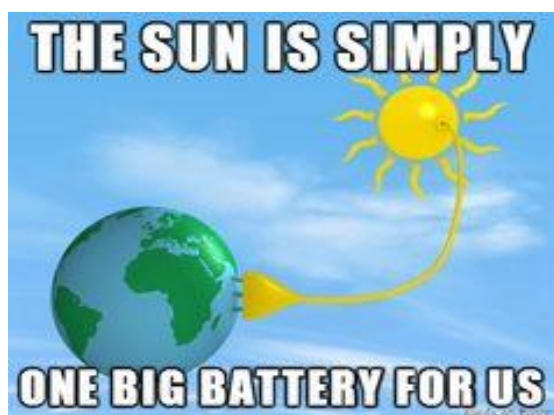


Solar To Go...

Solar power has become a reality in today's world. An increasing number of homes, offices, schools and other buildings are taking advantage of the new technology.



A BRIEF INTRODUCTION TO SOLAR ENERGY

Electricity can be generated directly from sunlight, by silicon solar cells – photovoltaic cells. They can be likened to a generator using sunlight as fuel. The electricity generated from the photovoltaic cells can be used immediately or stored in a rechargeable battery.

THE SOLAR CELL

The solar cell is a silicon based, brittle glass like material. The cell is approximately 0.3mm thick. When in use, it has to be mounted accordingly.

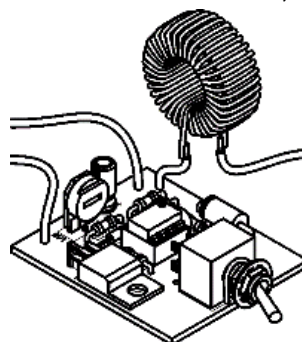
A single cell, when exposed to sunlight generates electricity, at its maximum power point, this is about 0.5 Volts with the current (Amperes) depending on cell area and Sun intensity.

The power generated by a cell when exposed to sunlight at an energy level of 1000 watts per square metre is its rated power.

At lower sun energy levels less power is produced. The maximum power voltage of about 0.5 Volts per cell remains fairly constant, while the current produced drops proportionally to the reduction of sun energy level.

Until recently school solar projects have been expensive and complex. Now we provide both kits and components suitable for entrance level and beyond.

Working closely with the Victorian Model Solar Vehicle Association and manufacturers, we are pleased to



provide a unique range of solar panels that have become the preferred panels for model competitions. Our product range includes parts for basic projects and “must haves” for

competitive solar vehicles e.g. **SOLAR PANEL POWER CONTROLLER** – Low Voltage (Code: SOLLV)

State run competitions for solar powered vehicles provide a great opportunity for development of new concepts in a fun event. Check the current state regulations on your state website or through Australian International Model Solar Challenge.

<http://nationals.modelsolar.org.au/>

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Q: How do I decide what gear ratio to use for my model solar car?

We can make no suggestions, as you need to work out the desired gear ratios for your own car. This depends on your car's wheel diameter and the solar panel's power. Please check the Victorian Solar Associations website for a simulator. That will allow you to calculate gear ratios.

Q: What can I use as a light source for the solar panels?

As for a light source, a good cheap indoor option is a halogen flood lamp of about 500 watts. These are available for a reasonable price. If you use such a lamp directly facing the panel and about 300mm away, you can expect about 50% Sun equivalent.

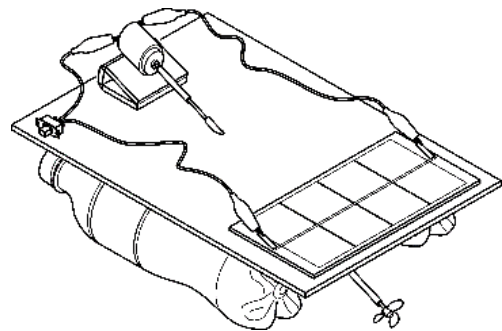
Caution - the lamp puts out more heat than the Sun so keep testing time short and allow the panel to cool down between tests.

