BEGINNER'S

GUIDE TO SOLAR ENERGY

LG Solar

Beginners Guide To Solar Energy

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Why You Should Choose a Solar System

Over the past five years, the cost of installing a solar system has gone down significantly. Now, solar energy can power a home throughout the day and greatly reduce how much a family spends on energy each year.

Those who don't take advantage of the natural energy of the sun will always pay for their electricity. Paying for electricity never goes away, no matter how much or little you use.

By harnessing the power of solar energy, you own a major part of the power you use. Choosing a solar system is an investment that immediately begins to pay for itself through the savings you get from relying on a renewable energy source for power.

Many homeowners pay off their investment in five to six years as a result of savings realized through solar (though results may vary).

Installing LG Solar's high-efficiency panels on your home helps you benefit from the sun's love and create a better relationship with energy consumption needs.

To help you select and install your solar system, an independent local installer, or LG PRO Installer trained by LG, will visit your home to assess its solar potential. You can find an LG PRO who will supply a free detailed quote by getting started at:

https://www.lg.com/us/solar/getstarted

The Benefits of Solar Energy

01 SOLAR POWER CAN SAVE YOU MONEY

Installing solar panels enables you to generate your own electricity rather than buying it from your electric company. This enables you to save money as every kW/h of electricity you use from your solar system is a kW/h of electricity you do not have to buy from your electric company.

02 ENVIRONMENTAL BENEFITS

By using electricity generated from the sun's love, we reduce the need to produce electricity from fossil fuels such as coal and gas, which create carbon dioxide (CO_2). This can reduce the potential for global warming and create a more sustainable and cleaner energy mix.

03 ENERGY INDEPENDENCE

With your own solar system, you can embrace the sun and the energy it is able to generate. This reduces your reliance on fossil fuels while increasing your control over your future electricity needs, expenses and lifestyle. If you add an energy storage system to your solar array, you gain even more control over your energy usage and costs.

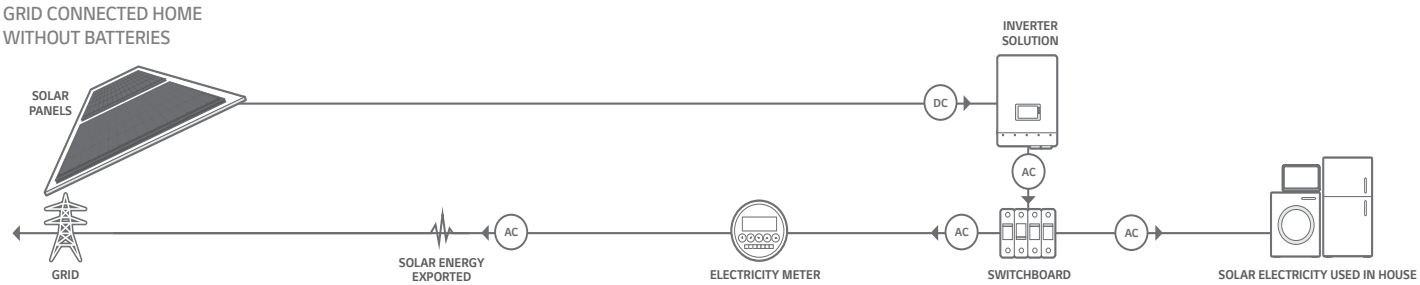
04 ENERGY RELIABILITY

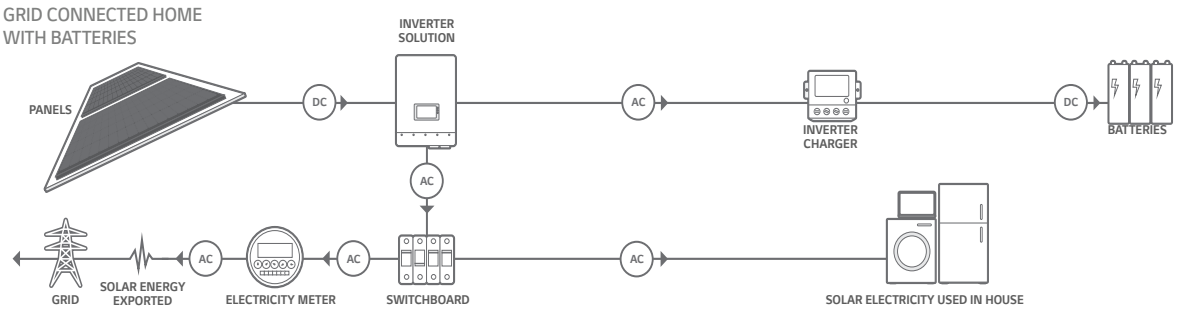
High-quality solar systems are a reliable power source. The sun rises and sets every day, and when the sun shines, solar panels generate electricity. While the weather and seasons vary, the amount of electricity that solar panels generate is predictable, and you can plan accordingly to get all the love from the sun you need to power your home. LG Solar's high-efficiency panels are designed to capture more of the sun, more of the time too, which helps expand how you power your home. You can also increase the financial benefits of your solar system by changing the times you operate your household appliances. For example, turning your washing machine on as you leave home in the morning instead of washing your clothes at night will avoid the higher electricity rates charged by some utilities during peak usage times. If you install an energy storage system, you can use the energy stored from your solar system during those times.

