Soft Technology

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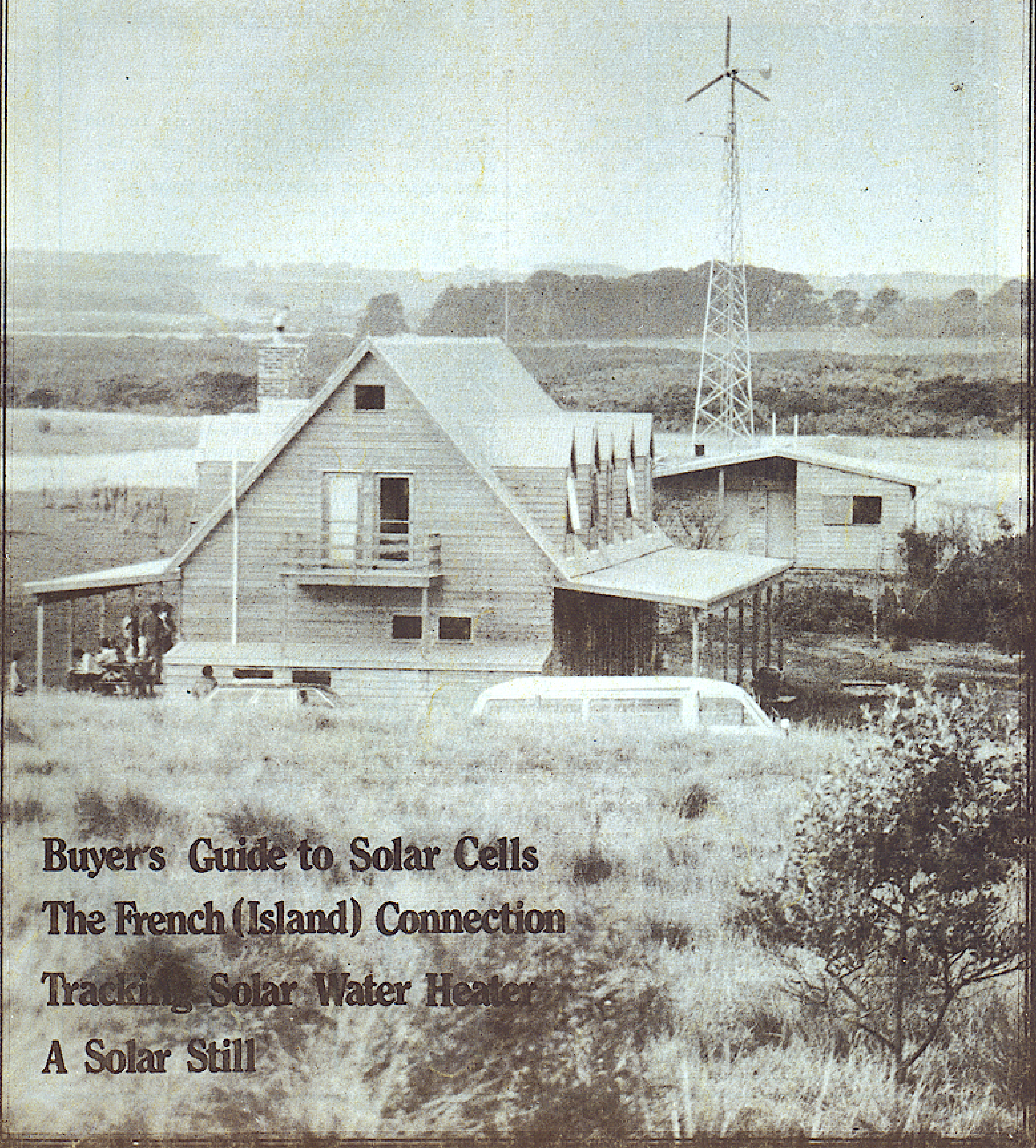


Buyer's Guide to Solar Cells

The French (Island) Connection

Tracking Solar Water Heater

A Solar Still

Editorial

The Age newspaper recently published some startling revelations concerning the S.E.C's secret plans to build a Nuclear power station in Victoria - possibly within 50km of the centre of Melbourne.

Although there have been rumours in the past about the existence of these plans - all strongly denied by the SEC at the time - it has only been with the aid of the Freedom of Information legislation that the truth of these devious backroom plannings has been brought into the open.

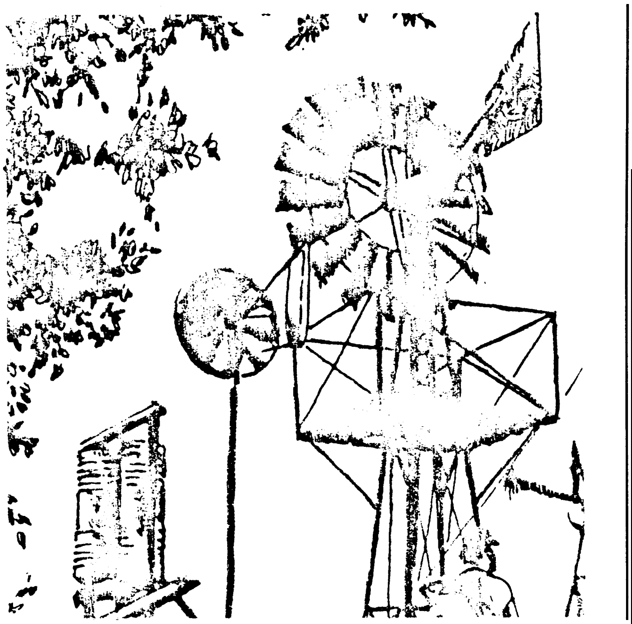
This raises a number of important questions which we should demand answers for: should government instrumentalities be allowed to spend our money preparing for projects which are clearly against the stated policies of the Federal and State governments? Why are these organisations not prepared to openly discuss issues that are of great concern to many people in this country? Judging from the numbers of people prepared to vote with their feet in recent anti-nuclear protest marches, it should be clear to the SEC that they do not have the will of the people behind them.

There is little evidence to suggest that the government is expending much time or money looking for alternative sources of energy and seems content to just import technology from overseas.

At a time when the rest of the world is gearing down its nuclear programs and re-thinking energy options, it is absurd to think that Australia, with our abundant natural resources including large resources of coal' and gas, should be secretly planning to introduce this most undesirable form of high technology.

In the USA and other countries, legislation was introduced some years ago forcing utility companies to buy back any suitable power produced by individuals for use in the power grids, a move which has led to the development of extensive "wind farms" where privately owned wind generators are erected in high wind areas, often on land that has little commercial value. It is this sort of rational approach to energy problems that will see us safely into the 21st century, not the 'easy' solutions so readily adopted by the faceless bureaucrats making decisions behind closed doors.

Tony Miller



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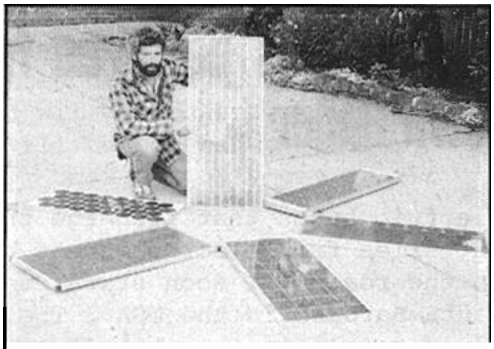

A buying guide for Solar Cells Page 7

This issue of Soft Technology was produced by Tony Miller, Noel Jeffrey, Malcolm Dow, Alan Leenarts, Mick Harris, Alan Hutchinson.
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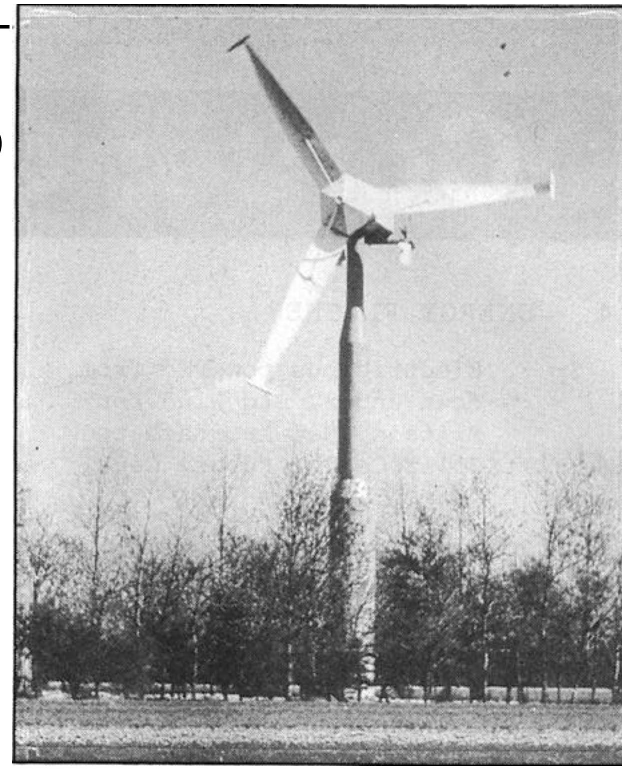
COVER: The Lodge at French Island with the 5 KW wind generator in the background.

Energy Flashes

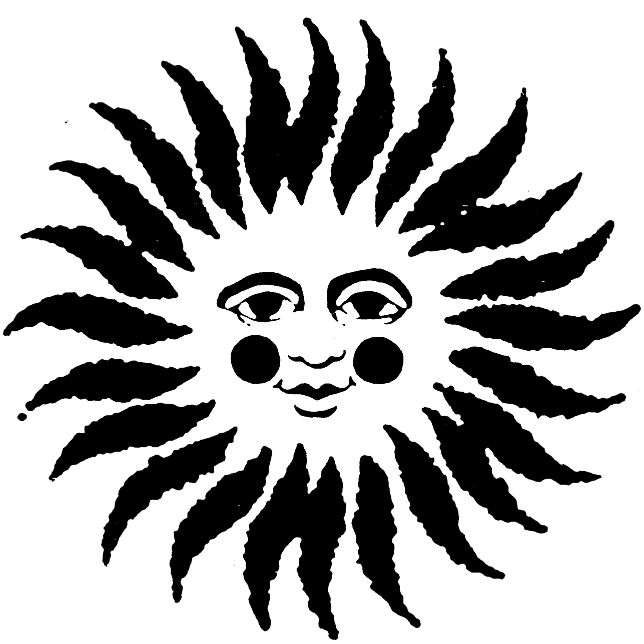


Electric Bus powered from down under

Electric buses that recharge their batteries from electromagnets buried in the road will soon start running in Santa Barbara in the USA. The system could revolutionise attempts to electrify public transport, and because no physical connection is required, there is no risk to the public, and no current collectors to wear out.

The buses rely on a technology called "inductive coupling power collection" A collector under the bus picks up energy across a 4 cm air gap and charges the bus's batteries.

One problem still to be solved is how to stop battery powered cars from being adapted to pick up the current,



Big Wind for Britain

Britain is to build one of the most powerful wind machines on what has been 'described as the windiest site in the world - Burgen Hill in the Orkney Islands. The three megawatt wind turbine will stand 45 metres high and will be completed late in 1986 at a cost of 14.7 million.

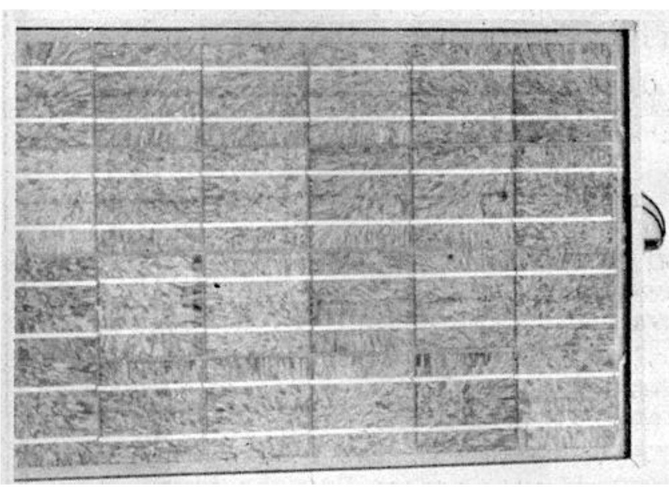
A smaller 250 Kilowatt prototype machine has been operating on Burgen Hill since last year - at one time withstanding windspeeds up to 152 km/h. Information from this smaller model will be of great value in the final design of the turbine. It is hoped that the new machine will provide a breakthrough to prove reliability for wind power machines. Innovative features will include a teetered or hinged hub and computer controlled variable pitch blade. tips to regulate power level.

The machine will be linked to the local electricity grid and will be able to meet up to 10% of the island's power needs.

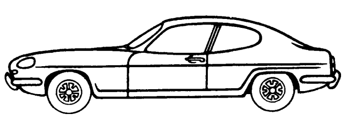
New approach to Solar Cells

Scientists in Britain are working on a new design of solar cell that could reduce the might of satellites and so bring down the launch costs.

The new cells are made from indium phosphide and indium tin oxide and absorb solar radiation more strongly than silicon. Each cell produces 0.75 Volts compared with 0.6 Volts for a similar sized silicon cell, so less cells are needed for a given power system. The cells can also operate over a wider temperature range and are not as susceptible to change from ultra violet radiation as silicon.



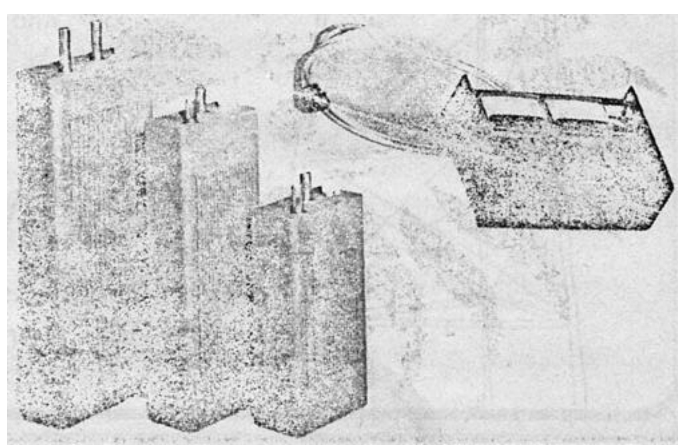
Future Cars

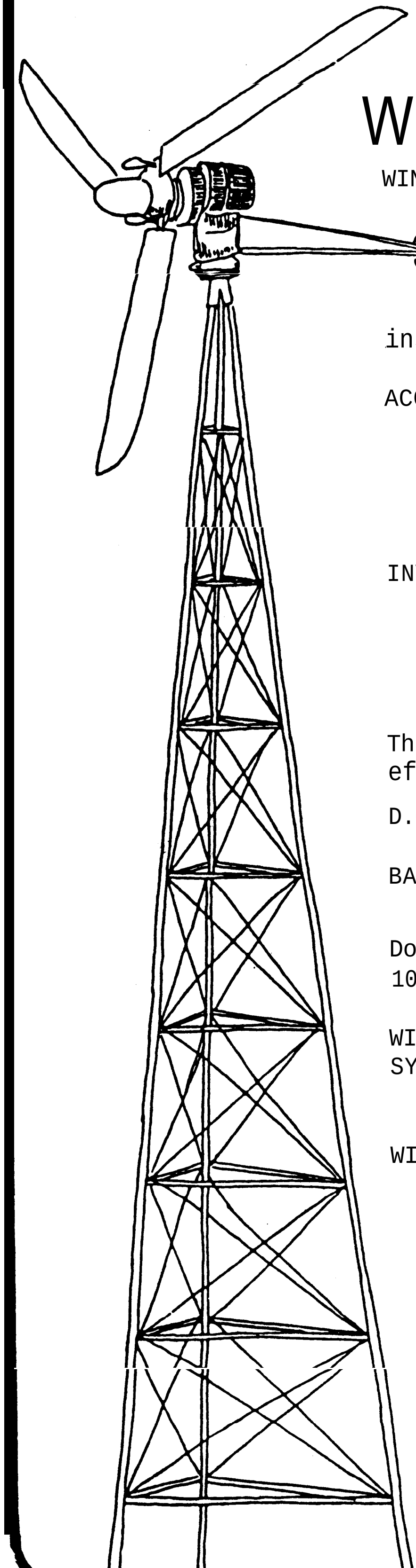


The car of the future will be made Largely of plastics and aluminium, have ceramic engine parts, variable transmission and will run on methanol. these forecasts came from engineers of Volkswagen in West Germany and were contained in a recently published book. They also predicted that by the end of the century only half the cars on the road will be powered by petrol, a quarter will be powered by fuels derived from coal but only one in two hundred cars will be electricity driven.