Q: Does the solar panel or motor have storage capacity?

The solar panel is a direct power source - switch it on, put it in the sun and it will go (given a sufficient level of sun intensity - the intensity can be measured using one of our Calibrated #10 panels). Neither the panel nor the motor has any storage capacity.

Q: We want to introduce Solar boats to our school's programme. We do not have a large budget. What do you suggest?

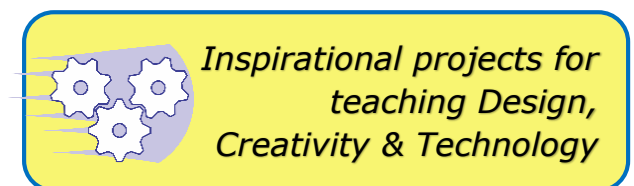
We offer an "Intro Solar Boat" boat kit, to introduce the concept of solar to students. However, if your budget doesn't extend to one kit per student, you can buy the motor and other parts and small solar panels separately. This way you can let each student build a boat, but share solar panels to control your budget.



If you wish to participate in the Model Solar boat competition the same applies – you can buy a small amount of competition panels to share around.

The "**Intro Solar boat kit**" is priced around the \$20 mark, and provides a lot more than just the panel and motor. Check out the Teaching unit (Instructions) that lists all the components that are included in the kit.

We have deliberately kept the price for these kits low. We support the **Victorian Model Solar Vehicle Challenge** organisation to further the aims of ensuring our youth / future citizens are learning about responsible energy consumption.



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SUN RELATED FACTS ABOUT SOLAR ENERGY:

"Solar" is the Latin word for "sun".

The interior of the Sun is extremely high in temperature, being filled with dense gases. Heat and light from the Sun are produced through a process called nuclear fusion.

Our Sun is actually a dwarf star. It is considered to be a mid-sized star compared to the billions of others throughout the universe.

The Sun is one million times larger than the Earth.

Light travels at a speed of 186,282 miles per second. It takes light, 8 minutes and 19 seconds to travel 93,000,000 miles from the sun's surface to Earth.

The earth receives about 1,366 watts of direct solar radiation per square metre when the Sun is directly overhead.

Solar Energy is measured in kilowatt-hour. 1 kilowatt = 1000 watts. One kilowatt-hour (kWh) of energy will burn a 100 watt light bulb for 10 hours.

The sun is also the main source of non-renewable fossil fuels (coal, gas and petroleum) which began life as plants and animals millions of years ago.

The amount of solar energy intercepted by Earth in one minute is approximately equal to the total electrical energy artificially generated on Earth in an entire year.

The Earth receives more energy from the sun in an hour than is used in the entire world in one year.

The fossil fuel we use to power our vehicles is actually a form of stored solar energy. The biomass that has been changed into oil by the Earth's geologic activity was originally formed as a result of solar energy.

Approximately 50% of the sun's energy is absorbed by the Earth's surface, while another 30% is reflected back from the Earth's surface.

The sun's energy reaching the earth's surface varies depending location, however a value of 1000 watts per square metre has been chosen as the standard energy level for measuring the power output of solar panels.

99.99% of all the solar energy in the form of solar radiation "goes to waste".

SOLAR ENERGY HISTORY :

Solar energy has been used for over 2700 years. In 700 BC, glass lenses were used to make fire by magnifying the sun's rays. In 1447, Da Vinci predicted there would be a solar industrialization.

In the 1830s, the British astronomer John Herschel used a solar collector box to cook food during an expedition to Africa.

In 1839 Alexandre Edmond Becquerel discovered the photovoltaic effect which explains how electricity can be generated from sunlight.

The first solar cell was constructed by Charles Fritts in the 1880s – it had a conversion efficiency of just 1%

Albert Einstein won the Nobel Prize in 1921 for his experiments with solar power and photovoltaics.

In 1941, Russell Ohl invented the solar cell, shortly after the invention of the transistor.

