



Off grid solar power 101

Everything you need to know for total power independence

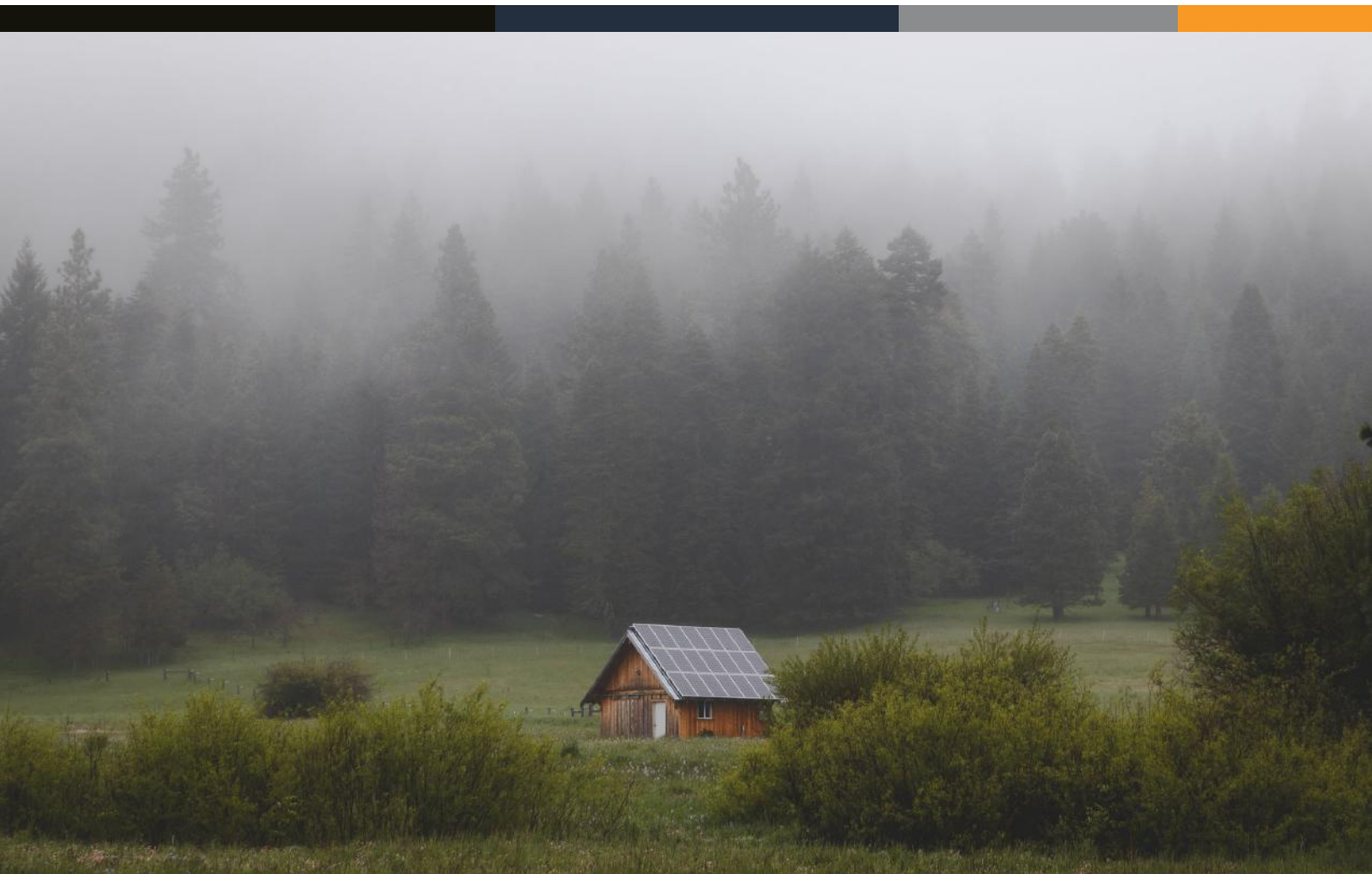
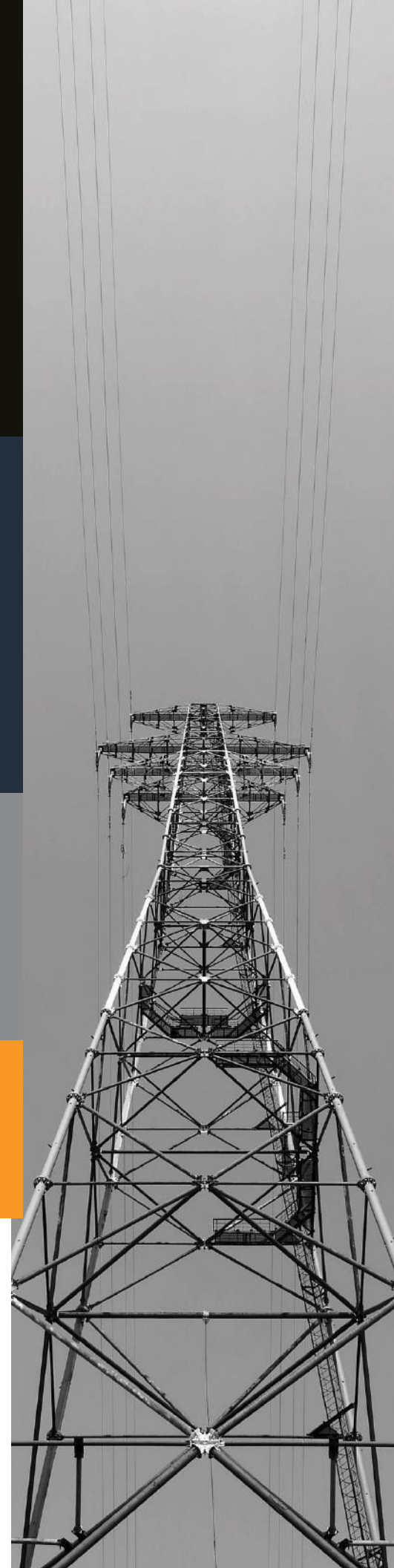


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Introduction

It wasn't that long ago that people considered solar power a pipe dream. Not anymore. With rapid advances making the technology cheaper, more efficient, longer-lasting, and readily available, it's clear that solar power is not only a viable but also an excellent option for meeting an individual home's electricity needs.

Nobody likes getting utility bills for electricity that seem to get more and more expensive every month.

Nobody likes relying on an electricity grid that is anything but reliable.

Nobody likes feeling powerless when it comes to their power.

That's why so many people are now going off grid using sunlight to produce 100% of their electricity needs. It's easy today to find a solar company to set up a solar power system at your home or cottage, and an even easier (and way cheaper) option is to go online for a solar power kit that you can set up yourself.

In this guide, you will find everything you need to know about off grid solar power and build an expertise that will enable you to find the very best solar power solution to keep your home powered up through any situation.

WHICH SOLAR KIT IS RIGHT FOR YOU?

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What does going off grid mean?

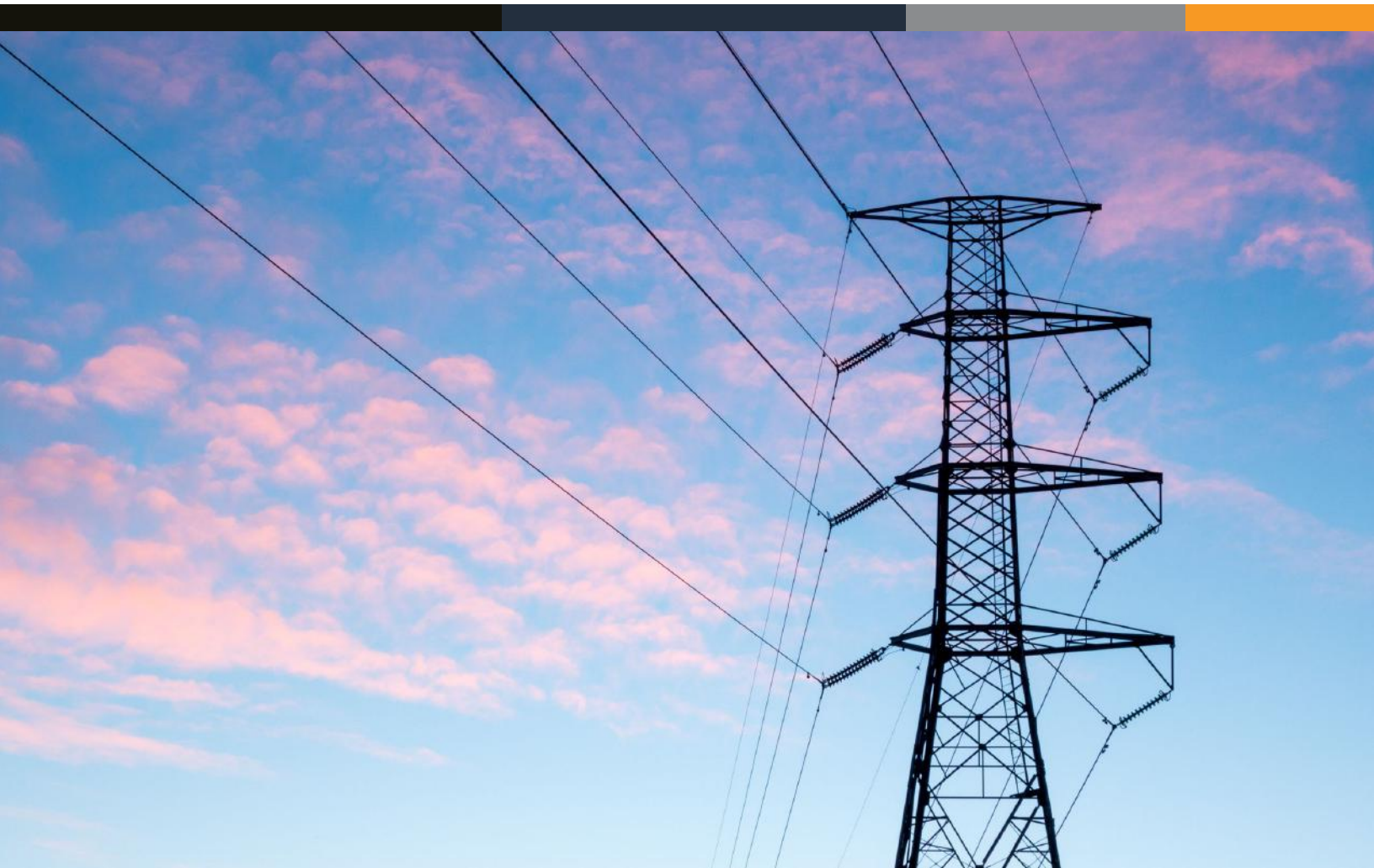
Going off grid means you no longer rely on outside services for your essential needs. The name comes from the [electrical grid](#), that network connecting the various power generation sources—nuclear, coal, natural gas, and renewables—to our homes and businesses.

