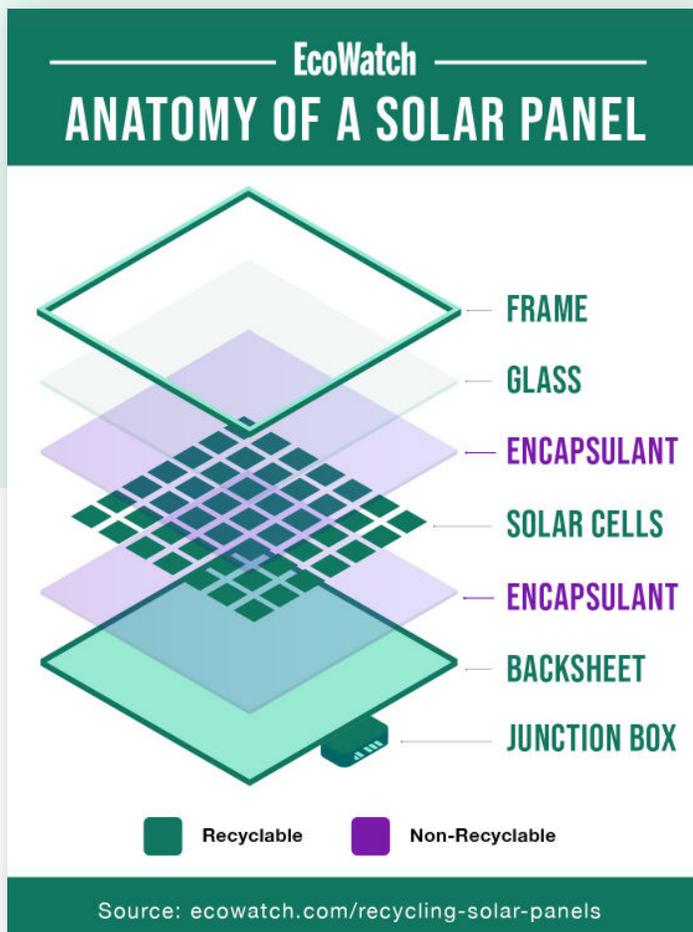
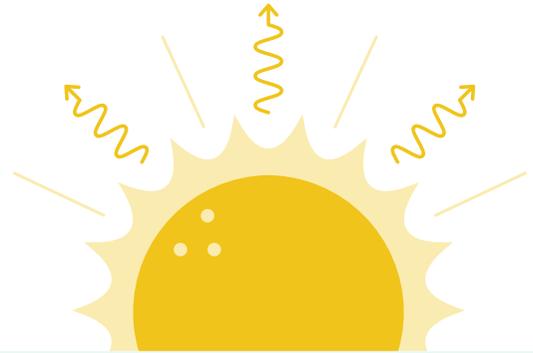
In this comprehensive solar panel guide, we will cover the following:

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What Are Solar Panels?

Before we dive into what solar panels are, it is important to understand what solar power is.

Solar power is energy from the sun. Each day, sunlight, also known as photons, travels to the earth. These photons contain energy, and this power has the potential to fuel the earth's energy needs. After all, the sun itself is a star which means it's really just one big nuclear reactor.



Solar power is often collected by using a technology commonly known as photovoltaics. Photovoltaics, also known as PV, can be used to supply power to your home or business.



Solar panels are designed to harness the power of the sun and convert it into usable energy for your home. The technology used in solar panels is relatively simple: First light will hit the silicon cells which will set the electrons into motion. This will generate electricity in a process known as the photovoltaic effect, the process that underlies solar technology.

Why Go Solar?



Solar energy is renewable

Solar energy comes from natural sources and is replenished more quickly than it is consumed. Plus, solar energy does not create harmful emissions that negatively impact the environment, so it is a clean source of energy.



You can save money on energy

If you rely on the sun for energy instead of your electricity company, you'll save money on your monthly energy bills. On average, a U.S. homeowner saves more than \$20,000 in long-term savings when they switch to solar.



You can increase your home's value

As with most home improvement projects, the value of your home will increase upon the installation of your solar panels. Yet, you won't have to pay more on your property taxes. In addition, solar panels are often desirable for prospective buyers, and buyers are often willing to pay more for homes that have solar panels.



You can achieve energy independence

Solar energy increases your energy independence so that you are no longer completely reliant on your energy provider. You won't have to be subject to the random spikes in energy costs, and if you have a backup battery, you'll be better prepared for power outages.

How Do Solar Panels Work?



As sunlight enters the atmosphere and comes into contact with your solar panels, the energy must undergo a process before it can be used in your home. The process to convert that energy into usable energy — called the photovoltaic effect — is a loop, and is as follows:

1

Sunlight hits the solar panel's two layers, the top n-type layer and bottom p-type layer.

2

The energy kicks an electron from its bond that exists on the upper n-type layer. This electron is now roaming freely and has left a positively charged hole where the electron was previously bonded.

3

The positively charged hole moves down to the p-type layer and the free electron goes through the solar system's conductive wire to the inverter or microinverters.

4

The inverter converts solar energy from DC energy to AC energy that can be used in your home.

