Soft Technology

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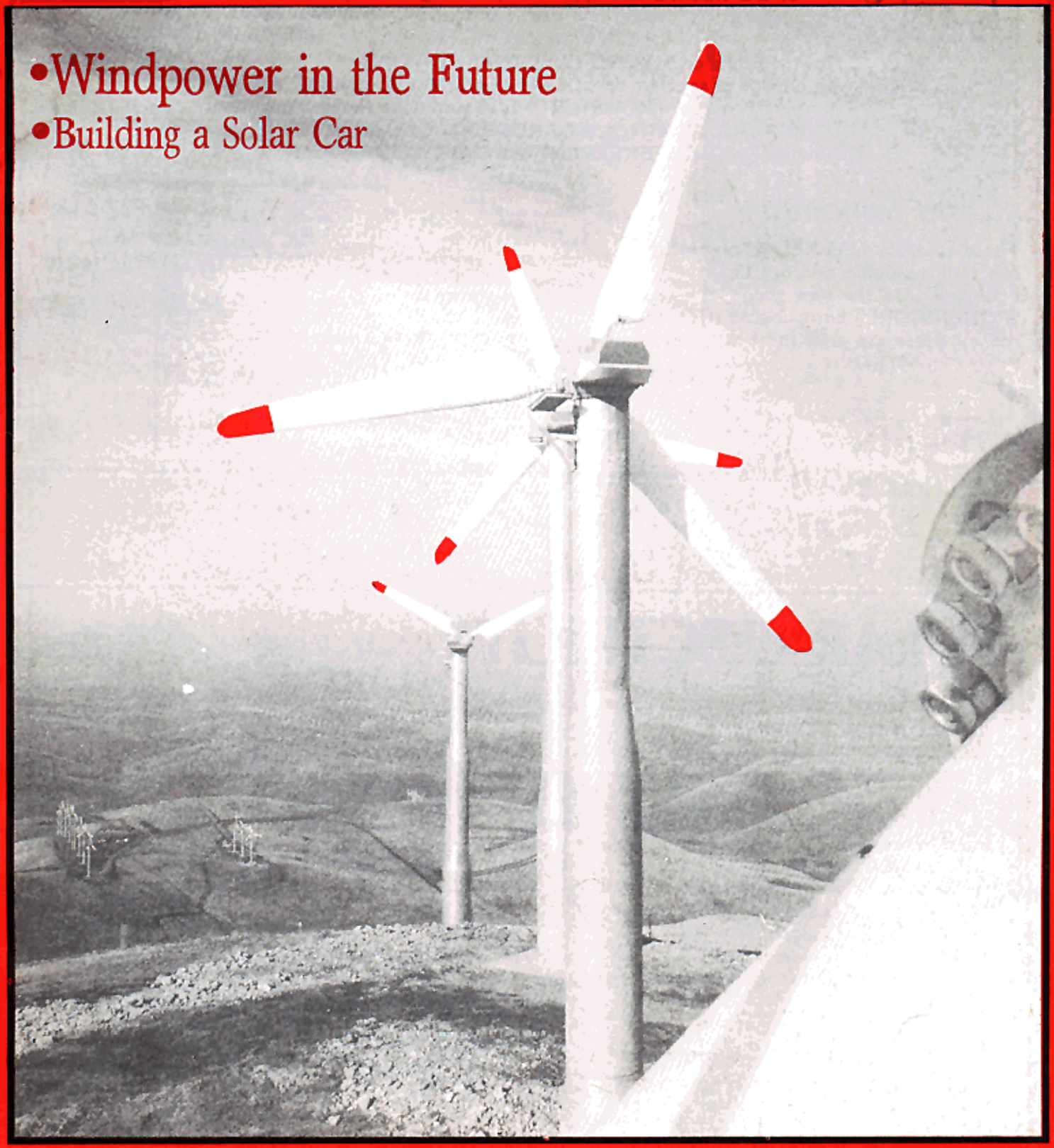

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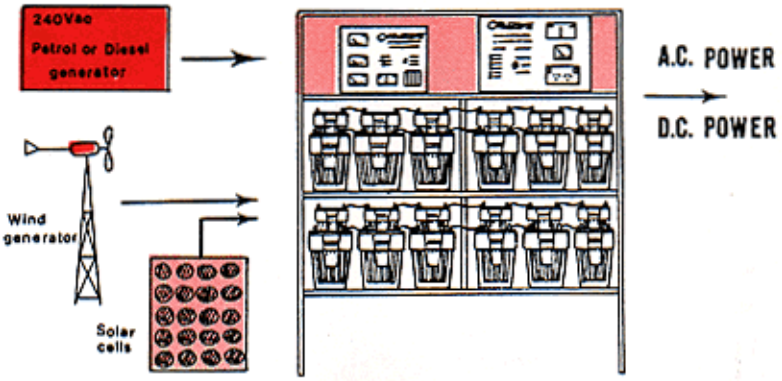

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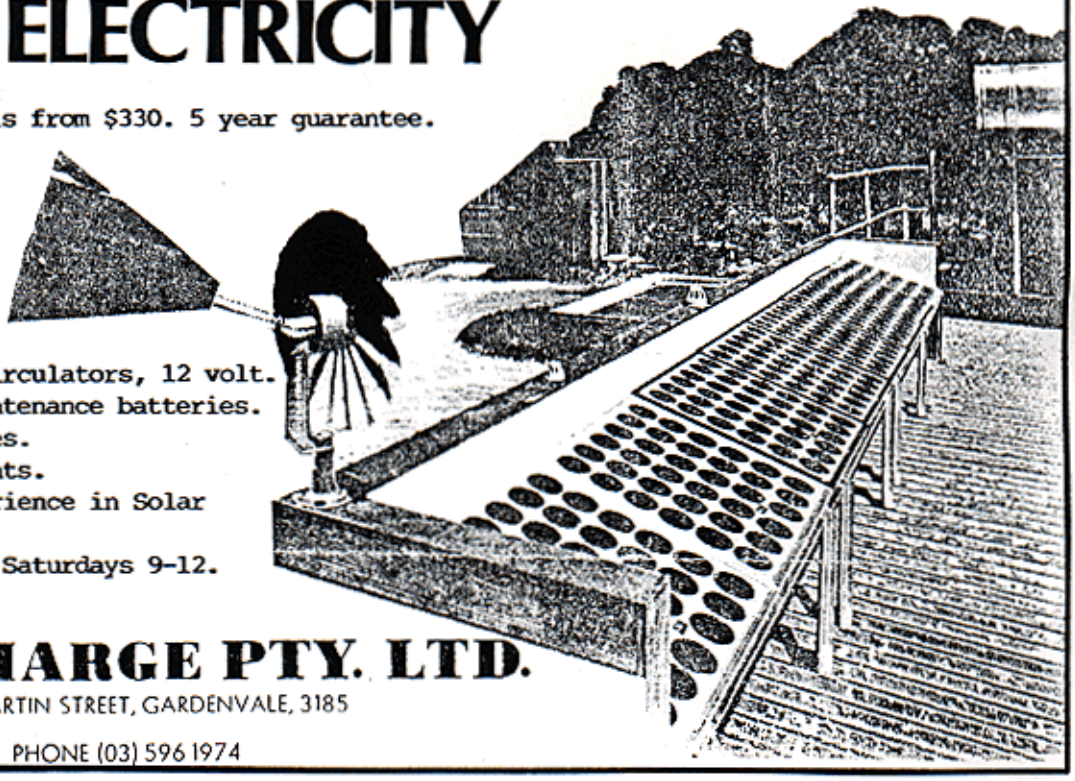

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Contents

4 **ENERGY FLASHES**
Solar Tandem, Pneumatic batteries & PV races.

6 **WHAT WILL THEY THINK OF NEXT!**
From the land that gave you Micky Mouse.....