Pot Belly Power

Wood stove owners now can produce electricity and hot water, as well as space heat, by retrofitting "Thermovolt" modules to their stoves. Photic Corp., Traverse City, MI, introduced the solid-fuel-fired "thermovoltaic" modules at RETSIE 84 in Anaheim, CA, in June. Direct conversion of heat into electricity is accomplished through a semi-conductor material. Power production ranges from 15w nominal (240 W-hours/ day) to 80 W nominal (1,300 W-hours/ day). All units are designed to charge 12-V d-c batteries or supply d-c appliancesdirectly. Water heating is accomplished by extracting heat from the module's liquid cooling system.





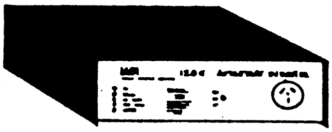
WIND POWER SPECIALISTS

WIND GENERATORS - REMOTE POWER SUPPLY SYSTEMS

New windgenerators: 125 watt to 10 kW DC.
Second hand windgenerators - fully reconditioned. Spare parts for new and second hand machines. Repairs, servicing and installation.

ACCESSORIES: Towers - free standing towers and poles. Tower cap adaptors, brake lever assemblies. Transmission cables. Voltage regulators and control panels. Deep cycle battery banks.

INVERTERS: WEA 'Autostart' solid state.



This inverter turns on and off automatically. Very high efficiency, guaranteed.

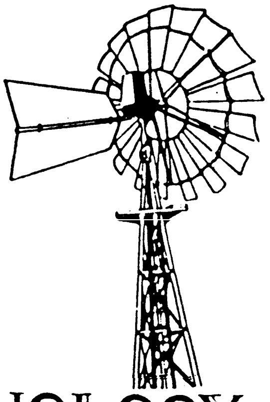
D.C. lights and appliances. Low voltage wiring parts.

BACK-UP: Generators. Heavy duty battery chargers. Solar photovoltaic and hydro generators.

Do it yourself parts - carved timber propellors, lm to 10m diameter.

WINDGENERATORS - GRID INTERCONNECTION SYSTEMS: Size available: 10 kVA, 17.5 kVA and 55 kVA.

WIND PUMPS Fan sizes: 1.8m to 7.6m diameter. Towers, pumps and accessories.



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a buyers guide to

SOLAR CELLS

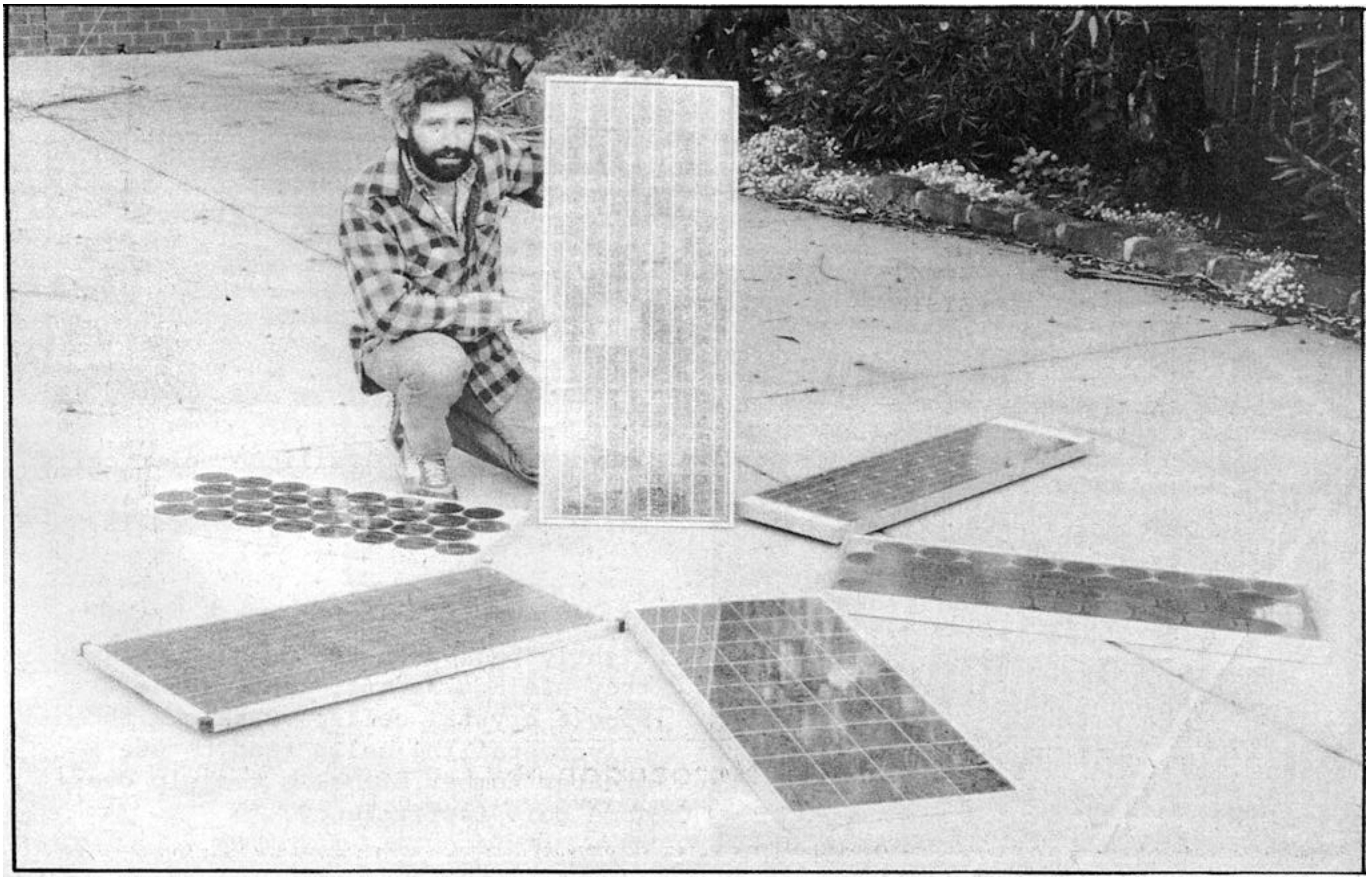
Photovoltaic or solar cells can often provide an economic alternative to SEC mains power where the cost of such connection is over $5,000 and electricity needs are not high, e.g. for lighting, TV and small appliances.

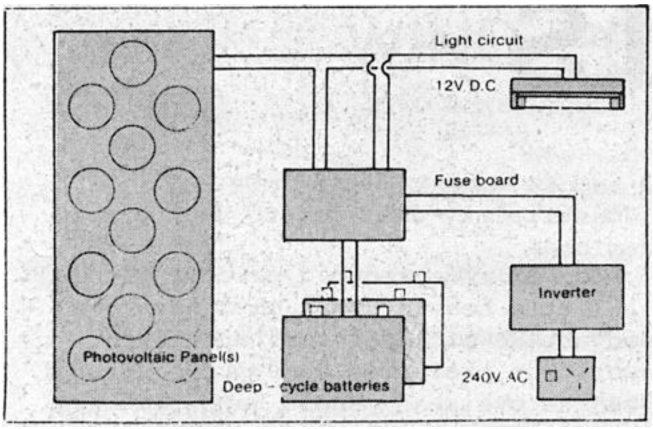
More cells can be added as needs expand and costs fall. (Already the $8,000 per watt of 1960 has fallen to less than $10 per watt today.) Import duty, which is currently 35%, is also scheduled to fall to 20% over the next 4 years. Quotes vary from $570 for a nominal 42 watt 2.7 amp panel to $360, with most firms offering good discounts for 3 or more units.

It certainly does pay to shop around.

The locallyproduced panels, although a little heavier than most have the advantage of lower cost and hence would be preferred. However, several of the overseas panels have features which make them satisfactory in specialised situations, The self regulating panels, although of lower output are excellent for small unattended situations.

Solar cells have no moving parts. They have long life and convert sunlight directly to electricity.

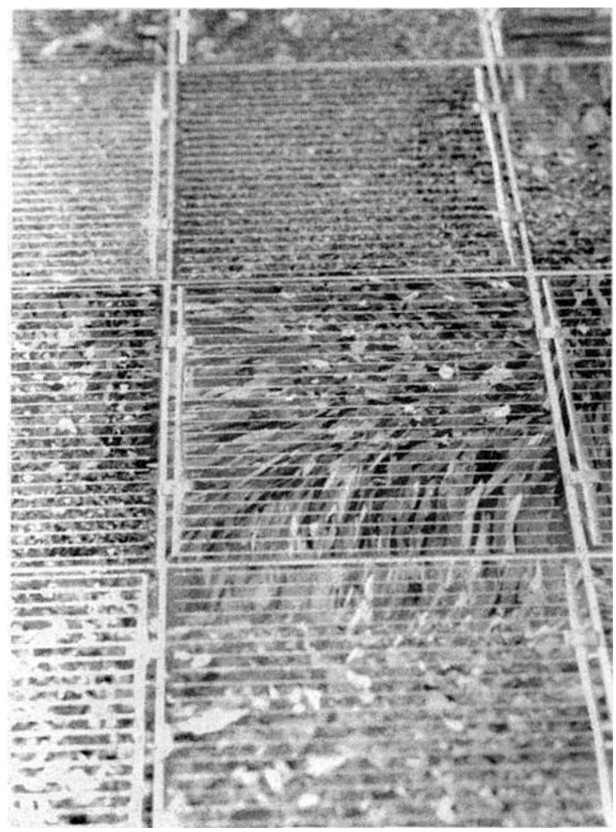


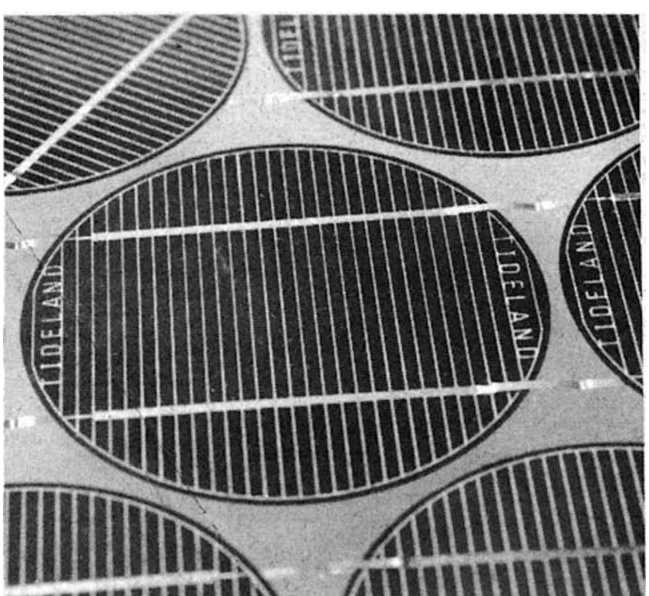


The silicon solar cell produces electricity when photons or light particles of sufficient energy dislodge electric charges (electrons) in a special type of silicon crystal made in layers similar to a transistor. These electrons then flow to produce our electricity.

The commonly available panels use three different types of silicon cell manufacture. The longest established technique involves the formation of a large single crystal of purified silicon which is then cut into thin wafers with a diamond saw. These cells are generally circular although occasionally they are trimmed to a square shape so they can be more tightly packed on the panel.

More recently the polysilicon cells were developed. These are cheaper to manufacture because they are made of a cast block of a number of silicon crystals. Hence they can be cast in a shape which allows them to be more





Above - Square polysilicon solar cells

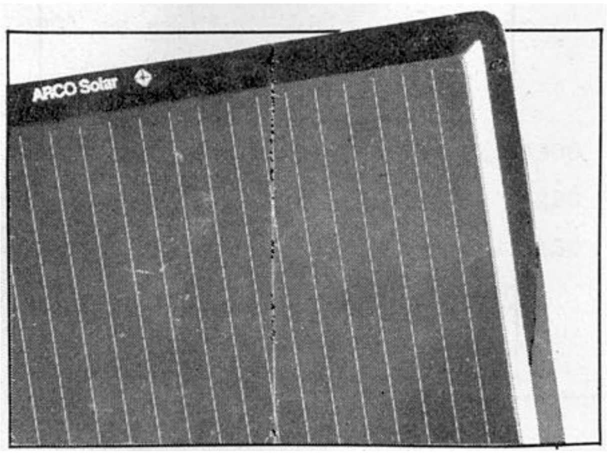
Left - Round single crystal cells.

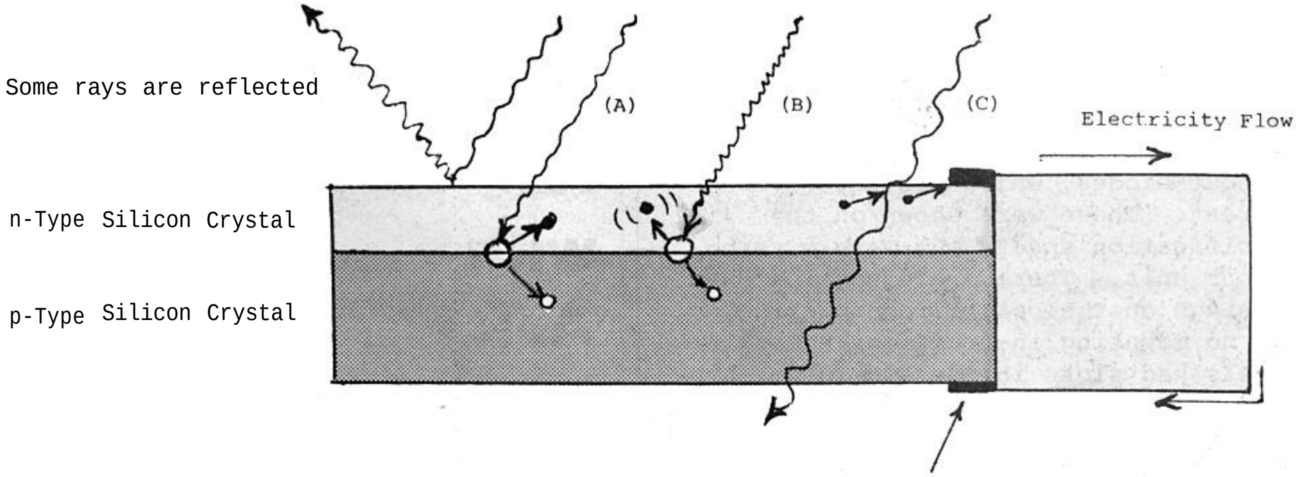
tightly packed on the panel. However they are not as efficient as the single crystal cells. Panels with polycrystalline cells tend to use a greater-number of cells to help overcome this inefficiency.