5

AC energy flows through your home and powers your systems, appliances and electricity.

6

The free electron travels through your home and back to the p-type layer of your solar panel to fill the positively charged hole and closes the loop. This process will maintain the flow of electricity.

Because many solar systems produce more energy than your home can consume in a given moment, many homes also choose to install a battery bank. This battery bank will store any excess energy or send the extra power back to the grid where it can be credited toward your future energy bills.

Did you know?

In any given hour the Earth is exposed to enough solar energy to offset the entire planet's energy needs for an entire year.

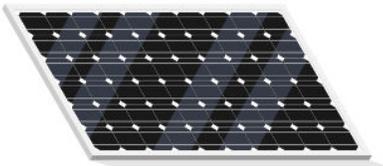


Types of Solar Panels

Even though solar panels all serve the same purpose, there are several different types and designs. Large commercial modules can be up to 7 feet tall, but you can also find portable panels that can fit in your pocket to take with you on a hike. Despite such differences, all types of solar panels can be broken down into three categories: monocrystalline, polycrystalline and thin-film.

Most home solar panel systems will be of the monocrystalline or polycrystalline variety, but monocrystalline solar panels have quickly become some of the most popular due to their high efficiency and long life span. However, each type of solar panel does have a purpose and is widely used. The type of solar panel you choose depends on your unique needs.

1



Monocrystalline

- Highest price
- Typically over **19%** efficiency
- Excellent choice when you have limited roof space

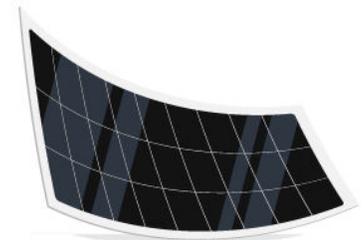
2



Polycrystalline

- Intermediate price
- Typically **15-17%** efficiency
- Great choice if space is not a limitation

3



Thin-film

- Lowest price
- Typically below **15%** efficiency
- Best for large commercial and industrial rooftops

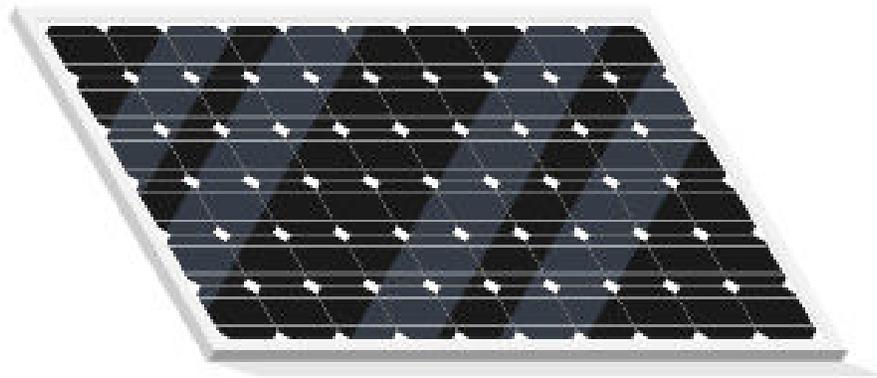
Types of Solar Panels

Monocrystalline

If you have limited roof space, then monocrystalline solar panels are the way to go. These panels have high efficiency ratings of over 19% and often exceed 22% efficiency. Because many types of solar panels struggle to reach 20% efficiency, these solar panels are absolutely worth the investment.

Monocrystalline solar panels are black solar panels and have a much more modern and sleeker look on your roof. Many homeowners go for monocrystalline panels, not only for their high efficiency, but because they do look better on most roofs.

These solar panels are the most expensive type of solar panel. However, they are more efficient and produce more electricity per panel. You will need fewer monocrystalline panels than you would other panels, so you can also save space on your roof.



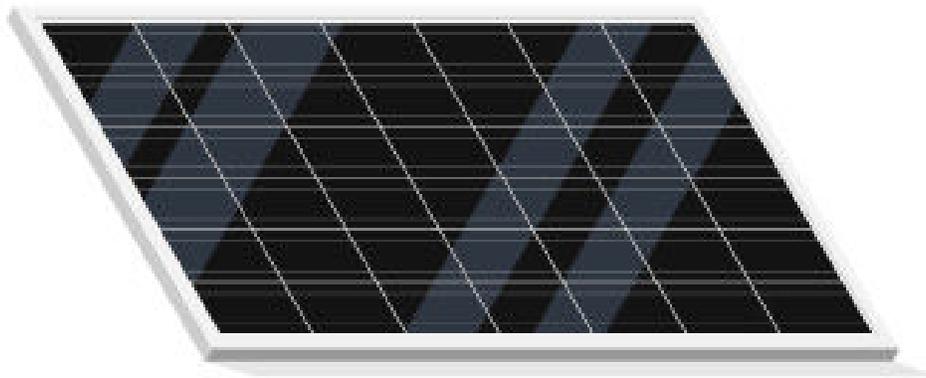
Types of Solar Panels

Polycrystalline

Although they may be less efficient than monocrystalline solar panels, polycrystalline solar panels are a good choice for homeowners on a budget. These silicon panels have an efficiency rating around 17% or lower, which is why these are often more affordable.

