



SOLAR POWER

The Getting Started Guide



Introduction

Considering solar? No matter whether you're thinking about buying or leasing, the best way to start is asking yourself what you want from a system. If you're like most people, you have one or more of these common goals:

-  Saving Money
-  Self-Sustainability
-  Environmentalism
-  Backup Power
-  Remote Power

You might feel drawn to one or more—or all—of these. But when it's time to choose your system, keep one primary goal in mind. As we dive deeper into the pros and cons of the different kinds of solar systems, you'll begin to see how each of these goals aligns with a particular system—and why focusing on one primary goal will help you decide.

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Grid-Tied Solar

Understanding The **Grid**

To understand grid-tied solar, you first need to understand “the grid.”

The Grid: What we call the grid is an electrical network made up of power lines, streetlights, and buildings that harnesses power from an energy source like a dam, nuclear plant, wind turbines, or a combination of the above.

Next time you're in a plane at night, look out your window. That sea of lights beneath you is the grid. The utility company regulates the power and charges you each month to use it. If you're collecting a power bill, you're connected to the grid—or “grid-tied.”

Why Grid-Tied Solar?

Homeowners connected to the power grid have several solar options, the most popular of which is a grid-tied solar system. If saving money and making a sound investment is your primary goal, this is your best option.

If you've designed your solar system to cover most of your power needs, then during peak hours your array may produce more electricity than you need to power your home. With a grid-tied system, this extra energy is then stored in the grid for later use.

Peak Hours: Solar systems harvest most of their energy during peak hours, which is usually 11am - 4pm.



Choose If: Your primary goal is to save money and make a sound investment.

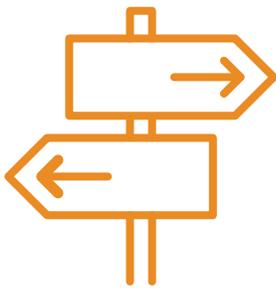


How Does It Work?

Here are a few of our favorite analogies to illustrate how exactly grid-tied solar works between the sun, your home, and the grid.

GRID-TIED SOLAR IS...

- A Two-Way Highway
- A River
- A Bank Account



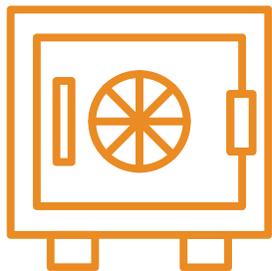
A TWO-WAY HIGHWAY

To understand the way it works, think of a one-way road. Power flows from the power plant, works its way through the grid, and ends up in your home. But a solar power system turns that one-way road into a two-way highway, allowing power from your solar panels to feed back into the grid.



A RIVER

To put it another way, consider the sun's energy as a river of energy that flows from the sky. That river travels through your solar panels to the grid, but as it passes through a breaker box on the side of your house, a stream of it is diverted to power your home. This breakaway stream is what powers your appliances, devices, and lights.



A BANK ACCOUNT

Here's one last comparison to show you how this helps you.

When running your home requires more energy, your system draws more power. But when demand is less, some of the solar energy you're creating flows directly back into the grid. This primary power you're "donating" acts like a deposit that you can then draw from when you need extra—like at night, or during long periods of overcast weather.

This process works like a bank account does—put power in when you don't need it, and withdraw some when you do. If you withdraw more than you are depositing, then the utility company will bill you for energy.

It's important to note that when the grid has a power outage, you'll still lose power in your home—even if it's sunny out and your solar array is collecting energy. An outage triggers the inverter to automatically shut off, disabling all energy flow to the house and the grid. After all, utility workers need to stay safe while they work on fixing the problems.

A way to combat this is with a Grid-Tied with Battery Backup system, which allows your house to stay up and running during power outages.

Should You **Choose** Grid-Tied Solar?

If you are like many people, you may be thinking...

“But I don’t want to be connected to the grid—I want to be totally free from it!”