Being off grid means you have your own independent source of electricity and do not need to pay a utility company to provide access to and power from the grid.

Hand down, the best independent source of electricity to power your life is off grid solar power.



In the US, 36% of the energy on the grid comes from petroleum, 32% from natural gas, 11% from coal, 8% from nuclear, and 12% from renewable sources.



Why go off-grid?

Millions of people have been using the electrical grid for a long time. It's the default way to get power, so why look for a different way? There are many reasons why someone might want to go off grid.

Physical factors

- The location is too remote
- The degeneration of electricity grid mean unreliable service
- Protection against weather and other emergencies
- Low energy needs

Economic factors

- The high cost of running a line to connect to the grid
- Eliminating monthly electricity bills

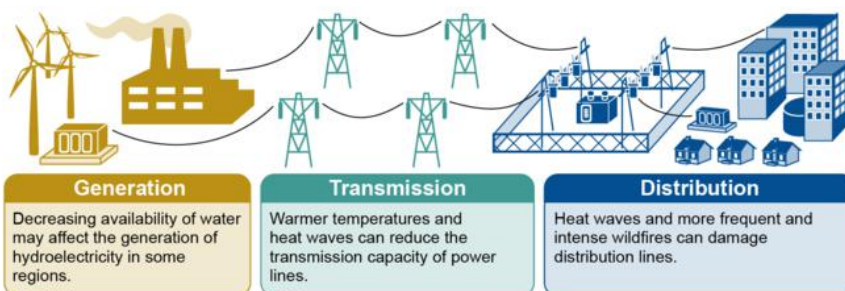
Personal factors

- Independence
- Privacy
- Self-sufficiency
- The security of being in control of your home
- The satisfaction of being ready for anything
- The ability to do-it-yourself
- Environmental benefits

Physical factors

Some people are just too far away from the grid so it's not even possible to have access to it. For them, an alternative off grid power source is their only option. But most of us are able to physically connect to the grid, so the question is: why would we want to go off grid?

The unreliability of electricity coming from the grid is a major concern for many people. Blackouts and brownouts are becoming more and more frequent because of damage caused by increasingly frequent weather events, the failure of grid components due to age, and the overtaxing of the system from an ever-growing population and demand for power.



Source: GAO analysis of reports. | GAO-21-423T

With the inevitable shift towards electric vehicles and the move towards smart homes, the demand for electricity is going to rapidly increase in the coming years. As people move away from using fossil fuels for heat and embrace environmentally friendly appliances like heat pumps that require electricity, it will place more and

more burdens on the already crumbling grid and make it more and more unreliable.

Most people just deal with temporary power outages by waiting it out without looking for other ways to maintain or secure their access to electricity such as solar power. Solar is a fantastic way to ensure you have power during emergencies through battery backup and solar generators, but those seeking to go fully off grid want to cut their reliance on outside electricity sources completely.

When you're off grid it doesn't matter whether access to the grid is cut off for a few hours, a few days, or indefinitely in the case of a catastrophic event. Your ability to generate and store all the power you need for everything in your home means you will always have plenty of reliable electricity, no matter what happens.

Then there are the situations when your electricity requirements are small, such as for a cabin or cottage. In these cases, an off grid system makes even more sense because the modest needs can be easily met by a relatively small and inexpensive off grid solution, even on the most remote island or deep-woods getaway.

Economic factors

Although setting up your off grid power source initially can be expensive, it is an investment that will not only increase the value of your home but will also more than pay for itself in the long run.

If you need to pay for the utility company to connect to a new build anyway, that initial expense for an independent off grid power source can often be even less than the connection fee, saving you money right off the bat!



ELECTRICITY USED BY THE AVERAGE AMERICAN HOME

11,150 kWh
per year

930 kWh
per month

30 kWh
per everyday

(Source: U.S Energy Information Administration)



Then once you have an off grid power generation system all set up, you'll never see another electricity bill. If you decide to get a loan to set up your solar system you should find that the amount you save on your monthly bill will cover your monthly loan payment, maybe even leaving some left over.

Regardless, most people find that their solar system pays for itself in 10 to 12 years, meaning that for the rest of the 25 to 30-year lifespan of the system's components you're saving the entire amount of what you would otherwise be offering as tribute to a monopolized utility company.



Personal factors

For a lot of people, their personal reasons for going off grid outweigh any physical or economic concerns. Often, their desire to be independent and free from the shackles of relying on others to provide what they need is why they choose to go off grid.

It's not hard to see why. The security, self-sufficiency, and privacy provided by an off grid power source offer a kind of freedom that's hard to put a price tag on. You're ready for anything and the ability to set it all up by yourself gives a sense of satisfaction second to none.

For some, there is also an ethical part to it. Most of the power flowing into the grid comes from dirty, polluting sources made with finite carbon-spewing resources. The environmental impact of creating and providing electricity through these traditional means is significant and many people feel an obligation to reduce this by using clean, renewable resources to provide their power.

Why use solar power to go off grid?

Once you choose to go off grid, your options for creating your own power are limited. You're left picking between gas, wind, or solar power.



Gas power

If you only need power occasionally, and not a lot of it, a gas-fueled generator can work. However, that kind of fuel is expensive, requires constant refilling, and may not be readily available in more remote locations.

A generator powerful enough to meet the needs of an entire home is impractical: it's large, expensive, and uses a lot of fuel. Unless you add battery storage, you only have power when the generator is running. Gas generators do not last very long and also require constant maintenance. As well, gas generators are very noisy, smelly, and dirty, and cannot be operated inside because of carbon monoxide emissions.

Honestly, it's kind of a crappy choice.

Wind power

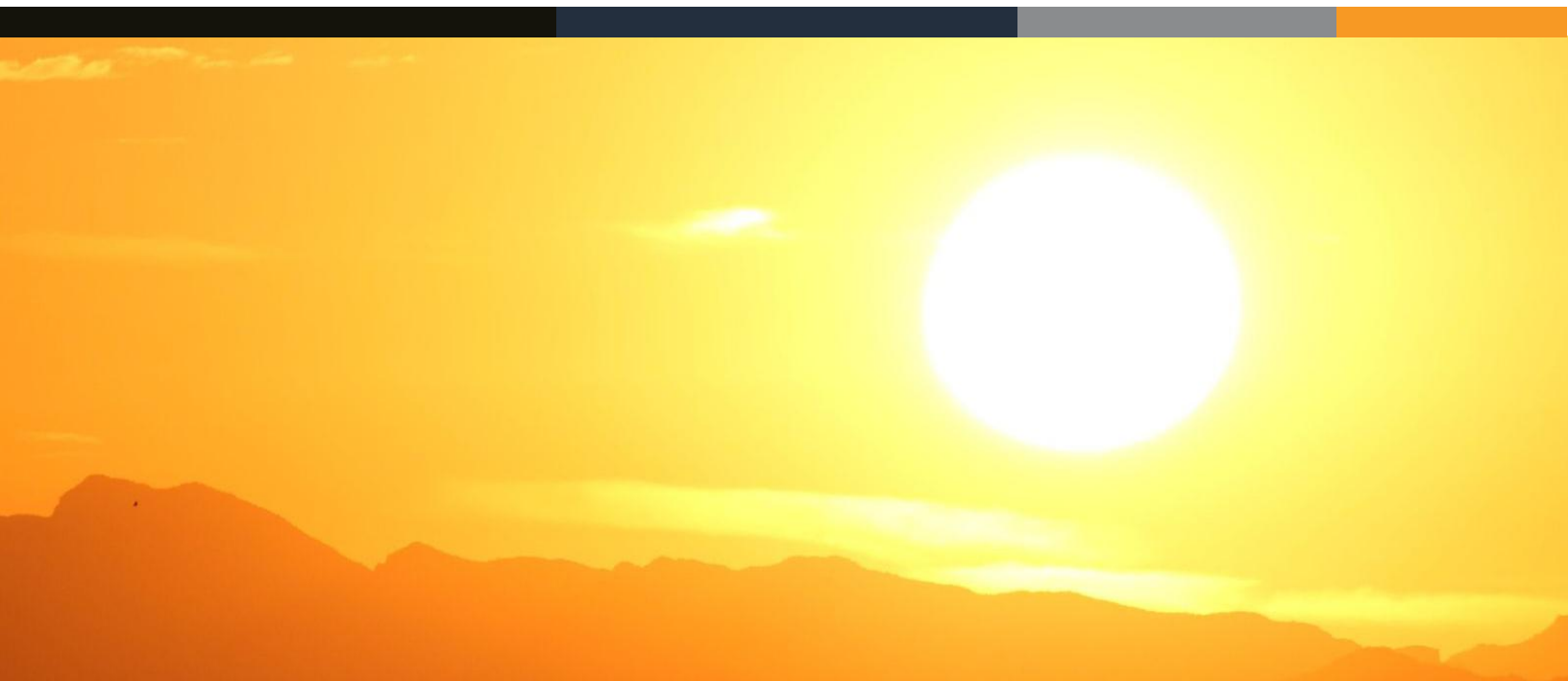
A wind turbine can also be an option, but once again it is only practical if your electricity needs are modest: the size of a turbine that can power a whole home is very large and expensive. It can be difficult to install and maintain. Definitely not a DIY option.