A main difference between monocrystalline and polycrystalline panels is the number of cells. Whereas monocrystalline solar panels have a single crystal that transfers electrons more efficiently, polycrystalline panels have multiple silicon crystals per cell.

Not every homeowner needs the highest efficiency panels. If you live in a state that gets a lot of sunshine (such as California, Florida or Arizona), then polycrystalline panels will likely produce enough energy to offset your electricity bills.



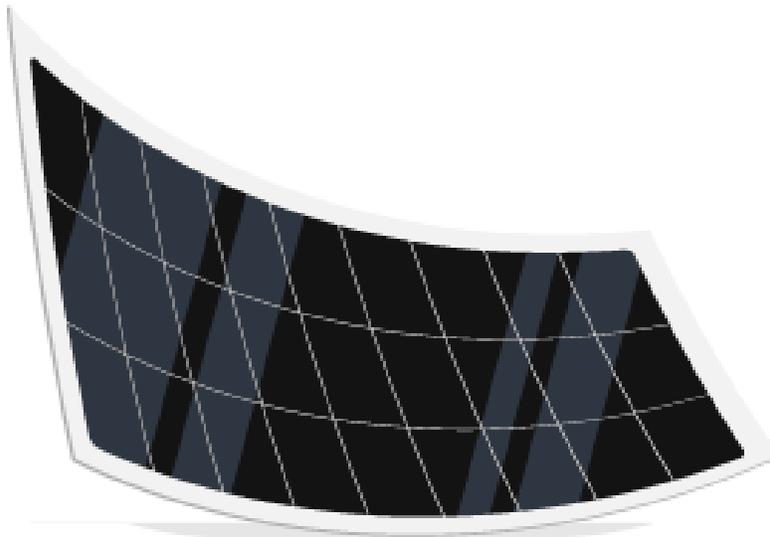
Types of Solar Panels

Thin-Film Solar Panels

Thin film solar panels are not often used for homes because they require a large amount of space and are not as efficient as their monocrystalline and polycrystalline counterparts. Thin film solar panels are not divided into cells; instead the entire surface is photovoltaic material.

Because the entire surface of the thin film panels is PV, these solar panels can be manufactured to be both flexible and lightweight. For that reason, thin-film panels are suitable for off-grid applications such as boats, RV's, cars and camping.

As the most affordable type of solar panel, thin-film panels are great for when you don't need to offset your entire electricity costs, but just need the panels for some sustainable energy support.