7 **WIND IN THE FUTURE.**
Lessons from the past point to the future

11 **BUILDING THE SOLAR CAR**
How the Warrugul Tech car was put together

14 **THE DARRIEUS ROTOR AT MOORA-MOORA**
Powering a whole community with wind

17 **THE SOLAR RESOURCES CATALOGUE**
Information on alternative technology from the ATA

21 **AN ELECTRIC GO-CART**
A simple electric go-cart that was easy to build

23 **THE ATA REPORT**
News and e-gents from the alternative technology association

25 **WIND TECHNOLOGY**
A look at the range of wind generators produced by Wind Technology Australia

27 **CITIES OF THE FUTURE 2**
Some ideas toward an Australian version of the Dartington concept

30 **SOLAR WATER HEATER FROM BOTSWANA**
How to make a simple water heater

33 **WESTWIND**
A look at windgenerators made by Westwind

35 **BOOK REVIEW**
Energy Works! by Keith Smith.

FUTURE WIND p7

This issue of Soft Technology was edited by Mick Harris with the help of Alan Hutchinson, Noel Jeffrey, Jeff Hilder and others.
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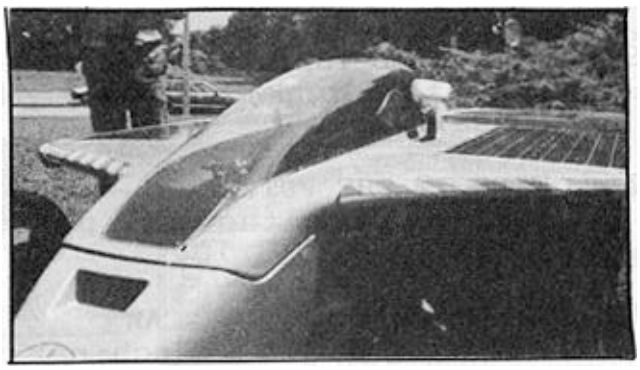
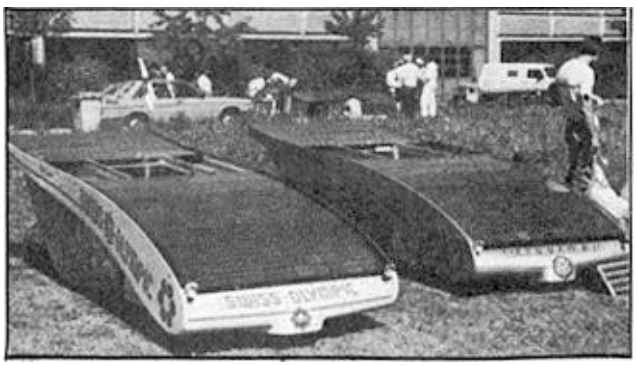
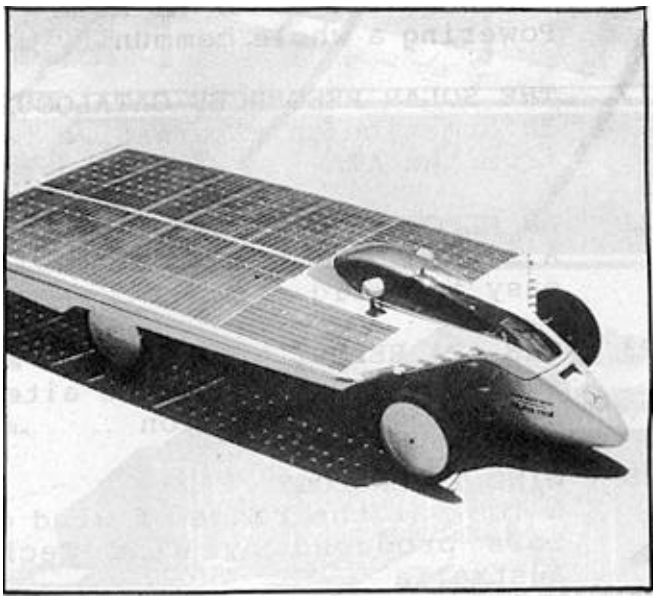
Energy Flashes

The Solar Grand Prix

A 368 Km five day race was won in Switzerland by a Mercedes Benz $100,000 car designed and built by its apprentices. The vehicle was fabricated from special ultra-light materials, had customised German-built Photovoltaic modules integrated into its design and employed silver-zinc batteries. Powered by 432 solar cells generating 480 watts it was driven by 2 D.C. motors through the three speed gear drive. Controls were provided by the Swiss company Noseda. Top speed was 75 KPH and 1 Kilowatt hours were used for the 368Km journey.







What a Gas

A pneumatic battery the size of a cricket ball can store enough energy to accelerate itself to break the sound barrier.

The batteries using pressures 1 million times greater than the atmosphere can be used for release mechanisms and in chemical plants where an electric spark would be dangerous.

Hymatic Engineering of Britain makes the batteries using computer controls to determine the dimensions of the leak proof container and specialised electron beam welding. The batteries on slow release could hold pressure for 15 years or more. The cost at present is approx. $200 but could fall to $20-$30 if there is a mass market.

Solar Tandem

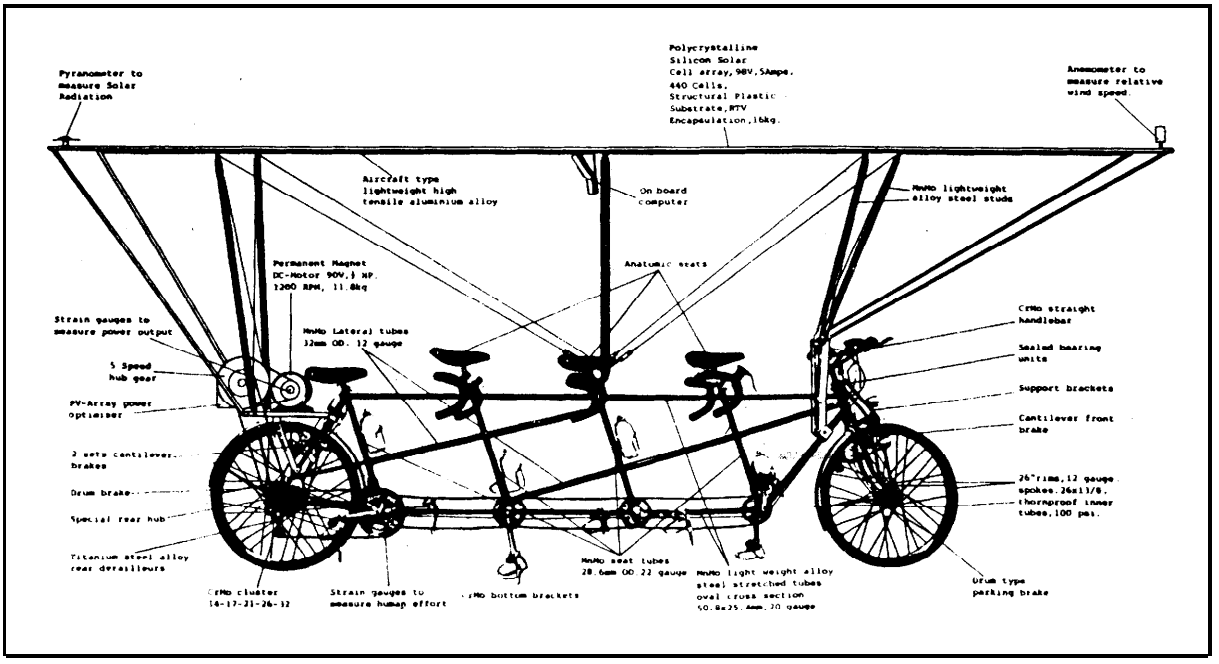
Over the last twelve months the Solar Energy Research Centre (SERC) of Queensland has designed, built and tested a solar powered four seater tandem bicycle.

This unusual vehicle, christened 'Solar Tandem' has a 5 square meter flat PV-array over the head of the riders, that feeds a 90 volt D.C. motor directly. No batteries are used for storage. Pedal power by the riders provides the additional push whenever it is needed.

The motor drives the rear wheel via a 5 speed hub gear/chain system. Independently the pedal power is transmitted to the same wheel (but different sprocket cluster) via a common 10 speed transmission.

'Solar Tandem' was recently entered into the 'Great Paper Chase' organised by the Queensland Courier Mail. The race covered a distance of 1,850 km between Cairns and Brisbane. A fourteen person SEX team won first prize in the enterprise class of the race by riding the full distance in 7.5 days averaging 250 km per day.