How a Grid System Works

A solar system is made up of multiple solar photovoltaic (PV) panels, a DC to AC power converter (inverter solution) and a framing system to hold the solar panels in place.

Solar panels are generally fitted on the roof facing a southern, easterly or westerly direction.





Homes in the United States are connected to the electricity grid via power lines. Our electricity system uses alternating current (AC), but the electricity generated by solar panels consists of variable direct current (DC). To transform the DC electricity into AC electricity for ordinary household use, solar systems use micro inverters attached to each solar panel or a central string inverter attached to a string of connected solar panels.

There is also a third possible inverter solution - power optimizers. These are a variance of the string inverter and the micro inverter. Once you're in the process of getting your solar system, ask your authorized LG PRO Installer for advice on which of these inverter solutions is the most suitable for you. Quality inverter/micro inverter solutions include Fronius, SMA, SolarEdge and Enphase brands.
Today, houses with grid-connected solar systems consume solar-generated electricity first, before switching to the electricity grid if more electricity is required than the solar system can generate.
Grid-connected solar systems can also feed electricity back to the grid if too much electricity is generated through your installation for the immediate needs of your home.

Unless you add storage batteries to your system, a grid-connected solar system is unable to store power in your home for use at night.

How Solar Systems Make A Little Love From the Sun Go A Long Way

A solar system is made up of several key components, all of which combine to generate electricity, regulate and control the flow of the electricity and to connect and mount the solar system to your home. A grid-connected solar system is comprised of panels, a string inverter or micro-inverters or optimizers, a roof mounting system and electrical accessories including circuit breakers and wires. It is important that all components work together, with no component compromising the performance, safety or life expectancy of any other component.

SOLAR PANELS

Solar panels on roofs of homes generate clean energy by converting sunlight into usable electricity. This conversion takes place within the solar cells and is a process that requires no moving parts.