**Thin Film
Solar Panels
Are Best For:**



Hiking



Boating



RV & Camping

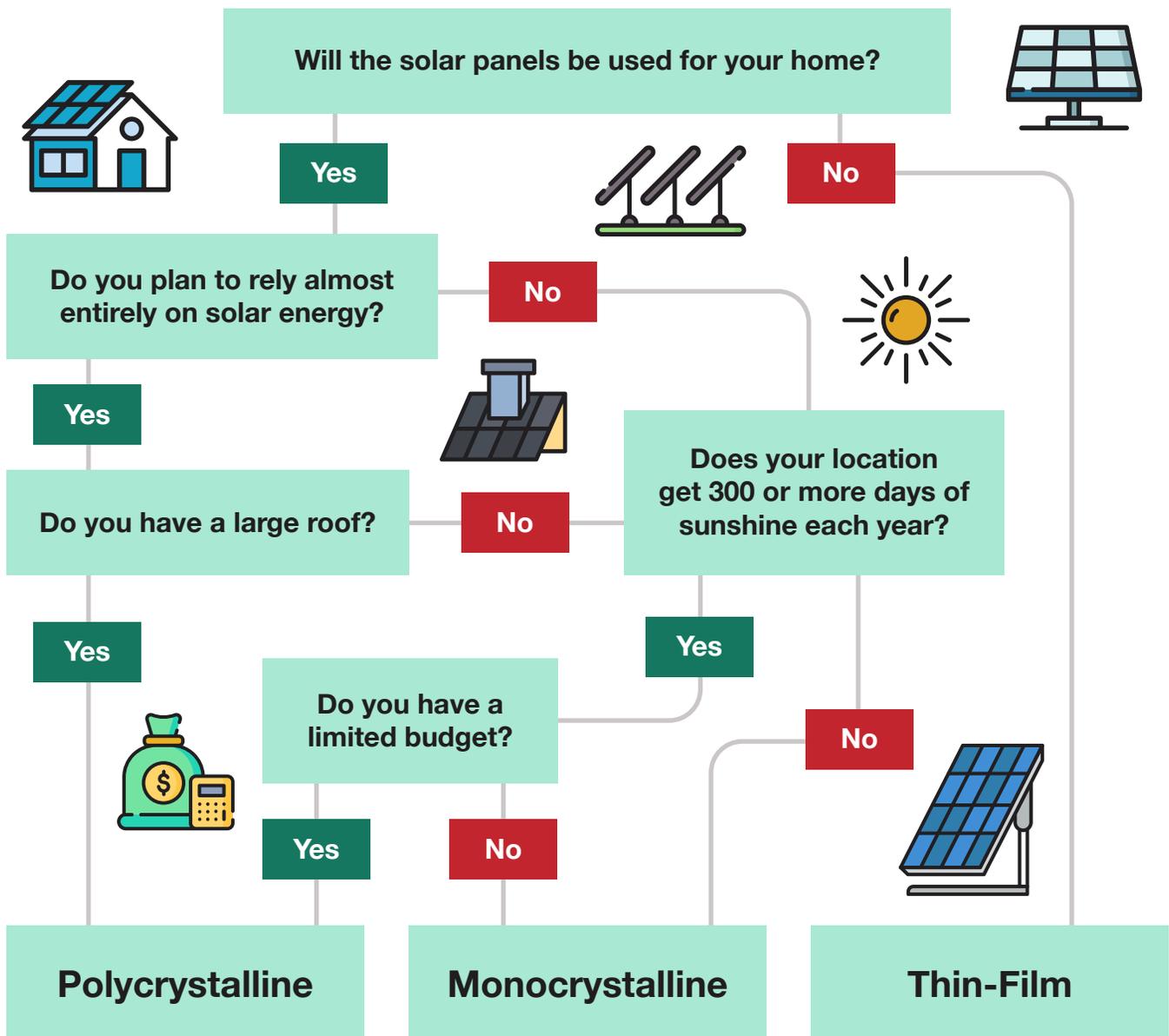


Ground
Mounted

Which Type of Solar Panel Is Best For You?

So, which type of solar panel is best for your home? The answer to this question depends on several factors. Not only do you need to consider how much energy your home uses, but you also need to take a look at how big your roof is, how much sunshine your roof will get, your budget and your overall energy goals.

To help you start to figure out which type of solar panels you want, check out the chart below.



Solar Specifications Explained



Solar panel efficiency

The efficiency rating is the amount of captured sunlight that it can convert into useful energy. Solar panel efficiency tops out just over 20%, and the most efficient solar panels will yield the greatest energy savings for your home.



Temperature coefficient

Temperature coefficient is how much or how little a solar panel's productivity is diminished when the external temperature rises. How solar panels work in extreme heat plays a key role in year-round energy production.



Production warranty

A production warranty guarantees a certain level of panel efficiency for each year after your panels are installed. The industry standard is 25 years but consider the annual degradation of your panel's power output.



Solar panel wattage

A solar panel's wattage is how much power it is capable of producing. The higher the wattage, the more energy a panel can produce at optimal functioning. A panel's size and efficiency can impact its maximum power output.



What Impacts Solar Production?

Solar panels can only produce optimal amounts of energy when installed in the perfect conditions. That said, not every home is suitable for solar panel installation. The following factors may impact your ability to rely completely on solar for your energy needs.

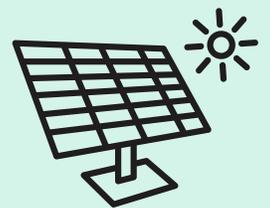
Shading on your property

If your property has a lot of shade from trees or other obstructions, then your panels cannot produce as much energy. Shaded properties may not be ideal solar panel candidates, or you may need to trim trees to improve production.



Solar panel tilt

If your solar panels aren't facing the sun, then they will not produce as much energy. Professional installation ensures that your panels are installed correctly and makes sure each is facing the direction that is exposed to the most sunlight.



Panel efficiency

The higher the efficiency rating, the better solar panels transfer sun energy to DC energy. High-efficiency panels are often more expensive and are best for homes that get less sunlight. If you live in a place with abundant sunlight, then you may not need the most efficient panels.



Latitude and climate

Solar panels installed in higher latitudes are subjected to less sunlight than systems installed in lower latitudes due to the changing tilt of the Earth. Panels also produce better in colder climates, so systems installed in hot climates will often produce energy less efficiently.



Solar Panel Cost

The cost of your total solar system depends on several factors, but a lot of it depends on where you live. Each state has a different cost per watt, but the average cost is \$2.66 per watt. The larger the solar system you need to offset your energy costs, the more it will cost. The same can be said for the amount of direct sunlight your panels are exposed to. The more sunshine you get, the more energy you'll produce.

You can expect the following to impact your panel cost:

Days of sunlight

If you get a lot of sunlight, then you can get by with less efficient and less expensive panels

System size

Larger systems will cost more simply because you'll need more panels

Your energy usage

The more energy you use on a daily basis, the larger the system you'll need to offset your energy costs