In 1954, scientists at Bell Telephone discovered that silicon (an element found in sand) created an electric charge when it was exposed to lots of sunlight. A few years later, silicon chips were used to help power space satellites.

A world record was set in 1990 when a solar powered aircraft flew 4060km across the USA, using only the sun's energy for its fuel.

ADVANTAGES OF SOLAR ENERGY

Solar power produced by photovoltaics is pollution free. It has no moving parts, and does not require any additional fuel, other than sunlight, to produce power. Solar panels are virtually maintenance free. There are no recurring costs.

Weight for weight, advanced silicon based solar cells generate the same amount of electricity over their lifetime as nuclear fuel rods, without the hazardous waste. All the components in a solar panel can be recycled, whereas nuclear waste remains a threat for thousands of years.

Water consumption is greatly reduced by changing over to solar energy.

Poisonous gas emissions are greatly reduced when solar energy is used.

It is estimated that the world's oil reserves will last for about 50-60 years, whereas sunlight is available for another 6.5 billion years, according to NASA and there is no way that we could over consume it.



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SOLAR ENERGY COLLECTION

The generation of electrical power is the most exciting use of solar energy. There are two common methods of generating electricity using photovoltaics. The most common method which can be seen in urban areas is the use of roof mounted solar panels. The less common method uses special solar panels and has sunlight concentrated onto them using mirrors or special lenses. This method requires large areas to set up the mirrors etc. and complex cooling systems on the solar panels. It is normally only used for industrial type arrays.

The solar technology can be distinguished into active and passive. Photovoltaic panels and solar thermal collectors which harness solar energy are examples of active solar technology. Passive technology includes constructing rooms to improve air circulation, orienting space to favourably use sunlight.

The typical home solar system that most people would be familiar with consists of roof mounted solar panels coupled to an inverter which is connected to the electricity mains. Energy produced by the solar panels and not used in the home is fed into the mains and the householder is given credit for this energy on their electricity bill. Obviously, during the night when the panels are not producing electricity, the house draws electricity from the mains and the householder is charged for this power. In areas not serviced by mains electricity, the typical system consists of several solar panels, an inverter, a battery, a charge regulator, wiring, and support materials. Sunlight is absorbed by the solar panels and is converted to electricity by the installed system. The battery stores electricity that can be used at a later time, like cloudy days or during the evening.

The amount of energy that goes into creating solar panels is paid back through clean electricity production within anywhere from 1 – 2 years, depending on where they are used. This compares with a serviceable life of decades.

By relying on battery backup, solar energy can even provide electricity 24 hours a day - even on cloudy days and at night.

Solar energy which comprises of radiant heat and light from the sun can be harnessed with some modern technology like photovoltaic, solar heating, artificial photosynthesis, solar architecture and solar thermal electricity.

It would take far less than 1% of the Earth's land area covered in solar panels to supply all of the world's electricity needs.

If all the rooftops in Australia were covered with solar panels, it would supply all the nation's electricity needs.

Thermal storage systems can store solar energy in the form of heat by using common materials with high specific heat such as stone, earth and water. Solar energy can be stored also in molten salts.

The fastest growing market for solar energy is in Third World Countries that have an abundance of sunlight and a population without electricity.

OTHER USES OF SOLAR ENERGY

Solar energy has been used by humans for heating, cooking food, drying food, removing salt from seawater and drying clothes.

Clothes can be dried in the sun using clothes lines, cloth racks etc.

Food can be cooked, dried or pasteurized using solar energy.

Horticulture and agriculture seek to make the maximum use of solar energy. These include techniques like timing of planting cycles and mixing of plant varieties. Green houses are also used to convert light into heat to promote year round cultivation of special crops.

Solar energy can also be used to treat waste water, salty and brackish water. Creating salt from sea water is also one of the oldest uses of solar energy.

Solar energy can also be used to heat swimming pools, power cars, for attic fans, calculators and other small appliances. It produces lighting for indoors and outdoors.

Space missions by various countries use solar energy to provide on board power their spaceships.

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