



Brighter Energy Solutions

ALTERNATIVE ENERGY TO FUEL YOUR POCKET

» Solar Energy Guide - Information and FAQs ebook

Welcome to the alternative energy series of [ebooks](#) brought to you by SolReka. In this free ebook you will learn about the power of solar energy, and the multitude of viable and alternative technologies which can be used by harnessing the power of the Sun.

Did You Know: “Nine quadrillion, that’s (9,000,000,000,000,000) kilo watts of solar energy fall on the continental United States every hour. This is the equivalent energy available from 4.25 trillion barrels of oil per day. Utilizing just 0.001% of this renewable resource would satisfy all our energy requirements.”

SolReka’s Energy Policy Mission Statement

To develop SolReka as a leading company for sustainable energy use and to promote the importance of alternative energy products for the economic, social and environmental well-being of all market sectors.

Statement of commitment

SolReka is fully committed to the following: -

- Offering sustainable and alternative energy products.
- Reducing our dependence on finite fossil fuels.
- Help reduce emissions of greenhouse gases.
- Actively promote and help reduce consumer energy costs.



For more information, please visit [energy solutions](#) section.



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Solar Power Uses

Solar power is used in a number of different ways. There are two very basic kinds of solar energy:

- Solar thermal energy collects the sun's warmth through one of two means: in water or in an anti-freeze (glycol) mixture.
- Solar photovoltaic energy converts the sun's radiation to usable electricity.

Here are the five most practical ways that solar energy is used: -

1. Small independent [solar photovoltaic systems](#). We see these used everywhere, from calculators to garden lights. Portable units can be used for everything from RV appliances while single panel systems are used for traffic signs and remote monitoring stations.
2. Solar pool heating. Running water in direct circulation systems through a solar collector is a very practical way to heat water for your pool or hot tub.
3. Solar thermal energy using glycol to heat water. In this method (indirect circulation), glycol is heated by the sun's rays and the heat is then transferred to water in a hot water tank.

This method of collecting the sun's energy is more practical now than ever. In areas as far north as Edmonton, Alberta, solar thermal to heat water is economically sound. It can pay for itself in three years or less.
4. Integrating [solar photovoltaic energy systems](#) into your home or business power. In many parts of the world, solar photovoltaics is an economically feasible way to supplement the power of your home. In Japan, photovoltaics are competitive with other forms of power. In the US, new incentive programs make this form of solar energy ever more viable in many states. An increasingly popular and practical way of integrating solar energy into the power of your home or business is through the use of building integrated solar photovoltaics.

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5. Large independent photovoltaic systems. If you have enough sun power at your site, you may be able to go off grid. You may also integrate or hybridize your solar energy system with wind power or other forms of renewable energy to stay 'off the grid.'

Several less commonly used applications which also harness the power of the sun include: -

Solar Cooking

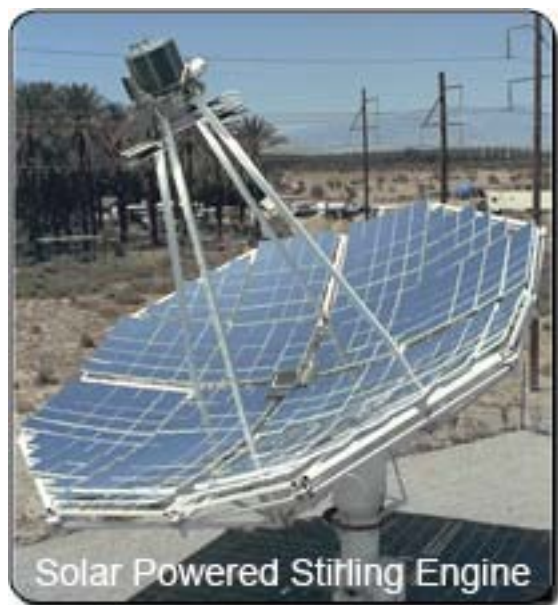
A solar oven or solar cooker is a device which uses sunlight as its energy source. Because they use no fuel and they cost nothing to run, humanitarian organizations are promoting their use worldwide to help slow deforestation and desertification, caused by using wood as fuel for cooking. Solar cookers are also sometimes used in outdoor cooking, especially in situations where minimal fuel consumption or fire risk, are considered highly important.

If you would like more information on different types of solar cookers, or perhaps you would like to have a go at building a pizza box, or parabolic solar cooker; then why not check out our solar cooking section.