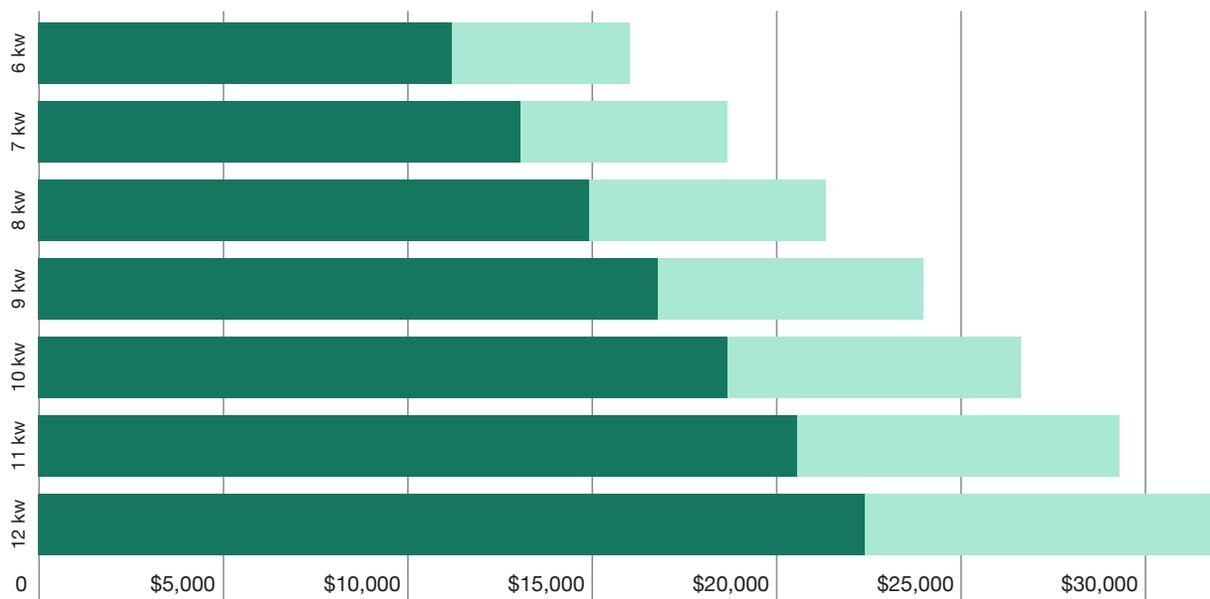
Cost per watt

States that have lower cost per watt have more affordable panels

Incentives available

Some states have more and better incentives than others that can help lower the total cost of your system

National Average Cost of Solar Panels by System Size



● Average Cost After Federal Tax Credit ● Tax Credit Savings Value



Solar Financing Options

Cash payment

When you pay in cash, you pay for your entire solar system upfront. This may seem like quite the investment, but cash payments are the best way to get the greatest return on your solar investment, increase the value of your home and take advantage of the federal solar tax credit.

If you are able to afford this upfront cost, then you will save yourself thousands of dollars in interest over time. You will also start to save money immediately and the payback period for your solar panels is less time.

Solar lease

Although leasing solar panels has become less popular due to the increased availability of solar loans, solar leases are an option that allows you to benefit from solar energy without the upfront cost. With a solar lease, you pay a monthly fee that allows you to “rent” the solar panels on your roof and use the electricity they generate to lower your utility bills.

Solar loan

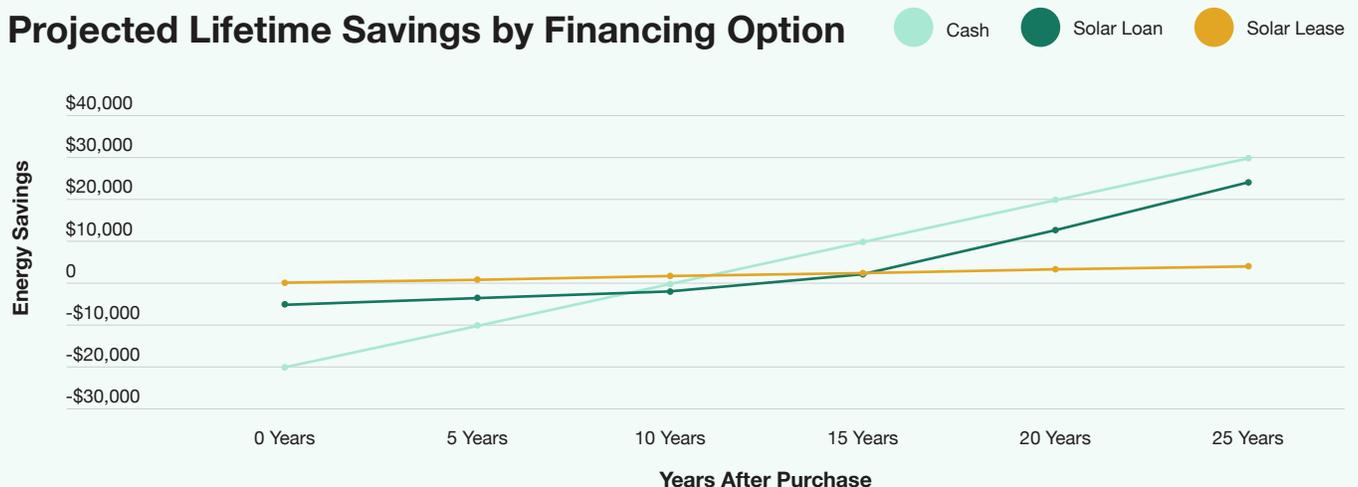
If you don't have the cash to pay upfront, then a solar loan is likely your best option. Many homeowners choose a solar loan because it often requires zero money down yet leads to energy savings, still increases the value of your home and you can benefit from the federal solar tax credit.

