



BUYER'S GUIDE TO SOLAR ENERGY FREEDOM

9 STEPS TO SECURING THE SOLAR INSTALLATION OF
YOUR DREAMS

ABSTRACT

This step-by-step guide will navigate you past the pitfalls and allow you to negotiate like a pro to achieve your solar energy dream.

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So, you love the idea of 'free' electricity and being a good steward of the environment? Join the growing crowd of solar enthusiasts – the allure of tapping into the unlimited energy of the sun to power your home, business and life can be hard to resist. As simple as the concept sounds, there are plenty of ways a solar installation project can go sideways. This guide will help you navigate the process so that whether you are a homeowner or a commercial business operator, you'll end up with a result you'll be proud to proclaim from the rooftops!

Solar energy installations generating 6 to 12 kW of electrical power can satisfy most or all the electrical energy needs of the average household. You can expect to pay anywhere from \$18,000 to \$36,000 for a turnkey installation before taxes and incentives are applied. Adding battery storage will increase your system price. Depending on where you live and when you turn your system on for the first time, tax credits can reduce the costs to roughly \$13,000 to \$26,000.

You can expect your solar installation to save you roughly \$600 to \$2,000 per year in electric utility charges – exciting, yes, but it becomes apparent soon enough that at this rate of savings, it will take years to have the system pay for itself. Many homeowners can expect their installation to pay for itself within 7 to 12 years, and perhaps six years or less in some cities where energy costs are considerably higher. The bottom line –the decision to purchase a solar installation for your home can entail a substantial upfront financial commitment that deserves appropriate consideration.

Below is a step-by-step guide to follow if you're serious about powering up your home or business with renewable solar energy while sidestepping common mistakes and reducing your risk.

STEP 1 – Confirm no existing or impending zoning bylaws or regulations set by the local government or neighborhood associations and strata councils restrict or disallow solar installations.

If you're living within a strata development, review your strata bylaws and have your executive council confirm any existing restrictions placed on solar installations due to aesthetic, access, noise, public safety or other reasons. Further, there may be municipal bylaws or zoning restrictions to consider, particularly concerning ground-mounted solar installations. Calling your local building permit department located within your municipal or rural authority can identify possible roadblocks to your solar plans. Of course, qualified local solar installers should also be able to enlighten you on rules and regulations affecting solar installations in your area.

STEP 2 – Review your home insurance policy to determine if coverage for a solar installation is available and affordable.

The severity and frequency of weather-related events have increased over the past decade, and insurance companies have taken notice and made sweeping changes in their policies covering such risks. Depending on where you live, insurers may exclude damage to solar panels and equipment due to extreme hailstorms, fearsome winds, wildfires and other natural events altogether, or they may set the premiums so high as to be unaffordable for many.

STEP 3 – Perform a home energy audit (also known as an energy assessment).

Become familiar with your home's total electricity usage – your most cost-effective first step may be implementing efficiency measures before considering a solar system. And a home energy audit won't break the bank. The typical costs for such a study run around \$200 to \$525 for a 1,500 square foot home (national averages are roughly \$0.12 per square foot for an ASHRAE Level 1 to \$0.35 per square foot for a Level 2 audit¹). In some locations, the local utility companies may offer a rebate or perform the energy audit for free to help customers save on their energy bills.



Energy audits analyze energy flows and highlight ways to improve efficiencies and reduce wasteful energy losses. The inspector may perform a blower door test – placing a fan at the main entrance door and sealing it against the door frame to ensure no leaks. The fan draws air out of the home while the inspector goes room-to-room checking for drafts arising from doors, windows and vents. Additionally, infrared scanning and thermographic inspection techniques allow the inspector to identify temperature variations along exterior walls that could signal air leakage arising from poor insulation.

Keep in mind – rebates and other financial incentives to assist you in purchasing a solar energy system for your home may only be available after undertaking a qualifying energy audit.

Here are several recommended steps you can take to reduce energy leaks in your home.

- a. Old and poorly maintained windows are often the largest source of drafts and undesirable energy loss or gain. Windows exhibiting the best insulating properties are triple-paned with special low-E (low emissivity) coated glass, argon gas-filled between panes and enclosed within thermally-resistive and insulated vinyl or composite frames. However, they are expensive and can quickly eat up a budget. Instead of replacing all windows, consider installing insulating windows only at locations facing the sun and the dominant wind direction.