Sunworld



Waste to Energy

With the U.S. producing 200 million tons of municipal solid waste each year and growing, landfill space at a premium and straight burning out of the question, Westinghouse Electric, Signal Environmental Systems and Combustion Engineering have become major suppliers of plants to convert waste into electricity or steam generation.

These plants using up ta 2,250 tonnes of waste per day can produce 4MW of electricity. The special reciprocating grates or rotating combustors operate at approx. 1400°C reducing the volume by 95% while electro-static precipitators control pollution levels.

And Now From The Land That Gave Us

MICKEY MOUSE RONNIE REAGAN & REUSABLE SPACE SHUTTLES

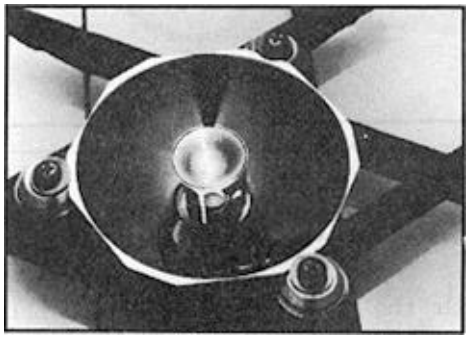
Two private users of photovoltaics in the states are making use of 12 volt panels for home appliances.

Richard Kimp has a P.V, panel mounted on his lawn mower to power up a Battery which runs a 12 Volt motor. He says the P.V. module sits in the sun all week, soaking up enough charge to run the D.C. motor for 2 or or 3 hours. We use it all summer round the home.

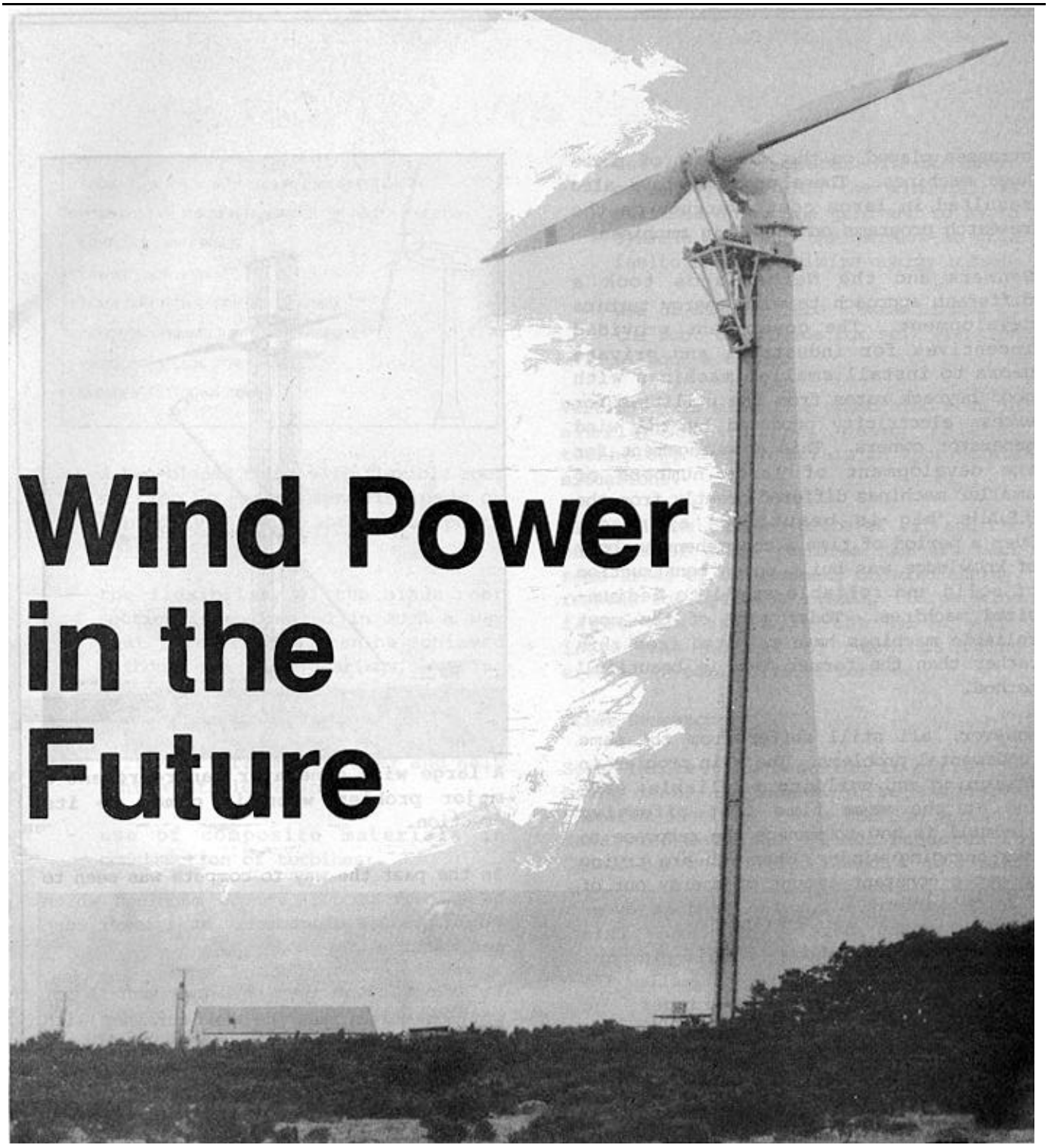
Bruce Johnson uses his panels to charge a pair of 12 volt batteries which powers a rotary tiller. Though it is out performed by its noisy fuel consuming cousins, I feel its quiet operation and me of renewable energy more than make up for its limitations. Bruce also uses this power source for a 12 volt chain saw and for a compost shredder.

An American company is now offering NiCad D-size batteries with built in P.V. panels. When flat the cells are placed in the sunlight and charge at half the normal battery charger rate or can be put on the normal charger. At present they are priced at $20 U.S.

Plush golfers may be sheltered from the sun and rain by solar panels in a new version of Solarwest's Solar Caddy. The roof has a P.V. array to charge the vehicles batteries, four way rain gutters, concealed wiring and a universal mounting system.



A solar cell collector which looks like a flashlight reflector. Its small size of about 2.5 inches in diameter is meant to make it possible to reduce the size of solar arrays used to power spacecrafts in orbit around the earth.



Wind Power in the Future

It has now been more than ten years since the oil crisis of the 70's inspired a drive to develop a new generation of wind turbines. A number of trends in the development of new turbines have become apparent during these years.

Sweden, Germany and especially the U.S.A. have followed a path which included massive government spending developing the biggest machines possible. The idea behind this was the bigger machines would be more cost effective.

However, this approach has led to a series of unexpected problems. These machines have developed a series of technical problems many of which have related to the

stresses placed on the materials of these huge machines. These problems have also resulted in large cost overruns on the research programs on these big machines,

Denmark and the Netherlands took a different approach to wind energy turbine development. The government provided incentives for industrial and private users to install smaller machines with good buyback rates from the utilities for excess electricity produced by the wind generator owners. This encouragement for the development of large numbers of smaller machines differed greatly from the U.S.A.'s 'big is beautiful' approach. Over a period of time a comprehensive body of knowledge was built up on construction of solid and reliable small to medium-sized machines. Today many of the most reliable machines have resulted from this rather than the former big is beautiful' method.

However, all still suffer from the same fundamental problems. The main problem in designing and building a reliable, safe and at the same time cost effective windmill is how to manage the response to ever-changing winds. When you are trying to get a constant amount of energy out of a large windmill, but the wind is ever-changing, you have a problem. This problem often shows itself in the breakdown of parts of the windmill. The bigger the windmill the bigger the problem.

In addition to this fundamental problem, research into wind has received a new setback with the recent lower prices of fossil fuels, especially oil. This has made it even harder for wind generators to compete with conventional energy sources.

A large wind generator can represent a major problem when it comes to its erection.