The downside of solar loans are the monthly payments and interest. Each month, you will pay the amount owed on your bill and any extra energy costs from your utility company. This option is still less than your energy bill, but can vary.

Power purchase agreements (PPAs)

A PPA is another type of solar lease. The company installs panels for free, and you buy the electricity they generate, usually at a discounted price. These agreements are the least appealing options financially for most people, and they don't let you take the federal tax credit. However, they have no down payment requirements and no monthly costs.

Projected Lifetime Savings by Financing Option



Solar Incentives Explained

Solar panels may be one solution to decreasing carbon emissions, but with the average cost of a U.S. solar system right around \$23,940, there is no hiding that solar systems are expensive. To combat these high prices, government entities and local utility companies offer financial incentives. Although each will differ by state, most U.S. residents can expect the following types of solar incentives:

Federal solar investment tax credit (ITC)

Everyone who purchases a solar panel system is eligible for the federal ITC that will credit 30% of the total cost of your panels toward your federal tax return.

State tax credit

Similar to the federal ITC, some states have similar tax credits that are credited toward what you owe come tax time.

Net metering

Net metering allows you to credit any overproduction of electricity toward future energy bills. Each state has different regulations, so check yours to see if this is an option for you.

Property tax exemption

The value of your property will increase but you will not pay property taxes on that increase.

Sales tax exemption

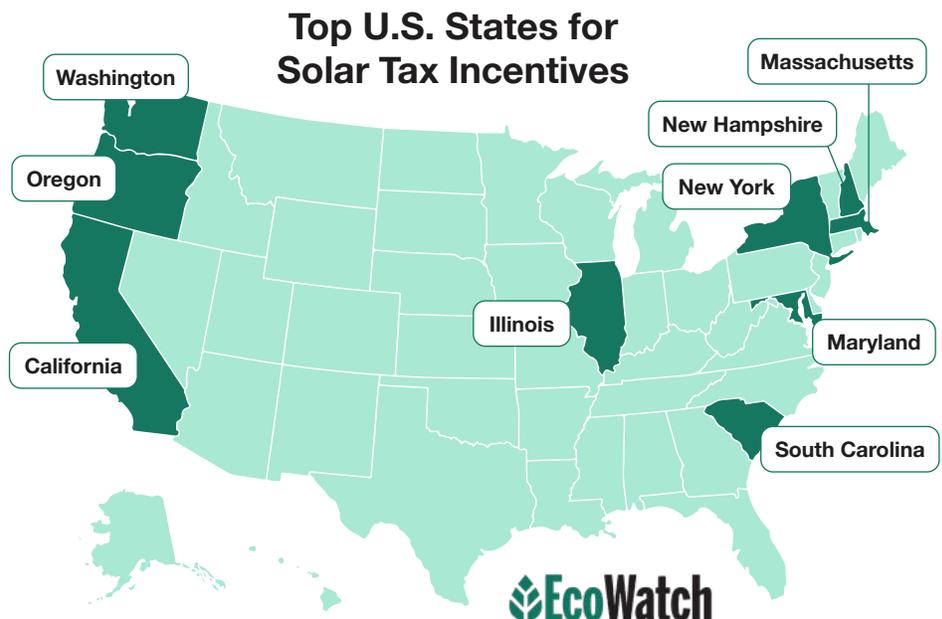
Some states have no sales tax on solar panels, so you can save more than \$1,000 on an average-sized solar system.

Local solar rebates

Local utility companies can have rebates available to qualifying residential customers. This cash is often applied straight to your solar panel bill.

Solar renewable energy certificates (SRECs)

As of 2021, 31 states and the District of Columbia have established renewable portfolio standards (RPS) or clean energy standards (CES) that requires a percentage of the electricity utilities to come from renewable resources. This incentivizes the state to reward solar installations.



Source: ecowatch.com/top-states-for-solar-tax-incentives
Results based on data from dsireusa.org. Check with your local government website for details.

Community Solar



Community solar is a community-based solar system that allows everyone to access renewable solar energy. Homeowners, renters, businesses and nonprofit organizations alike can buy into a community solar farm or garden to offset energy costs. Community solar is a great option for those who cannot afford or cannot install their own solar system. Instead of owning an entire solar system, those who invest in community solar own a portion of a larger solar farm.

How Community Solar Works

Virtual net metering has made community solar possible, and now more people can access solar energy. There is a positive outlook for community solar projects, but it is not yet available in every state. If you decide to invest in community solar, keep in mind that it may not completely cover your bills because:

- The kilowatt-hours produced by a community solar project are measured for each billing period and are divided based on ownership shares
- If a community solar array produces 10,000 kWh of electricity and you own 5% of the project, you get 500 kWh for that billing period
- The value of those 500 kWh will be subtracted from your electric utility bill, so if you use, for example, 750 kWh of electricity in your home, you'd only pay your utility company for 250 kWh