325 to 340W
LG NeON 2

350 to 365W
LG NeON R

INVERTER SOLUTIONS

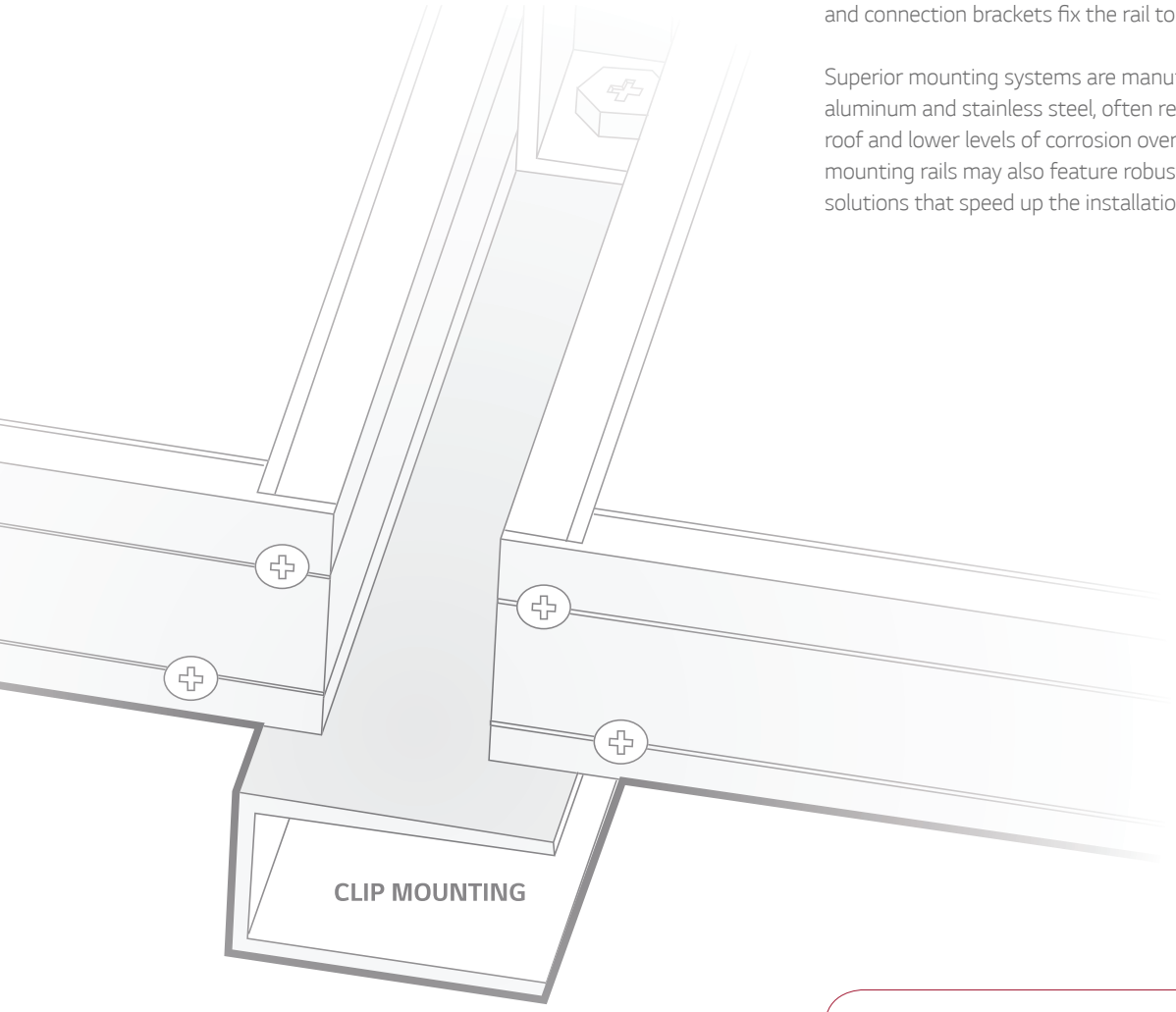
A solar inverter is one of the most important elements of the solar system. It converts the variable direct current (DC) output of a photovoltaic (PV) solar panel into a 240V alternating current (AC). This AC electricity can be fed into your home to operate your household appliances.

Depending on how your system is set up, the electricity that is not used in your home is either fed into the grid via a digital meter or stored in home batteries for later use. New hybrid inverters now include an integrated battery management system. The appropriate solar system inverters are based on several factors, such as your location and the local climate. Your LG PRO Installer will be able to give you information on the best long-lasting configuration for your home.

MOUNTING SYSTEMS

Solar systems are mounted to roofs with a mounting system using various railings, frames and tiles or tin feet. Most mounting systems are made of aluminum with stainless steel hardware and are designed to accept a variety of solar modules on a variety of roof types. Aluminum rails with clamps attach the solar panels to the rail and connection brackets fix the rail to the roof (see diagram below).

Superior mounting systems are manufactured with higher grades of aluminum and stainless steel, often resulting in less weight on the roof and lower levels of corrosion over longer periods of time. Quality mounting rails may also feature robust anchoring points and design solutions that speed up the installation time of your solar system.



Metering Your Solar System

There are two fundamental steps to take when connecting your solar system to the grid.

Your electric company will specify what type of meter is required to measure your solar generation and energy consumption. Your LG PRO Installer will be able to explain the details to you. You may be required to pay for the cost of the new solar meter, its installation and the cost of your solar system. Prices for the meter can be a few hundred dollars, so you should make sure that the solar electricity meter supply and the connection are included in the quote for your new solar system.

Installing Solar Panels for Your Solar System

TILTING AND ORIENTATION

Solar modules can face anywhere from the East to the South and the West, while still providing good output performance.

Depending on your location in the U.S., your grid-connected LG solar system will generate the most solar electricity when the panels are facing south at the right angle. The best angle can greatly increase the connection between the sun's energy and your home, which helps to build an even greater sense of energy independence.

Discuss your electricity usage with your LG PRO Installer so that your usage pattern can be matched with your solar panels' installation. Of course, the orientation, shape and size of your roof also play a major role in where the panels can be installed.