The latest cells type to hit the market in large quantities is the cell produced through vapour deposition. These cells are formed when a thin film of silicon alloy is deposited directly on glass. This method ‘should theoretically be by far the cheapest, however efficiencies are down, and manufacturing costs for these panels are still high at the moment.

Right - The back of an Arco panel (M73) showing terminal box.

Below - A thin film panel.





SILICON SOLAR CELL

Photon (A) has sufficient energy to dislodge an electron and cause a current flow.

Photon (B) has more energy and so releases an electron, and heats the crystal as well.

Photon (C) has insufficient energy to release an electron and passes through the cell.

How they compare ....

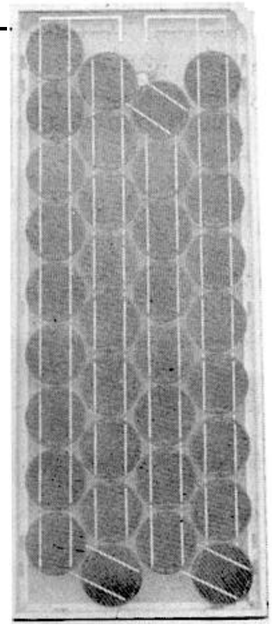
1. Tideland (now BP Solar)

Model GL 3641/12. 36 round cells encapsulated in Ethylene Vinyl Acetate to keep out moisture, white backing with aluminium foil for further protection, low iron content glass for good light transmission, anodised aluminium frame.

Double tinned connectors between cells, waterproof Terminal Box. 5 year guarantee. Cost approx. $360-370.

Peak Power	37.5 w
Voltage	17.9V (peak power)
	21.3V (open cct.)
Amps	2.25
Size	1023 x 416 x 37 mm

A 33 watt self regulating model, also available, has the advantage that it can be connected directly to the battery without an external regulator which controls the current. cost approx. $349. Recently a self regulating version of the 37W cell has been released. Some users feel that these cells give a better performance in low light situations.



General Comment:

These cells are well made. Some have 35 solar cells with approx. 0.6V lower output. There is a good junction box without diodes, which prevent reverse current. These were shown on the specification sheets but were missing on our unit. There are electrical warnings on the polysilicon backing but no mounting instructions. Earlier models had slots in the aluminium frame but later ones have an M6 continuous thread for easy mounting. They are the heaviest of those tested. Double heavy tinned copper connectors between the cells have plenty of slack to allow for difference in expansion.

had any fun with A.T. lately?

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if you're into something interesting then send us an article or a letter and let us all know.

2. Solarex

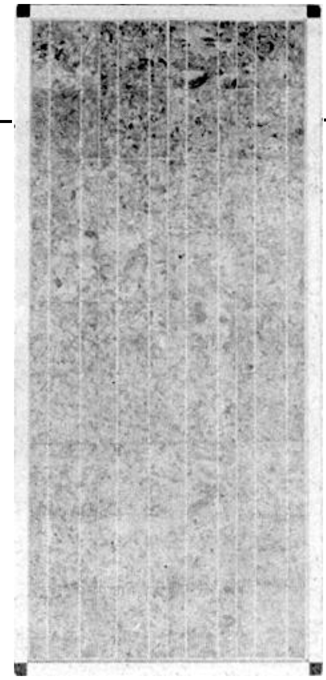
Model X1OOGT. 36 square cells encapsulated in white silicone rubber, low iron content glass, anodised aluminium frame, double tinned connectors between cells. These were originally straight but gave trouble, newer cells have more slack between cells; metal terminal box, 5 year guarantee. Weight 8kg.

Peak Power	42 watt
Voltage	16.2 peak power 20.2V open cct.
Amps	2.6
Size	966 x 456 x 25 mm.

X1OOG is 660 x 660 and $20 dearer.

	Peak Watts	Voltage		
X1050G	18.5	16.2	456x516	$300
Xl025GD	9.2	16.2	456x300	$220
X4GHD	1.5	16.2	230x11	$130

Prices for XlOOGT vary from $380-$400.

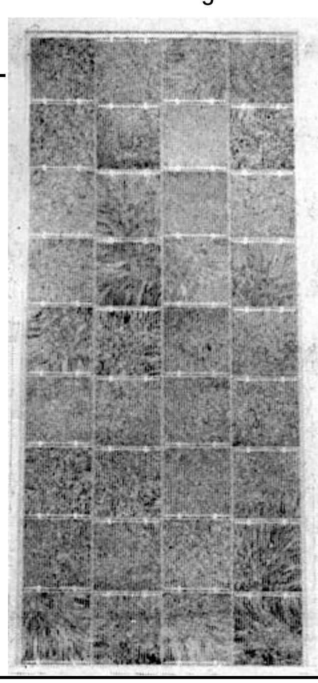


General Comments:

A well made panel with a good junction box and diodes. There were complete mounting instructions on the panel and a convenient continuous thread for mounting the relatively heavy panel. The glass panels have a roughened surface to reduce reflection but may collect dust.

3. Kyocera PSA 100H-361

A well constructed unit using 36 polycrystalline cells with a glass front and aluminium frame.



P.S.A. 100H

Peak Watts	40
Voltage	16.2 (Peak Power) 19.6 (Open cct)
Amps	2.47
Size	445 x 950 x 24.5
Weight	6kg
cost	$470

Other models have voltages at 8.1 volts and wattages of 20, 9, 4.5, 1 and .56 watts.

General Comments:

Unfortunately being imported the duty makes their price rather high. Well sealed with a good junction box but no diodes, threaded holes in the heavy frame had screws provided. Good solid connectors between the cells and at the end of the panels.

Continued Page 31

The French Island Connection

French Island in the middle of Western Port Bay is more notable for the things it lacks than for those it has. It has no made roads, no shire council or township and not even a pub. It used to have a penal settlement but that is now closed; it has no reticulated water, gas or electricity and the only real evidence- of the impact of civilisation other than a number of cars and motorbikes is the solitary telephone box at the end of the jetty.

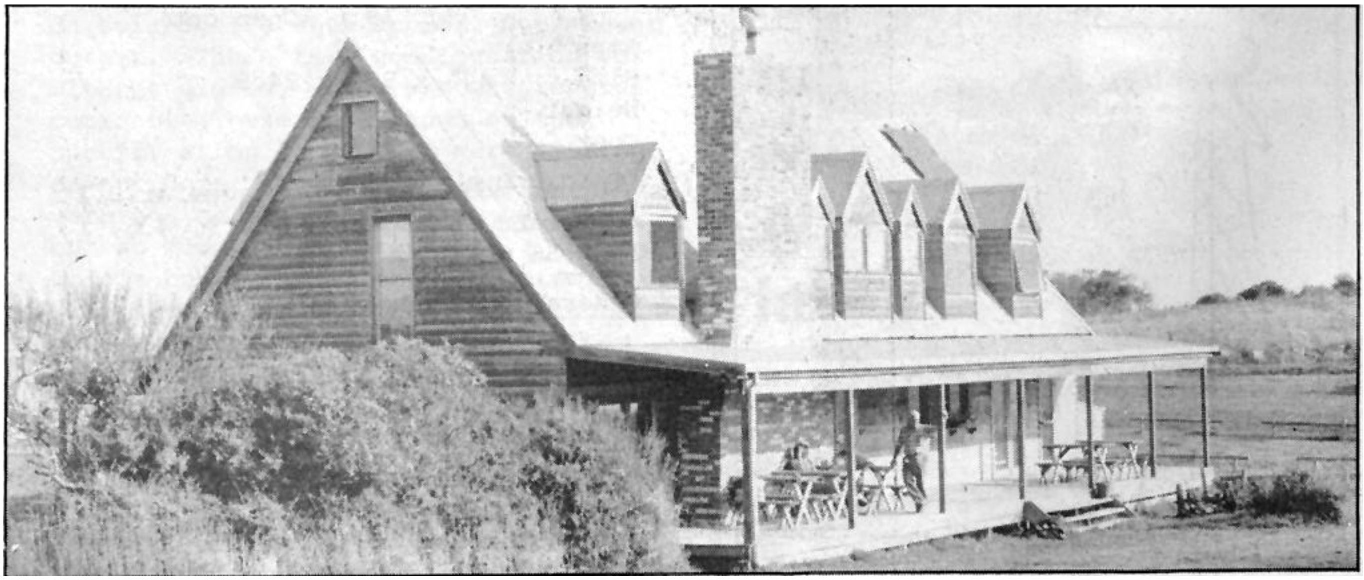
The 54 residents of this delightful rural island rely on their own small generator plants to supply their electrical needs, but these are costly to run and maintain.

Chris and Cathy Bandidt, who operate a new tourist facility called the French Island Lodge, opted for a more innovative approach to their energy requirements. With the help of the Victorian Solar Energy Council they installed an impressive wind-solar hybrid system to supply them with the power and hot water needed to run the Lodge.

The system, designed and installed by Survival Technology, consists of a wind generator, an array of photovoltaic panels, a motor driven generator for back-up, a battery bank, inverter control system and heat pump.

The wind generator is a 5KW ELEKTRO 3 phase permanent magnet alternator, driven by a 5 metre 3 bladed propellor through a 5:l step up gearbox. The generator which sits atop a 15 metre tri-strong tower, cuts in at 10kph and produces its 5kw output in a 40kph wind.

Over-revving - a major cause of wind generator failure - is controlled by a centrifugally activated variable pitch control which alters the efficiency of the propellor as wind speed increases, preventing it from exceeding a certain speed. There is also an automatic shut-down feature built into the system which will turn the tail of the generator out of the wind in the event of gale force winds.

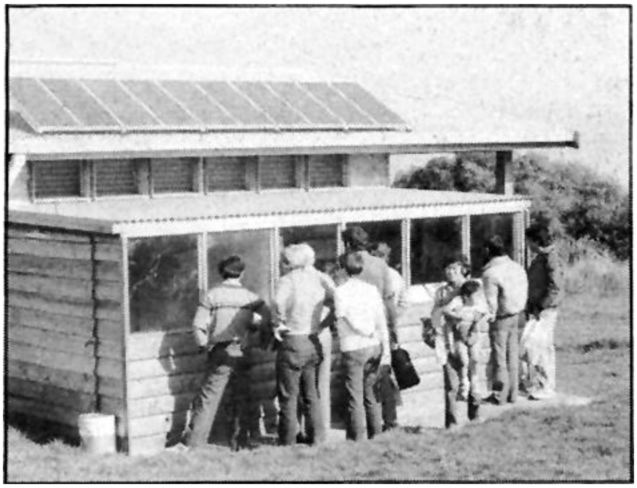


SOLAR CELLS

The solar part of the system consists of 10 panels of SOLAREX photovoltaic cells connected in series-parallel to produce a total of 2.5 amps at 130 volts. They are installed in such a way that they can be moved to match the angle of the sun at different times of the year. Apart from this adjustment and occasional cleaning of the glass surface the solar cells are maintenance free and should have a long service life.

BACK UP

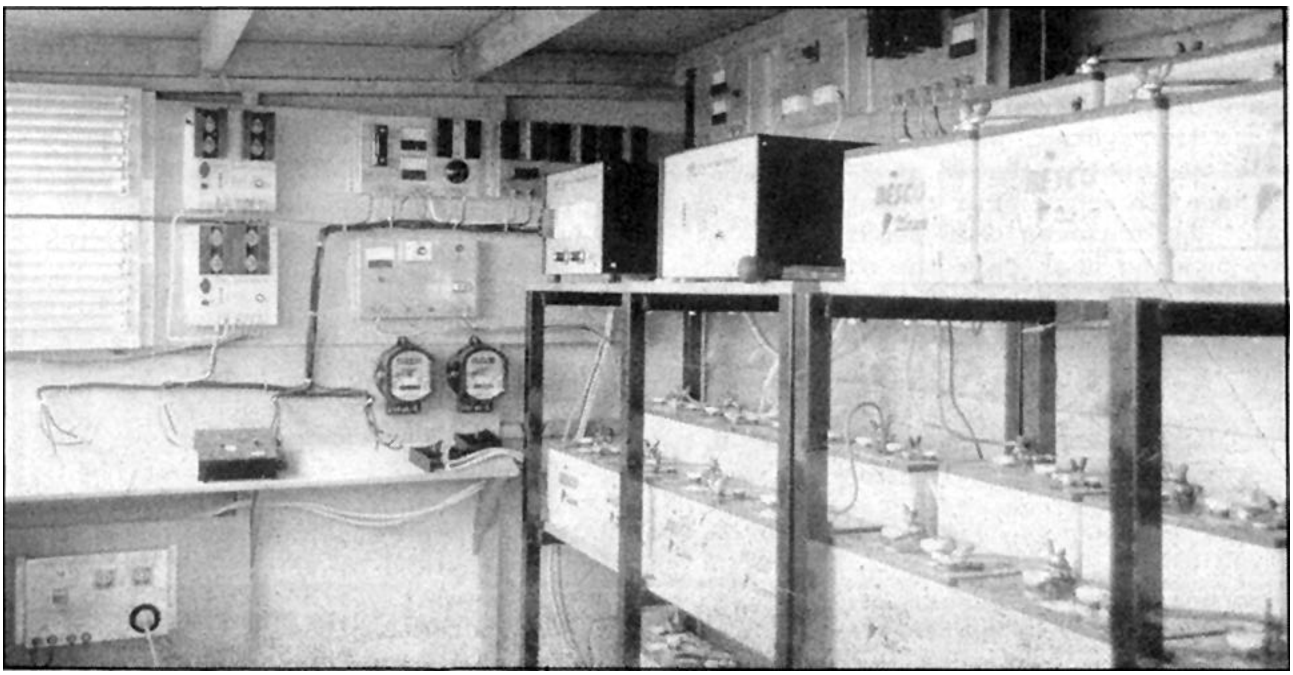
The third element in the supply system is the motor generator, a 10HP petrol driven motor with an output of 5KW at 240V. It can be used to supply power directly to the Lodge or to charge the batteries via an automatic regulating battery charger. The motor generator is used only if the power available from the wind and sun cannot keep up with the demand, or in the event of the equipment needing servicing.



ENERGY STORAGE

Because energy is not always being produced when it is needed, the solar panels and wind generator are connected to a bank of deep cycle lead acid batteries. There are 38 batteries with a storage capacity of 380 amp-hours at 114 volts, giving a total of 43kwh, enough power to run the Lodge for 4 days.

The batteries are housed in the control room some distance from the tower along with the electronic control equipment and the motor generator.



The direct current electricity stored in the batteries is unsuitable for running most equipment and appliances, so an inverter is required to convert the power to a usable form. The French Island Lodge system employs a 4OOOW fully protected electronic inverter manufactured by WEA in Aspendale to provide this power.

This unit can supply ug to 8OOOW for short periods and has a conversion efficiency of 95%. It will operate at any input voltage between 98 and 145 volts DC. and produces a regulated 24Ov AC. output.