Build a parabolic solar cooker ebook guide

Stirling Engines



The Stirling engine was invented in 1816, before the gasoline and Diesel engines. A Stirling engine can use any type of fuel, as well as solar energy and hot spring heat.

A Stirling engine is a closed-cycle regenerative heat engine with a gaseous working fluid. "Closed-cycle" means the working fluid, the gas which pushes on the piston, is permanently contained within the engine's system.

For more information visit: <http://stirlingengine.com>



Photovoltaic Solar Panels

Photovoltaic: (PV) solar technology turns light into electricity. It doesn't require direct sunlight, so it works even in cloudy Britain. The "clean" energy produced does not contribute to climate change - it produces no pollution, and is completely silent. There are no moving parts, so it is reliable and low-maintenance. There are no running costs, so once your system is installed the electricity is free.

How does PV solar work?

PV solar operates on the principle that electricity will flow between two semiconductors (typically crystalline silicon) when they are put in contact with each other and exposed to light. By linking a number of these 'cells' into a panel (also called a panel); a useful flow of electricity can be generated. Any number of panels may be used in a system, providing a very flexible approach to power generation.

Power from light

Photovoltaic (PV) devices convert light into electrical energy. PV cells are made of semiconductor materials such as silicon. When light shines on a PV cell, the energy is transferred to electrons in the atoms of the PV cell. These electrons become part of the electrical flow, or current, in an electrical circuit. The first wave photovoltaic cells used thick silicon-wafer cells but were cumbersome and costly. The second generation of photovoltaic materials were developed about 10 years ago and use very thin silicon layers. These brought the price down dramatically but still need expensive vacuum processes in their construction. The third wave of PV, can print directly on to other materials and does not use silicon.

Is the power produced by PV solar free?

Once you have bought and installed your equipment, yes, it is free. The system should not require any maintenance and uses no consumables; there are no ongoing fees.

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What can I use PV solar for?

PV solar produces electricity, and as such can provide power to any device that uses electricity. The electricity generated when light hits a PV material is direct current (DC), which is the same as that produced by a battery. This means that [PV solar systems](#) can run battery-operated equipment or charge batteries. Some typical examples of solar powered devices using DC power are: fluorescent lights, boat or caravan battery charging, phone charging, PDA charging, portable fridge, pumps. Using an inverter, the DC current produced by PV can be converted into alternating current (AC) to power mains-operated devices, like a portable television, laptop or radio/CD player.

Can I use PV solar to provide mains power to my house?

Yes, PV can provide all or most of the power you use in your house. Buying and installing the equipment to provide this amount of power is expensive (typically at least £10,500), but can be cost-effective where grid connection would be expensive. Nevertheless, the most popular type of solar PV system for homes and businesses in the UK is grid connected. Your [solar system](#) is connected to the local electricity network allowing any excess solar electricity produced to be sold to the utility. Electricity is taken back from the network outside daylight hours.

Alternatively, you can achieve complete independence from the grid by connecting your solar system directly to a battery that stores the electricity generated and acts as the main power supply. This is ideal for remote buildings, where the cost of connecting to the grid is high.

What about clouds and cold weather?

PV solar panels actually operate better at colder temperatures (some of the best efficiencies ever recorded were at the South Pole!). They also continue to work even in cloudy conditions, although they do produce less electricity. Under a light overcast, the panels might produce about half as much as under full sun level, ranging down to as little as 5-10% under a dark overcast day.

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How do I use PV power at night or in bad weather?

When combined with a battery, PV solar can be a reliable source of power day and night, rain or shine. PV systems with battery storage are being used all over the world to power lights, sensors, recording equipment, switches, appliances, telephones, televisions, and even power tools.

What do I need?

We have especially tried to 'make solar simple' and have therefore developed some kits for specific applications. These kits have been designed so that they include everything that you will need, and in some cases we have connected some of the components together. We provide simple instructions, which have been tested. If the kit does not provide a battery, you will usually need to know the voltage and capacity in Ampere Hours (Ah) of the battery that the system will be connected to. Naturally, if you have an application for which we do not yet have a kit, contact us and we will endeavour to help. We also sell a range of individual [panels and accessories](#) for those of you who are technologically confident!

How difficult is it to install and use?

This depends on what you buy! We provide kits to take the guesswork out of what components are required in a system, and with these, we provide easy, tried and tested instructions. Simple kits, particularly the mobile power kit and the small boat or caravan kits require little or no installation as they can be connected to a battery via a cigarette-lighter cable. Other kits require very simple wiring. Once installed correctly, PV is very simple to use - simply plug in your appliance. Some customers use their panels for multiple applications, and in some of these cases they need to unplug one connector and replace it with another.