¹ The American Society of Heating, Refrigerating and Air-Conditioning Engineers define three levels of energy audit, the most basic being the ASHRAE Level 1 audit that is applicable to smaller buildings with low energy usage. It consists of a walk-through by the auditor to evaluate energy efficiency. The extent of reporting and the use of testing tools is limited, and the auditor will review utility bills and interview the homeowners. A Level 2 audit is suited for larger homes and buildings. It supplements the level of analysis and reporting undertaken in a Level 1 audit by documenting the energy usage of each piece of equipment evaluated, offering projected costs to make improvements and calculating the savings one could expect to achieve with such upgrades. Level 3 audits are generally reserved for large and complex commercial buildings.

Weather-proofing leaky windows is a budget-friendly and relatively simple exercise. In the absence of an energy audit to locate drafts, you can place a burning incense stick near windows (and doors) on a windy day to check for leaks.

Windows that open and close typically leak at the opening. Installing a vinyl or rubber seal (available at any hardware or do-it-yourself store) along the edge upon which the moving window closes will eliminate drafty gaps. Fixed-frame windows may require a bead of flexible caulking along the glass-to-frame interface to seal against drafts (be sure to remove dried, cracked or loose old caulking first). Another option is to apply shrink-wrap film over the entire window opening to seal off leaks. Further, heavy window coverings can dampen drafts and reduce heat loss or gain.

- b. Drafty doors are a common feature of older homes. Fastening vinyl or rubber weatherstripping around the sides and tops of doors is a good start. Most likely, the bottom of exterior doors where they meet the threshold is the largest source of drafts. Fastening a rubber or vinyl door sweep to the bottom of the door with adhesive or nails will eliminate the nuisance.
- c. Vents that run to the exterior of the home can be sources of drafts. Remove the problem by applying expandable foam spray, sealant tape, flexible gaskets, or rock wool insulation stuffed into spaces around the vent.
- d. Installing more attic insulation is a cost-effective way to reduce excessive heat loss and gain in a home. Add layers of insulating batts between the bottom chords of the roof trusses or floor joists of the attic and lay more batts over the top and perpendicular to the joists. Alternatively, have an insulating contractor blow insulation into the space. And don't forget the attic hatch door. Layering and gluing two sheets of rigid foam insulation onto the hatch and applying weatherstripping all along the hatch frame's sealing edge will stop another nasty source of thermal leaks.
- e. It may be time to replace outdated appliances and electronics with more efficient options. Dishwashers, dehumidifiers, refrigerators, furnaces, air conditioners and washers and dryers are great candidates to review for energy efficiency. Look for the ENERGY STAR rating – it is the only government-backed standard for energy efficiency, certified by the U.S. Environmental Protection Agency.

To illustrate the difference in energy consumption of old equipment compared to new, consider the case of refrigerators. Since the ENERGY STAR specification was first applied in 1996 and updated several times to 2017, refrigerators consumed 24% less energy on average while corresponding refrigerator volumes increased by 18% over that same period. Similarly, new washing machines consume 25% less energy and 70-75% less water than 20-year old machines.



Every year, the ENERGY STAR [website](#) publishes its guide that ranks the energy efficiencies of various appliances and equipment. By purchasing a recommended brand, you stand to save hundreds of dollars each year in energy costs while enjoying the latest features and benefits.

- f. Switch to LED lights – they use much less energy and typically last many times longer than their incandescent counterparts. The Energy.gov site claims that "By replacing your home's five most frequently used light fixtures or bulbs with models that have earned the ENERGY STAR, you can save \$75 each year."

Consider that a 12-watt LED light can replace a 60-watt traditional incandescent bulb without sacrificing light intensity and save 75-80% in energy while lasting 25 times as long (roughly 25,000 hours versus 1,000 hours). Yes, LED bulbs cost a bit more than incandescent bulbs, but the premium is easy to justify. And in a growing number of jurisdictions, incandescent bulbs are becoming a thing of the past – disallowed and unavailable.

OK, we've discussed several energy-saving options to consider before jumping on the solar bandwagon. Having done that, think about what changes may arise in your home's electrical requirements. Perhaps by making your place more energy-efficient, the electrical demand drops significantly and will stay that way for years. If an electric vehicle becomes a future reality, it will increase the household electrical demand. Correctly sizing a solar system will need to account for such changes.

STEP 4 – Have a qualified professional solar contractor assess your home to determine its solar potential.

Is your roof large enough? Is it sufficiently exposed to the sun, or will you have to ground mount the panels? Is ground mounting even an option and if so, at what cost? Are there nearby trees or structures that can create shading concerns? Will they become an issue in the future?

In locations where Google Maps or other third-party companies collect the physical aspects of buildings and make them available on databases, sophisticated design software can access such information to calculate the size and pitch of your roof, its orientation to the sun, nearby shading potential and other factors. Technicians can then develop an accurate solar design and quote for you without the need for an on-site visit.