Benefits of Community Solar



All can
access solar



Sell or donate
your solar share



No maintenance
or repairs



Solar panels move
when you do

EcoWatch Top Picks

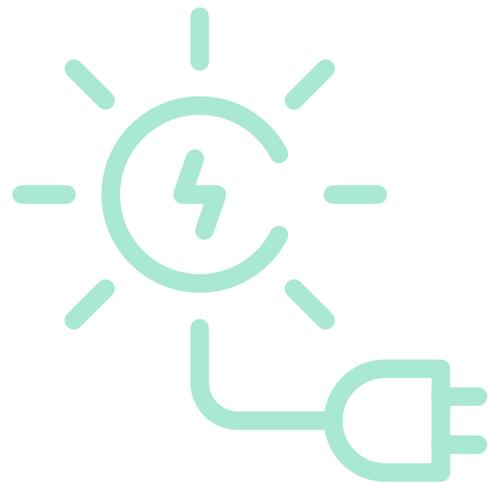
Best Solar Panels



There isn't one solar panel that is best for every home, and several solar brands possess the technology required to convert sunlight into clean energy. Yet, not every brand of solar panel rates the same in categories of durability, efficiency, product warranty, price point and temperature coefficient.

After reviewing the best solar panels on the market, our solar experts identified the solar panels that are the most reliable for homeowners who want to go solar:

- ▶ **SunPower (Maxeon):** Most Efficient
- ▶ **Silfab:** Best All-Around
- ▶ **Panasonic:** Best Temperature Coefficient
- ▶ **Canadian Solar:** Most Affordable
- ▶ **Trina Solar:** Best Value
- ▶ **Qcells:** Consumer Favorite
- ▶ **Mission Solar:** Best American-Made
- ▶ **REC Solar:** Most Reliable
- ▶ **Windy Nation:** Best for Small Solar Projects



When you're ready, we can help you find the best solar panels for your home. Read our [solar panel reviews guide here](#).



Best Solar Panel Companies



When it comes to solar panel installation, some companies rank above the rest. Our solar experts have spent countless hours sifting through all the top solar panel companies and have provided unbiased reviews of the companies that we truly believe are the best in the solar industry.

We select our top companies based on several factors, most importantly solar installation experience, service area availability, brand and company reputation, warranty coverage, ease of purchase and solar services.

Learn more about the best solar panel companies here.

Solar Company	EcoWatch Award	EcoWatch Rating	Avg Cost	Service Area
SunPower	Best National	5 / 5	\$\$\$\$\$	All 50 States
Momentum Solar	Top Regional	4.5 / 5	\$\$\$	11 States
Blue Raven Solar	Most Flexible Financing	4.5 / 5	\$\$	17 States
Palmetto	Top Customer Service	4.0 / 5	\$\$\$	24 States
ADT Solar	Superior Warranty Coverage	4.0 / 5	\$\$\$	21 States
Trinity Solar	Solar Veteran	4.0 / 5	\$\$\$	9 States

Ready for a free, no obligation quote? [Click here!](#)

How To Choose An Installer

There are more than 10,000 solar companies in the U.S., according to the SEIA. With so many options to choose from, it can be overwhelming to decide which solar company is best for you. We recommend considering the following factors:



Warranty Type

Warranties are incredibly important because it can save you thousands of dollars should your panels break. Look for manufacturer, production and workmanship warranties.



Solar Product Offerings

Some companies offer just one brand of solar panel whereas some have several brands and types of panels. If you don't know which panel you want or have a certain budget, look for an installer that has various options to choose from.



Customer & Service Reviews

Reading reviews is the best way to get to know a company. Look at both positive and negative reviews from reputable sites, such as the Better Business Bureau, to get the entire picture.



Accreditation & Reputation

A company's reputation can help you determine the trustworthiness of that installer. Look for accreditation, such as certification from the North American Board of Certified Energy Practitioners (NABCEP).

What to Expect

Solar Installation Process



Although it may differ slightly depending on your state and installer, most homeowners can expect to experience the following solar installation process.

Consultation

Get quotes from a few of your area's top solar companies to compare pricing and proposals

System design

A representative will take a look at your roof and design a solar system that meets your energy goals. Each solar system will only be as effective as its design.

Permitting

You may need permits and approvals from your municipality installing your solar panels. Your installer can handle this on your behalf.

Net metering

Apply and enroll to net metering prior to the installation if it is available. This step should also be handled by your solar company, but you may need to sign the documents.

Installation

Your installer begins work to assemble your panels after all permissions are granted. This may take anywhere from a day to a week depending on how complex your project is. Most installations are finished within a day.

Review and approval

Before your solar panels are turned on, you may need to get it reviewed by the city to ensure it is up to code. Both cities and utility companies usually require inspections. Your solar installer will arrange these inspections.

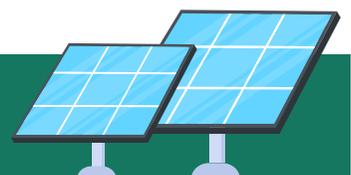
Using your system

After you get your final approvals, you'll be ready to turn on your solar system.

Applying for tax credits

Solar companies often walk you through how to apply for solar tax credits, rebates or grants available in your area.

Want to learn more about solar installation? [Click here.](#)



Other Solar Equipment

Your solar panels will take up the majority of your budget, but there are a few other pieces of equipment that you must take into account, namely:

Solar inverter

The inverter converts direct current (DC) solar energy into usable alternating current (AC). You can choose either one central inverter or several microinverters.