DAILY ROUTINE

Thinking about your daily routine and your electricity consumption will help you locate the best possible place for your home to receive the sun's energy. If you use a lot of electricity in the morning, an easterly roof will offer the most benefits. If you use a lot of electricity in the middle of the day, a south-facing roof is more ideal. On the other hand, if lots of electricity is used in the early and late afternoon, a south-west facing roof is more likely to offer the best outcome. With multi-string inverters, you can also put one group of solar panels (one string) on the east and one on the west to cover a wider timespan.

i Shading

The amount of electricity generated by your solar system directly relates to the amount of sunlight that your solar panels receive. If your solar modules are in the shade, the system will generate less electricity.

Even a single antenna or a chimney shadow on your panels can affect performance, while the overall effectiveness of your solar system is dependent on where you live. In some areas of the U.S., tree coverage greatly reduces the effectiveness of solar panels. Using micro-inverters or power optimizers on each panel instead of one large string inverter (where multiple panels are connected to one inverter) can help with shadow issues. If you believe that you may have a shade issue, talk to your LG PRO Installer during your consultation about whether power optimizers or micro-inverters are a potential solution for you.

MOUNTING

If a suitable roof area is not available at your home, LG solar panels can be fitted to a ground-mounted system in a sun-filled spot on your land. However, you will need to allow for additional costs for a ground mounting system and costs for running the cable safely in the ground. These options can be discussed with your local LG PRO Installer.

INSTALLING PANELS FOR GREATER PERFORMANCE

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LG is confident that our panels will give you years of reliable functionality and an even greater appreciation for solar energy. Although the cables, safety devices and mounting systems are less influential to the performance of your solar system, the use of poor-quality cables or isolators can lead to an early ending to your new-found relationship with the sun. In cases where non-branded plugs and cables were used, complete system failures have occurred.

For a decade of low maintenance to your solar system, it is strongly suggested that you purchase high-quality solar panels and quality solar inverters, and ask for high-quality system components in all aspects of your solar system.

Some inexpensive solar panels have failed in certain climates in as little as 24 months. Some issues have been water ingress, corrosion, hot-spots, failed bypass diodes or junction box failures. These types of failures lead to the write-off of the panel. Lengthy promised warranties are hard to claim if dealers, installers or panel manufacturers have gone into liquidation or have stopped operating.

How Many Panels Does Your Solar System Need?

An LG PRO Installer will visit your home for a site inspection to check the roof position, discuss your electricity usage pattern, suggest monitor options and, where applicable, conduct a shade analysis to ensure that the right quantity of the most suitable panels is placed in the optimum position. Buyers should insist that their installer also undertake a physical site inspection.

An installer's willingness to visit your home gives some indication of the quality of service you will receive for your purchase. As a result, we advise that you buy your solar system from a local installer and not an Internet-based solar sales agent.

Historically (when Internet solar sales were rapidly increasing), consumers purchased solar systems without site inspections. Sometimes this resulted in their installer highlighting the need for special roof brackets or a total switchboard upgrade before the solar system could be installed. These additions added unexpected costs and time delays to the installation.

Before making your purchase decision, find out who your point of contact will be if you have questions after the installation. Make sure that you ask for a comprehensive written warranty from your LG PRO Installer for the cabling and installation work, not just the panels, inverter and mounting frame.

How Long Do Solar Systems Last?

The key components susceptible to failure in your solar system are the solar panels, the inverter and some components such as fuses and isolators.
LG solar products tend to have longer life cycles as they undertake more quality control steps, use higher quality cells and solders, have stronger UV protection on backing sheets and ensure the water sealing of panels withstands decades of weather-induced deterioration. Very low-cost panels with less UV-stabilized backing sheets, cheaper sealants and more fragile framing can deteriorate faster, and can fail in as little as 2-4 years.

Unfortunately, sometimes lengthy warranties on cheaper products have been unobtainable, as both manufacturers and installers have avoided liability by going out of business.

The key warranties to investigate are for performance, product and labor. These cover the power output of the panel, a replacement panel and its transport in the case of a panel failure and the labor costs involved in replacing a panel. Cheaper panels often do not cover transport and replacement labor. Make sure you verify with your installer what is covered in the warranty and ask for the detailed warranty document. LG NeON® 2 and LG NeON® R panels are backed by a 25-year warranty that covers performance, product and labor (Labor costs in the rare case of a needed module repair or replacement are covered up to $450.)