GETTING INTO HOT WATER

There are times when more power is being generated than can be stored by the batteries, and the normal practice is to "dump" this power or use it to heat water in a conventional electric hot water system. The designers of the Lodge power system have taken a radical approach to get the most use from this excess energy.
They have incorporated a Siddons heat pump into the system, which converts electricity into hot water at 2- 3 times the efficiency of a resistance. element. It achieves this remarkable feat by pumping heat from the air into the water rather than creating heat directly from the electricity.

FEEDBACK

The hybrid wind-solar system is very much an experiment in environmental power design and since its installation in 1984 has been closely monitored so that the performance of each component can be assessed individually and as part of the complete

system. The information thus gained will be of vital importance in designing energy systems in the future.

The installation of this unique system was made possible by a grant of $29,556 from the Victorian Solar Energy Council. They see the project as an excellent promotional vehicle for the solar industry, which will contribute to market development. Also, the experience gained will improve the advisory capacity of the Council, and should prove to be of great educational value as well,

The total cost of the hybrid system was $34,560, which consisted of:

$12,300 wind generator and tower
$ 4,160 photovoltaic cells, mounting and controls
$ 4,260 batteries
$ 2,100 5KW generator
$ 5,490 storage shed, wiring labour, etc.

Anyone interested in looking at the system in operation or just having a holiday at the French Island Lodge can reach the Island by the ferry which travels regularly from Stony Point on the Mornington Peninsula.

Tony Miller

SUNTRAC

a tracking solar water heater

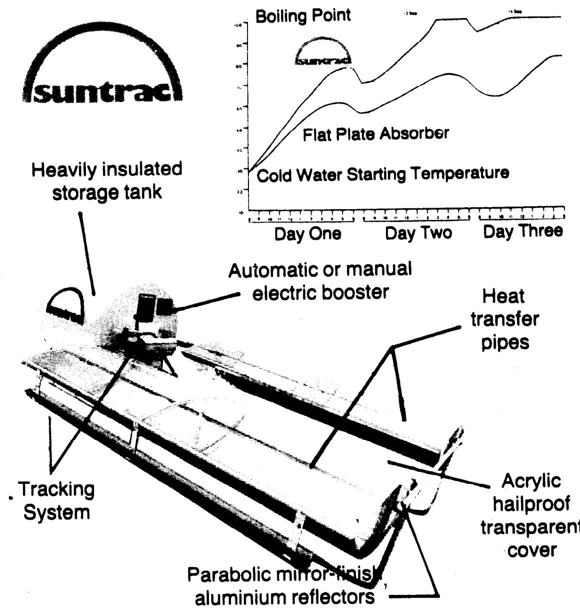
The 'suntrac' parabolic water heater was developed by Dave Adrian Little, formerly of Mt. Isa. The system, after winning the 1978 ABC 'Inventor of the Year' award, has gone to international acclaim. It has won awards from the World Health Organization and The International Salon of Inventors. The reason for its success is undoubtedly due to mechanical simplicity unioned with a high efficiency energy return.

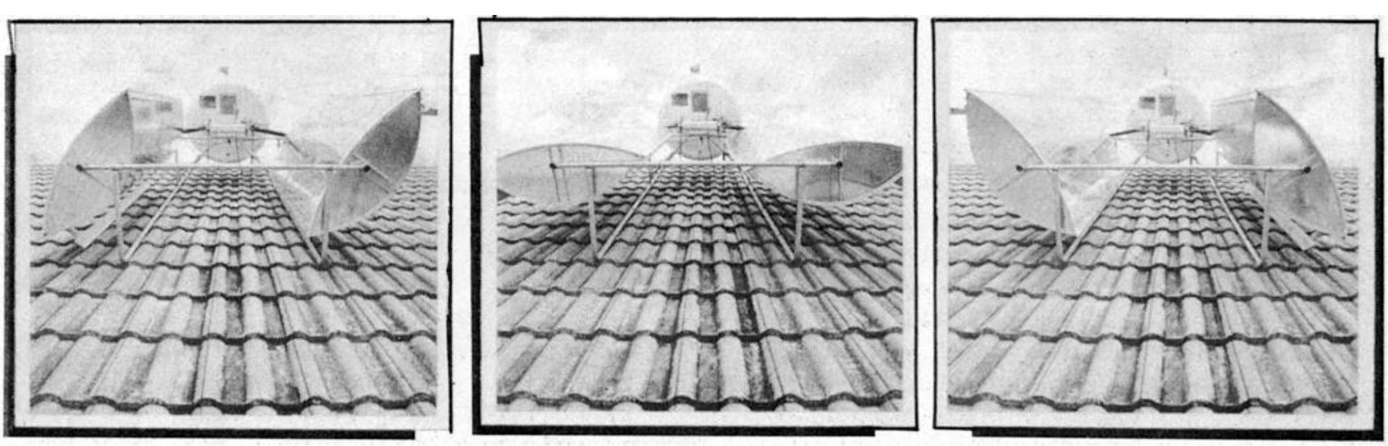
Basically the system is comprised of 4 parts:

1. Collectors
2. Tracking mechanism
3. Storage tank
4. Gravity heat pipes.

The collectors act as large magnifying glasses, which concentrate 1.7m^2 of sunlight onto the heat pipes. This makes 'parabolics' more efficient than flat plate collectors as parabolics can more readily absorb all available energy all throughout the day. On the other hand flat plate collectors are unable to add energy during early morning and late afternoon.

The tracking system is known as a 'Heat differential and switching system', It works thus: When sun rises in East, it heats expansion tube ‘A’, while 'B' is shaded. The expanding air forces diaphragm 'C' to right opening valve 'E'. This





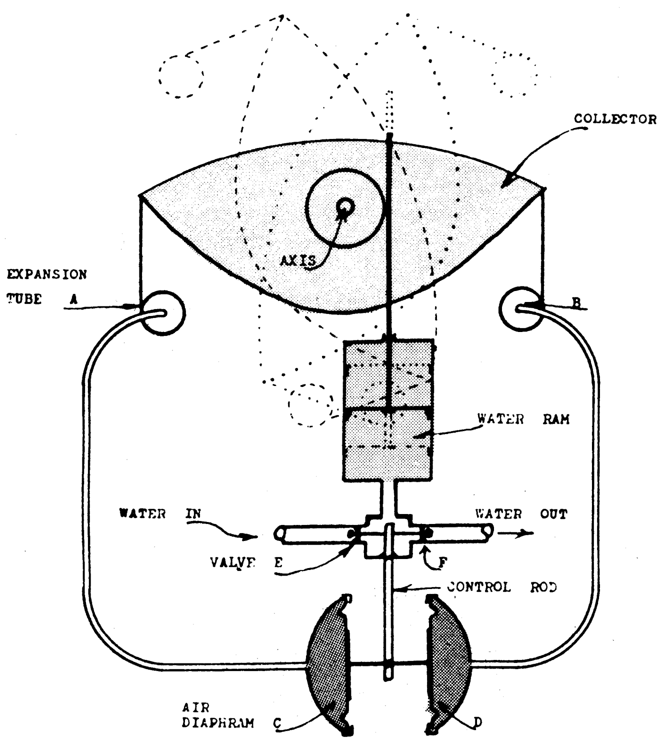
Tracking the sun as it moves across the sky. When exposed to the sun, expansion tubes trigger a valve which moves the collectors.

allows water mains pressure to enter the water ram, and forcing the collector eastwards by way of the push rod.

When the collector becomes square to the sun, both A and B are shaded, which places diaphragms C and D in the neutral position - and the collector in the most efficient alignment.

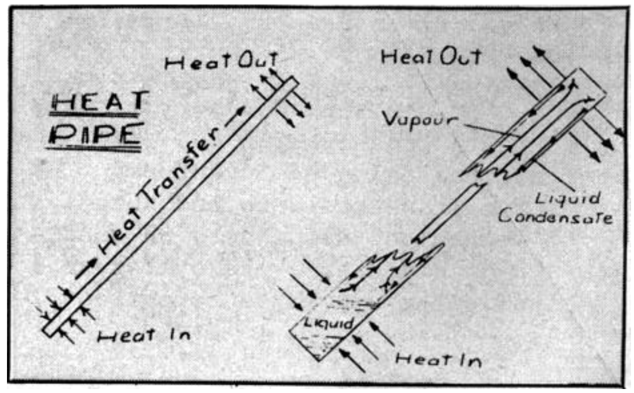
As the sun shines on tube B, it provides a steady 'bleed' of water from the ram. This controls the western tracking, the force for this comes from a counter spring.

HEAT DIFFERENTIAL TRACKING SYSTEM

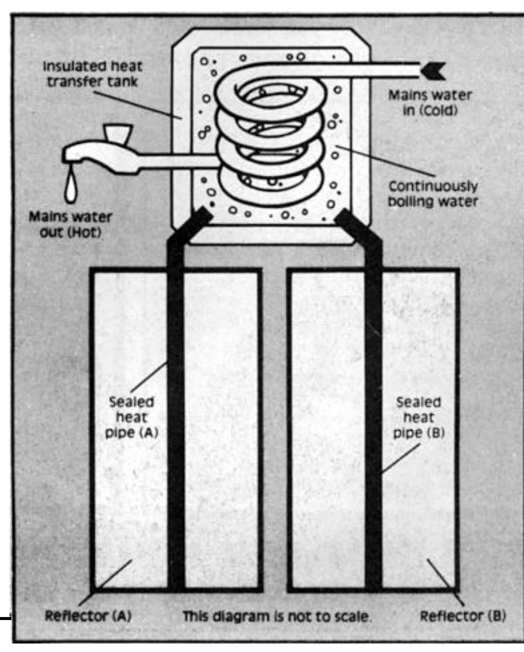


The gravity heat pipes are probably the most innovative part of the 'sun-trac' system. A gravity pipe is basically an evacuated copper tube, which is sealed with a small quantity of distilled and de-gassed water.

The principle of operation is as follows - in vacuum, water commences to boil at room temperature until vapour pressure increases, and boiling stops. If, however, the top section of the pipe is kept cooler than the lower section, vapour will flow from the hotter sections to the cooler section at supersonic speed. The vapour then condenses, losing its latent heat through the walls of the tube. The condensed vapour (liquid water) then runs back down the tube completing the cycle.



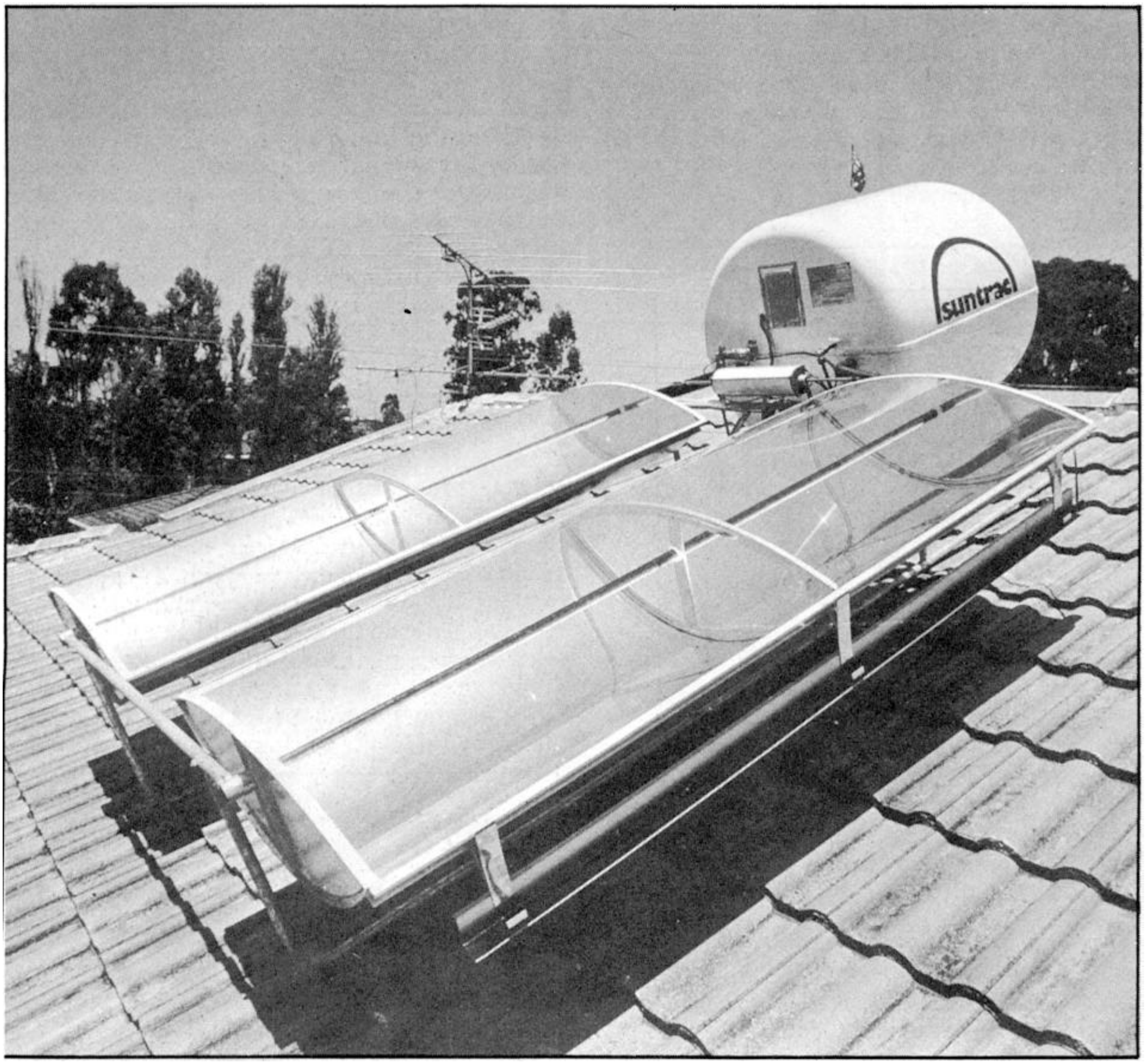
The tank is made from rotationally moulded polyethelene CL100. It is fully vented and under no pressure. Mains pressure is drawn from the unit by means of a copper heat exchanger coil in the tank.



This type of system is remarkably efficient, as no 'reverse-cycling'[1] can occur, i.e. the energy in the tank cannot be re-radiated through the collector (at nights or on cloudy days). The reason for this is that when the collector cools, the energy medium (vapour) condenses. This creates a vacuum between energy in tank and collector. The vacuum acts as an excellent insulator, minimising heat losses.

In general, the system is a rather hi-tech version of a tried and true water heating method. Undoubtedly a greater efficiency has been obtained, but unfortunately Hi-tech usually means Hi-price. Therefore, as an alternative water heater, the suntrac is far from ideal. If you have the money however, you will be getting value.