You also need to be in a location that not only gets enough consistent wind but where a 30 to 100-foot tall tower is practical, which means that it is not viable in a lot of places. In addition, wind turbines can be noisy and a danger to birds and other wildlife. It's also very visible and may not make your neighbors happy. Everyone will be very aware of your presence, all the time.

Solar power

Solar power is easily the best option to go off grid. The benefits of solar power are clear:

- Sunshine is free
- Solar panels and other parts last for a long time without maintenance
- A fairly small array of panels can meet all your electricity needs
- It is easily stored in batteries
- It is silent
- It is safe
- It is affordable
- It is scalable
- It is easy to install
- It has very little environmental impact



Off-Grid Energy Source Comparison	 SOLAR	 WIND	 GAS
Initial expense	Moderate	High	Low
Ongoing expense	None	None	High
Effectiveness	High	Moderate	Low
Maintenance	None	Low	High
Noise	None	Low	High
Safety	High	Moderate	Low
Durability	High	Moderate	Low
Availability	High	Low	Moderate
Environmental impact	None	Low	High
Ease of use	High	High	Moderate
Reliability	High	Moderate	Low
Scalability	High	Low	None
Stealth	High	None	Low

What if I'm not ready to go completely off grid?

If you don't think going completely off grid is right for you but still want to take advantage of the benefits of producing your own energy, you can easily set up a solar system that can meet at least some of your electricity needs. The rest can be supplemented by the grid. Any excess power generated can be stored in batteries for when the sun isn't shining or the grid fails, or fed into the grid for credit against power taken from the grid later. This is called a hybrid solar system and it's terrific:

- Reduce monthly expenses
- Increase home value
- Protection against power failures
- Lower reliance on dirty energy
- Expandable

One of the many beauties of solar power is that it is scalable. If you decide later on that you'd like to increase the amount of electricity you want to produce and go entirely off grid, solar power generation can be easily increased by adding more panels; if you want to be able to store more energy, more batteries can easily be added as well. It's a DIYer's dream.

Off grid solar power basics

Let's do a crash course on [off grid solar power](#) to lay the foundation for what comes next.

- Electricity is generated in solar power systems when sunlight hits the photovoltaic (PV) cells in a solar panel
- Inverters convert the DC electricity generated by the panels into AC electricity that most household devices use
- Electricity is measured in watts. A kW (kilowatt) is 1,000 watts. A kWh (kilowatt-hour) is the standard measurement of energy consumption, one kW over the course of one hour
- Solar power systems produce most of their electricity during during peak sunlight hours, which is when the sun's intensity is above 1000 watts per square meter
- Where you are determines [how many hours a day you will get peak sunlight](#): the national average is about 4.5 hours
- Excess power produced when the sun is shining is stored in batteries so be used during off-peak hours or in emergencies
- Solar panels can still generate power on cloudy days, rainy days, and even during the winter, just not as much as when the sun is shining its brightest
- The average home in the United States uses 11,156 kWh of electricity annually, which is about 930 kWh per month or 30 kWh every day. (Source: U.S Energy Information Administration)
- The average cost of electricity in the US is 16¢ per kWh, which translates to an average monthly electricity bill of \$144

- A relatively modest solar power system can more than handle the all energy needs of the average home, taking them completely off grid and saving \$1728 every year





THE BENEFITS OF USING A SOLAR KIT

▶ SAVE AT LEAST HALF THE COST USING A SOLAR KIT OVER A SOLAR COMPANY ◀

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SOLAR COMPANY COSTS



(Source: Solar Energy Industries Association)

SOLAR KIT COSTS



YOU KNOW EVERYTHING ABOUT YOUR SOLAR SYSTEM

- YOU KNOW** EXACTLY WHAT'S IN YOUR SOLAR KIT BECAUSE YOU CHOSE IT.
- YOU KNOW** HOW IT'S PUT TOGETHER BECAUSE YOU INSTALLED IT.
- YOU KNOW** HOW IT WORKS AND CAN TROUBLESHOOT ANY PROBLEM.
- YOU KNOW** HOW TO EXPAND IT WITH MORE PANELS AND BATTERIES.

YOU GET PEACE OF MIND

- NEVER WORRY** ABOUT YOUR SOLAR SYSTEM.
- YOU KNOW THE QUALITY** OF ITS COMPONENTS.
- YOU KNOW IT WAS DONE RIGHT.**
- IF ANYTHING GOES WRONG YOU CAN TROUBLESHOOT AND FIX IT YOURSELF.**

YOU'RE NOT ALONE

- YOU'LL HAVE HELP** PLANNING AND CHOOSING YOUR KIT.
- YOU'LL GET COMPLETE INSTRUCTIONS AND CUSTOMER SUPPORT.**
- LIFETIME CUSTOMER SUPPORT** MEANS HELP IS ALWAYS THERE FOR AS LONG AS YOU OWN YOUR SOLAR SYSTEM.

YOU CAN DO IT YOURSELF

- SETTING UP **YOUR OWN SOLAR POWER SYSTEM** IS THE ULTIMATE DIY PROJECT.
- ENJOY THE SATISFACTION** OF TAKING CONTROL INTO YOUR OWN HANDS.

YOU'LL HAVE FUN!

- THERE'S A **DEFINITE THRILL** THAT COMES ALONG WITH ALL THE OTHER BENEFITS.
- TAKING CHARGE, SAVING MONEY, LEARNING SOMETHING NEW...IT'S FUN!**

Ready to find the perfect solar kit?

Visit www.shopsolarkits.com and get your custom solar kit quote.



What's in an off grid solar power system?

A completely off grid solar power system is simpler than you probably think. There are only a few things absolutely required: panels to collect solar energy, an inverter to convert that energy into a form you can use, battery storage including a charge controller, and the cables and connectors that link it all together.

The production block

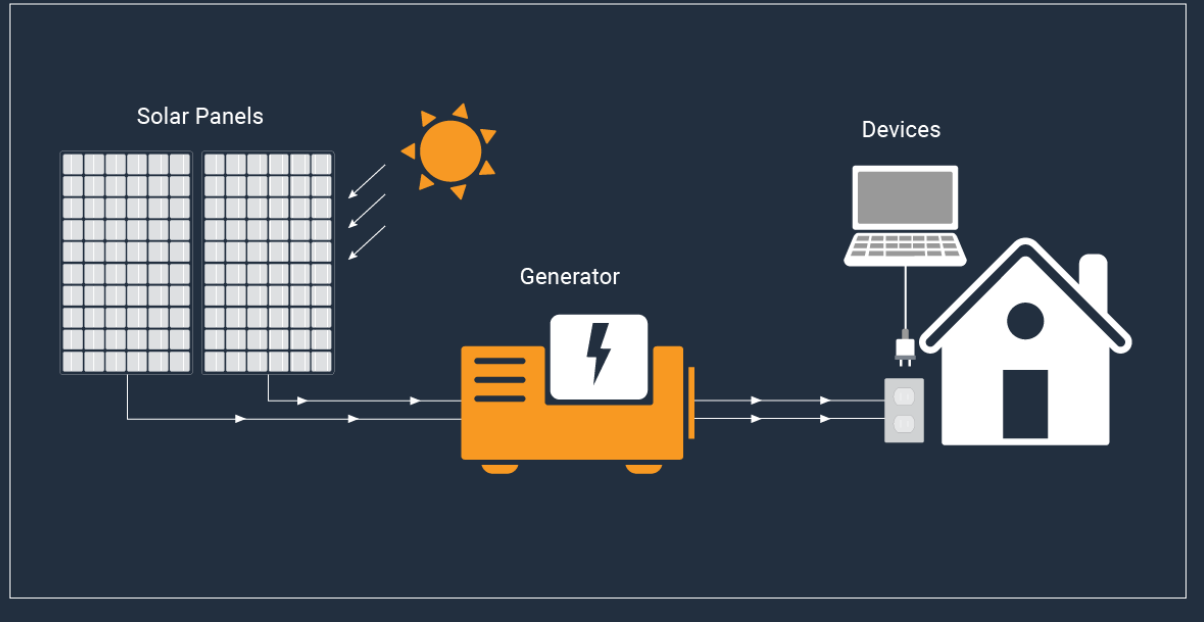
- [Solar panels](#) generate electricity from sunlight
- Cables bring power from the panels into the house

In the production block, sunlight is harnessed from the individual solar cells of a PV solar panel to create DC electricity. All of the energy produced by your solar array is then sent to be stored in either your battery bank or a solar generator, or used immediately.