Solar Panel Sizes

SMALL HOME

1-2 People

2-3kW System

Av. production per day: 12 kWh

MEDIUM HOME

2-3 People

3-4kW System

Av. production per day: 16 kWh

LARGE HOME

4+ People

5-8kW System

Av. production per day: 36 kWh

WHY PANEL EFFICIENCY MATTERS

A few years ago, many people who started embracing the power of solar systems did not consider the efficiency of their panels. If they wanted a 5kW system, they could buy 20 panels with 250W or 23 less efficient 220W panels. Most customers never imagined they would need more than 5kW of solar, and in many homes 20 to 32 panels will fit on the roof. That was the old way of using solar power.

Now, with the emergence of battery storage as a smart way to harvest energy generated during the day for use at night, panel efficiency has become an important consideration.

Making full use of the powerful relationship between modern solar panels and the sun, LG has now released a 360W and 365W NeON R in the 60-cell range. If you can save eight spots on your roof with a more efficient panel, you have more options for a smaller roof. You can even add another 3.6kW solar system for your batteries or electric car charging, which you would not have been able to do with less efficient panels.

It is important today to buy a system with future expansion capability in mind, both for batteries and for how you'll use the energy your system generates – cars, night consumption needs, etc. Buy now with the needs of the future in mind. Choose highly efficient panels and keep spare roof space for future expansion.

Incentives and Financing for Going Solar

ARE THERE INCENTIVES AVAILABLE FOR YOUR SOLAR SYSTEM?

Government incentives may be available for your solar system. Over the years, these incentives have changed, and they are likely to change in the future. Talk to your LG PRO Installer to get the updated information you need about the latest incentives applicable to you.

U.S. incentives vary greatly based on a homeowner's location. Many great programs are available for people on the local, state and federal level. In order to find out what types of incentives are available to you, LG will connect you with a local LG PRO Installer who can walk you through your options.

FINANCING YOUR SOLAR PROJECT

Consumers also have the option to finance a solar system. Often, homeowners redraw on their mortgage to finance the solar and battery system. Your LG PRO Installer can advise you about other available finance options, such as those from banks and government incentives.

Details on How to Choose a Solar Company

It is recommended that consumers use a reputable installer who checks your specific solar system requirements and ensures the connection between the sun and your home is strong. Please see the points below regarding the advantages of using a company promoting high-quality products.

01 A reputable solar retail company is more likely to fully evaluate your requirements and explain in detail what needs to be done in order to install your solar system.

02 A local diversified company is more likely to be around in the future to service any warranty issues or system upgrades. As we've shared in this educational piece, some solar installers and dealers make big promises, but then vanish.

03 If your installer is selling you LG solar panels, then LG is more than likely to service your panels in the future through your local LG PRO Installer. If you choose an unknown brand, again, the manufacturer may go out of business, or the importer may stop importing these panels into the U.S. A safe option is to buy branded solar panels from diversified manufacturers such as LG that have a proven track record. After all, the sun loves LG and knows the company's decades of innovation mean it's going to be here when you need it to be.

04 A reputable solar company will be fully aware of current electricity supply rules and will provide advice on the best system for your needs and location. Well-established businesses will be more likely to give you the most up-to-date advice.

05 If your local installer is aligned with LG, then he/she must install the solar power system to a high standard and act ethically in all business dealings with you, the customer.

Questions to Ask Before You Buy

Asking your solar installer a few essential questions may make a big difference to the service and benefits you receive. Make sure you get the answers in writing.

- What is the estimated monthly and annual production in KWh of my system in its installation position?
- What is the estimated solar electricity production in the best and worst months?
- Who will service and maintain my solar system? *Get an address and contact details in writing, preferably of someone reasonably local.*
- What are the responsibilities for each party: the installer, manufacturer and consumer?
- Who is responsible for connecting your solar system to the electricity grid? Is it the installer? When will it happen?
-
- Who is responsible for your meter change? *Make sure this is clarified. Quality companies usually offer to do the whole job.*
- How will the installer credit your solar rebate?
- Can I have a copy of the manual to get a detailed description of the solar panels?

SOME STATES REQUIRE INSTALLERS TO HAVE A LICENSE BEFORE INSTALLING A SOLAR SYSTEM.
THE FOLLOWING ELEMENTS ARE CONSIDERED WHEN DESIGNING A SOLAR SYSTEM:

- Your current electricity consumption and future needs.
- The available roof space and optimum panel location.
- The orientation and pitch of the roof(s).
- Impact of shading across all seasons and time of day.
- The structural soundness of the roof.
- Sizing the strings of panels for the correct voltage of the inverter solution.
- Ensuring the design meets building codes and electrical standards.
- Determining the most suitable location for the inverter and the way the cables are run.
- Considering appropriate monitor options and if batteries are appropriate.

