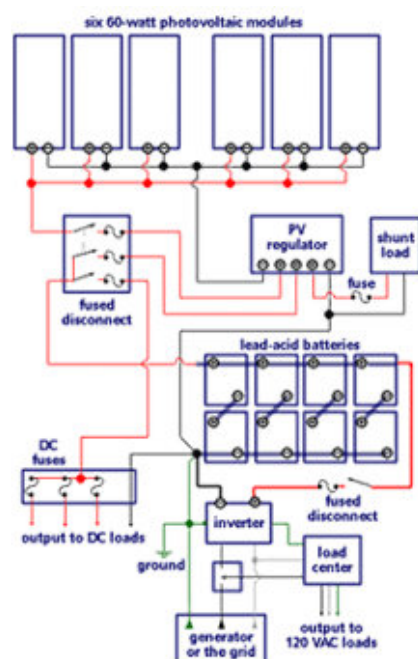


Solar Electric Overview

What are the Main Types of Solar Electric Systems?



[Click image above to see a larger diagram](#)

There are three main ways to configure a photovoltaic system. They are: Stand-alone; Hybrid; and Grid-tie systems.

The Stand-alone system uses an array of PV modules to supply your total electric needs. During the sunny days, excess energy is stored in a battery bank. That energy is then available for use at night or on cloudy days. PV systems are sized to keep you supplied even during the short days of winter or when it's cloudy for few days in a row. The advantage of this system is that it is completely independent of traditional energy sources and a fully functional system can be installed almost anywhere.

Hybrid systems use other energy generation sources in conjunction with PV. They are a great option for areas that don't have consistently sunny days. Wind generators are a good option in many areas. It is also possible to install a gasoline, diesel, or propane generator. A well-designed system configured in this way can supply all your power needs by running a generator just a few hours every day or two. This can save on wear, tear, fuel, and maintenance on your generator, as well as the annoyance of generator noise. The advantages of the Hybrid systems are their lower costs and their high margin of flexibility.

The third type of system is called "Grid-tie" or sometimes "Line-tie." In this system, the electricity your solar panels generate is fed directly into your local utility company lines. During the day, your system produces enough electricity to supply part or all of your electricity needs. Any excess power is sent back to the grid and either sold back to the utility company at cost, or your meter simply runs backward, lowering your electric bill. At night or when you need more power than you are producing, that power is supplied by your utility. One advantage of this type of system is that a battery bank is not required, which lowers costs. Many utility companies throughout the country offer incentives for Grid-tie systems. Check with your local electricity provider regarding the availability of programs. If you live in Tucson, Arizona and are in the Tucson Electric Power service area, click here to visit their Green Watts home page for more information.

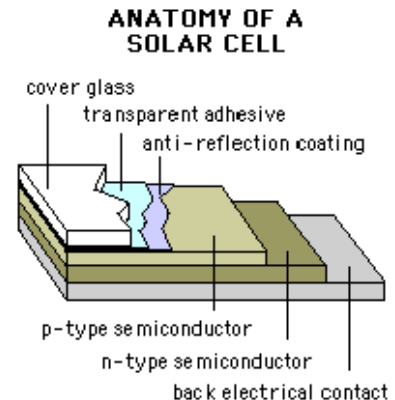
Components Of A Solar Electric System

What makes up a Solar System

Most common solar systems are made up of four major components: photovoltaic panels, a charge controller, batteries and if you are using AC appliances or selling back to the grid, an inverter. If you have more questions or would like some more in-depth info, please feel free to ask the experts at The Solar Store.

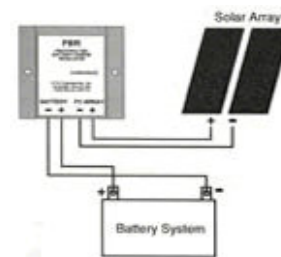
The Photovoltaic Panels

Photovoltaic panels, also known as solar panels or PV for short, are made of semiconductor materials. Within solar panels there are both a positive and a negative layer of semiconductor material. When sunlight hits the semiconductor layer in the solar panel, electrons travel across the junction of the two different layers of semiconductor materials, creating an electric current.



The Charge Controller

Any solar system that uses batteries needs a charge controller to protect the life of the batteries. A charge controller prevents the solar panels from overcharging the batteries, and stops the batteries from being drained by the solar panels at night. Many charge controllers also show information about your solar system's performance. Some even include a function called Low Voltage Disconnect, which prevents the batteries from being discharged too heavily. To pick the right charge controller for your system, you should first determine the type of batteries you'll be using (gel or lead-acid), then the voltage of your system (Usually 12, 24, or 48VDC) and the maximum amps your system can generate at that voltage. Remember, since charge controllers are relatively inexpensive, it is a good idea to oversize the charge controller. Doing so will not hinder system performance and will allow you to easily expand your solar array in the future.



The Batteries

Batteries are an essential part of any solar system that is designed to run during day and night. The two major types of batteries used in solar systems are lead-acid batteries and gel cell batteries. Lead-acid batteries are relatively low in cost but do require regular maintenance. Sealed gel cell batteries require almost no maintenance but can cost almost twice as



maintenance but can cost almost twice as much as lead-acid batteries and have larger physical dimensions. To determine the size requirement for your battery bank, see our Battery Sizing worksheet.



