Homeowner's Guide to Going Solar

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Since 2008, hundreds of thousands of solar panels have popped up across the country as an increasing number of Americans choose to power their daily lives with the sun's energy. Thanks in part to Solar Energy Technologies Office (SETO) investments, the cost of going solar goes down every year. You may be considering the option of adding a solar energy system to your home's roof or finding another way to harness the sun's energy. While there's no one-size-fits-all solar solution, here are some resources that can help you figure out what's best for you. Consider these questions before you go solar.

See the Spanish version here. Vea la versión en español aquí.

How does solar work?

There are two primary technologies that can harness the sun's power and turn it into electricity. The first is the one you're likely most familiar with – photovoltaics, or PV. These are the panels you've seen on rooftops or in fields. When the sun shines onto a solar panel, photons from the sunlight are absorbed by the cells in the panel, which creates an electric field across the layers and causes electricity to flow. Learn more about how PV works.

The second technology is concentrating solar power, or CSP. It is used primarily in very large power plants and is not appropriate for residential use. This technology uses mirrors to reflect and concentrate sunlight onto receivers that collect solar energy and convert it to heat, which can then be used to produce electricity. Learn more about how CSP works.

Is my home suitable for solar panels?

Solar panels are built to work in all climates, but in some cases, rooftops may not be suitable for solar systems due to age or tree cover. If there are trees near your home that create excessive shade on your roof, rooftop panels may not be the most ideal option. The size, shape, and slope of your roof are also important factors to consider. Typically, solar panels perform best on south-facing roofs with a slope between 15 and 40 degrees, though other roofs may be suitable too. You should also consider the age of your roof and how long until it will need replacement.

If a solar professional determines that your roof is not suitable for solar, or you don't own your home, you can still benefit from solar energy. Community solar allows multiple people to benefit from a single, shared solar array that can be installed on- or off-site. Costs associated with purchasing and installing a solar energy system are divided among all of the participants, who are able to buy into the shared system at a level that best fits their budget. Learn more about community solar.

Those interested in community solar can take advantage of a tool from SETO awardee EnergySage. The company's Community Solar Marketplace aggregates the many available options in one place and standardizes project information, allowing interested consumers to easily locate and compare multiple community solar projects in their area.

How do I start the process of going solar?

There are a number of mapping services that have been developed by SETO awardees that will help you determine if your roof is suitable for solar and can even provide you with quotes from pre-screened solar providers in your area. In addition to those resources, an internet search can help you find local companies that install solar panels. Because you will likely have many options to choose from, it's important to thoroughly read reviews of solar companies to make sure you are selecting the best fit for you and your home.

Solar co-ops and Solarize campaigns can also help you start the process of going solar. These programs work by allowing groups of homeowners to work together to collectively negotiate rates, select an installer, and create additional community interest in solar through a limited-time offer to join the campaign. Ultimately, as the number of residents who participate in the program increase, the cost of the installations will decrease.

Can I install solar myself?

Right now, the best way to install solar is through a qualified professional who holds a certification to do so and works with high-quality solar panels. The industry-standard certification is awarded through the North American Board of Certified Energy Practitioners (NABCEP).

How much power can I generate with solar?

The National Renewable Energy Laboratory (NREL) developed a tool called PVWatts for this purpose. It estimates the energy production and cost of energy of grid-connected PV energy systems for any address in the world. It allows homeowners, small building owners, installers, and manufacturers to easily develop estimates of the performance of potential PV installations, and can even compare solar's cost to utility bills. These tools are great for getting started, but make sure to work with a solar installer for a custom estimate of how much power your solar energy system is likely to generate.

For its analyses, NREL uses an average system size of 7.15 kilowatts direct-current with a 3-11 kilowatt range. According to SETO awardee EnergySage, that's enough power to meet all the energy needs for an average home in Austin, Texas.

Will I save money by going solar?

The amount of money you can save with solar depends upon how much electricity you consume, the size of your solar energy system, if you choose to buy or lease your system, and how much power it is able to generate given the direction your roof faces and how much sunlight hits it. Your savings also depend on the electricity rates set by your utility and how much the utility will compensate you for the excess solar energy you send back to the grid. Check the National Utility Rate Database to see current electricity rates in your area.