With several quotes in hand, you can select your favored installer (or two) and invite them to visit your home. There, they can undertake a final review and firm up their quote to you should anything change. Don't skip this step. Why? Because the installer should physically check the condition of your roof before finalizing their proposal. See the text box for details.

STEP 5 – Investigate the options available to support a solar installation.

Sole ownership of your solar energy system may not be your only choice. Other options may be available to you, as listed below:

- a. *Shared solar or community solar* – Such a program benefits members who pool their financial resources to purchase solar power from an on-site or off-site system owned by a utility, the community, a solar development company or a nonprofit concern. This option can be ideal for those who (i) rent their home, (ii) live in a multi-tenant building or whose residence does not have the right physical requirements to support a standalone solar installation, (iii) cannot or choose not to pay for their own system and (iv) don't want to be responsible for operating and maintaining a system.

Community solar expands the opportunity for all to enjoy the benefits of solar power. The community solar system bills its customers on a subscription model at rates typically lower than those charged by the local electrical utility.

According to the Solar Energy Industries Association, 2,056 megawatts of community solar have been installed in the U.S. through 2019. That's enough to power up roughly 390,000 homes. Plans are in place to see the U.S. add up to another 3,400 megawatts of community solar through 2024 or 2025. With this rapid growth, the chances are good this option will become available to you soon if it isn't already.

- b. *Solar leasing* – This program is similar to leasing a car – instead of paying for the system upfront, you lease or 'rent' the system. This option represents a great way to enjoy the savings and benefits of solar energy on your electric bill right away with little or no money down. You agree to a fixed monthly payment and any escalation clauses that apply. The lease contract is usually for 20-25 years. You have the choice to purchase the system from the lessor at any time during or at the expiration of the contract at a defined price. Alternatively, at the end of the lease, you can request the lessor to extend your lease or remove the system. Leases will contain a guaranteed power production clause – if the system fails to produce the stated power, you pay an adjusted lower lease payment. By locking in the price of your power bill, you avoid the possibility of hefty utility rate increases. What's more, when you lease, you're not liable for system maintenance and component replacement costs.

However, be aware that by leasing, you forego the opportunity to benefit from tax incentives enjoyed by those who purchase their system outright. And lessors may be less than responsive when maintenance is required. Also, buying a solar system likely adds value to your home; the same cannot be said for a leased system. A leased system can deter potential buyers who don't wish to adopt the lease agreement from the home seller or may have to qualify to take over the lease.

THE CONDITION OF YOUR ROOF IS A CRITICAL FACTOR

Solar installations are designed to operate for 30+ years – generally much longer than the life of your roofing system. So, properly qualified installers will check the condition of the roof and rectify existing problems or advise that a new roof be installed before solar panels are mounted. Further, they will discuss the steps and risks involved in having to disassemble and reinstall the solar panels should roof replacement be required at some point in the future. Installers who don't address such issues are installers to avoid using.

For most roof installations, the solar panel support structures will be lag-bolted into the roof and well-proven measures taken to ensure each roof penetration is properly sealed against leakage. With flat roofs, panels can be secured by weighted ballast mounting systems to avoid roof penetrations. However, in seismically active regions, ballasted systems will require anchoring that likely involves bolting.

Should roof mounting prove undesirable, ground-mounting solar panels may be the solution. Your installer should be able to advise if this possibility exists and provide you a quote if so.

- c. *Power purchase agreements (PPAs)* – In this financial arrangement, a solar developer undertakes all the steps to get a solar installation permitted, financed, designed and installed on your property for little or no upfront cost to you. In turn, you'll sign a PPA valid for 10 to 25 years that guarantees you'll pay the developer a fixed price per kilowatt-hour over the lifetime of the agreement. This fixed rate is typically 10-30% lower than that available from the local power utility. The developer is responsible for operating and maintaining the system. When the PPA contract term expires, you may request the developer extend your lease, sell you the system, or remove the system from your property.



PPAs are quite similar to leases. However, a PPA does not offer a solar production guarantee – you will pay for whatever power your system produces at the fixed price per kilowatt-hour. A lease arrangement includes a solar production guarantee, and you will pay a fixed amount each month based on the estimated amount of electricity the system will produce.

- d. *Solarize program* – Some areas support a Solarize program. Such a plan enables you and others in your neighborhood to pool your funds, select one solar installation company through a competitive bidding process, and negotiate a bulk purchase of multiple solar installations for every participant.