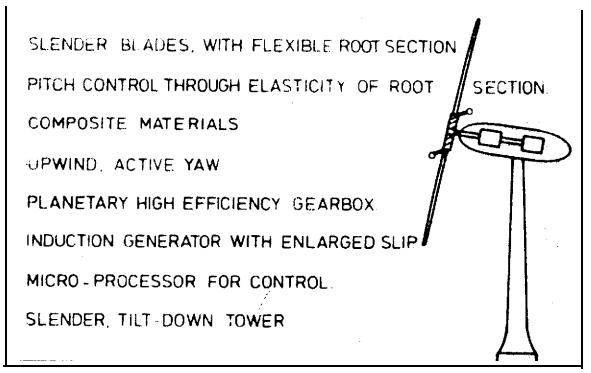
In the past the way to compete was seen to be through producing huge machines which would produce electricity at a lower cost per watt.

It is now clear that this approach is not working and in fact the wind turbines with rotor sizes from 15 to 30 metres have turned out to be cheapest for producing electricity.

The Future

So now making cost effective machines has to involve a new approach. Today research is starting to move in a new direction with simplicity of design being of major importance.

In the future, horizontal axis machines may well have these features:



- a two-bladed rotor with flexible root section to reduce dynamic loads on hub, drive train and its supports and tower;

- the flexibility of the blade root section is engineered in such a way that pitch control can be achieved without expensive bearings, sensing equipment, and servo mechanisms;

- an upwind rotor position to avoid turbulence from the tower and help achieve stable yawing;

- use of composite materials in construction of turbines;

- use of micro-processors to avoid current peaks when the windmill is switched on to the grid and to avoid dynamic loads on the gearbox at grid faults and to minimise energy losses;

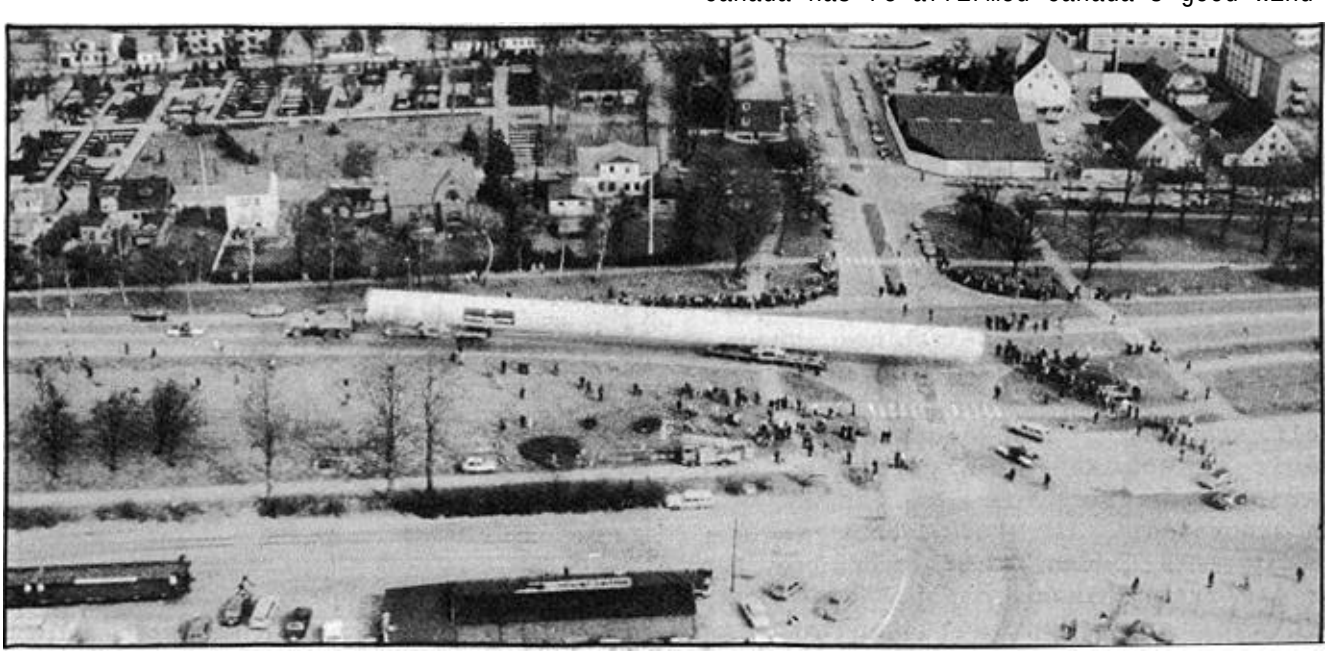
- use of slender tube towers hinged at the foot to provide for self erection without a crane.

Vertical axis windmills could also move in similar directions, using related technology and materials in appropriate situations.

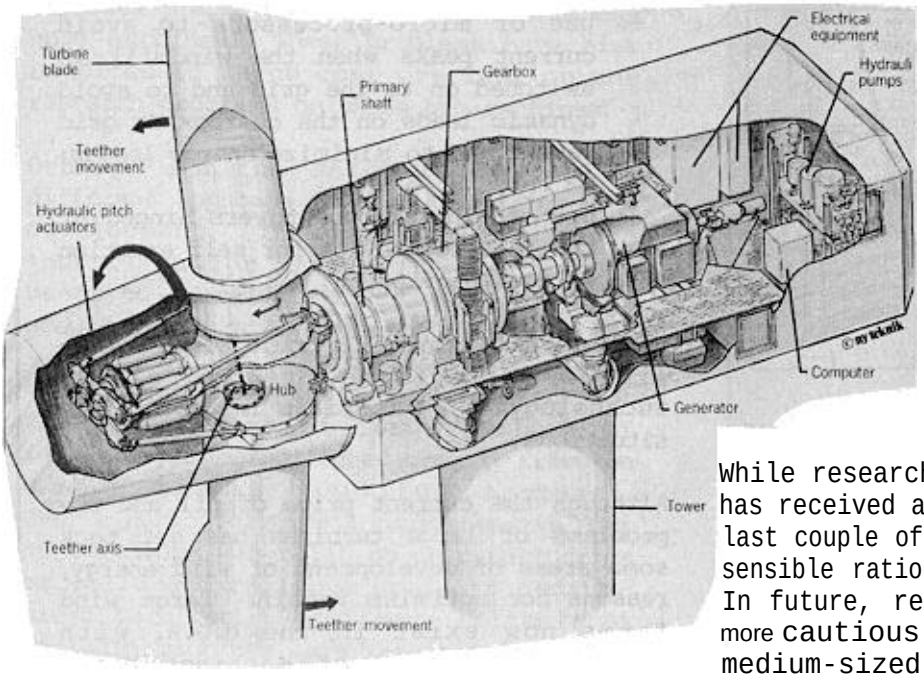
Although the current price of oil and the problems of large turbines has set back some areas of development of wind energy, reasons for optimism remain. Large wind farms now exist in the U.S.A. with increasing numbers of machines being erected in some parts of Europe.

Other Research

Some interesting research is currently being done. In Canada quite extensive research continues to be done on vertical axis wind machines. Other research in Canada has re-affirmed Canada's good wind



Transporting a large wind generator tower presents unique problems.



The Swedish built Maglarp wind turbine produces 3,000 kW. The turbine and blades where lifted together with the aid of two 88 metre erecting masts.

potential for small to medium-sized wind machines in remote locations.

In Hawaii some interesting work is being done on using wind turbines to produce hydrogen gas. This approach eliminates problems associated with trying to get a constant power output if the machine is connected to the grid, and problems of storage if the turbine is in a remote location.

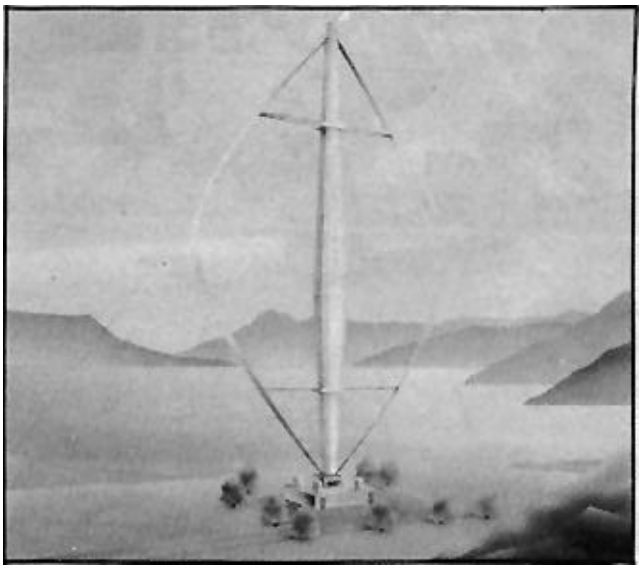
In Britain research is continuing on the Taylor 'V' Type Vertical Axis Wind Turbine. The turbine which resembles the letter 'V' has an inherent simplicity which could lead to being inexpensive both in terms of capital and maintenance costs. The turbine has some additional advantages over other vertical axis machines. These include: its use of simple straight blades without heavy cross arms; it is self starting; aero-dynamic control devices such as flaps, spoilers or variable pitch tips can easily be incorporated; its very short tower requirements for any sized rotor (only 3 or 4 metres) reduces capital cost and provides easy access to generators, transmission and to the rotor itself.