Battery back-up

Although not required, a solar battery allows you to store excess energy for future use. Instead of feeding overproduction back to the electric grid, your battery will store energy to be used at night or during a power outage. [Learn more about solar batteries here.](#)

Mounting system

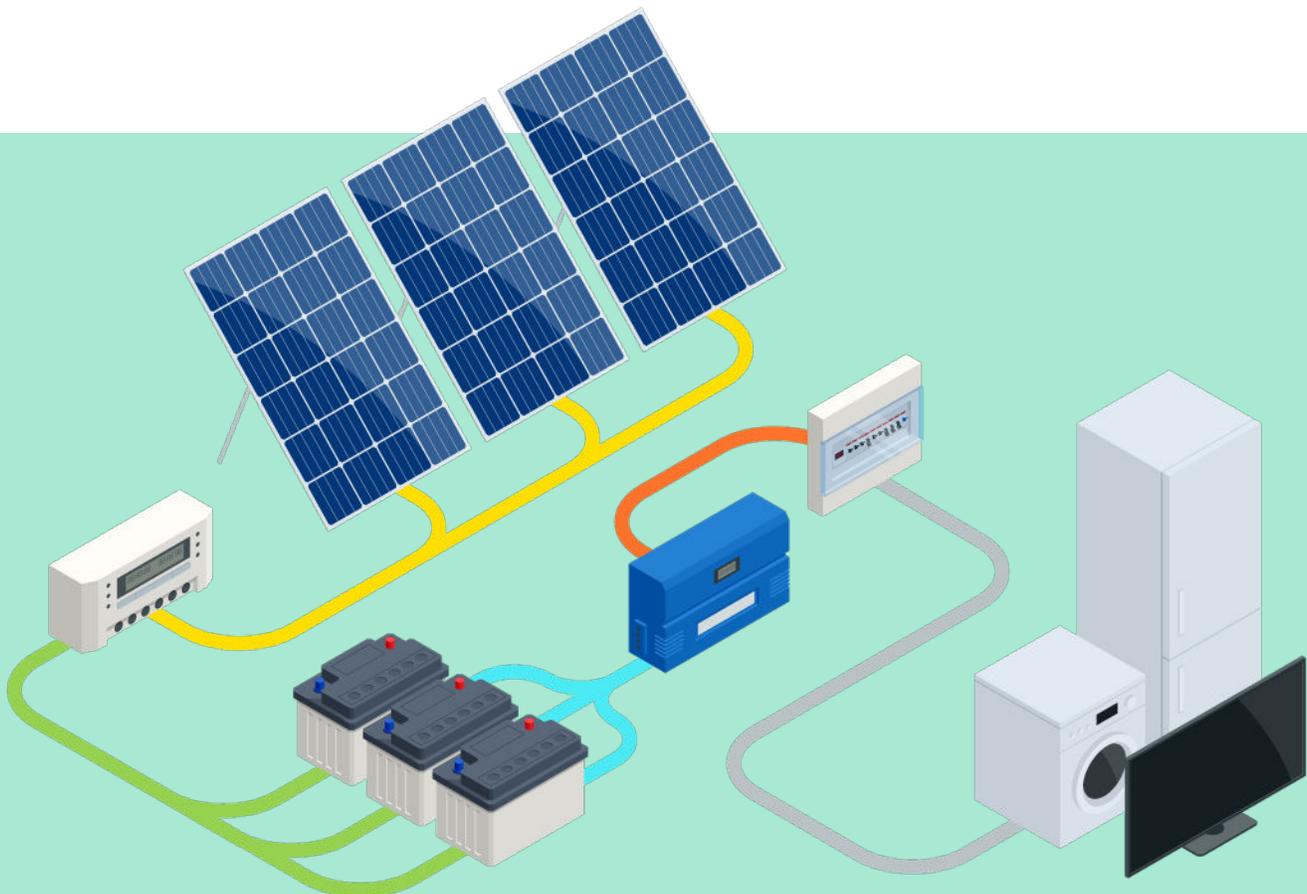
Solar mounting systems stabilize your panels and ensures that they will remain secure on your roof.

Wiring

Wiring must be used to connect your solar panels to your electrical system.

Solar charge controller

Charge controllers regulate voltage and prevents solar batteries from overcharging.



Solar Resource Guide



- ▶ [Best Solar Panels for Homes](#)
- ▶ [How Solar Panels Work](#)
- ▶ [Top Solar Panel Companies](#)
- ▶ [Community Solar Guide](#)
- ▶ [Solar Incentives Guide](#)
- ▶ [Solar Panel Financing](#)
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- ▶ [How to Install Solar Panels](#)
- ▶ [Most Efficient Solar Panels](#)



Want an accurate estimate for your solar system?
Check out [EcoWatch's Solar Calculator!](#)

What is your current monthly electric bill (approximately)

\$145

Who is your electricity provider? ⓘ

Select your electricity provider ▼

Current shade ⓘ

No shade A little shade Some shade A lot of shade Not sure

Property type

Commercial Residential Nonprofit

How old is your roof? ⓘ

Under 10 years 10-20 years More than 20 years Not sure