Alan Leenearts

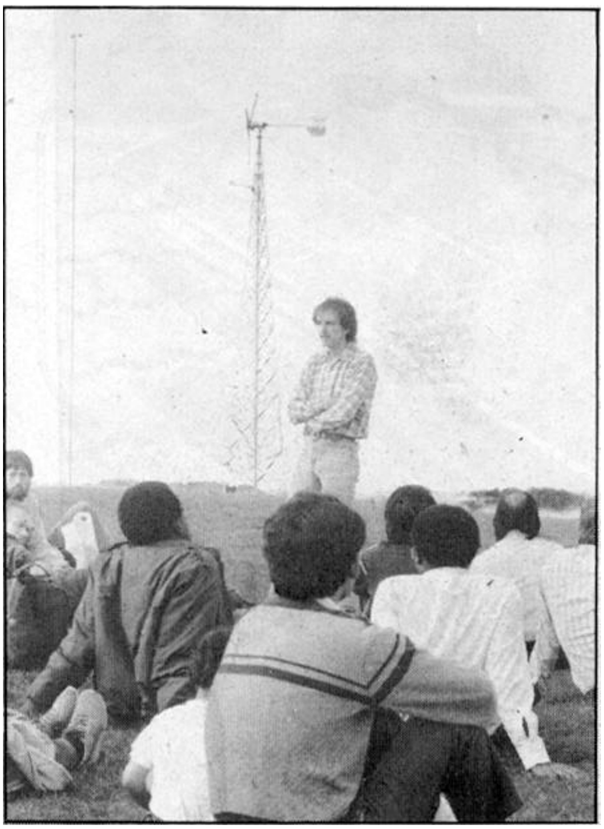


A.T.A

News, Events and Activities of the

After a period of brief rest over the Christmas/New Year period, work has renewed with extra vigour, both at the solar Workshop, with new group activities and in the background with organisation.

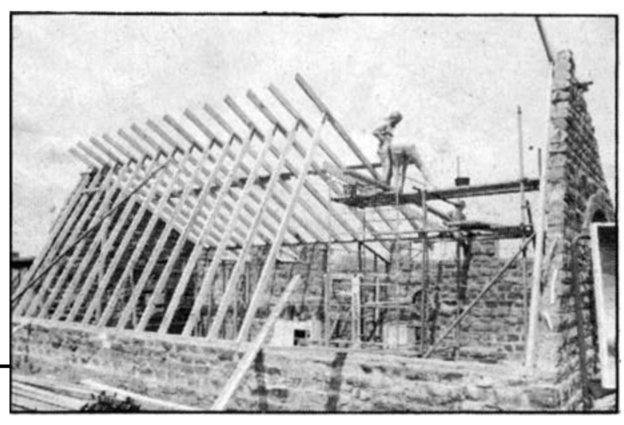
On 4th May, members of the group visited the Solar, Wind, Diesel hybrid system at the French Island Lodge, (refer the article in this magazine). The day went off very well with perfect weather and all those present finding a great deal of interest in the Hybrid power system. The ferry trip to the Island was an added feature.



Tony Stevenson describes" the wind system at French Island.

By the time you read this, the roof of the Solar Workshop should be complete, with only the doors and windows needed to take the building to lock-up stage. The front (North) wall of the workshop is to be glazed with a Polycarbonate material called "polygal". This material, while expensive ($21.50 per square 'metre) should give a long life, is very strong and has a double skin, giving a double glazing effect.

After this glazing goes up, the main roof will be lined. We are using an insulation material donated by Dow Chemicals. It's made of a layer of standard plaster board with a layer of insulating foam bonded on the back. We will lay this down on top of the roof beams, then use a layer of fibreglass insulation, the battens and finally the galvanised iron to finish the roof.



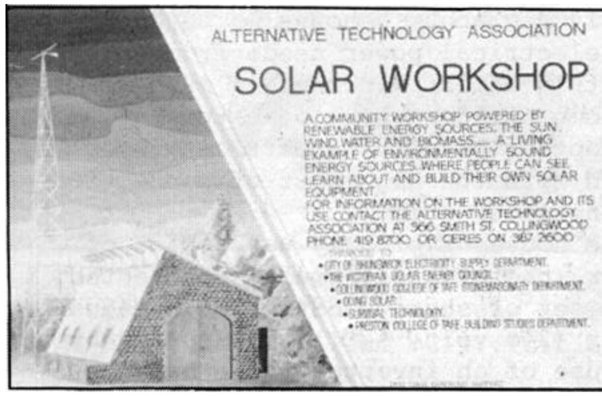
REPORT

Alternative Technology Association

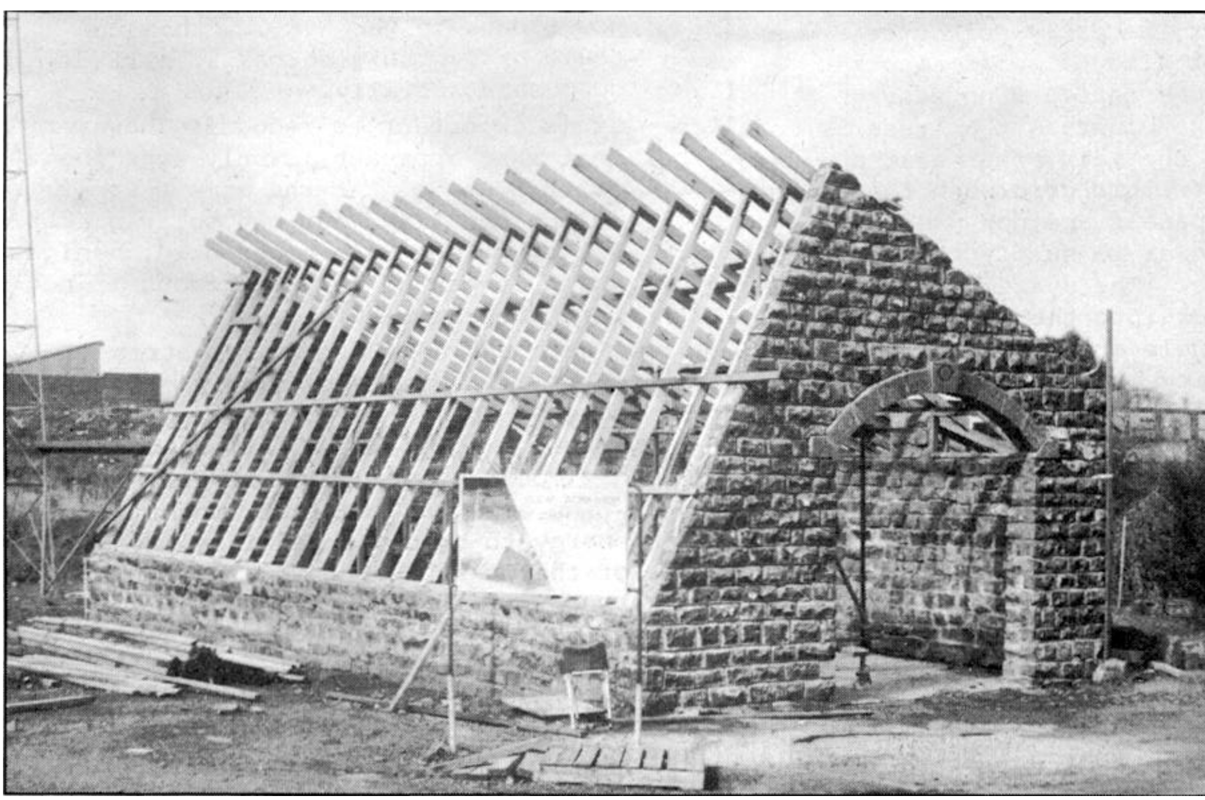
With the roof complete, we fit the wind generator into place, install the photovoltaics and battery bank. Then all we will need is a bit of wiring and we will have a working building.

We now have a Workshop group which meets regularly and is planning the construction of the building.

*Another new development is the Media Group. The Media Group produces "Soft Technology" as well as the Alternative Technology Association newsletter. It also produces leaflets and organises publicity which includes community radio ads, feature articles in local papers, etc. Interested people are very welcome in the group and should ring the ATA on 419 8700 for more information. If we are not in, leave a message and we will get back to you.



The Workshop Sign giving an idea of the finished buildings appearance.



The Solar Workshop in April awaiting the completion of the-roof.

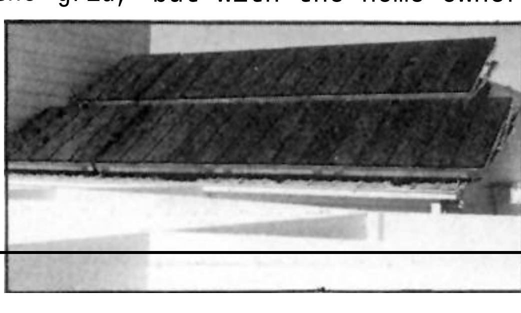
S.E.C. GOES SOLAR

These days there is nothing particularly new about a house which obtains its electrical power needs from solar electric cells. Increasing numbers of home builders have been turning to the option of solar electricity when faced with the high cost of connection to the power grid.

The houses typically use a bank of solar (photovoltaic) cells connected to a set of storage batteries. Mains power (240 volt, A.C.) is supplied by the use of an inverter and a backup generator tops up the batteries in the event that the sun is inadequate to keep the batteries fully charged.

However, recently Melbourne saw a different kind of solar electric house. One that has no storage batteries. Instead the house is connected to the main power grid and uses power from this grid when the photovoltaic panels are not producing enough power to supply the, needs of the house.. The system also puts power back into the grid when the solar panels are producing more electricity than the house can use.

This means that the home owner could actually get a credit on his bill for the extra power he produces which is allowed to flow back in the grids. The home owner still has to pay for the power that is used from the grid, but with the home owner



effectively running his own power station and selling his excess power back to the S.E.C., this could bring the electricity bill down substantially.

It is important to recognise however that this approach is only experimental at this stage. At the moment it is illegal to link your own solar electric system to the main power grid, besides which it can be very dangerous if not done the right way.

The house uses 21 square metres of solar cell panels to supply electrical power. The 56 photovoltaic panels supply a total of two kilowatts. They are mounted on adjustable frames which allow the maximum amount of energy to be collected in all seasons of the year.

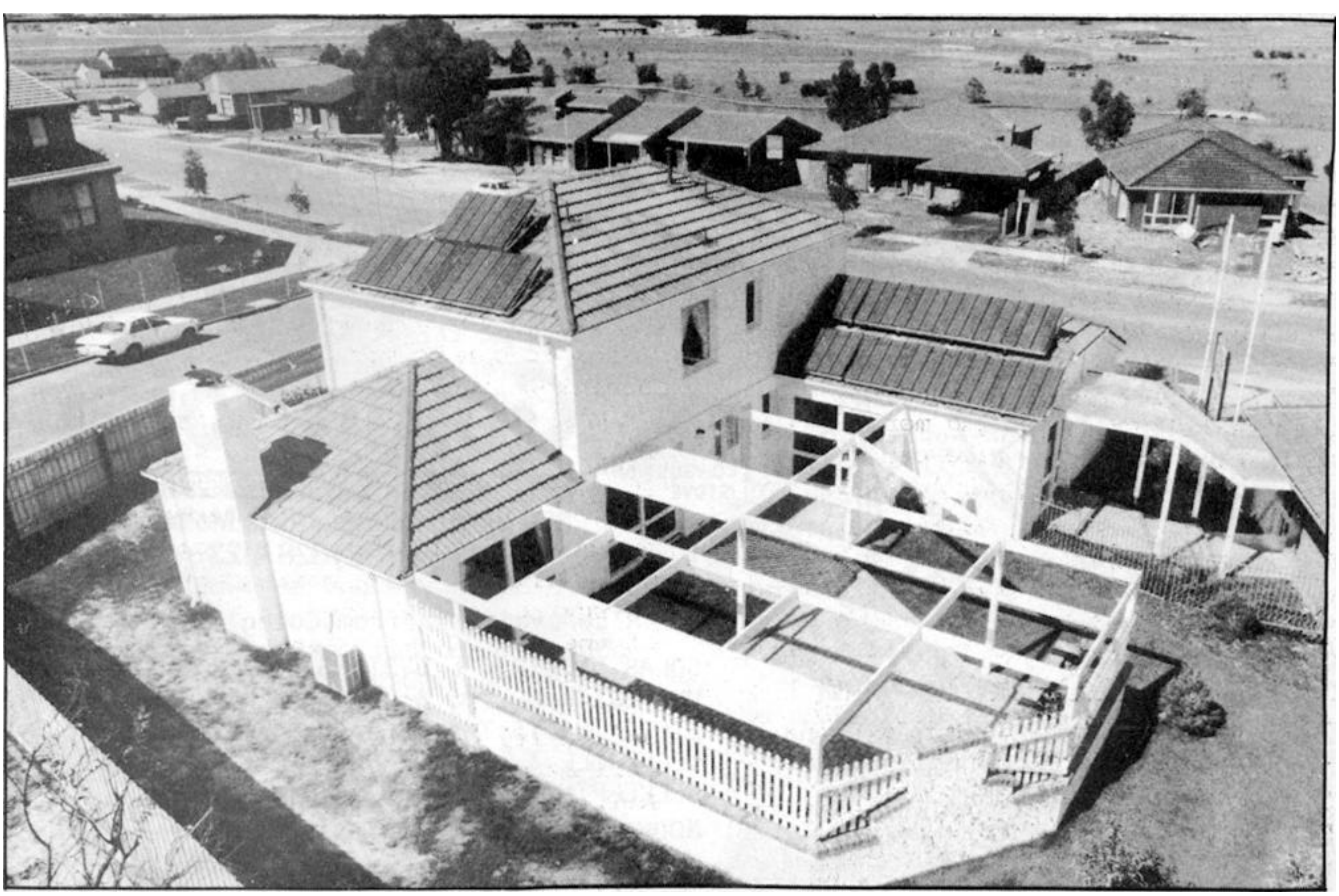
Power from the photovoltaics is fed directly into the inverter which has a capacity of five kilowatts. As well as delivering usable 240 volt, AX. power to the house, the inverter synchronises its output with the grid so power can be passed from the solar cells to the grid.

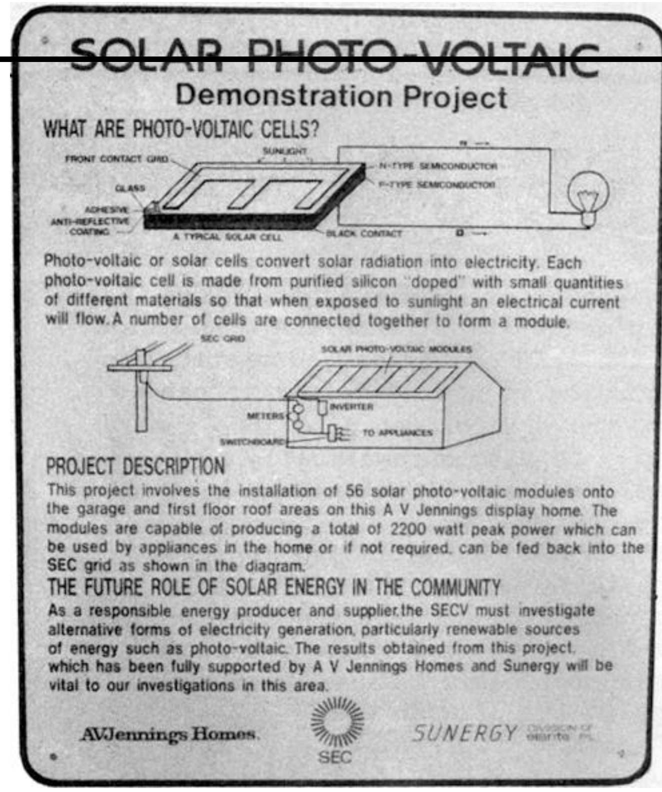
The inverter is grid interactive. This means it switches the connection to the grid on and off automatically according to whether power is needed from the grid or can feed into the grid. It also automatically adjusts itself to keep efficiency as high as possible.

The house is a standard Jennings two storey home. The S.E.C. felt it was important to test the system on a standard house and hence the house Lacks any solar design features to improve its efficiency.