While research on large wind generators has received a bit of a shake-up over the last couple of years, this could lead to a sensible rationalisation of wind research. In future, research looks like taking a more cautious path with the value of medium-sized wind turbines receiving recognition.

Mick Harris

References

Information for this article came from papers presented at Intersol '85, Conference of the International Solar Energy Society, June 1985, Montreal, Canada.



An artists impression of a megawatt scale machine to be built by DAF Indal.

Building a Solar Car

Here are some details on the construction of the "Solar Seeker" as promised last issue. The Solar Seeker is the student designed and constructed solar powered car which followed Burke and Wills' path in the first North to South crossing of the continent. (The West to East crossing had been made in 1982 by Hans Tholstrup with the BP Solar '"The Quiet Achiever"). This project, under the co-ordination of Ted Mellor, was part of Warrigul Technical School's Project Based Technical Year 12 Course, seeking to extend the education of a group of sixteen students.

Four design decisions made early in the project were:

(1) any materials must be repairable at any point in the journey

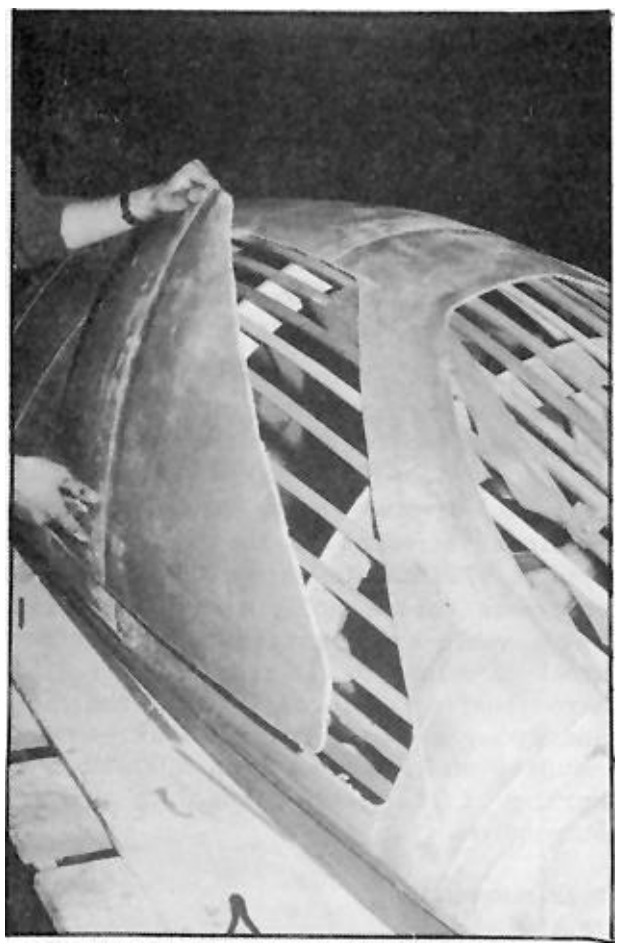
(2) a wing structure would support the solar array providing shade for the driver

(3) modern fibre composites would be used

(4) 4 bicycle wheels would be used because of their efficiency,

The Body

After research into the concepts of rolling friction and aerodynamics, the pooled ideas were brought together in scale drawings then scale styro-foam models were made to test air-flow and internal space. When a satisfactory composite was formed, full scale plan and elevation drawings were made on 2 black painted plaster sheets one on the floor, the other on the wall. A ply cut-out of a full sized man with moveable joints was pinned in position to obtain seating position, head height, leg length and width for the driver and the position of the mechanical components. From this dimensions were taken every '0.2 metres to make scale drawings and prepare a full sized mockup made of ply, chipboard, with cardboard components to test clearances and heights.



To construct the body, frames were made and fitted in their respective stations with hardwood battens over them except in the front and back section, where the sharper curves were too difficult for wood and shaped blocks of urethane were used. Carbon fibre, aluminium honeycomb sheet was used for the base and reinforced at the joints with Du Pont Kevlar fabric laid up with Cibagigy K36 Epoxy resin. This enabled the vehicle to do away with a heavy steel or aluminium frame. The upper

parts were covered with 6mm divynl cell foam and laid up with Kevlar. Maintaining a good curving temperature for the plastics was achieved by draping with tarpaulins and using blower radiators. When the resin had set, the openings for the doors and windows were cut and the internal woodwork removed. The body was then inverted and the internal coating of Kevlar completed the formation of the laminate. The stiffness, strength and lightness of the shell were quite impressive. Doors and windows were made of Lexan which was easy to cut, drill and form and despite a door being blown off and run over, it suffered only minor scratches.

Front Axle

This was pivoted in the centre to reduce torsional stresses to the body and made from 1 1/2inch diameter .035 inch wall thickness chrome molly tubing. Steering was a cable and drum from a conventional steering column to tie rods of fibre glass arrow shafts reinforced with carbon fibre and epoxy resin. The stub axles were mounted on king pins with "AEON" rubber springs fitted above them to provide suspension.

Rear Suspension

Rear suspension and transmission were mounted on a pivoted trailing arm frame with a straight rear axle of 1 1/2inch wheels were driven via a double reduction 3/8 inch chain drive through two overrunning sprog clutches to give differential action in the forward direction.

During the trip both axles had to be replaced due to breakage and drive was to one wheel only. Brakes were two 300mm Aluminium discs on the rear axle with pads mechanically activated by hand or foot; being mounted inboard they were little effected by the weather. Total area 18 sq inches. Suspension was also "AEON" rubber springs.

Wheels

Students designed and built their own hubs from aluminium alloy with 6000 series deep groove fully sealed bearings with 36 x 14 gauge spokes but the 700c aluminium rims could not take the road conditions and stresses and were replaced with 27 inch steel wheels. There were 3 punctures and no broken spokes.

The Motor

A l/2 HP 1200 RPM 24 Volt "Pacific" Motor rated at 20 amp performed magnificently although it weighed 10 kg it ran on voltages from 17 to 30, generated 30 amps downhill and drew in excess of 60 amps for some 12 minutes on a long hill climb coming out of Dubbo at 17 kph. Early in the trip it was fitted with aluminium fins and painted matt black which helped heat dissipation.

Solar Panels

Solarex Semi Crystalline Silicon 100mm sq cells fabricated into panels on lmm aluminium plate then with a transparent reinforced PVC film were specially made giving 600 watts output. The best output was on days of bright overcast with light drizzle. In the bright sunshine cell temperatures rose and once over the knee of the V/temp curve the voltage fell. A lighter array support would have reduced weight.

Batteries

Dunlop Pulsar batteries stored power for hill climbing, shaded areas, and for extended low light running. 5,8 and 10 pair batteries were experimented with and all performed well with high current performance and low internal voltage drop. Low light charging seemed to bring them back on full charge for the next day's run. Despite 36 volts being across the 24 volt battery and some acid boil over, their performance was excellent.