The storage block

- Charge controller protects batteries from possible damage
- [Batteries](#) store energy
 - Optional generator contains both batteries and charge controller plus inverter
- Cables connect components together

Solar energy is sent from the panels to a charge controller and battery bank or directly into a solar generator (which has a charge controller inside of it). The charge controller prevents damage to the batteries which store the energy for later use.

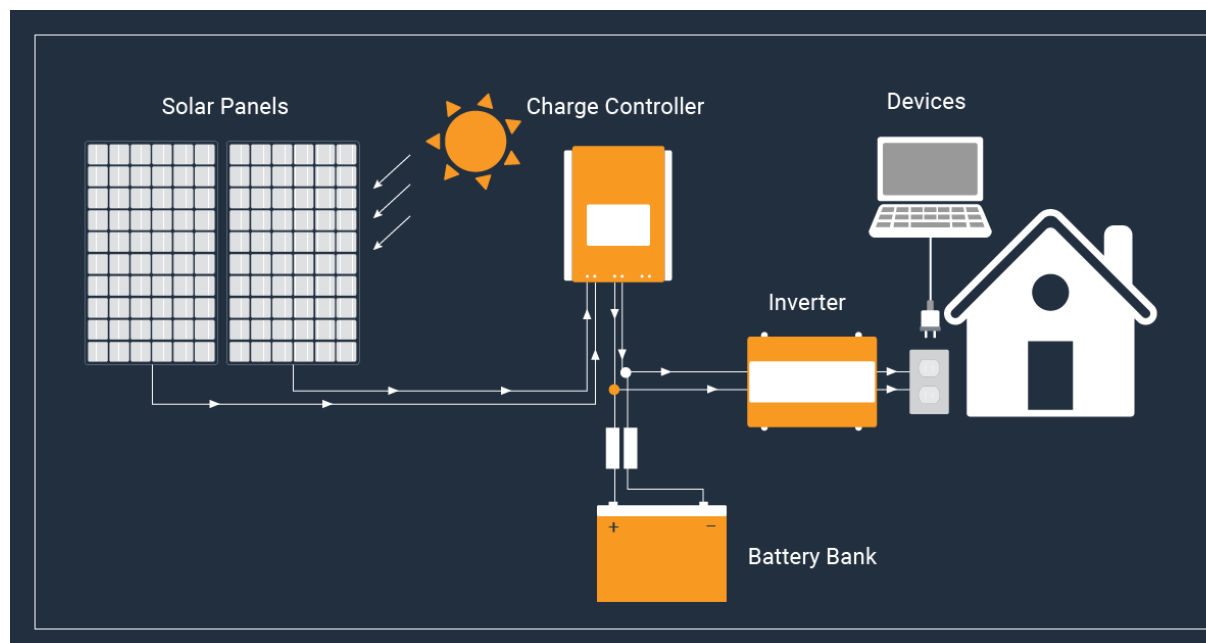


The distribution block

- Inverter converts DC into usable AC current
- Switchboard sends power to outlets around the home
- Cables connect components together

Most home appliances are run on alternating current, or AC electricity (standard wall plugs). In off grid solar systems, the DC electricity from the battery is sent through an inverter to modify the current into appliance-friendly AC electricity. From there, larger systems are sent to a home switchboard, or appliances are plugged directly into the inverter's output interface. If you are powering DC appliances, then it is possible to bypass the inverter to run those particular devices directly off of the solar power.

A [solar generator](#) has everything inside of it (battery plus charge controller and inverter) so that you can simply plug in your panels, plug in your appliances, and away you go.



Off grid solar power kits

When people start to think about going off grid with solar power, they will usually go to a solar power company. The company will examine the needs and the capacity of the home, then provide a quote that includes both the equipment and installation. The quote is, without fail, extremely expensive.

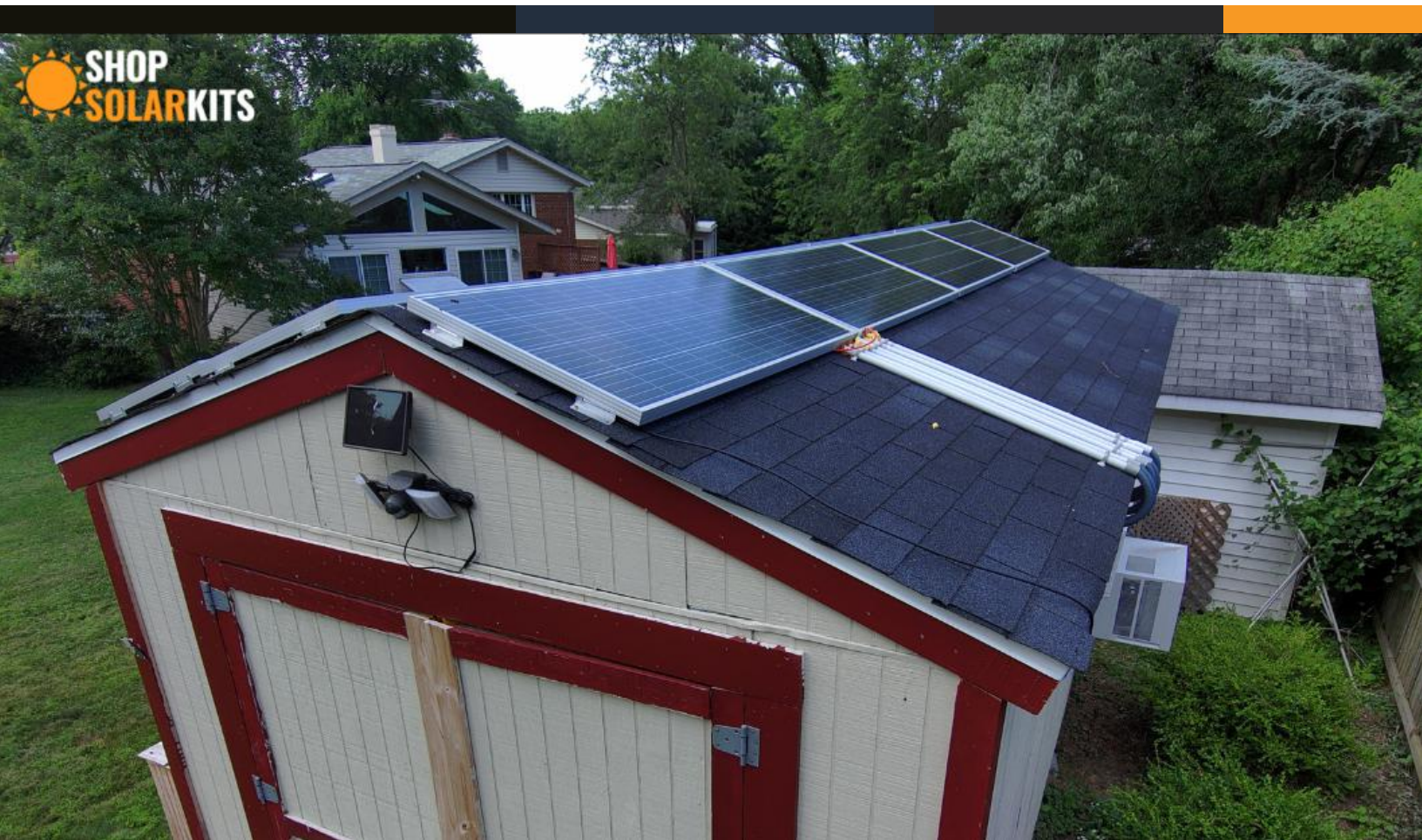
The average cost of an off grid solar power system provided by a solar company in the US is \$24,000, based on a 6 kW system with a cost of \$3.25 per watt and a 12 kWh battery bank, before any rebates or tax credits.

Save 50% with a solar kit

Consider that when you buy from a solar company, only about 37% of that cost is for the actual equipment, and 11% is installation labor. The other 52% goes into the “soft costs” of operating the business. (*Source: [Solar Energy Industries Association](#)*)

This means you can **save at least half the cost** by finding an alternative to hiring a solar company that cuts away these soft costs.

That alternative is a [solar power kit](#).



What's in a solar kit?

A solar power kit includes all the equipment required, custom-tailored to your needs. It will be the same equipment as the solar companies use, if not better. These kits can be purchased online from an [e-commerce retailer that specializes in solar kits](#).

Remember that \$24,000 a solar company will charge you? You can get a [6 kw off grid system in a solar power kit](#) for \$10,500. The cost of installation will add a couple of thousand dollars, but you can even save that if you do it all yourself.

You really can save 50% or more by choosing to use a solar kit.

How do you know which kit to get?

The idea of being more hands-on and using a kit can be intimidating, largely because solar power is still a bit of a mystery to most people. They think it is difficult to figure out what kind of system they require to meet their needs. The truth is that it's not that hard at all. [You can learn everything you need to know in under an hour](#).

The first step is [determining how much energy you will require](#). If you're planning to switch from on to off grid, this is easy: just look at your electricity bill to see how much power you've been using.

Alternatively, you can list the various appliances and tools that need to be powered and for how much of the day they need power, then add up their electricity requirements. [You can do these calculations yourself](#), or [a good solar kit retailer will help you figure it all out](#).

SOLAR KITS

▶ WHAT'S IN A SOLAR KIT? ◀

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PANELS

Turning light from the sun into electrons, solar panels are the most visible part of the solar kit. The more and bigger the panels, the more energy you can create. Want more later? No problem, it's easy to up-size your array.