A Solarize program softens the impact of the three most significant challenges you'll face if you decide to go solar alone:

- i. It reduces the sticker price of a single solar installation. Although the average cost of solar has dropped dramatically over the years in terms of dollars per kilowatt-hour, the upfront costs for your home installation may still be a deal-stopper. However, a qualified solar installer facing the happy prospect of contracting with you and dozens of your neighbors at one time can lower the per-unit delivered cost of your home system big-time due to volume purchasing and installation discounts. Further, by avoiding the marketing and sales costs associated with acquiring new customers one by one, the contractor won't need to pass such costs onto you and the other participants. And the right contractor will tap into all available government tax incentives and power utility rebates to lower your costs even more.
- ii. It lessens the complexity of the project. If you're not technically oriented, you may find the prospect of wrapping your mind around PV panel power ratings, solar irradiance, inverter choices, and other aspects of solar installations to be daunting. And selecting the right solar installer may add to your anxiety. A well-organized Solarize program can offer workshops and other programs and resources to educate and develop a core volunteer committee capable of managing these complexities for you and the rest of your group, leaving you with only having to decide to join in or opt out.
- iii. It shortens the timeframe to execute the project. It's not unreasonable for a solar project to stretch to 12 to 24 months from deciding to investigate until switching your power on. A Solarize program can create a sense of urgency and compress that timeframe to three to six months. One reason – a limited-time offer to act spurs many to move ahead

for fear of missing out. Further, there's comfort in numbers – if many people agree this is the way to proceed, you sidestep the worry of having made a (wrong) decision alone.

And that's not all. A Solarize project creates jobs (roughly 15 good-paying jobs for every 100 participating households), supports your community through local spending and training the next generation of solar workers, and reduces carbon emissions that benefit everyone.

STEP 6 – Collect at least three quotes from licensed and insured professional solar power installation contractors.

The [North American Board of Certified Energy Practitioners](#) (NABCEP) offers standard certification programs for solar installers. Check if the contractors you select are certified professionals. Other important issues to discuss with them include:

- a. Their familiarity with local permitting and power utility interconnection procedures – what is involved and who is responsible for doing what.
- b. Risk factors such as hail and other extreme weather events that may apply to your area – are the panels and other equipment they supply suitably manufactured and installed to withstand damage from such risks?
- c. Getting references for installations from other customers in the area. Contact these customers about the quality of the contractor's work, if the contractor completed the job on schedule, if cost overruns arose, if the contractor responded professionally to concerns and if they would use the contractor again. Be mindful that any references a contractor offers will be satisfied customers only – you may not get the whole story. Consider checking Google Reviews and other online sources to uncover additional insights. Ask how long the contractor has been in business. A little investigative work can help you assess the contractor's reputation in the community they serve.
- d. Receiving proof of their electrician contractor's license and perhaps their general contractor's license if local governing authorities require it. Ask if the installer has valid insurance for liability, property and workers' compensation to cover the period they will be working on your project.
- e. Their policies concerning after-sales service – the process and timeframes involved.
- f. Enquiring if they are dealing with any existing or pending judgments, liens or other legal actions and why. Liens are a matter of public record, filed with and stored by a government agency and available for inspection. You can contact or visit your local city or county courthouse and request the information from the clerk's office where business liens are filed. Consider connecting with the Better Business Bureau, the consumer protection office in your state and your local building inspector's office and determine if anyone has registered complaints against the contractor. If there are several, you need to question why – perhaps working with that contractor is too risky.

A well-structured and detailed quote will provide you all the information you need to decide how to proceed and with whom. As a minimum, it should clearly state:

- a. The upfront costs of the installed solar system.

- b. Details of the equipment, the parts and labor to install the equipment, the permits required to perform the work, and the monitoring and analysis software you can install on your computer and cellphone to review system performance on a real or near real-time basis.
- c. The system's performance specifications (how much power it can generate).
- d. Details about the warranties that apply and who is responsible for what (refer to the text box for more information).
- e. Whether your local utility supports net metering and will purchase the surplus energy your system feeds back to the electrical grid. Net metering (or net energy metering) is the agreement confirming:
 - i. Your utility will credit you for the surplus electricity you feed to the grid from your solar system through a 'smart' meter
 - ii. How much they will pay you for that electricity. Your 'smart' meter will measure the electricity you use from the grid and what you feed to the grid. Any credits for energy delivered to the grid are typically applied to your bill each billing period to reduce the amount you owe.
- f. Existing and forecasted utility energy costs and your monthly energy savings calculated from those costs, plus how much money your installation will save you year after year on your electricity bill and the anticipated payback time on your investment.
- g. The life expectancy of the system – solar installations should last decades. Solar panels slowly degrade in their ability to convert solar energy to electricity over time, but they should exhibit no less than 80% capacity after 25 years of service.