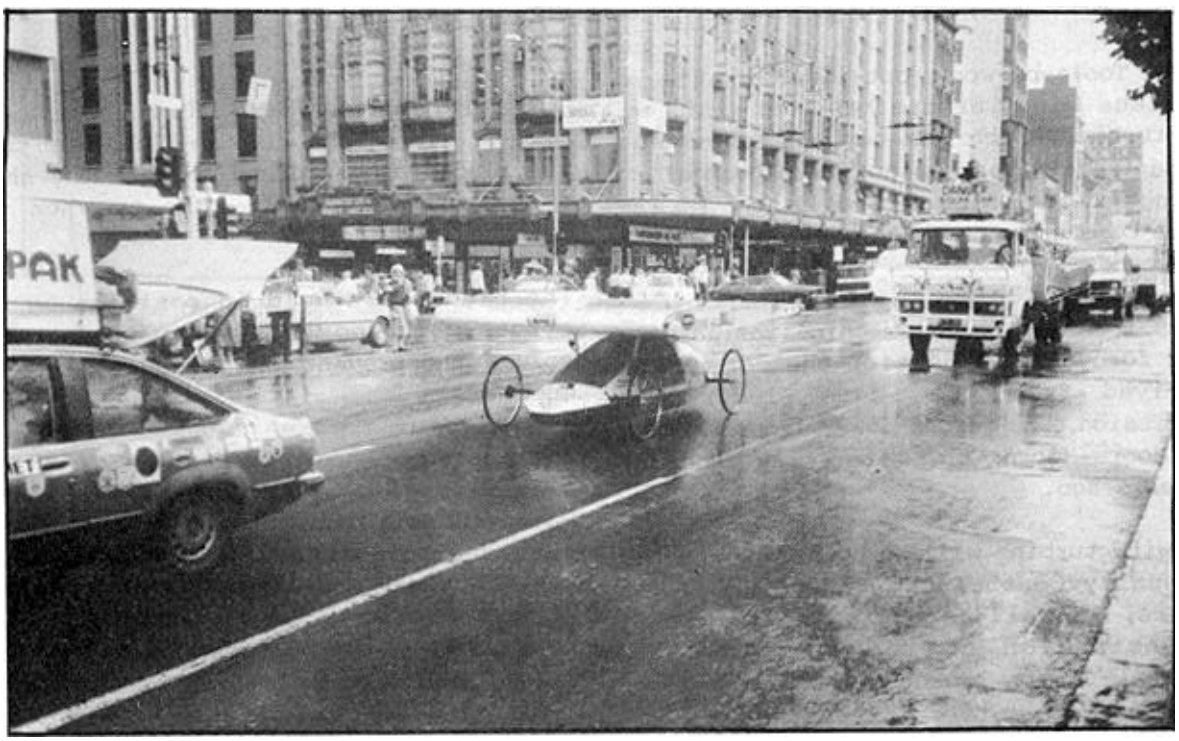
Electronics

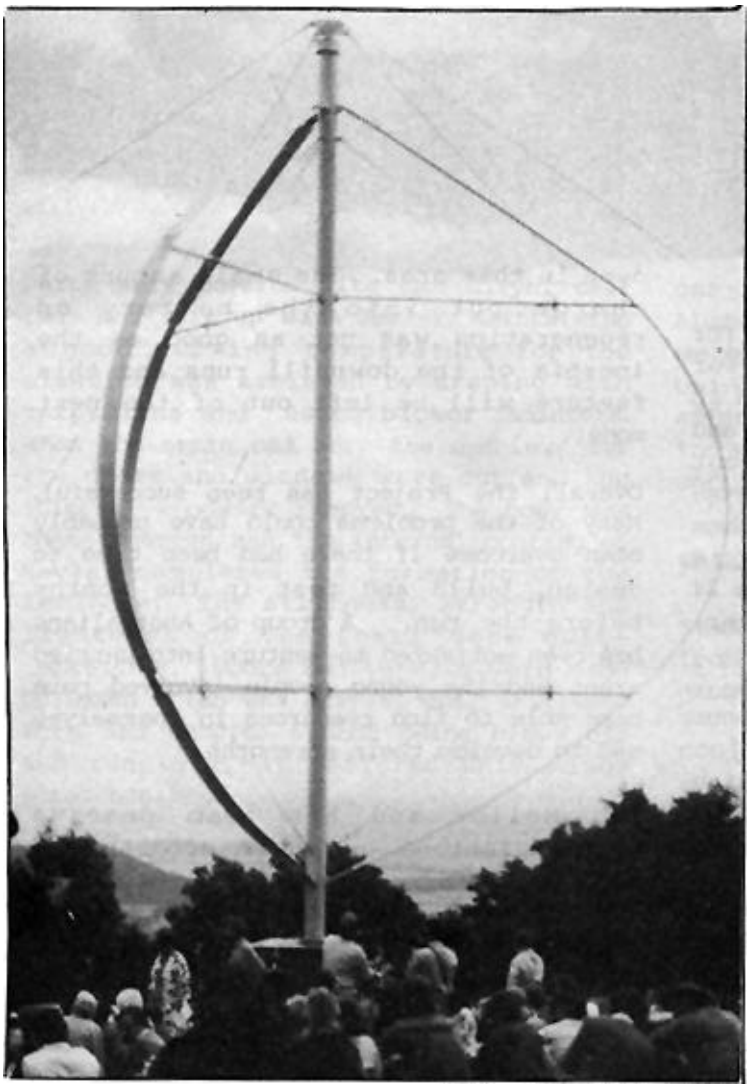
This was a difficult area due to the high current demands and to the back E.M.F. when rolling. The electronic chopper speed control and battery regulator did not perform well, and a simple on-off motor control proved effective on the long steady runs. For the run into Melbourne a stepped electronic current limiter was used for starting. More work needs to be done in this area. The small amount of charge put into the battery on regeneration was not as good as the inertia of the downhill runs and this feature will be left out of the next model.

Overall the Project has been successful. Many of the problems could have probably been overcome if there had been time to design, build and test in the months before the run. A group of Australians has been motivated to venture into untried areas and the young people involved have been able to find resources in themselves and to develop their strengths.

Ted Mellor and his team deserve congratulations on their efforts and success. We wish them further success in the 1987 B.P. Solar Challenge Darwin to Adelaide Electric Vehicle Pace.

Noel Jeffrey





A Darrieus Windmill

at

Moora-Moora

On Mt. Toole-be-wong, outside Melbourne, a Darrieus Wind Turbine has been erected. The turbine which was designed and built by Manfred Pruter, is now undergoing fine tuning and finishing touches at the Moora-Moora Community near Healesville, where it now stands.

It is ironic that the machine was largely paid for by compensation the community received from the State Electricity Commission, who forced power lines through the Moora-Moora Co-Ops' property a number of years ago.

The wind turbine will be used to power the Community Centre, the School and some houses, as well as acting as a working demonstration of the potential of renewable energy sources.

The Turbine

The turbine has three blades which are. made of fibreglass with an aluminium core. The blades are stressed to form the shape they would naturally take on when the turbine is spinning.

The blades are held in position by the struts which come out from the central column and prevent the blades flexing too much.

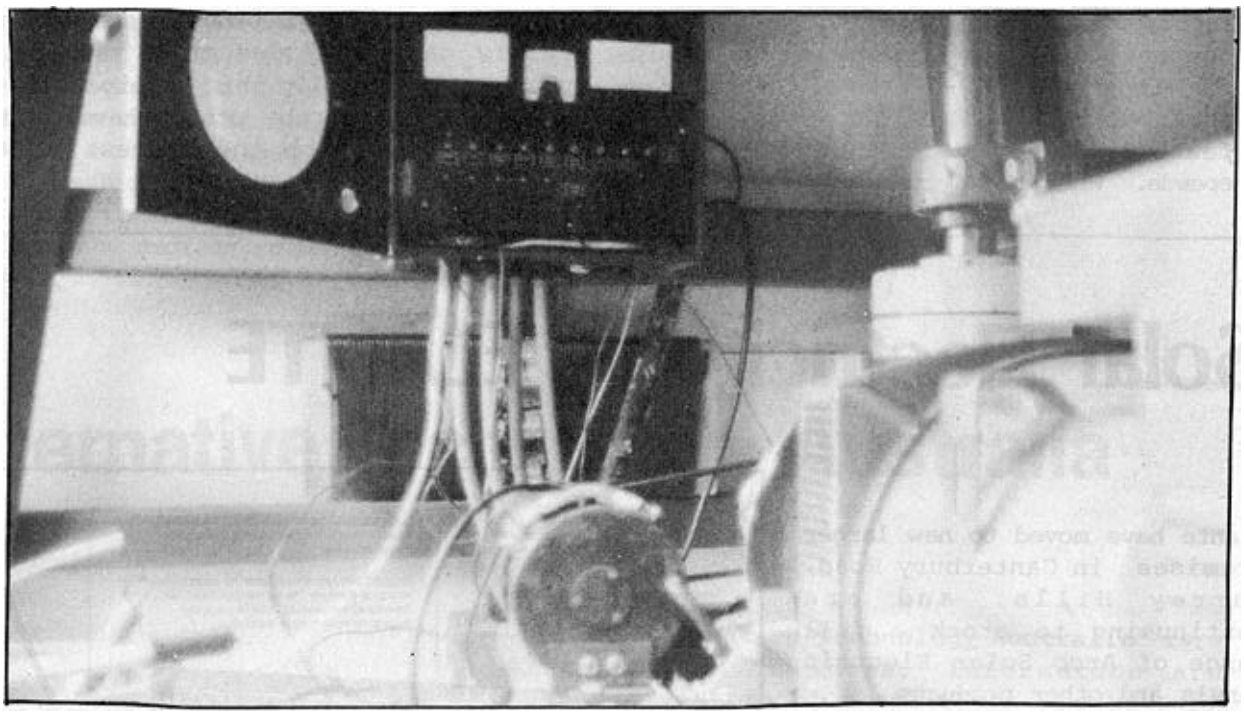
These struts should help overcome stress problems which have occurred with other Darrieus turbines. For example, the Darrieus on Rottnest Island in Western Australia was eventually removed because of cracking in the central column. Like many large machines, the cost of repairs was so high it wasn't worth fixing.

