

Your Complete Guide **Solar Solutions**



What is **SOLAR POWER?**

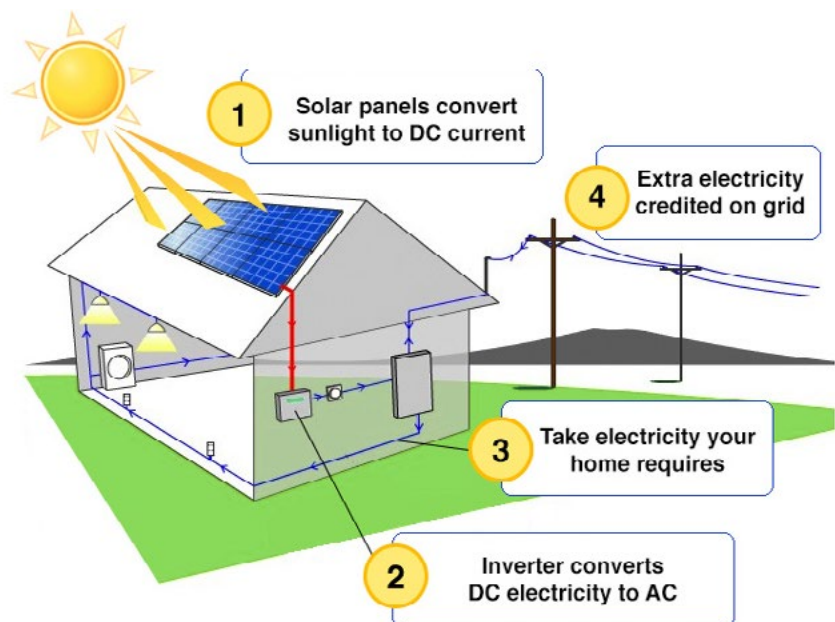
The Basics

Solar power at its most basic level is energy harvested from the sun. Solar photovoltaic (PV) converts energy from sunlight into electricity to power appliances, homes, businesses, farms, cars, and more. With the rise of concerns such as pollution, greenhouse gas emissions and escalating energy costs, solar power research has skyrocketed.

Solar PV systems contain numerous elements. There are hundreds of articles that go into the granular detail of a fully assembled PV system, but we will go over the basic layout. The main part to understand is that the rays from the sun do not hit the solar panel and magically convert into energy. An inverter or control device takes the energy from the sun and converts it into electricity that can be used to power your home or business. The solar panel soaks up the sun and converts energy to Direct Current (DC) electricity. Many appliances rely on Alternating Current (AC) electricity for power. The inverter or control device mentioned earlier can turn this DC electricity into AC electricity that is better utilized for devices we use daily. Once this energy is converted, it is distributed to appliances or to the electrical grid. We will go into more detail on the electrical grid in the “**How Can Solar Power Benefit You?**” section.

A Functioning System

Now that we have gone over the basics of converting the sun’s rays to usable energy, we can go into how the system works as a whole. Most PV systems don’t utilize just one solar panel. Although one PV panel does create electricity, most times a business or home will require extra electricity to run properly as more panels create more energy. Connectors, or housings, are used to connect solar panels together. These have both a female and male housing to create a strong connection. Both parts are needed and they easily snap into each other for simple installation. The connectors are attached to a UV resistant wire (multiple types of wire can be utilized here) with a crimped terminal. Once you have all these portions, your connection from one PV panel to the next is complete. Finally, a branch connector puts all the wires together to transfer the wires to the battery and battery controller.



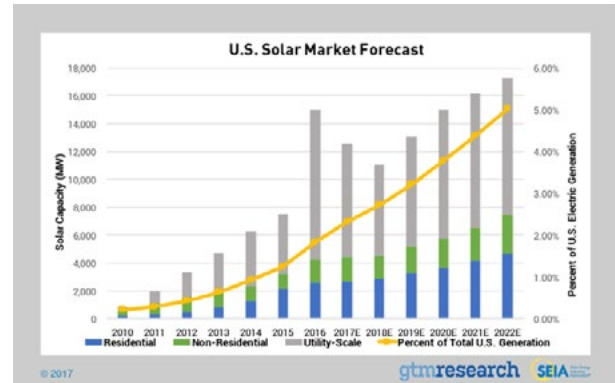
<https://creativeliving.tv/how-does-solar-power-work/>

The Potential for Solar Growth

Solar power and PV installations are growing at a record rate. According to Inside Climate News, there were only 1,000 solar installations in the year 2000. In today's world, this number has grown to over one million installations! This growth is not expected to subside anytime soon, with a new solar installation being implemented every two minutes in the United States. Overall projections for the U.S. solar market are heading upwards in residential, non-residential, and utility. As can be seen below, over 17 GW of solar PV capacity will be installed annually. **To put that into a solar perspective, 4.6 million PV panels provide just 1 GW of energy. You may be asking, how much power is 1 GW? On average, 1 GW can power up to 750,000 homes. With stats like these, solar power is impossible to ignore.**