STEP 7 – Sign a contract with the PV system installer offering the best value.

To assess what represents the best value for your situation, you need to consider:

- a. The installed price, the estimated cost per kilowatt-hour of energy generated and the payment terms.
- b. The contractor's ability to secure the required permits and inspections.
- c. The installer's willingness to help identify and access rebates, tax benefits and other financial incentives you may qualify for – check out [link to our site under](#)

ABOUT WARRANTIES

When discussing warranties for your solar installation, you're apt to hear about 'performance warranty,' 'product workmanship warranty' and 'service workmanship warranty' or variations thereof.

A performance warranty or guarantee is typically 25-30 years on most PV panels – with appropriate care, the panels should continue to generate energy over this time and longer (although their efficiency degrades slowly over time at rate of around 0.25-0.5% per year).

The manufacturer(s) of the panels and other equipment will offer their own product workmanship warranties that ensure the equipment is free from defects and pass all applicable standards and tests. Many manufacturers offer 12 to 25-year panel warranties.

The installing contractor will offer a service workmanship warranty to guarantee the work they do to provide a fully functional solar project. Qualified and certified installers typically offer a 5 to 10-year warranty after installation, with some offering a limited warranty of 25 years.

To avoid warranty hassles, be aware of the pitfalls:

> Using unqualified contractors or DIYers will jeopardize performance warranties.

> Using a contractor other than the original installer to undertake maintenance and service may void both performance and workmanship warranties

> Doing a poor job of maintaining the system can invalidate the performance warranty.

[Financial Incentives Supporting Renewable Energy\]](#) for information on such incentives.

- d. Quality and performance ratings of the equipment offered, including assessing the equipment's ability to withstand damage from hail and wind.
- e. The manufacturer's warranty and its reputation in the industry as indicators of equipment quality, value and performance over time. These issues will reflect on the installer's reputation – are they installing the best-value equipment?
- f. Delivery and installation timeframes.
- g. The process the contractor follows when handing the system over to ensure you understand how to operate and maintain the system competently and safely.
- h. The installer's ability to provide timely after-sales service as required.

STEP 8 – Apply for utility and government rebates if the installing contractor does not do so directly for your benefit.

Applications for such rebates can only be made for your solar installations once it is complete and operational. In the U.S., the [Database of State Incentives for Renewables & Efficiency](#) (DSIRE) provides an updated state-by-state listing with the particulars of available incentives and how to apply for them.

STEP 9 – Be prepared to change energy consumption habits to squeeze the most value from the PV system.

Solar installations can only supply electricity to a home when there's enough daylight to generate energy. When solar power is unavailable, you must pay the local utility for the electricity you use. Depending on their rate structure, the amount you pay for that electricity can vary significantly.

Following is a listing of the types of rates your electric utility could apply to your bill:

- a. Fixed rate (or simple rate) – you pay a flat dollar per kilowatt-hour rate for the energy you use.
- b. Step rate (or tiered rate) – you pay one price for your energy use up to a specific threshold value and another price per kilowatt-hour after exceeding that threshold during a billing period.
- c. Time of use (TOU) rate – you pay a maximum rate during peak hours and a lower rate during off-peak hours.
- d. Tiered within time of use rates – during both peak and off-peak periods during the 24-hour day, you're charged a different energy use rate after exceeding threshold values within each period.
- e. Seasonal rates – some utilities will charge a higher rate during winter and summer when demand for heating or cooling is highest.
- f. Weekend/holiday rates – these rates are often considered off-peak rates and generally apply only to customers on tiered or time of use plans.

- g. Demand rate – commonly used for commercial and industrial accounts, you pay a base rate for energy, and the demand rate is added to this base rate and calculated by using the highest amount of power you use during any 15, 30, 45 or 60-minute average over a billing period

The best way to avoid surcharges from your utility and get the most from your solar installation, especially for those who must pay time of use and step rates, is to employ battery storage with your solar installation. That way, you can store the energy produced from your PV array for use during peak hours and when the sun is not shining. If the battery storage is sufficiently sized, it can eliminate all utility charges and act as a reliable backup during power outages.

So, there you have it – nine steps you can follow to ensure you've covered your bases and make your transition to solar energy an enjoyable and meaningful process. After all, you want to love your system!

If you have questions and seek more information that can impact your solar project, or if you want to learn more about the fascinating world of renewable solar energy to power our world, visit www.SolarEnergy.com.

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