Another difference between this louse and many of its rural counterparts is the solar cells must attempt to supply power to high wattage equipment such as the stove and air conditioning.

The resident communicates with the power supply authority by use of this push button pad. The only visible part of the CALMU





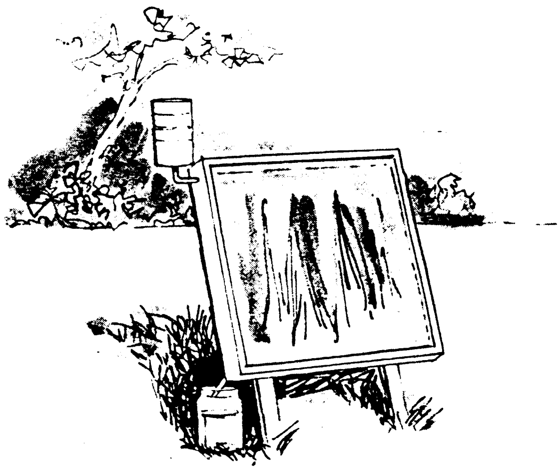
Another feature of the house is the Credit and Load Management Unit (C.A.L.M.U.). This is an experimental microprocessor-based information system developed in Britain. It replaces conventional electricity meters and line switches.

The C.A.L.M.U. unit provides information on how much electricity has been used by a household, what it costs, details on tariffs available and times of day when they are available and how much time is being used at any one instant. This continuous low of information can lead to reduction of power usage and consequent money savings.

The whole project is part of the S.E.C.'s ongoing investigation into ways to use alternative energy reources. The S.E.C. believes that conservation of non-renewable energy resources such as oil, gas, and coal, by substitution with renewable non-polluting resources such as solar photovoltaics, if developed to achieve economic cost effectiveness; will give substantial long term benefits to all.

Mick Harris

Simple Solar Projects NO. 5



A Solar Still

This design comes from a book called "Solar Science Projects . . . for a cleaner environment" by D. S. Halacy. It was first published by Scholastic Book Services in 1959 with later editions in 1971 and 1974. Although the book is somewhat dated (especially) the section on photovoltaics) it still has some good ideas of which this one on the solar still is one of the better-ones. Other projects in it include a reflective cooker, a solar furnace, a solar oven and a solar water heater.

If you want to get a copy of the book it may be a little difficult to get hold of. I got a copy from a library. However you may be able to get a copy if you look hard enough. The designs and descriptions are good and detailed so it could be worth the effort.

The principle of the solar still is a simple one, and is observed on a grand scale in nature. Clouds are droplets of water evaporated from the surface of the sea or from damp ground and then condensed high in the air. In the process of evaporation, solids such as salt are left behind. Many readers will be familiar with the commercial harvesting of salt in shallow ponds, for this is one of the oldest of man's uses of solar energy.

The still uses the same principle, but it is a little more complex than simply letting sea water run into a pond to evaporate. By means of a glass-plate collector we increase the temperature in the still to speed evaporation. Researchers have shown that it is possible to produce almost a quart and a half of water a day for each square foot of the collector's surface. Thus the still should have a maximum output of more than one gallon a day. Of course, this figure represents ideal conditions, but it will be interesting to compare your results with it. The still described here was tested in mid-winter, and produced more than one quart in six hours.

To begin construction, first assemble all the needed materials (except the glass). Redwood is preferred where possible because it resists rotting, while other woods will deteriorate with constant exposure to water.

At the lumberyard where you buy the 8 ft. board (1 x 4") have a groove cut l/8" wide to a depth of 3/8". Locate the cut ½" from one edge. This is the slot for the glass window. cut the 1 x 4 redwood sidepieces to the proper length as shown in the drawing.

Drill two holes at each corner of the sidepieces and assemble with wood screws. The ½" plywood back may now be put in place and holes drilled for screws. Notice that no screws are put in at the corners, to prevent interference with those holding the sides together.

Mark the locations for the large holes that will receive the ½" tubing. Drill a 1/8" hole as a guide, and then drill three 5/8" holes and one 3/4" hole, as shown. Be sure the large hole is the proper size for the cap which we'll solder to the end of the top tube.

The two drain holes can now be drilled, both of them ¼" in diameter. One of these is located in the centre of the bottom 1 x 4; the other is in the side 1 x 4, positioned at the vee formed by the bottom and plywood back. Study the drawing to be sure of locating this hole properly. The side drain can now be inserted.

Now is a good time to calk the joints at the bottom and sides and apply several coats of sealer to the inside of the collector box. This is done to make it watertight, and so that the distilled water will run out the drain tube and not seep through the bottom of the box. Allow to dry thoroughly and check for leaks.

We know that any surface receiving heat will reradiate part of that heat.

To prevent as much heat loss as possible, and also to present a smooth surface for condensation of water vapor, we line the inside of the box with aluminium foil. Running the foil in one piece across the plywood back and the bottom 1 x 4 will make an additional waterproof layer to help proper drainage. Notice that the foil extends into the bottom glass slot also.

Foil 24" wide will do the job in one piece. If it is necessary to use narrower foil, apply the section toward the drain tube first and lap the other section over it. Use glue, rubber cement, or airplane dope to apply the foil. Start at the top, carefully unrolling the foil for a smooth job. Let the edge of the foil extend a ¼" past the edge of the glass slot. This excess will be forced into the slot later when the glass is slid into place. Next line the inside surface of the other three 1 x 4's to complete the job.

Since some salty or otherwise undesirable water may not be evaporated before it reaches the bottom of the black towel wick, we provide a vee-shaped trough to catch this waste and prevent it from mixing with the distilled water at the bottom of the still. Made from galvanized iron, this 24" trough is a 90° angle with legs 1½" wide. This can best be bent at the sheet metal shop.

Drill a hole in the very centre of the angle, as shown, to receive the centre ¼" copper drain tube. Put the short length of tubing in place and solder securely. To keep the waste water from spilling out the ends of the trough, it is curved slightly by "crimping" the edges in several places.

Once the drain trough is completed it may be put in place by inserting the copper tube in the hole drilled for it. This should be a snug fit. Carefully punch through the aluminium foil first with a pencil, then press the trough down until it just touches the foil at the centre.

We are now ready to start on the

Materials

1 x 4" redwood board - 8 linear ft.
½" plywood - one piece, 24 x 24"
Single-weight window glass - one piece, cut to measure
½" O.D. copper tubing - 4½ ft.
½", 90° copper elbow - one
½" copper pipe cap - one
Galvanized iron - one piece 3 x 24"
¼" I.D. copper tube - six inches
Large tin can - one
¼ x 1½" wood screws - approx. 30
Black terry cloth - approx. 2 yards (one large bath towel)

"wick" for the still. The ½" tubing used at the top and bottom to support the toweling is cut to size with a tubing cutter or fine hacksaw. Or ask your hardware dealer to do this for you, being sure to give him accurate dimensions.

In addition to holding the toweling in place, the top tube is the distributor for the water supply. To accomplish this we drill two rows of No. 50 holes, at right angles to each other. The holes do not go through both walls of the tubing and are spaced approximately 2" apart.

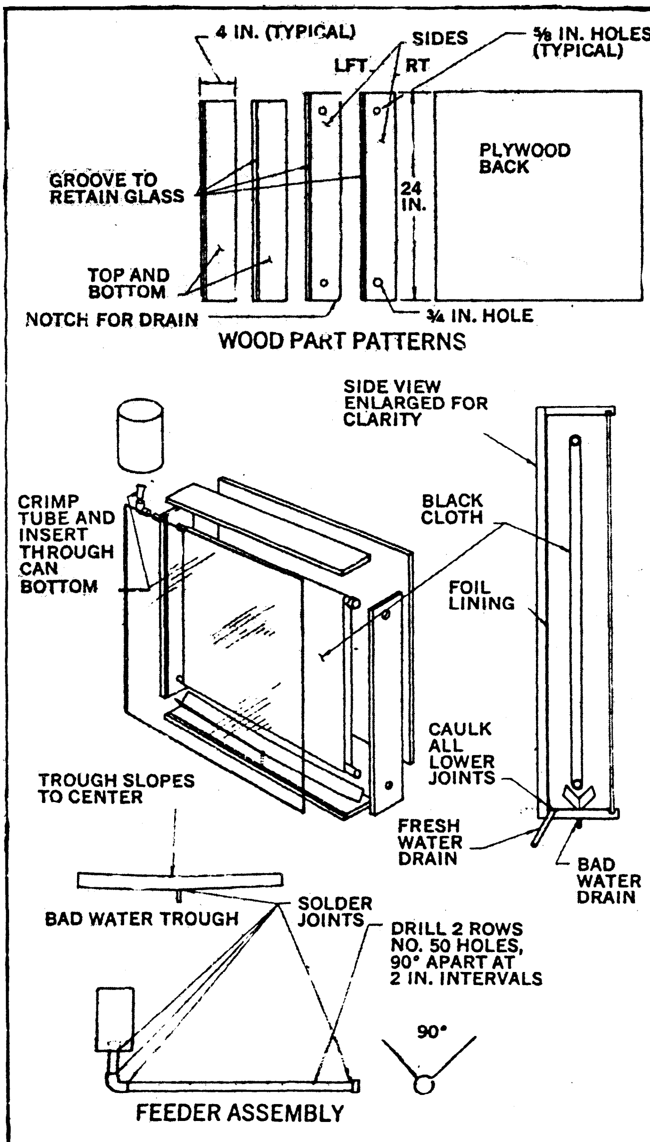
Our still uses a quart can as a reservoir. Cut the top from a large juice can and remove the paper. Next, cut a 4" length of ½" copper tubing and flatten one end in a vise or with a hammer. This tube will serve to meter the water into the long tube so that too much isn't fed to the toweling.

With a chisel, carefully cut a slit in the centre of the can bottom. Allow the metal to bend inward slightly, and check the size of the slit until the flattened tube fits snugly with about ½" of it extending inside the can. Solder the tube in place, making sure it remains lined up.

Now slide the cap onto the far end of the drilled top tube and solder it in place. Push the tube through the holes in the box, being careful of the aluminium foil lining. Prop up the box so that it is tilted back about 45° from the vertical and rotate the tube so that the two rows of holes are properly positioned to feed water into the toweling when it is looped around the tube. The tilt of our still will vary with the position of the sun, so we are striking a happy medium in locating these holes.

With the tube in the right position, force the end cap into the 3/4" hole. This should be a snug fit and hold the tube in the proper place. Now solder the ½" elbow to the open end of the tube so that it points straight up. The free end of the tube soldered to the can is inserted in the elbow and soldered in place. Some water in the bottom of the can will prevent the joint at the can from melting while you work on the elbow.

Now attach a hinged 1 x 4 prop to the back of the box, using small wood screws as required. This supports the still and also gives us a means of adjusting the



SOLAR STILL

tilt to best face the sun. At this time also nail on the two legs, making sure to leave the proper one about ¼" long so that water will run toward the fresh water drain.

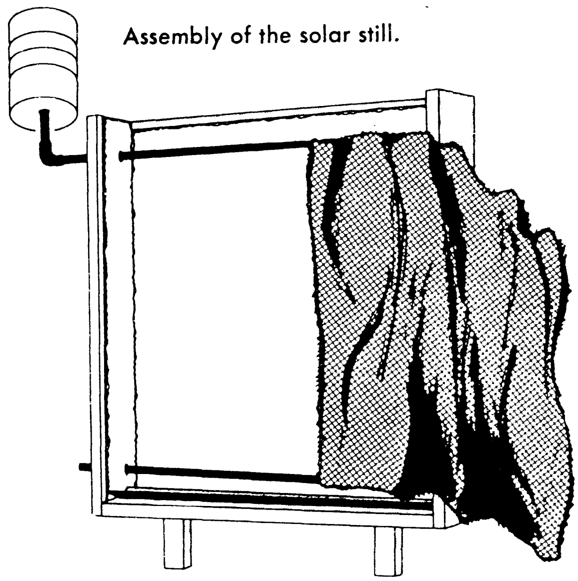
Smooth the ends of the bottom tube that will support the toweling and insert it in place. Now we are ready to sew the toweling together. The still in our plans uses a towel 24" wide, with the ends lapped and sewed in two places to make a loop. In measuring for this, make the loop slightly smaller than the distance between the tubes, because the towel will stretch somewhat when wet. Too much sag would cause it to touch the back of the box and thus contaminate the distilled water.

With the towel sown together and dampened, slip the ½" tubes halfway out and start the towel loop onto the tubes inside the box. The bottom tube is slid back into place first, then the top tube 'is carefully raised into position and forced back into the 3/4" hole. Adjust the towel so that it covers the entire length of the tubes and is smooth. Do not let it touch the sides of the box.

At this point, remove the top 1 x 4 piece so that the dimensions for the glass can be taken. Slide a heavy piece of cardboard into the grooves. Trim to fit. Have your glass supplier cut the glass to measure. The grade of window glass known as "water-white" allows more of the sun's rays to pass than ordinary glass does and is therefore more efficient for our purpose. However, if it is not available, standard single-strength glass will do.

Slide the glass into position. Make sure it is as clean as it can be, particularly on the inner surface, which will not be easy to reach when the still is assembled. Detergents may interfere with proper forming of droplets on the glass, so use plain water for cleaning.

Handle the glass very carefully to avoid cutting yourself on the sharp edges. With the still at a 45° angle, start the glass into the slots and ease it downward. When it contacts the aluminium foil at the bottom groove it should force the foil neatly into place. Replace the top piece, tighten the screws, and the still is ready for operation.



Assembly of the solar still.

Distillation is easy with our solar plant. First, orient the still so that the sun's rays strike it as close to a right angle as possible. Mount the still on a level surface so that the uneven legs will give it the proper slant for draining. If the reservoir can is not vertical, carefully twist it until it is. The towel should be snug enough to hold it, and the force fit of the end cap in the 3/4" hole helps in this respect.

Now fill the reservoir, and to make sure that the still really works, add some salt to the water! After a few minutes the towel will begin to receive water from the distribution tube. If it doesn't, or if the flow is too slow, very carefully open up the flattened tube in the bottom of the can with the point of an ice pick. Be cautious about this, however, as we don't want the water to flow into the towel faster than it can be evaporated.

Heat from the sun is trapped in the box, and the black towel absorbs this. Water is therefore evaporated from the towel much faster than it would be normally. The vapor, free of all solids, recondenses on the smooth surface of the glass and the foil on

Continued Page 33

Planning for the Sun

Detailed, careful planning which can help with a shift to renewable energy sources has been virtually non-existent in Australia. However this has changed in Victoria with the production of a draft "Solar Plan 1985", produced by the Victorian Solar Energy Council.

The Solar Plan is part of the Victorian Government's comprehensive approach to energy planning. It begins with the reasons for a shift to renewable energy sources, then the current status of the renewable energy options, and finishes with a strategy for increasing the use of solar energy.