We hear this comment a lot—and yes, there are other options besides a grid-tied solar system. (We’ll cover them later in this guide.)

But if saving on upfront cost and maxing out your Return On Investment (ROI) is your primary goal, and you are already tied to the grid, then a grid-tied solar system is going to be your best option.

Alternatives to grid-tied require more money upfront. And although these other systems are ideal in some instances (which we’ll cover shortly), they aren’t suitable if you’re looking to use solar to save money and grow wealth.

You’ll only hurt your ROI by adding additional upfront and maintenance costs.



Rule of Thumb: If you *can* use the grid as a means of energy storage, *then use it*. Especially if saving money and maximizing your return on investment is your #1 goal.

Price Table of Common Grid-Tied Systems

	546 kWh/mo	1,093 kWh/mo	1,457 kWh/mo	2,914 kWh/mo
PRICE	\$7,571	\$13,851	\$17,496	\$34,067
HOME SIZE	2 BED 1 BATH	3 BED 2 BATH	4 BED 4 BATH	5 BED 3 BATH
POWER BILL REDUCTION	100%	100%	100%	100%
POWER SAVINGS OVER 25 YRS*	\$19,656	\$39,348	\$52,452	\$104,904

Prices are based on average 2018 market prices.

*Savings estimates are based on \$.12 per kWh price for power. Your savings will be greater if you pay more than \$.12/kWh, or if the price of utility power increases in the future. Production estimates are based on an average of five sun hours per day.



Off-Grid Solar

Why Off-Grid Solar?

Powering a home in a remote location can be challenging.

For example, running power lines from the utility company to a rural house can cost you \$30,000 to \$100,000 or more.

That's why using an off-grid solar energy system—one that relies on an energy storage unit to store and regulate power—to power your remote home is a reliable and cost-effective solution. (Especially after you factor in the 30% federal tax credit and state incentives).

The cost of bringing the grid to a rural or remote home:
\$30,000 - \$100,000



Choose If: Your primary goal is to live remotely, and be as self-sufficient as possible.

How Does It Work?

Basically, off-grid solar is like owning your own power plant. Off-grid systems have no monthly utility bill—because, as we said, an off-grid system relies on itself to store and regulate power to your home. However, that means there are additional costs you need to factor in over time.

ADDITIONAL COSTS:

1. A Battery Bank

For example, you'll need a battery bank. Remember how a grid-tied system deposits and withdraws energy from the grid itself? You can't get that with an off-grid system because there's no grid to connect to.

Instead, with an off-grid system, your battery bank acts like a power grid just for you—during the night or short periods of overcast weather, it will give you the energy you need. Depending on your power storage needs, the cost of this battery bank can be anywhere from \$1,000 to \$20,000.

2. Battery Maintenance

Battery maintenance is another cost you'll need to plan for—most battery banks require routine maintenance. The good news is that maintenance is simple to perform. Setting aside 15 minutes to read the maintenance instructions can save you thousands of dollars in battery costs over time—and extend the life of your batteries for years more than you'd think.



3. A Gas Generator

Most people with off-grid systems add a gas generator to help make up for the weak winter sun and the reduced hours of daylight we see when it's not summer. Fortunately, your solar provider can give you the information you need to help your solar array and gas generator work together in tandem—to make the most cost-effective off-grid system money can buy.

If you install too many solar panels, you'll over-produce energy during peak seasons. If you buy a generator that's too big for your needs, you'll end up just wasting fuel.

You'll see the best ROI if you work with an experienced solar technician to help you design a "Goldilocks" system that's just right for you.

