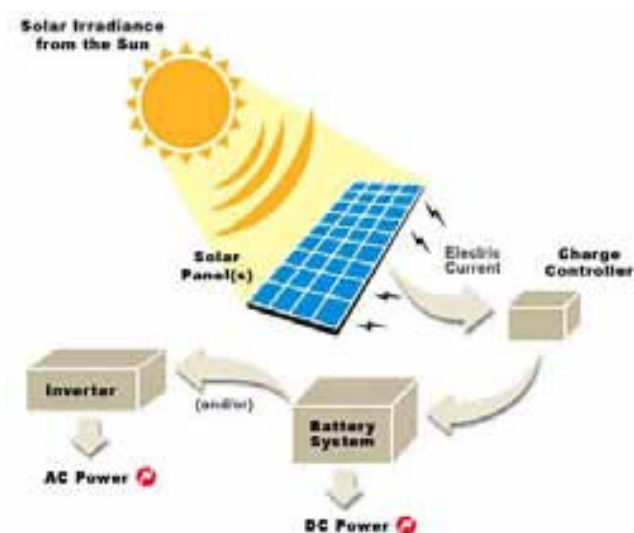
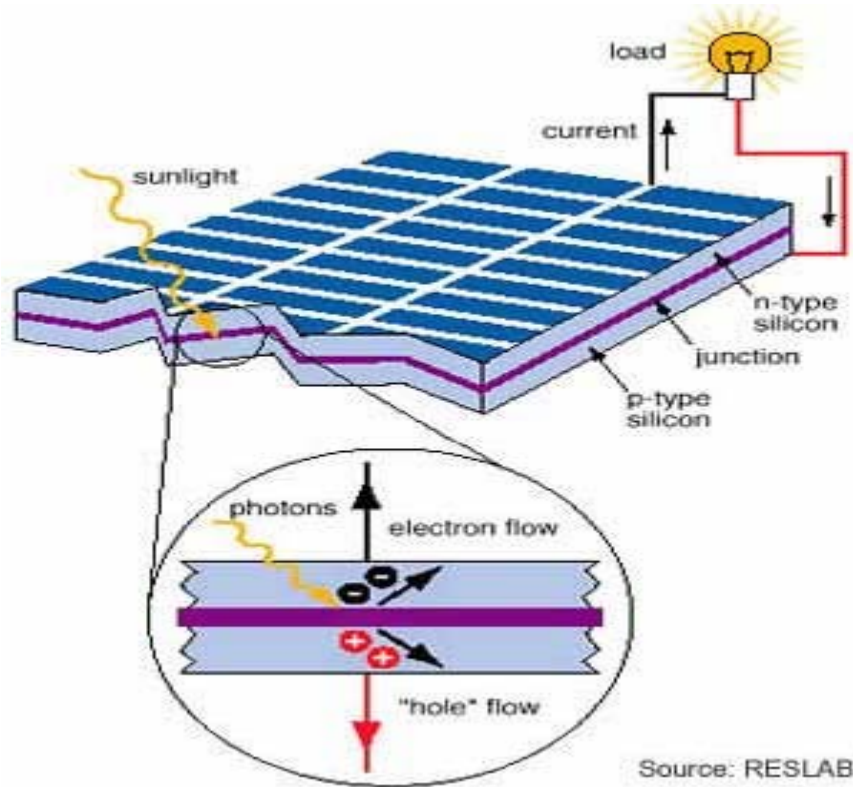


**How does solar power and P.V panels work**  
the urban gardener  
Australia's online hydroponics supplies & indoor grow shop

Solar power has the extraordinary ability to give us an abundance of energy just by hitting the earth surface.