The plan begins with a statement about the major benefits of renewable energy sources. "The promise of renewable energy sources is that, coupled with energy conservation measures, they offer the best prospects for secure, sustainable global energy supply into the very long-term, at a stable real cost, and at an acceptable level of social and environmental impacts". This sets the stage for the plan and is mentioned just before the current Victorian Government's objectives regarding renewable energy sources. These government objectives really form the basis for the plan. They are

(i) To systematically encourage the commercialisation and maximum market penetration of feasible solar products with an emphasis on Victorian manufacture, and

(ii) To contribute to the Government's long-term strategy for a shift in the Victorian economy away from dependence on fossil fuels towards greater reliance or solar-based renewable energy,

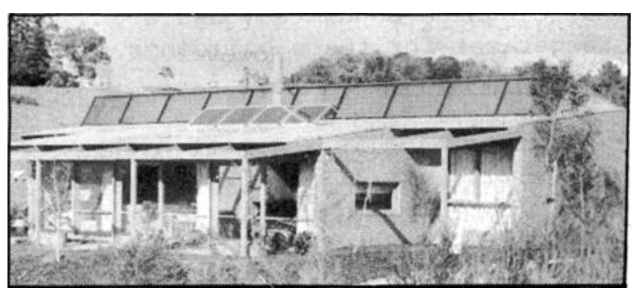
Next the current state of renewables is covered. This section of the plan makes interesting reading, giving useful background information on the situation as it is today.

But the most interesting part of the Solar Plan is the strategy for increasing the role of renewables in our society. Each area which is dealt with, includes an overall future strategy, (which includes a statement of objectives), a list of programs and activities as well as a list of targets which should be achieved.

Passive Solar Buildings

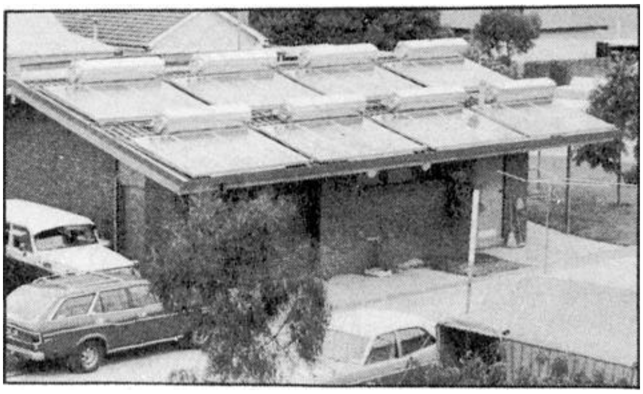
Passive-Solar Conservation Building Design is dealt with in greater detail than any other area in the Solar Plan. It receives prominence because passive design is currently cost effective and yet relatively rare, and hence its widespread usage would have a major impact on society's energy usage.

The objectives regarding Passive design are to increase the numbers of new buildings with these features, as well as to increase the number of established buildings through "retro-fitting" with solar features.



To achieve this the plan recommends the following:

(1) An expanded informational, educational and promotional program;
(2) Action to safeguard access to sunlight;
(3) Review and reform Building regulations and planning legislation to assist in the development of passive solar design;



(4) Energy Conservation retrofits should be expanded to cover all types of houses; and
(5) New public housing and government buildings should make use of passive design features.

Specific targets include:

Establishment of passive construction design standards for new public housing (to be in place by January, 1986);
(2) To have overall energy performance standards for new housing which specify acceptable levels of heat loss and gain (to be in place by January 1987);
(3) To improve thermal performance of new buildings so by 1990 energy consumption is on average 20% lower; and
(4) an investigation of energy saving through retrofitting existing buildings be conducted, and a target set for these buildings.

Solar Water Heating

Solar water heating is the next highest on the priority list. Objectives include:

(1) to stimulate the development of more cost effective water heaters; and
(2) to encourage increased market penetration north of the Great Dividing Range.

Programs and activities to achieve this are:

(1) continue development work which can improve cost effectiveness;
(2) assist local industry to improve water heater design;
(3) conduct a pilot program for selective purchase of solar water heaters for use in public housing;
(4) research load management of solar-electric off-peak water heaters;
(5) develop solar appliance testing and labelling;

Specific targets include:

(1) to assist in development of a solar water heater at least 20% more cost effective (by 1990);
(2) start purchasing solar water heaters for Government buildings north of the Great Dividing Range during' 1985; and
(3) increase market penetration of solar water heaters to 10% north of the Great Dividing Range (by 1990).

Biomass

Biomass was seen as important because of its contribution as a vehicle fuel. The relatively short life of our oil reserves could make alcohol important relatively soon compared with other fuels such as coal, which have a longer life.

Objectives here were:

(1) to demonstrate and evaluate petrol-biomass alcohol blends (medium term);
(2) to evaluate pure alcohol transport fuels (long term);
(3) to encourage use of wood and agricultural residues for heat and power production; and
(4) to encourage the conversion of organic wastes to biogas.

To assist this:

(1) a study on the potential of biomass fuels should 'be completed;
(2) petrol-alcohol blends for transport should be evaluated;
(3 a pilot scale alcohol production plant should be established;
(4) research, development and demonstration should continue;
(5 commercial use of wood and agricultural waste in direct combustion and co-generation should be encouraged;

Photovoltaics

Photovoltaics (PV) were seen as important because of their contribution in powering private homes where connection to main power grids is too expensive. Objectives were to:

(1) encourage the use of PV systems in remote areas; and
(2) to encourage Victorian manufacturers to be involved in design and manufacture of PV systems.

Programs and activities to do this are:

(1) produce information packages;
(2) Provide information comparing the cost of PV pumping system and grid power, diesel generators and windmills;
(3) government should promote PVs for cost effective situations;
(4) investigate the potential for incentives to encourage the use of PVs for appropriate locations;
(5) government bodies with remote power needs should install PVs where appropriate;
(6) investigate the testing and labelling of PVs;

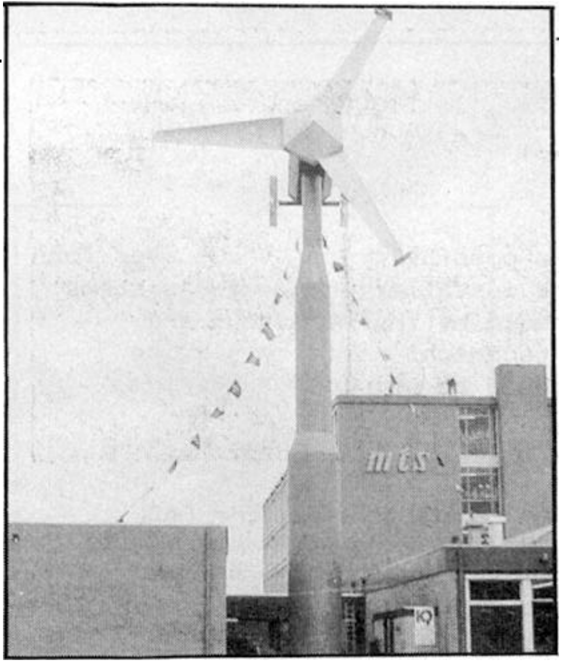
Targets are:

(1) to increase Victorian PV sales to 200 kWp/year if the price drops to $3/Wp and by 100 kWp/year, if the price remains *above $4/wp, (by 1990);
(2) to realise an installed PV capacity in Victoria of 700 kWp on the low-module-price scenario and 400 kWp on the higher price scenario.

Solar Pool Heating

Solar pool heating is seen as important because solar is highly suitable for providing this type of low grade heat and at much lower cost than the alternatives. Objectives were:

(1) to increase the number of public and institutional pools heated by solar; and
(2) to encourage solar heating for private pools through informational and educational means.



This was to be achieved through:

(1) financial incentives to encourage the use of solar for public and institutional pools;
(2) a promotional campaign including production of printed information to encourage the use of solar;

A specific target is "to encourage at least 70 additional public, institutional and commercial pools in Victoria to install solar heating systems over the period 1985-1990".

Wind Power

Wind was seen as potentially useful in two ways - as a cost effective way to provide power for remote locations and (with larger generators) to contribute to the main power grid.

Objectives were:

(1) to evaluate the potential for grid connected wind power;
(2) to promote the use of wind for remote area power supply; and
(3) to encourage the local production of wind generators.

Programs and Activities related to wind were:

(1) to complete current studies on wind potential;
(2) to install a demonstration wind generator, connected to the grid;
(3) to produce -information packages on the costs, benefits and applications of wind generators;
(4) wind power should be actively promoted by Government agencies;

(5) the possibility of incentives for the installation of wind systems should be investigated; and
(6) a technical advisory service should be provided.

Hydroelectricity and Geothermal

With both of these the Solar Plan recommended an assessment (or reassessment) of the potential energy available.

Active Solar Space Heating and Cooling

The aim here was "to encourage research and development work to improve the cost-effectiveness of active solar space heating and air conditioning systems".

Solar Industrial Process Heating

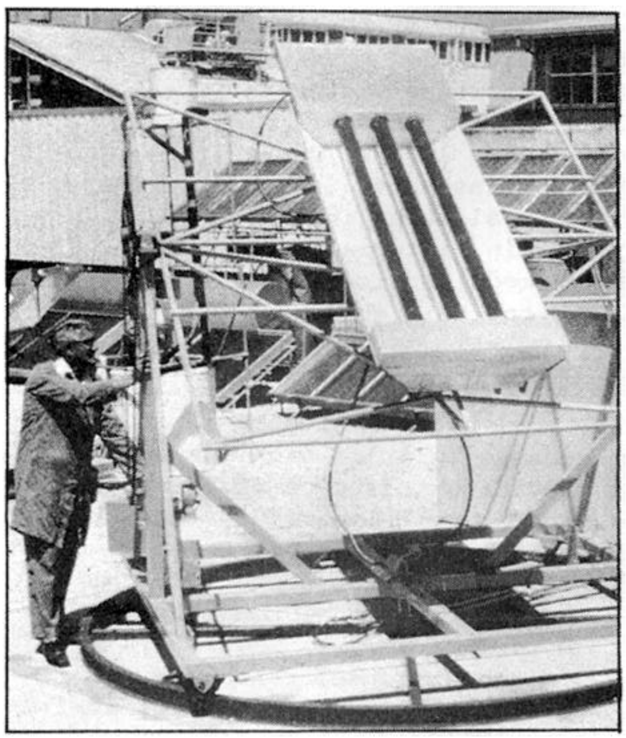
Objectives here were:
(1) to investigate the prospects for solar greenhouses and solar water heating in dairies in Victoria; &
(2) to encourage development work aimed at radically improving the cost-effectiveness of solar systems for the manufacturing industry.

Programs and activities include:
(1) completion of a market survey on solar greenhouses;
(2) encouragement of development work on innovative systems and technology for use in solar greenhouses; and
(3) investigation of prospects for solar water heating in farm dairies.

The Solar Plan includes an Appendix which brings all the objectives, implementation programs and targets together in an easy to read implementation strategy. A refreshing thing about the whole Solar Plan is its emphasis on action . . . actually getting things done. This is where the targets and implementation programs make the difference between what could have been a stuffy, vague and relatively directionless document. Instead the Solar Plan is a strong statement of future directions; pointing the way to an environmentally sound, economically sustainable energy future.

The big danger now is that an inadequate allocation of resources will result in the Solar Plan failing to achieve much of its recommendations, and hence putting the plan into action becomes a political question. Let us hope the Victorian Government has the strength and vision to put its money where its mouth is.

Copies of the Solar Plan are available from the Victorian Solar Energy Council, 10th Floor, 270 Flinders St., Melbourne, 3000. Phone: (03) 6544533. For anyone interested in renewable energy planning, it's a must.



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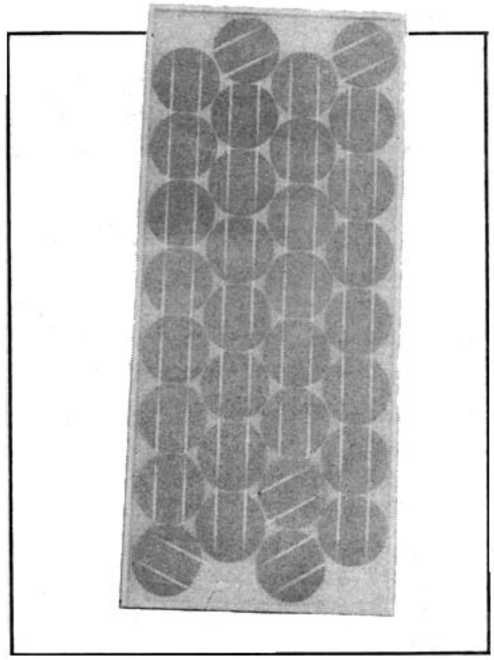
4. Sharp NT103E

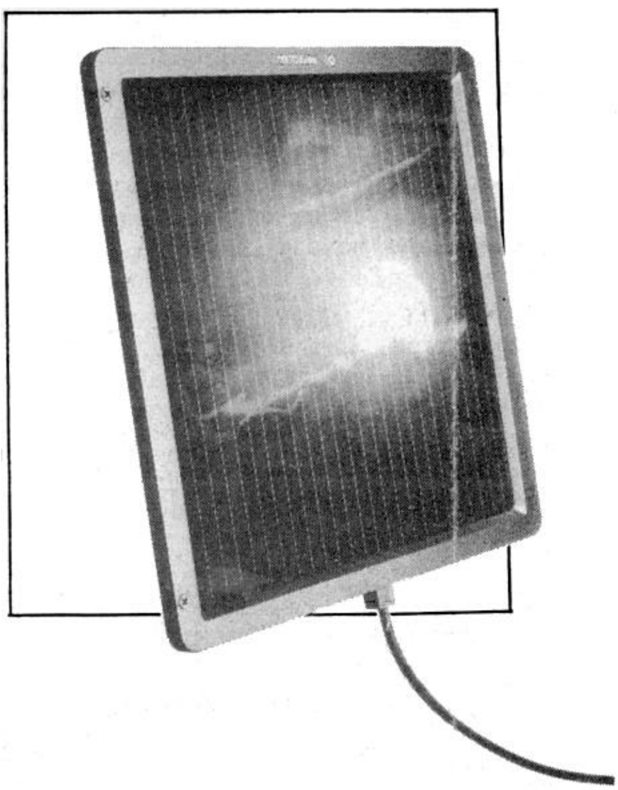
One of the less widely available panels using single crystal cells. Glass frontwith aluminium frame. Electrical connections are via a wire hanging from the back of the panel. Had the lowest number of cells of all the panels we examined,

Peak Power	35.2w
Voltage	15.5V (Peak Power)
	18.8 (Open cct.)
Current	2.27A
cost	$470

General Comments:

A very well made panel but no junction box or diodes. With 32 cells its voltage is a little lower than most,





5. Arco Solar Genesis

G100 Thin film deposited on glass. Encapsulated in glass and polymer in a moulded plastic frame tempered glass back, 1.5m cable mounting holes. 1 year guarantee. Weight 1.4Kg.

Max. power	5 watts
Voltage	14.5 (peak power)
	20.8 (open cct.)
Current	.35
Size	347 x 333 x 13
Price	$128.

Another model approx. 1200 x 350mm is due out soon.

General Comments:

A very neat unit with convenient mounting holes in the solid plastic frame. There is no junction box but a 1.5m cable to where it is to be used. The lower wattage could be used for battery maintenance and like the smaller wattage units tends to be expensive.