Price Table of Common Off-Grid Systems

	WEEKENDER ie: Huntin' Shack	CABIN ie: Vacation Cabin	LODGE ie: Efficient Home	RANCH ie: Home or Business
SYSTEM PRICE	\$3,669	\$7,929	\$15,268	\$22,562
BATTERY COST	\$534	\$1,466 - \$7,224	\$2,798 - \$14,920	\$10,472 - \$37,999
EST. SUMMER PRODUCTION	2.88 kWh/day	7.29 kWh/day	21.87 kWh/day	43.74 kWh/day
EST. WINTER PRODUCTION	1.44 kWh/day	3.64 kWh/day	10.93 kWh/day	21.87 kWh/day
ENOUGH TO POWER...	Lights, phone, tablet, TV, computer, maybe a small efficient fridge.	Lights, phones, tablets, TVs, computers, fridge, freezer, power tools.	Lights, phones, tablets, TVs, computers, fridge, freezer, power tools, well pump.	Lights, phones, tablets, TVs, computers, fridges, freezers, power tools, well pump & more!

Prices are based on average 2018 market prices.



Grid-Tied With Battery Backup

Why Grid-Tied With Battery Backup?

We've all experienced a blackout.

One minute you're watching TV or reading a book and then—pitch black. Next, you find yourself trying to navigate through your dark house, while you trip over toys and stub your toe on the corner of the coffee table desperately looking for those darn candles.

But if you had a grid-tied system with battery backup, you wouldn't even flinch—and you'd be the one house in the neighborhood that still had the lights on.



Rule of Thumb: What's critical that you keep powered during an emergency? Your answer will help you determine how much backup power you'll need.



Choose If: Your primary goal is to be able to power your grid-tied home in an emergency.

How Does it Work?

As we've learned, traditional grid-tied solar systems only operate when utility power is available—and they shut down for reasons of safety when it isn't.

So, during a power outage, your grid-tied PV solar system will stop working, even during peak sun hours. But with the addition of batteries and a backup inverter, your system will provide seamless, uninterrupted power for your household during an outage. (You might find this especially important if you have critical devices or appliances that need to stay up and running.)



With this type of system, you'll size your battery bank depending on what kind of power is critical in your home, and on how many hours or days of backup you'd need to feel comfortable.

Because of these variables, the battery portion of a grid-tied system with battery back-up can vary from \$2,000 to \$20,000+. This might not be the best route for people wanting to maximize their solar investment, but, going grid-tied with battery backup does add peace of mind for those that want it.

Price Table of Common Grid-Tied With Battery Backup Systems

	291 kWh/mo	583 kWh/mo	874 kWh/mo	1,639 kWh/mo
SYSTEM PRICE	\$3,669	\$7,929	\$15,268	\$22,562
MAXIMUM BATTERY CAPACITY	18.72 kWh 8 AGM BATTERIES	18.72 kWh 8 AGM BATTERIES	39.84 kWh 16 AGM BATTERIES	55.2 kWh 24 AGM BATTERIES
IDEAL FOR BACKING UP...	Fridge, lights, a few outlets for phone charging, efficient well pump.	Fridge, lights, a few outlets for phone charging, efficient well pump.	Fridge, freezer, lights, outlets for phone/TV/computer, well pump, security system.	Fridges, freezers, lights, outlets for phones/TV/computers, well pump, security system.
POWER SAVINGS OVER 25 YRS*	\$10,476	\$20,988	\$31,464	\$59,004

Prices are based on average 2018 market prices.

*Savings estimates are based on \$.12 per kWh price for power. Your savings will be greater if you pay more than \$.12/kWh, or if the price of utility power increases in the future. Production estimates are based on an average of five sun hours per day.

A large array of solar panels is shown in the foreground, tilted towards the right. The panels are dark with a grid pattern. In the background, a red barn with a grey roof and a small cupola is visible. The sky is dark and overcast. The overall scene is dimly lit, suggesting dusk or dawn.

**Which System Should
You Choose?**

Be Choosy

Self-sustainability is the ultimate goal for many solar owners—both grid-tied and off-grid. Solar offers freedom and savings while making a positive impact on the environment.