The struts and other design features of the Manfred Pruter's turbine make the machine very solid, so stress of materials should not present a problem.

The turbine which was hoisted into place by a crane, spins at 75 rpm. This then runs through a standard off-the-shelf industrial gearbox to produce 1,500 rpm for the alternator, which is also off-the-shelf equipment. In fact where-ever possible, off-the-shelf equipment has been used to keep costs low and make supply of spare parts a simple matter.

When Manfred Pruter designed the wind turbine, he decided to build a machine that was of sufficient size to generate 30 kilowatts of power when strong winds were blowing. However, because he knew these winds would be the exception rather than the rule, he sized the gearbox and alternator so they would only produce a maximum of 17.5 kilowatts.

This means that in the moderate winds which will be most common, the turbine will be able to generate significant power



Inside the base of the Darrieus Rotor, The main shaft from the turbine is visible in the top right hand comer with the alternator directly below. The starter motor is in the centre bottom with the control panel above.

Because the turbine is a vertical axis type, all major parts, the gearbox, alternator, control gear etc. are all easily accessible at ground level, increasing ease of maintenance and repair. The other advantage of the vertical axis design is the unit does not have to constantly track around to face into the wind the way the more conservative horizontal axis machines do.

instead of only being able to generate significant power in strong winds.

Batteries and other bits

The Darrieus rotor generates a maximum of 17.5 Kw at 240 volts A.C. This power is used, via a battery charger, to charge a 110 volt battery bank. The battery bank is composed of 500 amp hour, 2 volt

batteries and is used to power the Community Centre and School. Once these batteries are charged, excess power is available on a priority system with the next priority being a nearby house cluster, then heating and last the operation of a pump. When all power needs have been supplied, the machine shuts down.

The power for the Community Centre is drawn from the battery bank through a 1.8 Kw inverter to give 240 volt A.C.

The output of the Darrieus rotor is regulated electronically and the speed is controlled by use of progressive loads. If winds reach 40-50 knots the machine shuts down. The turbine tends to self feather, loosing efficiency at higher speeds. When the machine does shut down, the disc brake applies slowly so as to minimise stress on the machines moving parts.

Before the machine starts up a computer senses wind speed over a period of 10 minutes and only if the wind speed is high enough and constant (not gusty) will the machine start. A starter motor at the base of the turbine runs the turbine up to operating speed.

Manfred Pruter's Darrieus Wind Rotor at Moora-Moora has been designed with care and conservatism. Despite their advantages, these wind machines have never really taken off due to a variety of problems. Hopefully this turbine will be successful where the others have failed. We will report on the success of the machine in future issues.

Mick **Harris**

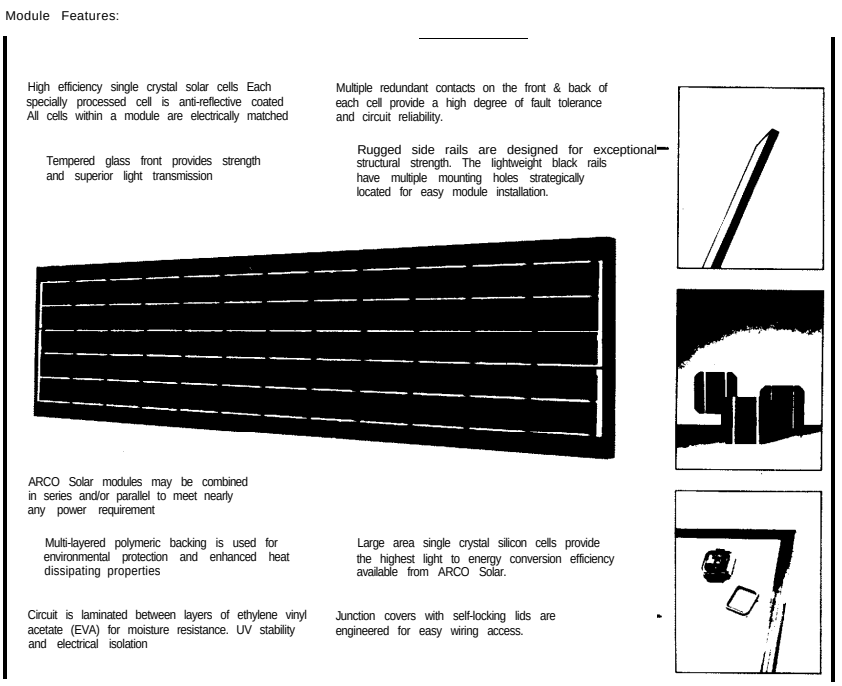
Solar Electricity by ELANTE

Elante have moved to new larger premises in Canterbury Road, Surrey Hills, and are continuing to stock a full range of Arco Solar Electric Panels and other products.

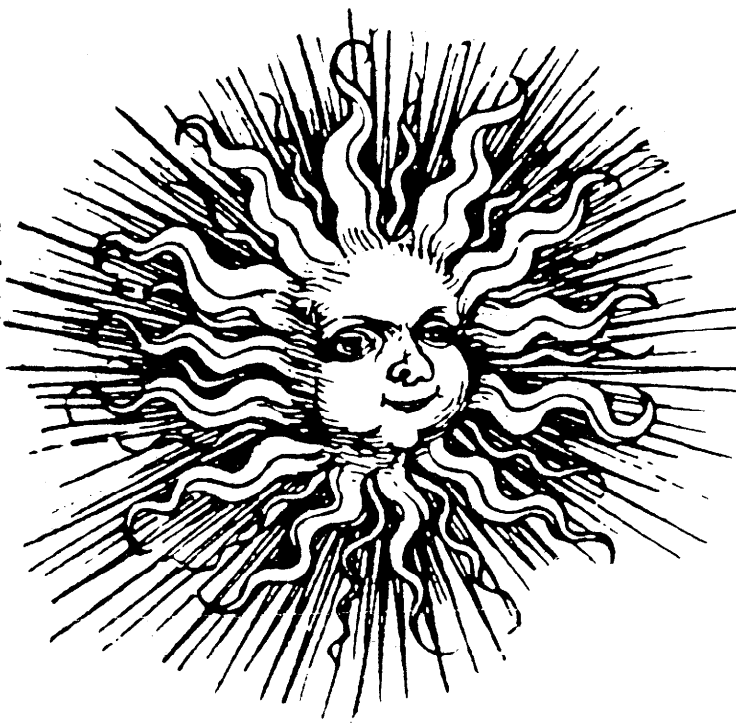
In addition **Elante** are also stocking a number of new lines which make a visit to their new premises a must,

The new address is:

Elante Pty. Ltd.
382 Canterbury Road,
SURREY HILTS,
VICTORIA 3127
Ph: (03) 836 9966.