Segment Growth

The solar power industry is often broken down into residential, non-residential and utility segments. Residential was the first large market to grow, but non-residential is seeing the highest growth currently. Compared to 2015, non-residential solar power has grown 49%. Most of this is attributed to new users whereas a lot of the residential segment is existing solar installers. Utility PV, or energy on the grid, also has potential that could skyrocket. These installations are often much larger in size than residential or non-residential segments, representing about 72% of all capacity installed in 2016. Although residential and non-residential have more installations by number, their smaller size contributes to this difference. With all three of these segments expected to grow (both in size and number is installations) solar power is predicted to be the fastest growing energy initiative for many years to come.



<https://www.seia.org/us-solar-market-insight>

Growth Factors

With technology continuing to grow, solar power is expected to follow. With these technological advancements, the cost of solar power has declined. This makes it easier to recuperate the initial installation costs of the PV system. **As of January of 2018, solar power is slightly cheaper than natural gas and significantly cheaper than both nuclear energy and coal.** This is a major reason that solar power continues to grow today. The government is on-board with solar power by offering tax credits and new regulations to incentivize more consumers, businesses and cities to install new PV systems. With all these factors combined, it is easy to see why solar power is expected to be one of the highest energy sources for growth and efficiency in upcoming years.

1 GW can power up to 750,000 homes.



How Can Solar Power Benefit You?

Utilizing a PV system brings unique benefits to every kind of installer. For businesses and consumers alike, we see monetary gains, environmental advances, and more to show how solar power can benefit you.

Residential Solar Power

Residential is what most people think of when they hear solar power. This is usually the most talked about portion of PV as homes are where solar power first started being used for significant amounts of energy. Many early adapters of residential solar power saw decreases in cost to power their homes. In 2017, the average family spends over \$1,430 a year on energy bills. This number is found using national averages for energy usage and average national energy price, so this number will vary from household to household. In the past, utility rates consistently increase from year to year at about 2.2% per year. This means that in the future, a household will see their utility bill increase; this creates the perfect incentive for residential solar power. Although solar power may be a larger up front cost, the energy bills savings over a **20 year span can save up to \$30,000 (can depend on your state of residency) and will pay off installation costs on an average of four years** with the possibility of even less time. In addition to the savings on your electricity bill, a properly installed solar PV system can increase the value of your home, especially in sunny states. With these monetary incentives, solar power is becoming more popular every year in the residential market.



Non-Residential Benefits

Non-residential PV consumers, such as businesses, installers, or developers, have seen massive growth in recent years. We may not hear about these installations as much in the news, but non-residential solar PV brings numerous benefits. A major reason for an increase of non-residential installations is due to the government. **Recently, the United States federal government proposed a 30% tax credit** on solar power installations. With non-residential solar installations being considerably larger than a residential installation, this credit causes major waves. This credit shows the support that the US has for the solar industry, largely in relation to environmental causes. When solar power is utilized, the carbon emissions are reduced helping to rebuild the health of the environment. This has been a concern in the past for both the government and citizens alike, with the tax credit showing these opinions. In 2015, the government voted **these tax credits valid until 2023**, predicting more growth for the non-residential market. These credits also allow installers to complete PV applications for a lower price, completing another incentive for solar power. Many company types, such as automotive dealers, have also noticed an increase in customers when they utilize solar power because it customers are attracted to a company that works for a good cause. With cost savings, tax credits, and company success, it is clear why the non-residential solar market is booming.

Recently, the United States federal government proposed a **30% tax credit...** these tax credits are valid until 2023



Thriving in the Utility Sector

The utility market in solar power is the largest division of the three. Large communities and energy grids have been rushing to keep up with solar advancements to make the most out of their energy. Solar power plants have helped to create clean energy and stable fuel prices for around two decades, according to the Solar Energy Industries Association. The solar utility segment also benefits from tax credits as they help to curb the United States' concerns about climate change. Because this power is utility-scale, it's often seen as one of the fastest ways to reduce carbon pollution. The utility-scale solar market is distinguished by distributing the energy as well as storing the solar energy for days that may not be as sunny. With this, residential and non-residential segments can also benefit. To keep this momentum going, 26,000 MW of utility-scale solar power is in the works, enough to power more than 4.3 million households. This staggering installation growth is predicted to create more jobs in the economy with more than 51,000 solar jobs being added just in 2016. With large scale applications, solar is expected to be one of the main growth markets to help the country as a whole.