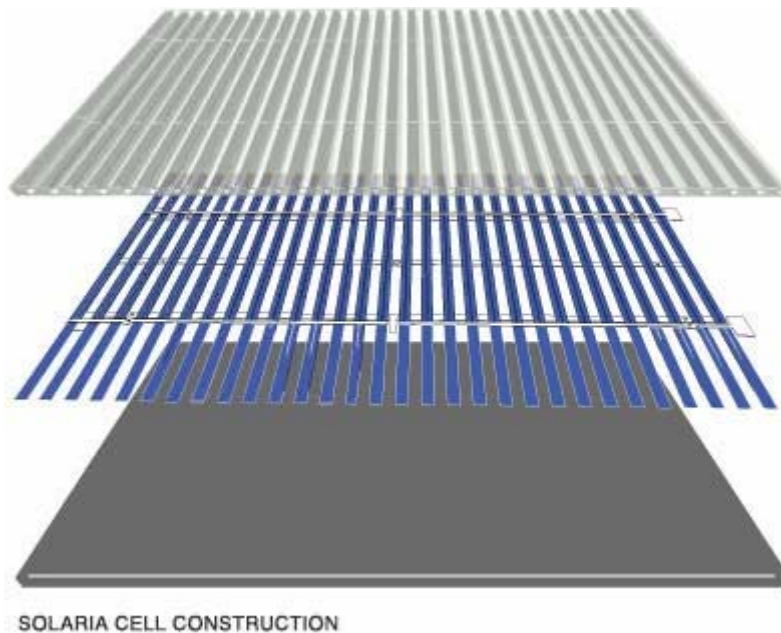


Energy from the sun reaches a particular earth surface and we then convert this energy into the usable form called electricity. Solar panels are used to collect the solar energy and convert it to usable energy. In order to do this solar panels use photovoltaic cells (PV). The word photovoltaic actually means light electricity. Photovoltaic cells are composed of semi-conductors. Although there semi conductors can be made from many materials, the most common is silicon.



Energy from the sun's rays cause a reaction when they hit the surface of the semi- conductor. The chemical composition of the solar panel allows for the energy hitting the surface to be absorbed, which in turn, causes the electrons to move away from the atoms creating electricity.

Currently, the technology used in semi-conductors is limited allowing only a percentage of energy from the sun to be absorbed. Fortunately, everyday advances are being made in this field which will allow for more solar energy to be absorbed and converted.



## Why use Solar Power

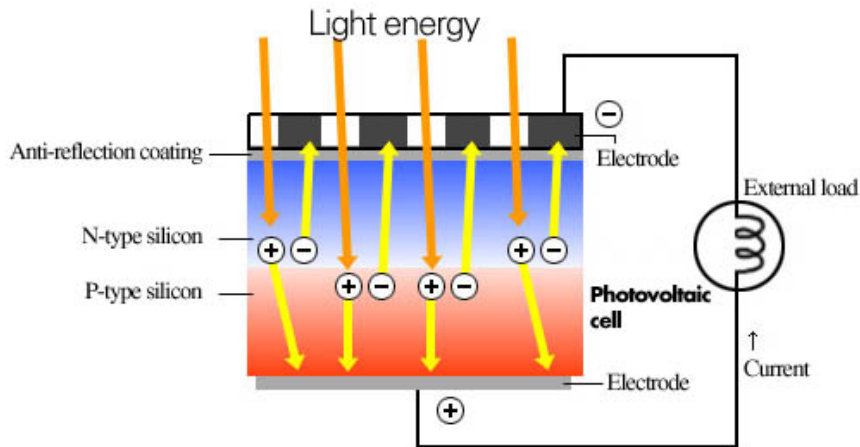
Before you even begin considering your solar options, it's important that you know why, exactly, solar is right for you. Without getting into any of the humanitarian reasons for doing it, like the environment or cleaner air, let's look at real, measurable reasons. First off, the cost to power your home, cabin, RV, and other things is rising. Electricity is hitting more and more of us squarely in the pocket book. So more and more people, like you, are looking into alternative ways to generate electricity to cut down their bills. Guess what? This is not the best reason to get into solar. I know, seems counter-intuitive for someone writing a book about solar power and PV panels to tell you that solar may not be the right answer for you. But it's the truth. Solar is a great way to generate electricity and is perfect for the situations its best suited for. There are times, however, when other alternatives may be better but not often.

## (PV) cells and solar panels

The word "photovoltaic" is actually a mixture of two Greek words: "photo" (light) and "Volta" (the Italian physicist who is credited with inventing chemical batteries). So photovoltaic means "light into electricity." Remember this, because you'll see a lot of literature on solar energy, solar panels, and solar heating that are not systems to create electricity from the sun, but instead are other solar applications, such as water heating, home heating, and so forth. It's

also important to note that while photovoltaic apply to the creation of electricity from sunlight, there is more than one way to do it.