INVERTER

The electricity created by solar panels is in direct current (DC) but household devices almost always use alternating current (AC). The inverter converts DC into AC power. This is either done in serial, where one inverter handles the power from all panels, or in parallel, where individual micro-inverters on each panel do the conversion.



BATTERIES

Batteries ensure your home has power available 24-hours a day by storing excess power generated during peak sunlight hours for use when it's too dark to generate it, or during an emergency.

CHARGE CONTROLLER

Charge controllers protect batteries and keep them from over-charging by regulating the voltage and current flowing into them from the solar panels.



GENERATOR

Many solar kits come with a generator which combines the charge controller, batteries, and inverter into one portable unit. They also contain various types of AC and DC outlets you can directly plug devices into.

CABLES AND CONNECTORS

Solar kits come with all the various cables and connectors needed to hook the various parts together into a single unit system. Most require little effort to connect using simple plug-and-play connections.



LIFETIME SUPPORT

Although a solar kit can be considered a DIY project, you are never alone. Solar kits come with 24/7 lifetime support to help you through any hurdles you might encounter. This begins when we help you choose the right kit for you and lasts for as long as you own the system.

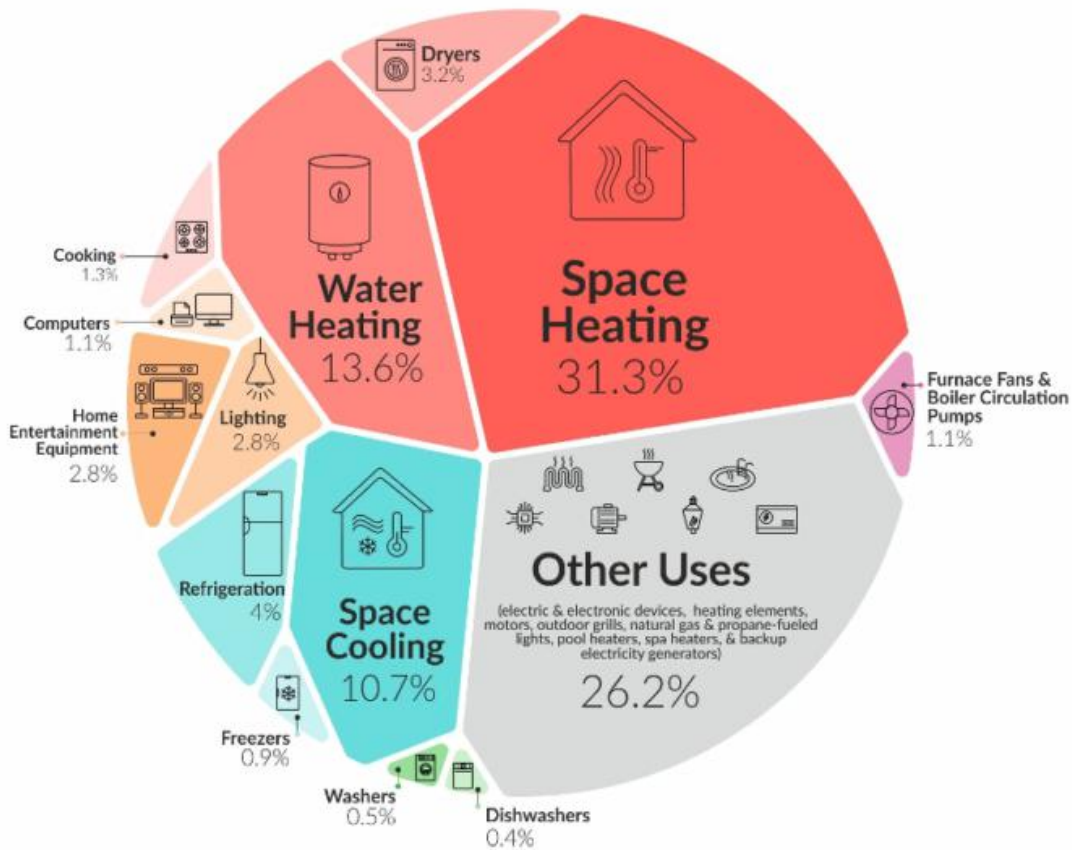
Ready to find the perfect solar kit?

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 SHOP SOLARKITS

Once you know your energy requirements you can determine what kind of [off-grid solar kit](#) will meet your needs. You can purchase the solar kit online and have it shipped directly to the site where it will be installed.

Residential Energy Use by Appliance
Percentage of Total Gross End-Use Energy Consumption in Single-Family Households



www.fixr.com/blog | Source: U.S. Energy Information Administration (EIA) - Annual Energy Outlook 2021



Installation

Once you buy your kit, packages containing the kit's components will start to arrive at your door. All that's left is the installation itself. For that you have three options:

1. Hire a professional installer
2. Do it yourself
3. A combination of both



Hiring an installer

You can find an installer to do the work. Again, [a good solar retailer](#) can help you source a reputable installer in your area. The installer will handle setting up the panels, running the cabling, and connecting it to the electrical system in your home or cabin. There is a cost to this, of course—a few thousand dollars at least—but it will still be far cheaper than if you hired a company to do everything including providing the equipment.

DIY installation

With a little knowledge, you can set up and [install your solar power system yourself](#). There are online resources such as a [digital mini-course](#) that can teach you everything you need to know to become an expert in solar power, including how to install a solar kit yourself. This can save you a lot of money, plus give you a sense of satisfaction like no other.

DIY with a pro

Perhaps you want to do the installation but aren't sure about the electrical work of connecting things to your house. No problem, you can easily install the panels and run the cables yourself, then hire an electrician to hook it all together.

A solar kit does include detailed wiring diagrams, so an electrician isn't really necessary; the average homeowner has the DIY chops to do the whole installation, including wiring.

Exactly how much will it cost to go off grid with a solar kit?

Up to now we've been dealing with averages, but [how much will it actually cost you for your particular solar kit system](#)? As with most things, the answer to the question of how much it costs is: that depends.

There are four factors affecting the cost of that kit:

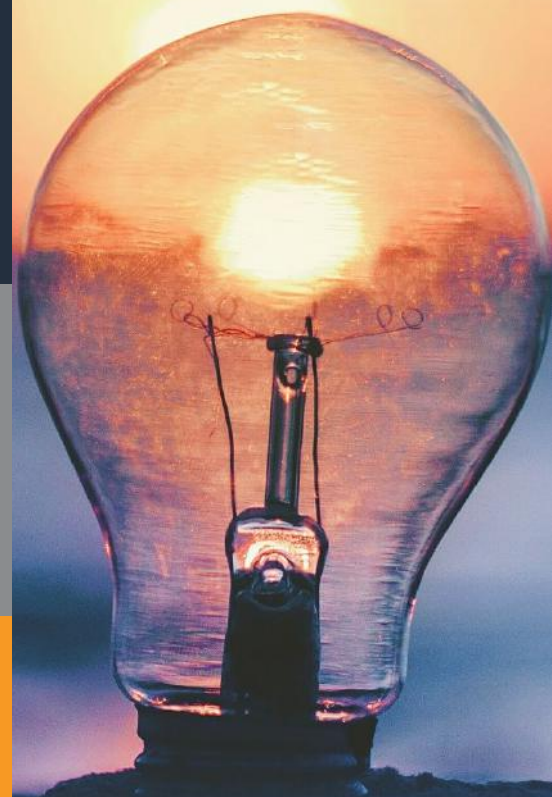
1. How much power do you want to store?
2. How much power do you need to generate?
3. What quality of equipment do you want?
4. How much support do you want?

How much power do you want to store?

It might seem strange to begin with storage, but think about it: you need your solar system to provide you with all of your power 24/7. But the sun doesn't shine all the time. In fact, the sun only gives peak sunshine for a few hours a day. That means your solar panels need to collect enough power during those few hours to last you the whole day, and you have to be able to store it all to use when you're not actively generating power.

This means batteries.

[Solar batteries](#) are normally kept next to your electrical circuit breaker panel. They are not large and can easily be stacked or racked, so unless you are very limited in the space around your panel you can have as many batteries as you want or can afford.

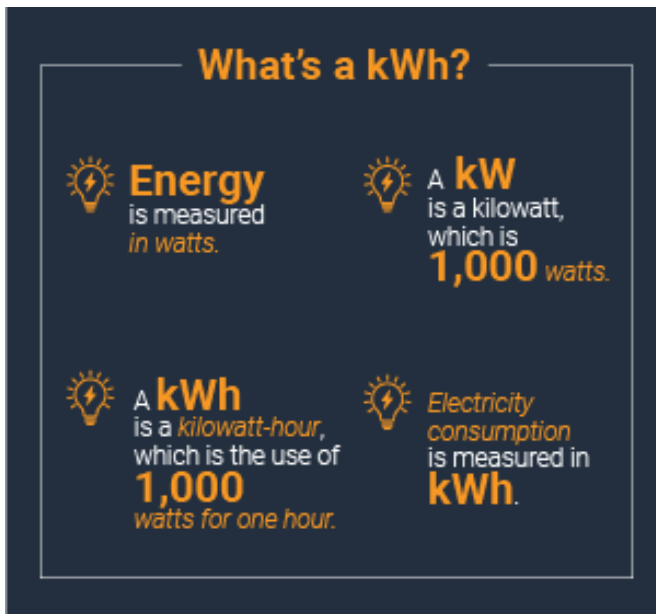


WHICH SOLAR KIT IS RIGHT FOR YOU?