Important

What you should know about the 25-year Performance Warranty

Over time, all solar panels will show degradation and produce less electricity. In order to give buyers some guidance about the level of expected degradation, a warranty is offered by most manufacturers. This warranty lasts, in most cases, for 25 years and guarantees, for conventional panels, an output of around 80% of the original capacity. LG guarantees up to 90.08% efficiency for the NeON® 2 and the LG NeON® R guarantees up to 90.8% efficiency with a 25-year performance warranty.

Unfortunately, this warranty can easily cause confusion. Please note that an output warranty IS NOT a performance warranty. An output warranty only covers a portion of the costs for replacing your solar panels and only if your panel is in working order. On the other hand, a performance warranty covers all costs of replacing a faulty solar panel with a new one.

In many sales promotions, the 25-Year warranty is highlighted, but when it comes to an output warranty, you will have to pay for removing panels from the roof, shipping the panels for testing, the return, and reinstallation.

Output warranties don't cover the full cost of replacing a panel, especially when the customer has to spend many hundreds of dollars on install/uninstall costs.. Be aware of glossy 25-Year warranty stickers – it is the performance warranty that counts toward getting the most out of your investment in using solar energy to strengthen your relationship with the sun.

Additional Tips To Get Started With Solar

Unfortunately, as in any industry, some unscrupulous companies can affect the reputation of professional, positive and reliable suppliers. Please see these helpful hints on how to avoid poor-quality solar system installers.

1. Undertake some solar research via our Frequently Asked Questions (FAQs).

2. Do your research about brands and prices. There are some very cheap offers in the market, but these cheaper deals can hide poor quality equipment. You are looking for a product that lasts at least 25 years so that your financial investment is repaid over and over. Research the companies offering cheap deals.

3. Don't give in to pressure and deadlines. If the salesperson cannot give you the time to make a considered decision, then they might be afraid you will discover something bad about the deal after doing a bit of research. If the company has just arrived in town with a great deal, they might be gone after the install, leaving you to your own local devices. Please buy from reputable solar companies. In the years to come, you might need their solar expertise and support.

4. How big is your roof and how big a solar system can it fit? Remember to allow some reserve space for when you install a solar storage battery for nighttime solar power use, and then again for more battery storage capacity to charge up an electric car in the future. Your quality solar system is built to last 25+ years. Go back 25 years to the days of brick phones, dot matrix printers, and boomboxes to consider what the next 25 years will be like and how your home power needs may grow.

5. Solar systems vary in quality and size, and so does the price. Lower-grade systems may cost you more in the future in repairs and replacements. Use your tax rebate wisely. You are making a 25-year or longer investment, so please consider quality and real warranty support over everything else. And remember, a solar system with a good brand name and performance at the time you sell your home might increase your property value.

6. Panel Types & Certifications: We recommend the high-efficiency NeON® mono-crystalline solar panels. They have a black appearance and from our point of view will aesthetically blend in more to your roof and neighborhood than the blue multi-crystalline solar panel variety.

7. Solar systems attract government rebates. You should check with the installation companies if the offered panels are eligible for local and federal tax credits. To find out what incentives are available to you, visit our blog page, https://www.lg.com/us/solar/blog.

8. Performance Warranty: Many manufacturers will offer 10 years' performance warranty and an 80.2% performance efficiency warranty at 25 years (LG guarantees 89.6% with the NeON® 2). For the average consumer, it becomes difficult to separate the "wheat from the chaff." Companies like LG offer a full labor warranty and a product replacement warranty. Finally, make sure that the manufacturer has a local legal entity in the U.S. Should you have a dispute in the years to come, a company with no link and contact in the U.S. may be hard to communicate with when it comes to consumer rights.

9. Choose a quality inverter solution to go with quality panels: An inverter is the heart of your solar system. It will have a direct impact on the efficiency of conversion from solar energy to usable electric power. The more efficient the inverter solution, the better the energy conversion process will be.

10. Quotes & Buying: Do not get pressured by salespersons to sign a deal then and there. Use reputable and established local businesses to install your solar system.

Visit us at LG Solar:

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For more information visit: http://lg.com/us/solar

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