**A photovoltaic cell generates electricity when irradiated by sunlight.**



Those “solar panels” we all think of automatically are only one way that the sun's rays are being captured and turned into electricity. Regardless, we're talking about smaller-application systems which utilize those solar panels you're familiar with seeing and not “solar collectors” or “solar hydro-electric systems” that boil water using intensified sunlight and then convert the boiling water into power. All those aside, let's look at the basics of how those black solar panels you've seen and read about actually work. Each panel is made up of cells, usually lined up in a grid or honeycomb pattern. Each cell captures light from a specific spectrum (or range of) and converts that into electricity. The material used to make each cell can vary a bit from panel to panel, depending on the technology used, but it's usually a semiconductor material of some kind. The light in the spectrum(s) they're tuned to agitates the electrons within the cell, causing them to move. The freed electrons travel through the material and become electricity in a direct current (DC), flowing in one direction (due to the design of the solar cells). This electricity can then be manipulated to be used in applications like lighting, heating, etc. In today's technology, panels are improving almost daily and can catch and utilize a much wider spectrum of light than panels of only five years ago could. In fact, your latitude is no longer the major issue it once was in determining whether PV is right for you because these much wider spectrums of capture mean that even places with limited peak sunlight exposure can get great results from their solar PV system.



## Types of solar power system

There are three basic types of solar-electric generation systems for use in small and residential applications: autonomous, hybrid, and grid-connected. Each system is unique in how it applies solar power to the application it's intended for, but each has the common characteristic of using solar PV systems to generate the electricity in the first place.

**The Autonomous System** of solar PV is merely a solar-electric system that is used as the only means of generating electrical power for the application. This is often the choice when powering a specific appliance or process that does not need to be active 100% of the time, such as night lights, road signs, water pumps, and so forth. Autonomous systems are used in everything from the simple little patio lights you buy at your local hardware or home improvement store to automatic livestock water trough pumps and electric fencing. This is one of the cheapest and fastest ways to set up a solar PV system.

**The Hybrid System** of solar PV is a system that relies on solar electric generation as the primary means of generating electricity for the application, but has some kind of backup generator for ensuring the system is powered as close to 100% of the time as possible. This is usually the setup for remote cabins, recreational vehicles, and some security applications. The backup generator is usually gasoline or diesel fuel powered and will automatically start up whenever the power in the system reaches a specified low point or when a bank of batteries for power storage reaches a low charge.

Finally, the **Grid-Connected system** is the most common residential setup for solar PV. In this application, the house or building to be powered by solar is also connected to the utility power grid, which supplies the electricity not supplied by the PV system. In most residential applications, the solar PV does not supply enough power to run the entire household, but is instead a supplement to the power purchased from the local utility. In times of peak production, extra power from the solar panels not being used by the home is returned to the power grid and credited, while in times of low production, power is mainly derived from the grid while the PV system lies dormant. Solar PV systems use batteries to

store excess power for later use, with the exception of many grid-connected systems. Since batteries can often make up nearly half the cost of the solar PV system itself, it's no wonder they get left out when they aren't really required.

### **Advantages and disadvantages of solar power**

Solar power generation has definite advantages and a couple of strong limitations as well. Before you make a decision as to whether solar is right for your application, let's look at those pros and cons. Solar power advantages are many. The creation of electricity with PV requires no moving parts or loud motors, so it is quiet, and safe. It is also very versatile and can be utilized in a number of applications where other forms of electrical generation are not feasible or would require great cost to implement. Solar PV systems are also easily built to be modular, so adding to them for future expansion is very simple once the system is in place. Solar has a few disadvantages as well. First, the initial costs of solar are more expensive per watt generated than most other forms of alternative electrical generation. Solar is also not 100% reliable 100% of the time and can only generate electricity during specific times of the daylight hours. Solar electricity is also not as efficient as some other means of generating power when you consider the losses incurred through conversion and storage of the power generated.