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Sizing your battery bank



To figure out how much power you need to store to meet your daily needs, you must first figure out the demands of all the devices you need to power up in watts per hour:

- Every device uses a certain number of watts per hour, including recharging an electric car
- Estimate how much time each appliance will be used every day and for each one multiply the watts per hour by the number of hours of daily use it gets
- Add it all up to determine the total daily demand: this is how much energy your system needs to produce every day to meet your needs

You can also [use an online calculator](#) to help figure out yours daily watt-hour requirements.

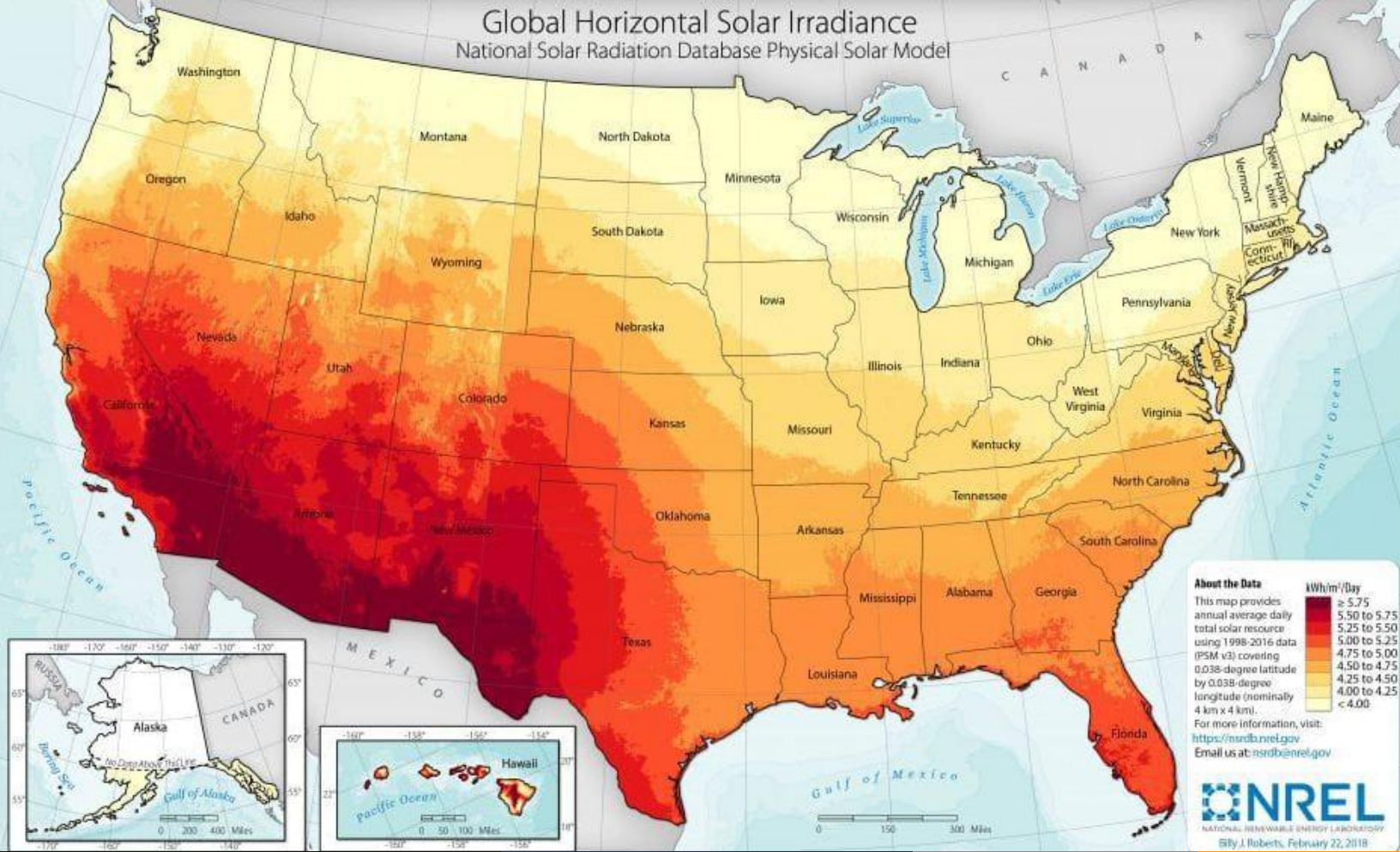
The next step is determining how big your battery needs to be to provide this amount of electricity all day. It's not enough to only store the minimal amount you need in a day because you also have to plan for rainy or cloudy days where your system won't be generating optimum power. The rule of thumb is to assume you'll have a 3-5 day stretch where you're not producing all you need.

This means that to go fully off grid your battery bank should be able to store 3 to 5 times your daily watt-hours.

How much power do you need to generate?

There is a very simple cost ratio when it comes to the amount of power your solar system will generate: more panels mean more power but the cost increases incrementally as you add more panels. This includes not only the cost of the panels themselves but also the cost of a larger single inverter in a serial array or more individual micro-inverters in a parallel array, plus all the cables and accessories to connect everything together.

Global Horizontal Solar Irradiance National Solar Radiation Database Physical Solar Model



Conveniently, the amount of power you need to produce in a day with your panels is the daily watt-hour amount you calculated when figuring out the size of your batteries. So now we need to determine how many solar panels you have to have to meet this need:

- You can only count on maximum electricity production during the time when the sun is shining the most, called peak sunlight hours
- Peak sunlight hours depend on where you live; generally, the more south you are, the more hours of peak sunlight you get
- The average is 4.5 hours in the US
- Your solar array must be able to produce your total daily requirements during peak sunlight
- Divide your daily watt-hour requirements by the number of peak sunlight hours you get; for example, produce 9000 Wh in 4.5 hours of peak sunlight you need to produce $9000/4.5=2000$, so your array must be able to produce 2000 watts per hour, or 2kW
- The number of panels times the size of the panel must be greater than 2000, for example a system of 400 watt panels requires 5 panels, if you're using 200 W panels, you need 10
- This is the bare minimum: you should go for a little bit more to charge up the extra space in your battery bank as well, just in case, but you never want to go smaller
- As a benchmark, the cost of a good quality 400 watt solar panel is about \$350 to \$400
- The initial cost per kW of an array decreases as the panel size increases

You might prefer to use more smaller panels than fewer large ones because bigger panels are heavier and often require minimum order sizes. There will likely be a limit to the number of panels you can have based on where you will be putting them. If they will be roof-mounted, then that limit is the size of your sun-facing roof. If they will be ground-mounted, the limit becomes the surface area of the land you're putting them on.

Remember, it is always possible to add more panels later, and you can have a mixture of roof-mounted and ground-mounted panels. The flexibility of solar power generation is one of its many advantages.

Cost/kW comparison for solar panel sizes



What quality of equipment do you want?

As with everything, you get what you pay for. Some solar equipment is better than others, so it pays to be aware of the specifications and historical reliability of the brand you're purchasing.

Most of us want to have the best quality possible, not only because it makes us feel better knowing we have the best, but also for other very practical reasons:

- It will perform better: your panels will generate more power than a similarly-sized array of lesser quality and your batteries will store more
- It will require less maintenance: they won't break down and need to be fixed
- It will last longer: they won't need to be replaced as often, which is particularly important if your initial investment is being amortized over a period of time to make it worthwhile; it would defeat the purpose if your system broke down before it had a chance to pay for itself

You can alleviate these concerns by choosing a reputable solar kit retailer. They will only offer high-quality equipment and back it up with a good warranty. You don't always get that from a solar company.

Think about the future

You should stick to buying your solar equipment from sources where solar is their only business and avoid buying from places where you have less faith in what you are getting, such as giant online retailers or big box stores where quality doesn't matter, only the volume of sales.

Returning solar equipment back to the seller is not as easy as taking a shirt that doesn't fit right and returning it back to the store. You only know if there's a problem once everything is installed, and trust us, it's a real pain in the you-know-what to take back an array of solar panels after they've already been attached to your roof.

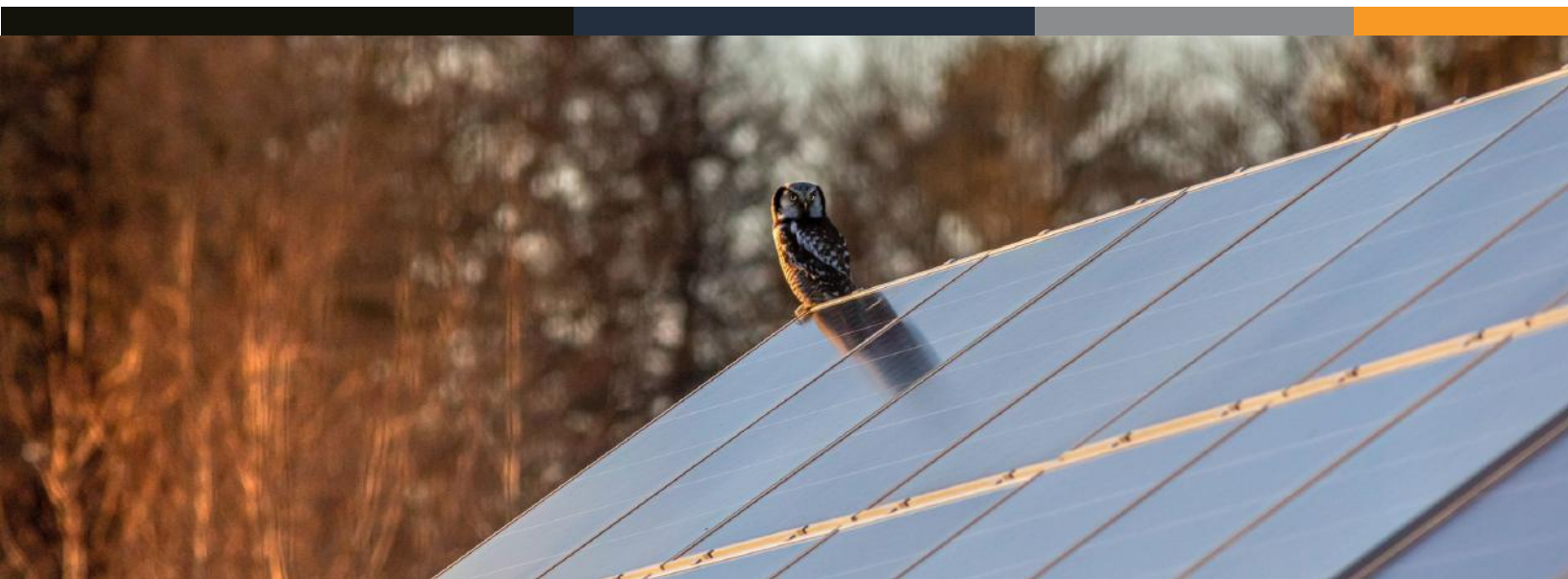
One more thing to consider is that being off grid means your solar system is likely your only source of power so reliability is key, otherwise you'll literally be in the dark while dealing with repairs or replacements.