In some cities around the country, solar is already cost competitive with the electricity sold by your local utility. The cost of going solar has dropped every year since 2009, a trend researchers expect to continue. Not only are the prices of panels dropping, so are the costs associated with installation, such as permitting and inspection—also known as "soft costs." All of SETO's funding programs are working toward improving the affordability of solar and making it easier for consumers to choose solar.

It should also be noted that energy efficiency upgrades complement solar energy economically. By using Energy Star appliances and other products in your home, you'll need less solar energy to power your home.

Can I get financing for solar?

Consumers have different financial options to select from when deciding to go solar. In general, a purchased solar system can be installed at a lower total cost than system installed using a solar loan, lease, or power purchase agreement (PPA).

If you prefer to buy your solar energy system, solar loans can lower the up-front costs of the system. In most cases, monthly loan payments are smaller than a typical energy bill, which will help you save money from the start. Solar loans function the same way as home improvement loans, and some jurisdictions will offer subsidized solar energy loans with below-market interest rates, making solar even more affordable. New homeowners can add solar as part of their mortgage with loans available through the Federal Housing Administration and Fannie Mae, which allow borrowers to include financing for home improvements in the home's purchase price. Buying a solar energy system makes you eligible for the Solar Investment Tax Credit, or ITC. In December 2020, Congress passed an extension of the ITC, which provides a 26% tax credit for systems installed in 2020-2022, and 22% for systems installed in 2023. The tax credit expires starting in 2024 unless Congress renews it. Learn more about the ITC.

Solar leases and PPAs allow consumers to host solar energy systems that are owned by solar companies and purchase back the electricity generated. Consumers enter into agreements that allow them to have lower electricity bills without monthly loan payments. In many cases, that means putting no money down to go solar. Solar leases entail fixed monthly payments that are calculated using the estimated amount of electricity the system will produce. With a solar PPA, consumers agree to purchase the power generated by the system at a set price per kilowatt-hour of electricity produced. With both of these options, though, you are not entitled to tax benefits since you don't own the solar energy system.

Navigating the landscape of solar financing can be difficult. The Clean Energy States Alliance released a guide to help homeowners understand their options, explaining the advantages and disadvantages of each. Download the guide.

How can I find state incentives and tax breaks that will help me go solar?

DOE created the Homeowner's Guide to the Federal Tax Credit for Solar Photovoltaics to provide an overview of the federal investment tax credit for those interested in residential solar photovoltaics, or PV. It does not constitute professional tax advice or other professional financial guidance. And it should not be used as the only source of information when making purchasing decisions, investment decisions, or tax decisions, or when executing other binding agreements.

DSIRE is the most comprehensive source of information on incentives and policies that support renewable energy in the United States. It is operated by the N.C. Clean Energy Technology Center at N.C. State University and was funded by the U.S. Department of Energy. By entering your zip code, DSIRE provides you with a comprehensive list of financial incentives and regulatory policies that apply to your home. Additionally, an experienced local installer should be able to assist you in claiming any state and local incentives, as well as the ITC.

If you want to learn more about state and federal solar policies regarding incentives and tax breaks, the Solar Power in Your Community guidebook (PDF) has a section—Appendix A on page 87—that explains it in detail.

How will solar impact the resale value of my home?

Buying a solar energy system will likely increase your home's value. A recent study found that solar panels are viewed as upgrades, just like a renovated kitchen or a finished basement, and home buyers across the country have been willing to pay a premium of about $15,000 for a home with an average-sized solar array. Additionally, there is evidence homes with solar panels sell faster than those without. In 2008, California homes with energy efficient features and PV were found to sell faster than homes that consume more energy. Keep in mind, these studies focused on homeowner-owned solar arrays.

When it comes to third-party owned (TPO) systems, data shows that while they add some complexity to the real estate transaction, the overall impacts in terms of sales price, time on market, agreement transfers, and customer satisfaction are mostly neutral. In some cases, TPO systems can even add value.