The Inverter

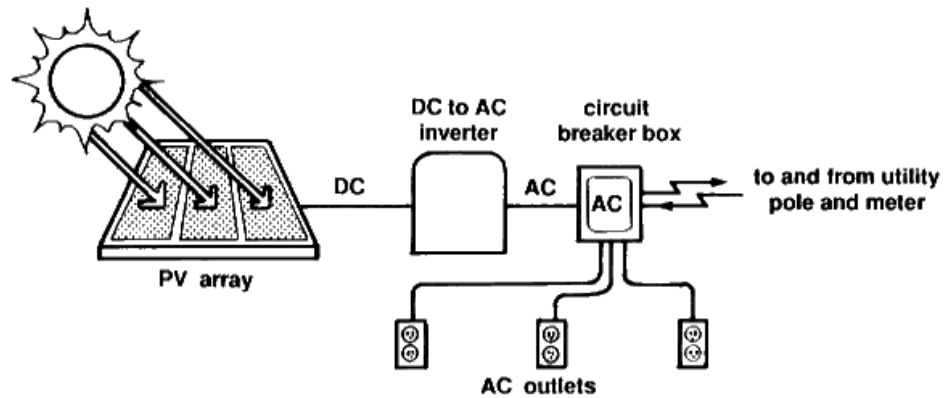
An inverter takes DC electricity from the solar panels or batteries, and converts it into the AC electricity used by common household appliances. Inverters generate one of three major “wave” characteristics. They are sine wave, quasi-sine wave and square wave. Sine wave inverters are required to run some sensitive electronics, and are usually recommended for large systems. However, since sine wave inverters are more costly, you can use modified sine wave inverters for running non-sensitive loads such as lights. There are many different brands and models of inverters. It’s a good idea to consider future expansion when choosing an inverter.



< [Back to Solar Electric](#)

Grid-Tied Systems

The Sunshare Program, the Best of Both Worlds



Tucson Electric Power (TEP) is one of the most solar friendly utility companies in the west. The recent unveiling of the Sunshare™ program allows everyone within the TEP service area to get involved in environmental protection while saving money and adding value to their homes.

What is a Grid Tie System?

A grid-tie system combines the comfort of a grid connection and the power of solar electricity into one system. Grid-tie systems are designed to feed directly into your main electric box to reduce your use of electricity from the grid. If your solar system is producing more electricity than you are using, the system will even feed power back to the grid. TEP offers net metering for the power you feed back to the grid. This means that if you are producing more power than you are using, it will spin your electric meter backwards, reducing your monthly bill.

What is the Advantage of a Grid-Tie System?


The main advantage is its cost and low maintenance costs and hassle. Since grid-tie systems feed directly in the grid, expensive and high-maintenance batteries are not needed. Also, since you are still connected to the grid, strict system sizing calculations are not required, giving you a large range of options. You can have a system as small as 1 KWH to reduce your electric bill, or a system that is large enough to virtually eliminate your electric bills.

Is the Grid-Tie System Cost Effective?

Grid-tie systems are cost effective when viewed in the long run. Although the current return on investment is projected to be about 20 to 25 years, there are several factors to consider. The cost of electricity is projected to increase significantly in the near future. Since the Sunshare™ program is net metered, the amount received from TEP via your grid-tie system will rise in proportion with the cost of electricity, reducing the time needed for the system to return its investment.

Another fact to consider is that solar panels carry a 20-year warranty, which guarantees that the panels will last as long as your return investment. Also, installing a solar system in your house will increase both the value of your home and its marketability. How do I qualify?

To qualify for the Sunshare™ Program you must be a TEP customer and have 550 square feet of un-shaded space exposed to the true south. The location of the PV panels must be within 100 feet of your electrical distribution panel. The solar panels must to be mounted at a 32 degree angle (this can be achieved with the mounting hardware included). TEP also requires their Sunshare™ customers to report meter readings and to have a flat rate billing plan. If you fail to qualify or do not agree with any part of the program, you can still have a net

metered grid-tie system designed by The Solar Store in accordance with your specifications. And, depending on your specifications, you may still qualify for the TEP rebate and the tax credit. Please call The Solar Store at  (520) 322-5180 or Contact Us to find out more about the Sunshare™ program, or any other solar system.

Solar Power For RVs

When most people buy their RV they do so to experience the freedom of America's wild open spaces while maintaining all the comforts of a home. Yet many RV owners find their aspirations for freedom limited by the need to plug into an RV park's power source to charge their batteries and run their appliances. Solar power can change this and give you the unlimited freedom you've always wanted. The Solar Store offers a variety of solar energy kits for RVs, ranging from a small battery maintainer to our Weekender and Full Freedom line which can keep you on the road as long as you wish. If you have any questions or would like a bigger customized system, just use the Contact Us form at left to email us and we will design one to fit your needs.