How much support do you want?

The final cost consideration is customer service. You will probably have a lot of questions during the process of buying, installing, and using your solar power system. You should be able to count on your supplier to help you every step of the way.

You might feel like you're getting a great deal buying from Amazon or Home Depot, but that might end up biting you in the you-know-what if you don't have the support you need to get the system you deserve up and running quickly and easily, not to mention properly.

That's another reason to only buy from places where solar is their only business and [customer service is a priority](#). They'll not only help you figure out what your power needs are and what kit to get, but they'll also be available to help you out with whatever you need for as long as you have your system.



Yes, but how much will it actually cost me?

The average American house needs a system sized between 5 kW and 8.5 kW, depending on how much sunlight it gets. The only way to know for sure is to do the work to figure out what your exact needs are and how much peak sunlight you will get. There are [very handy online calculators](#) that make this easy to do.

Then you need to decide how much storage you want and choose the system that's right for you.

SOLAR KIT COST COMPARISON			
SYSTEM SIZE	BATTERY CAPACITY	PANELS	APPROX. COST OF SOLAR KIT
2.4 kW	2.56 kWh	4 x 200 watts	\$2,600
3 kW	3.1 kWh	6 x 200 watts	\$4,000
6 kW	9.6 kWh	6 x 390 watts	\$8,300
6 kW	12 kWh	12 x 390 watts	\$10,600
13 kW	19 kWh	18 x 390 watts	\$16,400
13 kW	28 kWh	18 x 390 watts	\$20,900

Save 30% on the cost of a solar power system

Here's some great news of all Americans: you can claim a credit on your Federal taxes equal to 30% of the cost of your new solar power system. [The Federal Tax Credit for Solar Photovoltaics](#) is independent of any rebates you might receive from your local electric utility or State government rebates, and can be claimed on your Federal taxes for the year the installation was completed. The Federal Tax Credit is a direct dollar-for-dollar reduction in how much tax you have to pay and also has no limit up to 30% of the system's cost.

What this means is that you can knock off almost 1/3 of the cost of your solar power system, no matter how expensive your system is. If you paid \$12,000 for your solar system (equipment plus installation) you can get a \$3,600 credit on your taxes, effectively lowering the cost of the system to \$8,400.



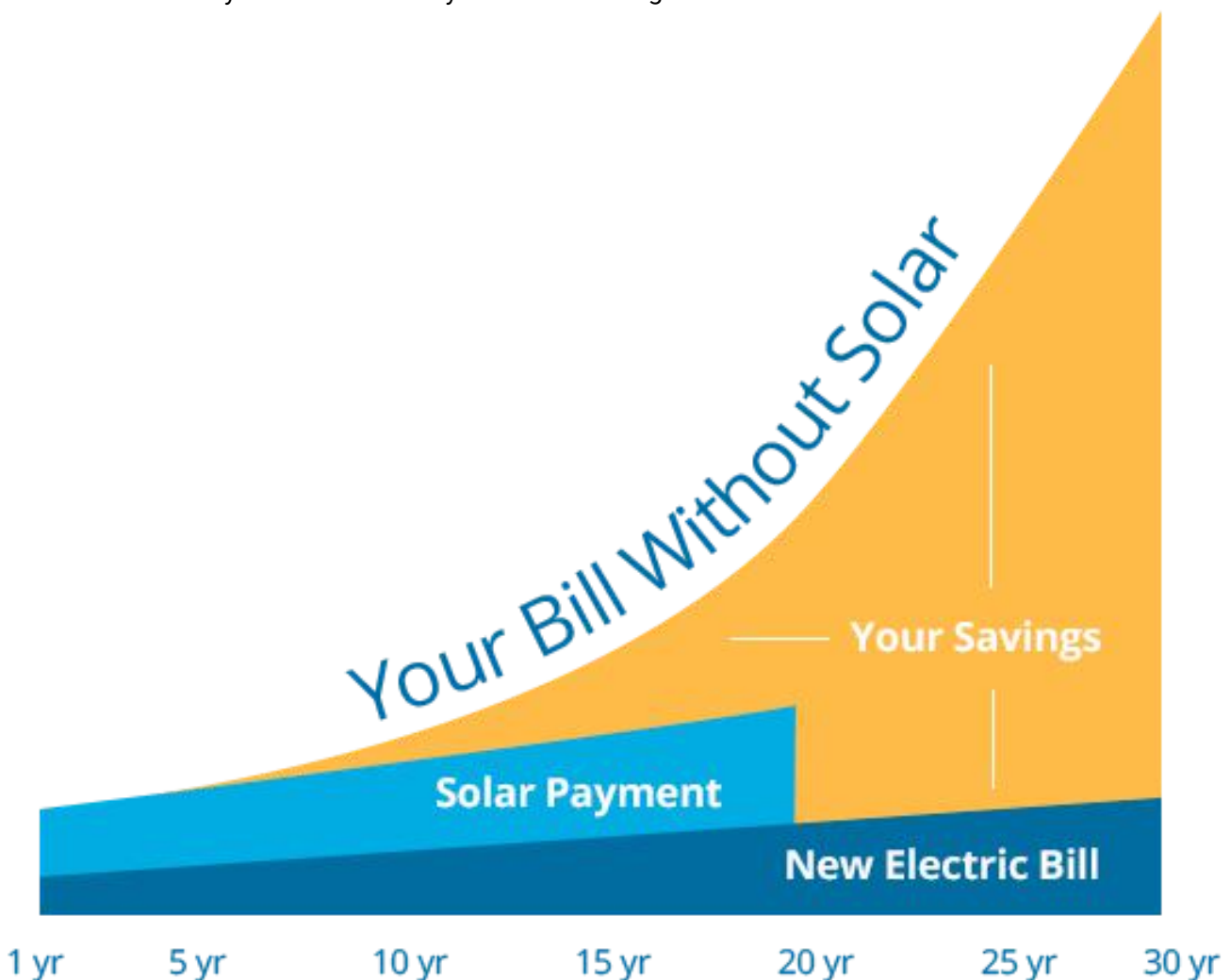
How much can I save going off grid with solar?

When performing a cost-benefit analysis of going off grid, you cannot only consider the expense of acquiring your system. You must also look at the long-term savings your system will bring.

The [average cost of electricity in the US](#) is 16¢ per kWh, which is \$4.80 each day, \$144 every month, or \$1728 a year.

Because you're looking to go completely off grid, your solar system will offset 100% of your electricity bill. This means that the average house would save \$1728 every year on utility bills.

To figure out how much you'll save in total you need to take into account the cost of the system itself, so you take the total amount you save on electricity over the system's entire lifespan and subtract the initial cost of the system to calculate your overall savings.



Source: [All About Green](#)

Total savings over the life of the system

Say you decide that a roof-mounted 6 kW solar system with 12 kWh battery storage and 12 panels can handle your electricity needs. You need to add the cost of racking which is about \$1400. The cost to set it up yourself with a solar kit would be $\$10,500 + \$1400 = \$11,900$, minus the 30% tax credit for an initial investment of \$8330. This would take only 4 years and 3 months to pay off in monthly savings; the same system from a solar company would take 9 years and 9 months.

This means that after recouping the cost of a solar kit cost you would save \$44,500 in electricity bills over its 30-year lifetime (probably more because the cost of electricity will only keep going up).

If you chose to go with a solar company and paid \$24,000, after 30 years you'd have saved \$35,000.

LIFETIME SAVINGS COMPARISON FOR 6 KW SOLAR SYSTEM WITH 12 KWH BATTERY		
	SOLAR KIT	SOLAR COMPANY
Initial cost	\$11,900	\$24,000
Cost after 30% tax credit	\$8,330	\$16,800
System lifespan	30 years	30 years
Time to recoup initial cost	4 years 9 months	9 years 9 months
Years of pure savings	25 years 3 months	20 years 3 months
Total lifetime savings	\$43,600	\$35,000

This is all based on averages. If you want to know exactly how much you specifically will save you need to do some calculations based on where you live and how much energy you'll use.

Exact numbers for an off grid retrofit

If you're retrofitting a building that is currently on the grid to an off grid setup, you can see your exact savings just by looking at how much you're currently paying each month to the power utility: that's how much you'll save by going off-grid with solar.