The PV Value® tool is helpful for both home sellers and homebuyers. It calculates the energy production value for a PV system and is compliant with Uniform Standards of Professional Appraisal Practice and has been endorsed by the Appraisal Institute for the income approach method. Make sure your appraiser uses this tool to get the most accurate estimate of your PV system's value.

Can I go solar without changing the aesthetics of my home?

Yes! Building-integrated photovoltaics, or BIPV, allows homeowners to alter the appearance of their solar panels so they match their surroundings. SETO has funded projects that commercialized technology enabling homeowners to add a graphical layer to their solar panels so they blend in with the roof. Learn more about BIPV.

I have heard a lot about solar plus storage. What is that and do I need it?

Storage refers to energy storage, most often in the form of batteries. Installing energy storage with a solar system can help utilize the power generated when it's needed most, regardless of whether it's sunny outside at the time. Storage allows you to save that energy and use it later in the day, like when you turn the heat on at night or run the dishwasher after dinner or even when the power goes out. Ask your solar installer if they offer battery storage options and learn more about storing solar energy.

Is solar safe?

Absolutely! All solar panels meet international inspection and testing standards, and a qualified installer will install them to meet local building, fire, and electrical codes. Also, your solar energy system will undergo a thorough inspection from a certified electrician as part of the installation process.

What are the environmental benefits of solar?

Using solar power instead of conventional forms of energy reduces the amount of carbon and other pollutants that are emitted into the environment. Reducing the amount of carbon in our atmosphere translates into less pollution and cleaner air and water.

What does [insert solar lingo] mean?

Confused by insolation, inverter, and irradiance? Consider the solar energy glossary your handy guide to all the solar lingo.

What should I do if I believe a solar company is misrepresenting itself or its products?

No one should feel they are being taken advantage of while pursuing clean energy. At the federal level, you can contact the Federal Trade Commission to report fraud, scams, and bad business practices. At the state level, laws vary depending on where you live. You can contact one of the consumer protection offices within your state or territory to see how they can help, too.

Where can I find other resources to learn about going solar?

Residential Consumer Guide to Solar Power – In an effort to make going solar as effortless and streamlined as possible, the Solar Energy Industries Association developed this guide to inform potential solar customers about the financing options available, contracting terms to be aware of, and other useful tips.

A Homeowner's Guide to Solar Financing: Leases, Loans and PPAs – This guide from the Clean Energy States Alliance helps homeowners navigate the complex landscape of residential solar system financing. It describes three popular residential solar financing choices and explains the advantages and disadvantages of each, as well as how they compare to a direct cash purchase.

Solar PV Project Financing: Regulatory and Legislative Challenges for Third-Party PPA System Owners– Third-party owned solar arrays allow a developer to build and own a PV system on a customer's property and sell the power back to the customer. While this can eliminate many of the up-front costs of going solar, third-party electricity sales face regulatory and legislative challenges in some states and jurisdictions. This report details the challenges and explains alternatives.

A Beautiful Day in the Neighborhood: Encouraging Solar Development through Community Association Policies and Processes – This guide, written for association boards of directors and architectural review committees, discusses the advantages of solar energy and examines the elements of state solar rights provisions designed to protect homeowner access to these benefits. It then presents a number of recommendations associations can use to help bring solar to their communities.

Selling into the Sun: Price Premium Analysis of a Multi-State Dataset of Solar Homes – This report from Lawrence Berkeley National Laboratory finds that home buyers are consistently willing to pay premiums of approximately $15,000 for homes that have solar across various states, housing and PV markets, and home types.

SEIA Residential Lease Disclosure Form – This form for solar energy leasing companies will help consumers better understand the terms and costs of their solar leases. The form is also designed to help consumers choose among competitive providers.

Residential Solar-Adopter Income and Demographic Trends – This report from Lawrence Berkeley National Laboratory finds that while solar adoption skews toward high-income households, low- and moderate-income households are also adopting, and that the rooftop solar market is becoming more equitable over time.

Learn more about the solar office's accomplishments.

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