How I can work out what size panel I need?

The type of panel you choose will depend on two things: how much power your panel will produce and what you want to use the panel for.

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How much power will a kit provide?

- The average daily output of each solar kit assumes 4 hours of good sunlight, and that your panel is ideally orientated to the sun.
- Output will be considerably less during overcast conditions, particularly over winter.
- Conversely, there may be times when the output is higher.

How much power do I need?

As a rough guide only:

- Trickle charging: 5-20W
- Weekend leisure, top-up charge: 20-80W
- Touring and live-aboard: not less than 80W

If you are not sure please [email](#) us for guidance.

The more information you can provide, the more accurately we can size a system for you.

It is helpful to know:

- What you want to power and any electrical details (W,A,V) you have,
- Whether it is mains or battery operated,
- How long you want to use it for each day,
- Whereabouts you want to use it and at what times of year.
- If you already have a battery we'll need to know its capacity (Ah).
- Any other information you have, like the appliances Watts or Amps, is also helpful.

How much power will it produce?

The power (watt hours) produced from your panel can be estimated by multiplying the power rating by the number of hours peak sunshine. As a very rough guide, the UK, northern Europe and Canada average 1 hour of peak sunshine per day in winter and 3 hours in summer. Thus, a 30 watt panel will produce 90 watt hours of power on an average British summer's day.



Will this be enough?

The amount of power you need can be calculated by multiplying the power of your appliance by the length of time you expect to use it each day. For example, if you expect to use a 30 watt CD player for two hours a day you will require 60 watt hours of power. The power (watts) used by an appliance should be written somewhere on the appliance. If you cannot find it, look for Amps (A) and volts (V) and multiply them together to estimate watts ($A \times V = W$).

How do I choose a battery?

Battery size (Amp hours, or Ahrs) will depend on the amount of power you need each day (see the previous question 'Will this be enough?'), and the number of days you want to be autonomous for (that is, how many days you want the battery to supply power without being recharged by the PV panel). The daily power (watt hours) required, multiplied by the number of days autonomy, gives you the amount of available power that the battery needs to be able to supply. Thus if you require 60 watt hours every day, and 5 days autonomy, you need 300 watt hours available. However, as most batteries cannot be drained more than half empty, total battery storage needs to be at least twice the available power. In our example the battery would thus need to hold at least 600 watt hours. Battery size in Ahrs is then obtained by dividing the battery storage by the battery voltage (usually 12 or 24 volts). Thus, $600/12$ gives 50Ahrs. In this case, the battery would need to be at least 50Ahrs.

What type of battery should I use?

It is possible to use any 12V flooded or sealed lead-acid battery with our panels, though it is better to use a "deep cycle" battery. Deep cycle batteries are designed to endure sustained discharge whereas some batteries, e.g. car battery, are designed for short bursts of energy only. We recommend a 75Ahr flooded lead acid battery.

Is PV solar environmentally friendly?

Yes. PV solar is a renewable energy that does not rely on burning fossil fuels (technically, the sun will stop burning in 4.5 billion years but for all practical purposes, it provides an endless source of energy!). More energy reaches the earth from the sun in one day than would be



consumed by the world's population in 27 years. Even better, PV solar generates no CO2 so does not contribute to global climate change. While operating, it is silent and emits no pollutants or waste, and it requires no fuel.

Is PV solar a new technology?

Although PV was first described in 1839 (by French physicist Edmond Becquerel, when he was just 19), its commercial development began only in the 1940s. By 1954 Bell Laboratories had produced a 4% efficient crystalline silicon cell. Since then, development of sophisticated semi-conductors has increased operating efficiencies to more than 14% (and even more in the laboratory) and brought down prices. In the 1950s and 1960s PV cells were used in space, for example, powering radio transmitters on satellites, and solar-powered satellites continue to be launched every year. Today, however, PV is used around the world for applications ranging from large-scale power generation to building power to battery charging.

Summary

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Please take a moment to check out other books in the series on alternative energy and sustainable energy solutions by visiting [ebooks section](#).

Recommended reading: -

[Earth4Energy](#) - Create electricity at home. Reduce your bills by 80%.

[Build a parabolic Solar Cooker](#) – Easy to follow instructions; includes parabolic template.

[Home Made Energy](#) - Guide to generating your own electricity.

Peace, light, and love

SolReka Ltd

www.solreka.com

Brighter Energy Solutions