Please read I, II and III below

Kit Designation	Rated Power and Brand	Typical Daily Energy Output	Regulator Controller	Limited Warranty	Mount	Price
RV Maintainer Maintain batteries	10-11 Watts (16.5 VDC * .62 A)	3.72 Amp Hours / 66 Watt hours	Optional	Module 5 years regulator 5 years	UFB-01	\$175.00
Solar Helper Maintain multiple batteries	20-21 Watt (16.5 VDC* 1.20 A)	7.20 Amp Hours / 126 Watt Hours	SunGuard SG-4	Module 5 years regulator 5 years	UFB-01	\$285.00
Weekender Weekend use only	50-65 Watt (16.7 VDC * 3.0 A)	18.0 Amp Hours / 300 Watt Hours	SunSaver 6 SS-6L	Module 20 years regulator 5 years	UFB-01	\$485.00
Dry Camper Unplugged camping	72-80 Watts (17.5 VDC * 4.6 A)	27.6 Amp Hours / 480 Watt Hours	SunSaver 10 SS-10L	Module 20 years Regulator 5 years	UFB-01	\$645.00
Dry Camper Expander Add-on panel	72-80 Watts (17.5 VDC * 4.6 A)	27.6 Amp Hours / 480 Watt Hours	(change to a sunsaver 20 SS-20L)	Module 20 years	UFB-01	\$670.00 (controller upgrade \$25.00)
Full Freedom Long-term remote camping	115-125 Watts (17.6 VDC * 7.1 A)	42.6 Amp Hours/ 750 Watt Hours	Mark-15	Module 20 years regulator 5 years	UFB-01	\$1050.00
Full Freedom Expander Add-on panel	115-125 Watts (17.6 VDC * 7.1 A)	42.6 Amp Hours/ 750 Watt Hours	(change to a Mark 22)	Module 20 years	UFB-01	\$1060.00 (controller upgrade \$10.00)

*Voltage at Pmax

I. Specifications are based on panel placement at full right angle to the Sun and 6 hours of full sun per day. Actual watts are dependent on location and climate.

II. Each kit includes instructions, flush mounts, mounting fasteners, 20' of 10/2 UV resistant wire w/ strain relief, regulator (if applicable) and connectors required for typical installations.

III. Due to a worldwide solar panel shortage, all prices are subject to change, and all prices are estimates. Please call for further information.

Solar Cooling


Did you know that heating and cooling are by far the most energy consuming activities in your home? Wouldn't you like to prevent your electric bill from skyrocketing every summer? Although proper insulation is still essential for cutting energy costs, you can now cool your entire house with the power of the sun by using the SolarChill® evaporative cooler, developed by Southwest Solar.

How does it work?

The SolarChill® units are easy to install and work well in both an urban and rural setting. The SolarChill® is a custom built evaporative cooler designed to run efficiently on a 12 VDC current either directly from a PV panel, or from a PV panel through a battery. Wiring is quick and simple and you can cool your house with the power of the sun in a matter of hours.

How do I select a system?

The best way to size a system is to measure the cubic area of the room you're planning to cool and match it with the CFM of the SolarChill®. The recommended PV watts are located to the right. The low end number in this field indicates the size of PV Panel that will operate your cooler only during peak sunlight hours, typically between 11AM to 4PM in the summer. The high-end number in this field indicates an oversized panel that will provide enough voltage and current in non-peak sunlight hours to run your SolarChill® most of the day. If you plan to operate your SolarChill® during the night, contact The Solar Store for sizing. Please use the Contact Us form at left to email us, or call us at

 (520) 322-5180 if you have any questions.

New 110 VAC Models for On-Grid Locations

Model	Size in Inches H, L, W	Fan Diameter	Actual Watts	CFM	Price	Recommended PV watts
24120HP	35.5-22-36	24"	240	520	\$1084	320-500

12 Volt Models

Model	Size in Inches H, L, W	Fan Diameter	Actual Watts	CFM	Price	Recommended PV watts
1412XP	19.5-21-24	14"	38-52	1150	\$637	60-80
2012HP	26-21.5-24	20"	53-73	2000	\$695	85-130
2412HP	35.4-22-36	24"	80-120	4000	\$925	120-200
2-2012HP	29-22-48	2@20"	95-130	4400	\$1052	150-260

24 Volt Models

Model	Size in Inches H, L, W	Fan Diameter	Actual Watts	CFM	Price	Recommended PV watts
1424XP	19.5-21-24	14"	42	1200	\$650	60-80
2024HP	26-21.5-24	20"	70	2200	\$703	85-130
2424HP	35.5-22-36	24"	105	4000	\$969	110-180

2-2024HP	29-22-48	2 @ 20"	130	4400	\$1137	150-240
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Kar Kools 12 volts

Model	Size in Inches H, L, W	Fan Diameter	Actual Watts	CFM	Price	Recommended PV Watts
212	11.4, 13.3 10.3	2 @ 4.5"	20	200	\$229	30-40
312	11.5, 14, 17	3 @ 4.5	24	300	\$252	35-45
412	11.5, 14, 17	2 @ 5.5	65	400	\$274	85-120