Exact numbers for new construction

For a system that has never been on the grid, you can calculate your exact savings by using the calculation you made when you were figuring out how large a system you need. That's when you determined the energy needs of all the devices you'll be running on electricity. Knowing [how many kWh of energy each one would require according to the amount of time it will be used over the period of a month](#) makes figuring out your cost savings easy.

Take your total monthly energy consumption and multiply this by the price your local electric company would charge you to provide that. This is how much you can expect to save every month.



Planning an off-grid solar power system

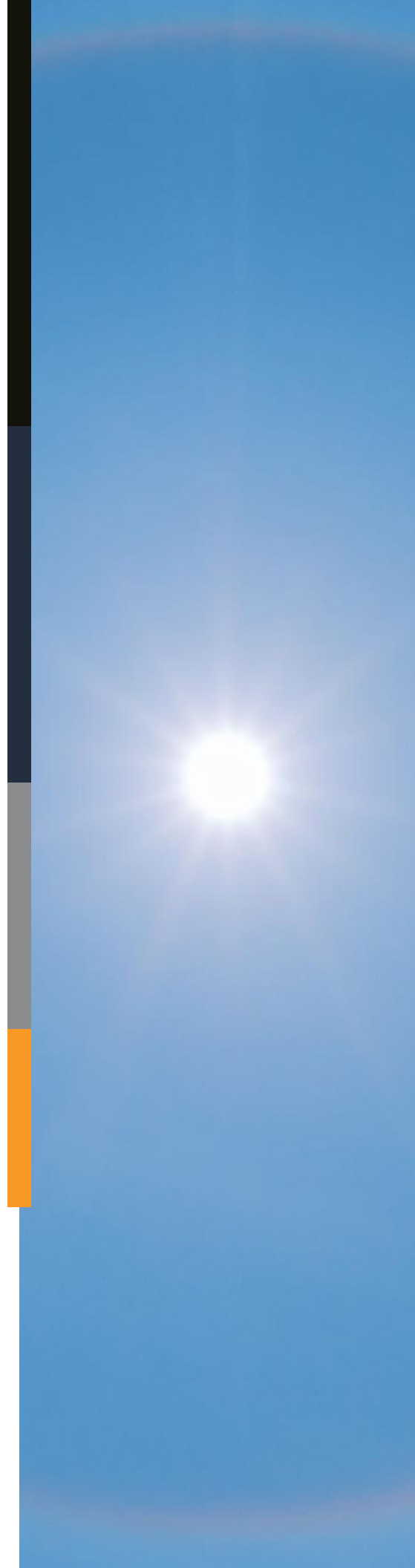
We've already covered the key parts of planning your off-grid solar power system:

- How much power do I need? The daily demand of all devices to be powered by the system
- How many hours of peak sunlight do I get? Depends on where you live
- Where should I put the panels? Where you get the most peak sunlight during the day: on a roof, on the ground, or both
- How many solar panels do I need? However many panels you need of a certain size to meet your daily energy needs in the number of peak sunlight hours you get
- How many batteries do I need? How many days you want your system to be able to provide power if the panels are unable to generate power—overnight or longer in the case of an emergency—multiplied by your daily watt-hour power usage

Armed with this information you can shop knowledgeably for the solar kit that's right for you.

How long do off-grid solar power systems last?

How long your solar power system will last largely depends on your panels and your batteries because these are the parts that have a finite lifespan. Of course, these can all be replaced or upgraded meaning your system as a whole can continue to provide energy long into the future.





Solar panel lifespan

In a typical installation, today's solar panels can be expected to last about 25-30 years. It is important to get high-quality panels with a warranty to match because inferior panels will not last nearly as long and may fail before you recoup your initial investment through energy bill savings.

All panels will eventually need to be replaced due to the [natural and unavoidable](#) degradation of the components. In fact, every year solar panels become about 0.5-3% less efficient until they are no longer capable of efficiently turning light into electricity.

Solar battery lifespan

The longevity of a battery mostly depends on what kind of battery it is. The lithium batteries we recommend and which are part of any good solar kit usually come with a 10-year warranty but will probably last closer to 20 years before needing replacement.

WHICH SOLAR KIT IS RIGHT FOR YOU?

Get a custom quote from **Shop Solar Kits** today



Where's the best place to put solar panels?

Obviously, the best place to put your solar panels is wherever they will get the most sunlight for the longest period each day. In the United States, you can expect to get between 4 to 6 hours of peak sunlight per day, when the sun is at its zenith.

The best orientation is to have the panels facing south to get maximum exposure as the sun moves from east to west across the sky. Your exact optimal orientation will depend on the location because you may have trees or another building partially in the way.

Which leads us to the big question: do you mount your panels on your roof or on the ground?

- Ground: most people choose to ground-mount their solar panels because that's how you can usually get the best location for the array that gets the most sunlight
- Roof: panels mounted on a roof look cleaner and more traditional and are never in the way



Maintenance and cleaning may be a factor to consider: panels on the roof are generally harder to access, whereas the maintenance and cleaning of a ground-mount system are much easier because you can walk around it.

Often there isn't a choice to make because either the roof can't hold enough panels in the right orientation, or there isn't enough space on the property for a ground-mount system. Even when either is possible, usually one option is clearly better than the other so the choice is easy to make.

If neither option can provide enough power to meet your off grid needs, maybe a combination will do the job. You can have some panels on the roof and some on the ground, all you need is a combiner or junction box to connect the cables running from the sources together on their way toward your indoor components. Similarly, you can link together panels on multiple roofs or from more than one area on the ground.

Odds are if you want to use solar power to go off grid, there's a way to do it.

Installing an off grid solar system

Solar companies like to make it seem like solar power systems are complicated and difficult to set up, but that's not really the case. Your average homeowner has enough DIY chops to do at least 90% if not all of it by themselves, especially with the guidance, [education](#), and support available from a good solar kit retailer. Your solar kit will also include the schematics and wiring diagrams that show you exactly how to connect it all together.

Racking

The first step is to mount your solar panels on a rack, either on a roof or on the ground. Racking equipment is not included as part of a solar kit, but specialized parts for your particular mounting solution can be purchased and delivered at the same time as the rest of the kit. You can expect to pay about \$150 per panel for a roof-mount rack, or from \$50 to \$300 per panel mounted on the ground.

Mounting panels involves installing the racking system then attaching the panels. Rooftop racks are screwed directly to the roof, while grounded solutions are secured to the ground with proper footings.

Cabling

Before mounting, cables are attached to the panels, as well as microinverters if you're using those, and run through the racking system to a junction box to connect them all together. A single cable then runs into the building where it connects to the in-house part of the system.

Storage

Once inside the house, the cable running from the panels connects to the charge controller to regulate the current that then feeds into the battery bank.





Current conversion

From power storage, the system connects to the inverter if the current hasn't already been converted by micro-inverters at the panels or an inverter included within a generator.

Electrical panel

The final step is wiring the solar system into the home's electrical panel. This may be the most complicated part, but still well within the capabilities of most homeowners. If in doubt, a professional electrician can be called into to complete this stage in a few hours or less.

Expanding an off grid solar system

There are good reasons why you may want to make your off grid solar power system larger. You may have underestimated your energy requirements, or maybe you've added more devices and increased your energy needs, or maybe you couldn't afford a large enough system to start with and want to expand. Perhaps you just want to store more power.

Whatever your motivation, the good news is that it's very easy to boost your energy production by expanding elements of your system.

- More power: add more panels and don't forget to increase the capacity of your inverter if necessary
- More storage: add more batteries

Adding more batteries is as simple as plugging the additional batteries into the series. All you need are the batteries and cables. If you can wire a light switch, you can do this yourself; with some batteries, like [the Mammoth series](#), it's as simple as putting a plug into a socket.

Adding more panels is only slightly more complicated. It will be more work to install the panels themselves, then connecting them to the system will require some simple rewiring. None of this is too difficult for anyone to do by themselves.

Where can I get an off grid solar power system?

You really have only two good options for where to get your system:

1. Get a solar company to do everything for you
2. Get a solar kit from an [online retailer](#)

We've already covered the pros and cons of using a [solar company versus a solar kit](#) and we believe that the solar kit is your best option. Not only will it end up being much cheaper, but you can be sure that you're getting [the right solar power system to meet your needs](#). Plus, it's a lot more fun.



Ready to go off grid?

Hopefully, you're now ready to join the growing number of people who are choosing to sever their ties to the electric utility and go off grid by producing their own electricity through solar power.

Maybe you're sick of forking over so much money every month. Maybe you want to be completely independent. Maybe you just have no choice because of where you are. Whatever your reasons, solar power is the best option due to its affordability, capability, and dependability.

To get started on your off grid adventure, [talk to one of our experts](#) and find the solar solution that's right for you.

Want to know more about off grid solar?

You can explore specific aspects of off grid solar power deeper through one of our many off grid articles:

- [Off grid solar FAQ](#)
- [Everything you need to know about off grid solar kits](#)
- [Why use a solar kit to go off grid?](#)
- [Benefits of off grid solar kits](#)
- [How much does it cost to go off grid with solar?](#)
- [Off grid solar power calculator](#)
- [How big does my solar system need to be for off grid?](#)
- [How many solar panels do I need to go off grid?](#)
- [Off grid solar system installation](#)
- [Top 10 reasons to use a solar kit to go off grid](#)
- [Off grid solar panels](#)
- [Best solar panels for off grid](#)
- [Off grid solar batteries](#)
- [Best solar batteries for off grid](#)
- [Best solar generators for off grid](#)

Good luck on your off grid adventure!



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KIT IS RIGHT
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