But since you know you're going to save money, feel more independent, and be more environmentally friendly—no matter which system you purchase—you can afford to be choosy when it comes to your other needs.

GRID-TIED



For most homeowners, a grid-tied system makes the most sense. By utilizing the grid for energy storage during higher production hours, you'll end up saving more on your solar system's upfront cost. You'll save money on a battery bank if you don't want one, because only systems that don't have access to the grid need them. These are important considerations, especially if saving money and maximizing your return on investment is your #1 goal.

OFF-GRID



For homeowners in remote areas, or perhaps vacationers looking to power their home-away-from-home, off-grid systems are the way to go. Their ability to provide ample electricity, with backup power through a generator and battery bank—and the benefit of being completely off the utility grid—make off-grid systems the perfect choice for complete energy independence. They may cost a bit more, but with no monthly utility bill, you'll quickly offset the price of purchase.

GRID-TIED WITH BATTERY BACKUP



You wish to install battery backup, however, if your area is prone to power outages, or if you have sensitive appliances or pieces of equipment which need to stay on at all times.

Additional Benefits of Solar.

Increases your home's property value.

Some studies have shown that having a solar power system can increase your home's value by as much as \$6000 for every kilowatt of power the system produces.

Let's break that number down: if you installed a 9.44 kW grid-tied system in your home, you'd spend between \$16,000 - \$17,000... But it could increase the value of your home by as much as \$55,000 or more! That's roughly a 350% return on investment.



Compare those numbers to a luxury kitchen remodel, which brings only about a 60% payback of the new kitchen cost. In other words, if you spent \$30,000 on a kitchen, you'd add just \$18,000 or so in value.

However the numbers work out, there's no denying that homebuyers are willing to pay a premium for properties with a purchased solar installation.

Pay less in property tax.

Most states have a renewable energy property tax exemption, which means the value that a solar system adds to a home does not increase the property taxes you pay! In other words, in our scenario above, you'd only pay property taxes on a value of \$200,000 (the value of your home before solar), and not the post-installation appraised value of \$255,000.

This is also unlike, for example, a new kitchen—where you'd have to pay more taxes for the additional value you added to the property.



Increase land value (with an off-grid system).

The cost of land is a soft savings that often gets overlooked when deciding to live off-grid. Most remote properties tend to be much cheaper, because their lack of access to the grid poses more problems.

However, when you mitigate this lack of access with off-grid solar, your property value will shoot up—way up. Whether you're planning a second home, remote cabin, or vacation getaway, off-grid solar is a doubly smart investment.

Summing Up.

Solar is a personal choice—and which system you buy will depend largely on your needs and wants. No matter which kind of system you choose you'll be making a positive impact on the environment, so you can feel good about your decision.

But we understand that choosing a system can be confusing. To make it simpler for you, here are our recommendations.

Choose grid-tied if...

You're already connected to the grid and looking to save on your utility bill, add resale value to your home, and make a smart long-term investment. You'll be required to stay connected to the local utility grid, obviously, and for that privilege, you'll need to pay a small monthly fee (roughly \$20).

The permits you need to get started can be challenging to obtain. And of course once you're set up you won't have backup power during a power outage.

Choose off-grid if...

Your home or structure has no access to the utility grid.

You'll be 100% responsible for your own stored energy, which means you'll need a battery bank and backup generator.

But the list of pros is attractive. For starters, you'll be able to find cheaper and more desirable remote properties. Like grid-tied, you'll never pay for power again. And you'll save a lot of money when you remove the costs of connecting to the closest grid—if that's even possible.



Choose grid-tied with battery backup if...

You're grid-tied and you want extra backup power.

This choice is more expensive—and delivers a far lower ROI than other solar options—which means you should only think about it if return-on-investment and cost savings aren't your biggest concerns.

On the plus side, this choice delivers flexibility and energy independence combined. You'll have peace of mind in the event of power failure, or when your PV panels underproduce (such as at night or during the winter months).

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