Universal Benefits: Coming Full Circle

Although three main segments bring their own unique benefits, there are ways you can benefit across the board. In addition to the cost savings mentioned earlier, a process called "net metering" is utilized in many applications. To put it in simple terms, **"net metering" is the process of selling excess solar power back to the grid.** For example, if your residential home converts more solar power than needed, your home can sell that extra energy to the utility scale sector to recuperate some costs. This is the same process with the non-residential market who can also sell their excess energy. This is in part how the grid is able to store up energy, while the other segments are able to make the most of the energy they have collected. The exact process of net metering can vary by state, so for more specific information, be sure to check out your state's net metering rules. Lastly, we can't forget the qualitative benefit of solar power for the environment. Everyone using PV systems is helping to reduce carbon emissions and reduce pollution. This trend will hopefully continue to keep the planet clean and healthy.

NET METERING is the process of selling excess solar power back to the grid.

Who is DEL CITY?

Del City has always been interested in helping the environment and making sure that you have the best products available. For 70 years, Del City provides the highest variety and quality of various tools such as wire, cable, loom, fuses, circuit breakers, and more! Del City plans to continue this trend of expanding their product offering, now introducing a line of solar products. With these tools, Del City can help your solar application go smoothly and continue to function to the best of its ability.

The Components

Del City carries products that are multi-functional. Items such as loom, loom clamps, lugs, cable ties, and more are UV resistant to be sure that the solar install is protected from the sun's rays. Without UV resistant products, the sun may wear away at the PV install, making it less efficient or completely ruining the connection. For example, if you use a shrink tube or tape that is not rated for UV environments, the seal could break, thus exposing your installation. Because solar power has the upfront cost, you want to be sure you have high quality products to ensure these costs stay minimal. To fasten and secure your wires or other parts of your PV system, Heyco solar clips and fasteners are great to get the job done. These provide the ideal method to manage and organize your PV module wire. With stainless steel and smooth edges, these clips are sure to perform. For a large amount of wires or larger applications that need more protection, Del City offers UV loom. It is made with heat stabilized nylon with an added UV stabilizer, putting it a step above the rest. For even more information on our solar accessories, check out our website at www.delcity.net.



UV Resistant
High-temperature
Split Loom
(High Rise Ridge)



Nylon 12
Solar Cable Ties



Zinc Plated
SPOC-5D
Steel Clamps
(EPDM removable jacket)



FUSION Battery
Terminals



Marine Grade
Tinned Wire



Black Dual Wall
Shrink Tubing

The Specific Necessities

In addition to the array of PV accessories, Del City recently expanded into the solar specific realm. With multiple kinds of PV Connectors, PV Branch Connectors, Solar PV cables, and solar tools, Del City provides a more comprehensive approach to a PV installation. Del City carries both TE Solarlok PV4-S Connectors and Multi-Contact (Stäubli) MC4 Connectors. Both are single pole connector systems that require both a male and female housing for a secure connection. These are easy to install with minimal parts and keep your installation running properly. Without PV connectors, a system with multiple solar panels cannot be completed. The TE Solarlok connectors utilize an industry standard crimping tool that is ready available and are frequently used by installers today. The MC4 connectors are often seen as the industry



standard for the solar energy industry, with over one billion in practice. In a multi-panel configuration, the MC4 connectors are usually most common. Both brands are tested extensively to ensure functionality, safety, and reliability.

For parallel or serial-parallel connections of PV modules, Del City carries a Multi-Contact MC4 Branch Connector. A branch connector is used when multiple connectors need to be merged together. This is often seen in larger installs to minimize the amount of wires and save space. Multiple options ensure that the connection is secure for both a male and female housing. **The branch connector is easily pluggable with the inward connectors and makes for a very simple installation.** Like the original MC4 connectors, they provide constant spring pressure and are often seen as the industry standard in the solar industry.

In case you want to save even more time for your configuration, Del City offers Solar PV assembled cables. These come with connectors (MC4) already installed on each end. This reduces the need to crimp terminals or install the connectors on your individual wire. The connectors will still have the same easy pluggable install into each other. A male housing is found on one end and a female housing on the other. In case you aren't using the pre-assembled cables, Del City offers a Solar PV Crimp Tool in order to crimp your terminals and wire correctly to easy install either your TE Solarlok or MC4 connectors to your solar panels. This crimper is designed specifically to crimp PV connector contacts to create the most secure crimp. With this line of solar products, Del City wants you to be confident in your PV installation.



TE Connectivity Solarlok PV4-S Cable Couplers



Stäubli MC4 Cable Couplers



Stäubli MC4 Branch Connector



Stäubli MC4 Assembled Cable



HEYClip™ SunRunner® Cable Clips



SunBundler® Crimp Lock Cable Ties



TE Connectivity PV Crimp Tool

Next Steps

Del City doesn't plan to slow down anytime soon on adding new products and helping to be an industry expert in the electrical supply world. For more content, check out our blog at www.blog.delcity.net. Our team is more than happy to answer your questions, so don't hesitate to reach out at 1.800.654.4747. We hope you enjoyed learning more about solar power!

Del City offers Solar PV assembled cables. These come with connectors (MC4) already installed on each end.