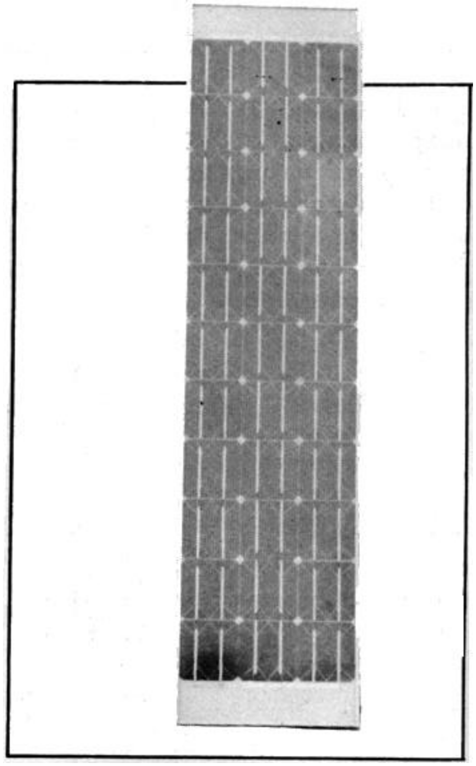
6. Arco M 73

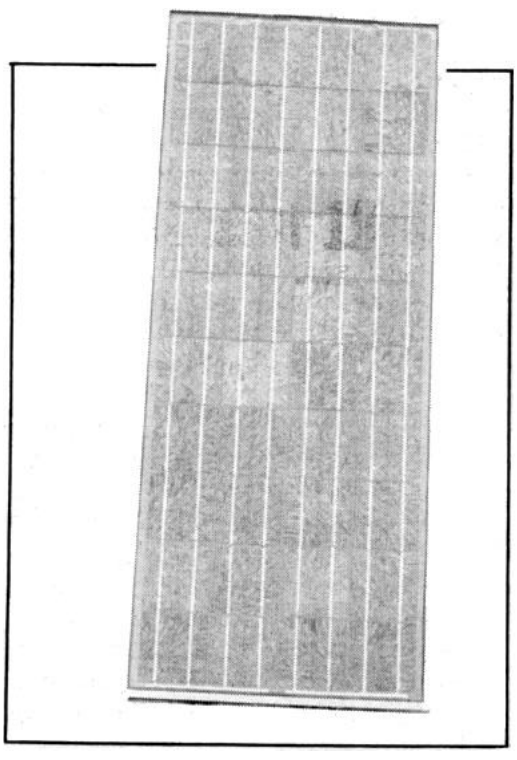
An attractive panel with 33 single crystal silicon cells.' The edges have been trimmed on these cells to give a square shape which allows them to be packed into a smaller panel area. Cells are laminated between layers of vinyl acetate for moisture protection with an impact resistant tempered glass front. Five year warranty.

Maximum Power	40 watt
Voltage Peak	16.4 volts
Voltage Open Circuit	19.8 volts
Current	2.44 amps
cost	$475-00

General Comments

Very well made. Two junction boxes with diodes and mounting holes drilled in the aluminium frame. A self regulating unit, the M63 is available for around $375-00.





7. AEG PQ10/40/01

The panel is constructed with poly-crystalline cells, each 10 cm by10 cm and sealed between two glass-panes. The frame is stainless steel. Electrical connections are via two wires hanging from the panel. The panel uses more cells than any of the other panels we examined; a total of 40 cells.

Peak Power	38.4
Voltage	17.8 (peak power)
	24V (open cct.)
Amp	2.2
Weight	4kg
Size	1076 x 459 x 11
cost	$570

General Comments:

A very well made unit with a stainless steel frame and 2 glass sheets. No junction box or diodes provided. This unit should be useful where sea water may cause corrosion problems. It is the lightest of the panels tested.

SUMMARY

	PANEL	ORIGIN	LOWEST PRICE/ PANEL	VOLTAGE	WATTAGE	AMPS	NO. OF CELLS	CELL TYPE	PANEL CONST.	TERMINAL BOX	PRICE/ WATT
1.	Tideland GL3 L3641/12	Aust.	$360	17.9	37.5	2.12	36	Single Crystal	Alum.	Yes	$9.6
2.	Solarex X100GT.	Aust.	$380	16.2	42	2.75	36	Polycry.	Alum.	Yes	$9.0
3.	Kyocera PSA100H -361	U.S./ Japan	$470	16.2	40	2.47	36	Polycry.	Alum.	Yes	$11.75
4.	Sharp NT103E	Japan	$470	15.5	35.2	2.27	32	Single Crystal	Alum.	No	$13.3
5.	Arco Genesis	U.S.	$128	14.5	5	0.35	1	Film	Plastic	Cable	$25.6
6.	Arco M73	U.S.	$475	16.4	40	2.44	33	Single Crystal	Alum.	Yes	$11.8
7.	AEG PQ10/40 /01	Germ.	$570	17.8	38.4	2.2	40	Polycry.	S.S.	No	$14.8

Conclusion

All cells examined were very well made and many of the earlier faults e.g. water penetration and breaking off of intercell connectors seem to have been remedied.

The prices in this article should only be taken as a general guide. They do vary considerably from place to place. Don't dismiss the imported panels - many are very good quality and at times then can even be bought cheaper than the locally produced panels.

Finally, in compiling this article, we took all the care possible to provide accurate, detailed information. Any slight errors or omissions are accidental. We say this because sale of solar cell panels is becoming increasingly competitive, and an article such as this could upset some retailers, suppliers and manufacturers, who feel their product has not had justice done to it.

SOLAR STILL from Page 26

the back and sides. You'll see this a few minutes after you put in the water; first the glass steams up, then droplets form and run down to the bottom.

Don't expect the water to gush from the still like a Niagara, but put a can or bottle under the drain to catch the distilled water. On a sunny day the still will begin producing soon after you set it in operation and will drip water steadily into the container. To guard against evaporation of this distilled water, some experimenters run a tube from the drain to a corked bottle.

Panel Suppliers & Information

The firms listed below are able to design and install systems consisting of Photovoltaic Cells, control panel and deep cycle batteries with an inverter to convert the battery voltage to 240V to operate normal appliances.

New South Wales

Independent Advice

Energy Information Centre
Argyle Centre, 33 Playfair,
The Rocks, Sydney, 2000
Ph: (02) 234-4444

* Retailers

AMTEX Electronics
36 Lisbon Street
Fairfield, 2165
Ph: (02) 728-2121
Kyocera and Photowatt solar cell panels

Aqua-lab Solar
35 Hobart Street
Riverstone, 2765
Ph: 627-441.9
Arco solar cell panels

Aralven Solar Generators
Portion No. 9, Aralven Road
Koruya, 2537
Ph: (044) 74-2993
Solarex and Arco solar cell panels

Border Gas and Solar Centre
317 Wagga Road
Lavington, 2641
Ph: (060) 255 322
Solarex solar cell panels

Elders Pitt Son Am1
(44 branches in N.S.W.)
Arco Solar cell panels

Energy Centre
Hardwick Crescent
Kippax ACT 2615
Ph: (062) 542 666
Solarex solar cell panels

Indian Pacific Solar Electric
5 Park Street
Erskinville 2043
Ph: 519 9311
Arco solar cell panels

Lucas Industries
Sydney Sales Office
117 Parramatta Road
Auburn 2144
Ph: 647 1877
Solar Power Corporation solar cell panels

Maitland Solar Energy Supplies
149 Swan Street
Morpeth 2321
Ph: (049) 33 5580
R and J Francis solar cell panels

Monaro Solar Centre
Polo Flat Road
Cooma 2630
Ph: (064) 82 2260
Solarex solar cell panels

Moore and Smith
68 Wollongong Street
Fyshwick ACT 2609
Ph: (062) 80 5522
Solarex solar cell panels

Natural Energy Centre
34 Casino Street
South Lismore 2480
Ph: (066) 21 3239
Photovoltaic cells

Northern Rivers Solar
Clark Street
Ballina 2478
Ph: (066) 864 620
Solarex solar cell panels
Arco solar cell panels
Kyocera-Solavolt solar cell panels

Nowra Solar Centre
Lot A, 3 Princes Highway
South Nowra 2541
Ph: (044) 215 977
Solarex solar cell panels

Philips Electronic Component:
67 Mars Road
Lane Cove 2066
Ph: 427 0888
Photowatt International solar cell panels

Quirks Victory Light Co
16 Court Road
Double Ban 2028
Ph: 327 6630
Arco solar- cell panels

Self Sufficiency Supplies
Shop 3, Cnr. Clyde & Forth Sts.
Kempsey 2440
Ph: (065) 627 704
Solarex, Arco, Tideland solar cell panels

Solohart Albury-Wodonga
315 Wagga Road
Lavington 2641
Ph: (060) 25 5322
Arco solar cell panels

Solahart Central Coast
394 The Entrance Road
Long Jetty 2261
Ph: (043) 32 1983
Solarex solar cell panels

Solahart Coffs Harbour
58 Moonee Street
Coffs Harbour 2450
Ph: (066) 52 6133
Solarex solar cell panels
Tideland solar cell panels

Solahart Grafton
47 Fitzroy Street
Grafton 2460
Ph: 42 5425
Solarex solar cell panels
Tideland solar cell panels

Solarex Pty Ltd
5 Bellona Avenue
Regents Park 2143
Solarex solar cell panels

Solec Industries Pty Ltd
44A Moonee Street
Coffs Harbour 2450
Ph: (066) 52 6105
Solarex solar cell panels

South Coast Energy Centre
39 Queen Street.
Moruya 2537
Ph: (044) 74 2957
Solarex solar cell panels
Tideland solar cell panels

Southern Cross MachinerySyd P/L
39 Grand Avenue
Granville 2142
Ph: (02) 638 0481
Solarex solar cell panels

Southern Cross Machinery
84 Edward Street
Wagga Wagga 2650
(069) 215 366
Solarex solar cell panels

Southern Cross.Machinery
37 Rankin Street
Forbes 2871
Ph: (068) 521 047
Solarex solar cell panels

Southern Cross Machinery
Cnr. Victoria St & Depot Rd
Dubbo 2830
Ph: (068) 823 330
Solarex solar cell panels

Southern Cross Machinery
90 Melbourne Street
East Maitland 2323
Ph: (049) 335 552
Solarex solar cell panels

Southern Cross Machinery
88 Maitland Road
Muswellbrook 2333
Ph: (065) 433 102
Solarex solar cell panels

Southern Cross Machinery
476 Peel Street
Tamworth 2340
Ph: (067) 663 781
Solarex solar cell panels

Southern Cross Machinery
209-215 Gwydir Highway
Moree 2400

Sunstream
17 Giselle Avenue
Wyoming 2250
Photovoltaic Panels

Tideland Energy Pty Ltd
100 Old Pittwater Road
Brookvale 2100
Ph: (02) 938 5111
Tideland solar cell panels

Victoria

* Independent Advice

Victorian Solar Energy Council
10th Floor
270 Flinders Street
Melbourne 3000
Ph: (03) 654 4533

Energy Information Centre
130 Flinders Street
Melbourne 3000
Ph: (03) 63 1195

* Retailers

Elante Pty Ltd
5 Cremorne Street
Richmond 3121
(03) 429 9733
Arco Solar cell panels

Going Solar
320 Victoria Street
North Melbourne 3051
Ph: (03) 328 4123
Tideland (B.P.) and Solarex solar cell panels

R.J. & R. A. Kirby
RMB W610
Ballarat 3350
Ph: (053) 422 388
Solarex and Arco panels

Lucas Industries Aust Ltd
300 Lower Dandenong Road
Mordialloc 3195
Ph: (03) 586 8209
Solar Power Corporation
solar cell panels

Powlec Pty Ltd
9 Mersey Street
Box Hill 3128
Ph: (03) 898 7752
Tideland and Solarex panels

Solar Charge Pty Ltd
122A Martin Street
Gardenvale 3185
Ph: (03) 596 1974
Solarex panels

Solar00
420 Canterbury Road
Surrey Hills 3127
Ph: (03) 830 4320
Arco & Tideland (B.P.) panels

Suntron Energy Company
13 Belinda Crescent
Doncaster East 3109
Ph: (03) 848 8653
Solarex, Kyocera, Sharp
& AEG Panels

Survival Technology
66 Maroondah Highway
Croydon 3136
Ph: (03) 725 5550
Tideland and Solarex panels

Outlook Alternatives
RMB 9010
Wangaratta 3678
Ph: (057) 27 3261
Tideland panels

Western Australia

* Independent Advice

Solar Energy Research Institute
13 Howard Street
Perth 6000
Ph: (09) 326 4240

J.T. Day & Co
(Agent for Solarex)
16 Mumford Place
Balcatta 6021
Ph: (09) 344 4000

Energy Information Centre
Centreway Arcade
799 Hay Street
Perth 6000
Ph: 425 4255

Lucas Industries
(Agent for Solar Power Corporation)
647 Wellington Street
Perth 6000
Ph: (09) 321 8855

* Retailers

Atkins Carlyle
(Agent for Tideland)
44 Belmont Avenue
Belmont 6104
Ph: (09) 277 0511

Nissho Iwai Australia
(Agent for some Japanese manufacturers)
5 Mill Street
Perth 6000
Ph: (09) 321 2835

Solar Cells WA
(Agent for Arco)
21 Broun Avenue
Bedford 6052
Ph: (09) 272 6566
A.H. (09) 298 8016

R.F. Datodi & Assoc.
(Agent for AEG, Sharp, Kyocera, Tideland)
48 Buckingham Drive
Wanneroo 6065
Ph: (09) 409 1730

Philips (Elcoma Division)
(Agent for Philips)
94 Belgravia Street
Belmont 6104
Ph: (09) 277 4199

South Australia

* Independent Advice

Energy Information Centre
175 North Terrace
Adelaide 5000
Ph: (08) 212 1400

* Retailers

Natural Energy Centre
147 King William Road
Hyde Park 5061
Solarex panels

Elders Pittson A.M.C. Ltd
4 Santo Parade
Port Adelaide 5015
Arco solar panels

Natural Technology Systems
120 Prospect Road
Prospect 5082
Ph: (08) 447 298

Zolar Energy Products
264 Ward Street
North Adelaide 5006

* Note: This list is not conclusive. Check with the Energy Information Centre for more information.

Queensland

Alternative
37 Bengalla Street
Toowong 4066
Ph: (07) 371 6994
Solarex and Tideland

Solar Generation
Caloundra Road
Palm View
Ph: (071) 945 118
Solarex, Tideland

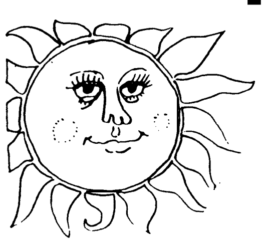
Tasmania

Leven River Traders
37 King Edward Street
Ulverstone 7315
Ph: (004) 26 4884
Solarex solar cell panels.

Heat Ray and Energy
6 Stevens Street
East Devonport 7310
Ph: (004) 27 8870

* Note: We think that there are other suppliers in both these states, however, not many. Check the 'phone book.

Cheap Solar Cell Panels



The Alternative Technology Association is currently looking at a scheme to obtain solar cell panels for its members and subscribers at lower prices. Many people who wish to buy a small number of solar cell panels must pay the full amount, not being eligible for the $40 or more discount you get if you buy, say, 10 or more panels. By members getting together as a group and buying in quantities, we should be able to get substantial discounts, which could lead to savings of hundreds of dollars.

If you could be interested in this scheme, give us a ring, or drop us a letter stating who you are, where you are, how many panels you anticipate needing and when you would need them.

The Alternative Technology Association is a group of people interested and involved in Alternative Technology. Our Activities include meetings, film nights, practical workshops and field trips,

MEMBERSHIP
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Rates $14, $7 pensioners, unemployed, students, $20 institutions.

SUBSCRIPTION
Subscribers-receive Soft Technology four times a year.
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I wish to JOIN SUBSCRIBE and enclose $.......

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ADDRESS.....................................POSTCODE........INTERESTS......................

Send to Alternative Technology Association 366 Smith St Collingwood Vic. 3066