Solar Energy Resources Catalogue



This Catalogue has been produced by the **Alternative Technology Association** (ATA). The ATA is a community based organisation-involved in the promotion of technology-which works in harmony with the environment. The group runs a wide range of activities including meetings, film nights, field trips and practical workshops, The ATA also produces a quarterly magazine **Soft Technology** and a monthly newsletter. It built and manages the Solar Workshop and maintains the Alternative Technology Resource Library. If you wish to contact the group write to the ATA at the address at the back of this catalogue.

Alternative Technology Australia

"Alternative Technology **Australia"** is a source of ideas, information and inspiration for all those who have an interest in Alternative Technology.

The book provides the reader with a rich supply of practical, do-it-yourself information from solar housing through wind, water and sun down to waste disposal. It is filled with the practical experiences of people from all over Australia.

Price: $7.95 POSTED.

Soft Technology:
Back Issues

Soft Technology magazine contains current Australian information on the whole range of renewable energy sources and alternative technologies. It includes a balance of practical construction articles and reports of Alternative Technology developments both in Australia and overseas. A limited number of back issues are still available,

Number 8.
Appropriate Technology.
Methane Digestion.
Electric Vehicles.
Wind measuring methods.
Electric moped race.
Solar ponds.

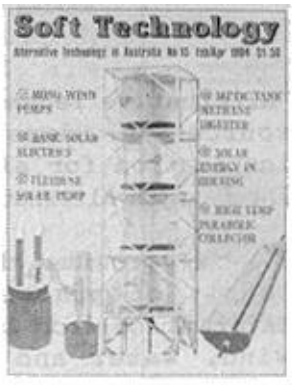
Number 10.
Solar Mudbrick flats.
Rowing Bike.
Storage Batteries.
Solar Electric Fridge.
Solar power station.
Australian Centre for appropriate Technology.

Number 11.
Build a cheap solar water heating collector.
Wind generator towers.
Human powered vehicles.
Natural cooling for summer heat.
Energy saving checklist.

Number 12.
Savonius Rotor for water pumping.
A Coolgardie safe.
Solar, water and Wind powered house.
Debuzzing inverters.
How to make an old house energy efficient.

Number 13.
Home made water wheel.
Window box air heater.
Simple solar pumping.
A Solar Controller.
The Wind turbines of Rottnest Island.

Number 14.
Producer Gas.
Solar greenhouses.
Suburban Solar Houses.
Blacksmiths bellows.
Solar Fruit Dryer.
Meekatharra Solar power station.
Solar Pumping.



Number l5.
Basic solar electrics.
A Septic tank methane digester.
Solar energy in housing.
Mono wind pumps.
Parabolic collector.
Fluidyne solar pump.

Nuder 16.
Community built and run solar greenhouse.
Bicycle trailers.
Nepalese watermills.
Solar electric system in a suitcase.
Siddons Solar Heat pump.

Number 17.
Solar retrofitting.
Realities of solar house design.
Home made wind generator.
Keep cool desert style.
Batteries, Fuses, Volts & Amps
Simple solar projects.

Number 18.
Biotecture.
Alternate energy politics.
Alice Springs appropriate technology centre.
Fuel saving in vehicles.
A Simple electronic power supply.

Number 19.
Solar cell buyer's guide.
Suntrac tracking solar water heater.
A solar still
Wind power on French Island
Planning for the sun.
S.E.C. goes solar.

Number 20.
Battery buyers guide.
Flying Foxes-
Solar car project.
Australia's Solar Future.
The Wales Centre for Alternative Technology.

Number 21.
Adelaide's Solar Village.
A low technology waterwheel,
Solar power 12v timer.
Designing cities for people,
High efficiency solar electric pumping.
Journey of the Solar Seeker

The Solar Workshop

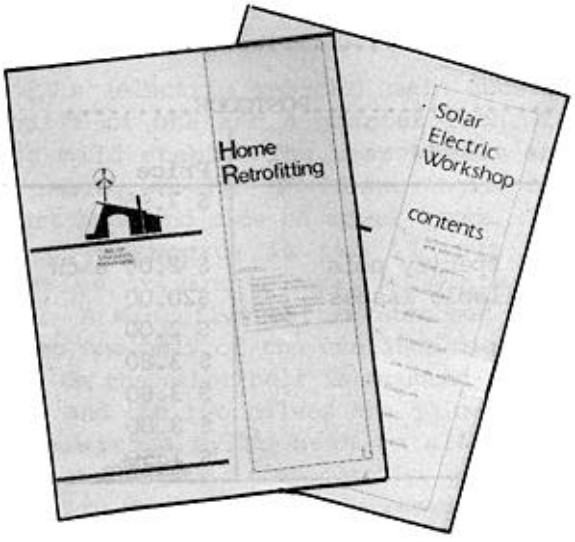
A detailed description of the **Solar workshop** including information on the wind 'generator, solar electric system, water turbines, solar water heating and the buildings passive solar design. The booklet includes diagrams with detailed explanations of the various features of the workshop. It also contains details on materials used their costs and sources.

Price:$2.00 POSTED

Information Kits

Solar Electricity

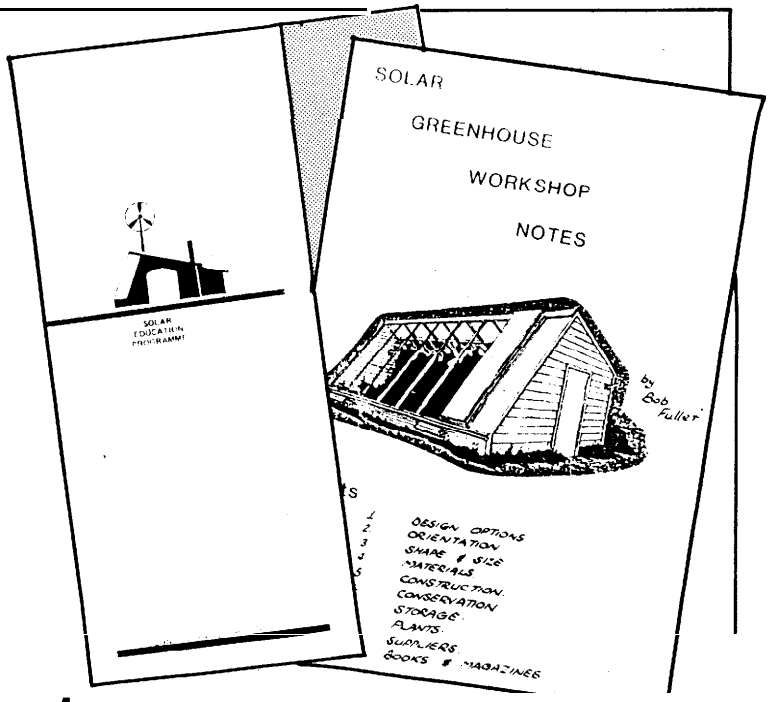
Everything you could ever want to know about setting up your own solar electric system. Solar cells, batteries, wiring, inverters and appliances are all covered. How to design and size your own system and once its put together how to maintain it with the minimum effort.



Home Retrofitting

How to make your existing home save energy by adding features which will improve its thermal performance. Includes information on insulation, weatherstripping, building modifications, landscaping, energy use of appliances and emergency measures to save energy. Each kit includes energy saving stickers.

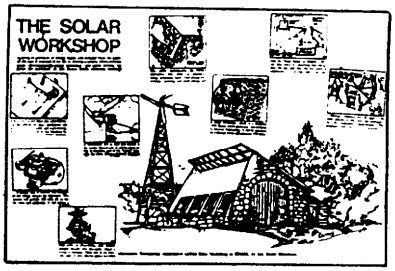
Solar Greenhouses



Standard greenhouses overheat in summer and are to cold in winter. A correctly designed solar greenhouse gives the plants the best conditions all year round. The kit describes in simple terms **how to design a solar greenhouse,** materials to use and where to get them. It also gives a recipe for a small Solar Greenhouse and information on a simple greenhouse you can build into your home.

Price: **All $3.80ea POSTED.**

The Workshop Post



An attractive poster showing the Solar Workshop and its features, Includes illustrations and basic explanations of the **solar cells, wind generator, waterwheel, back-up generator, wood heater, water** supply **system,** solar water **heater and the buildings design.**

Price:$1.50 POSTED

Order Form

NAME.....**ADDRESS**.....

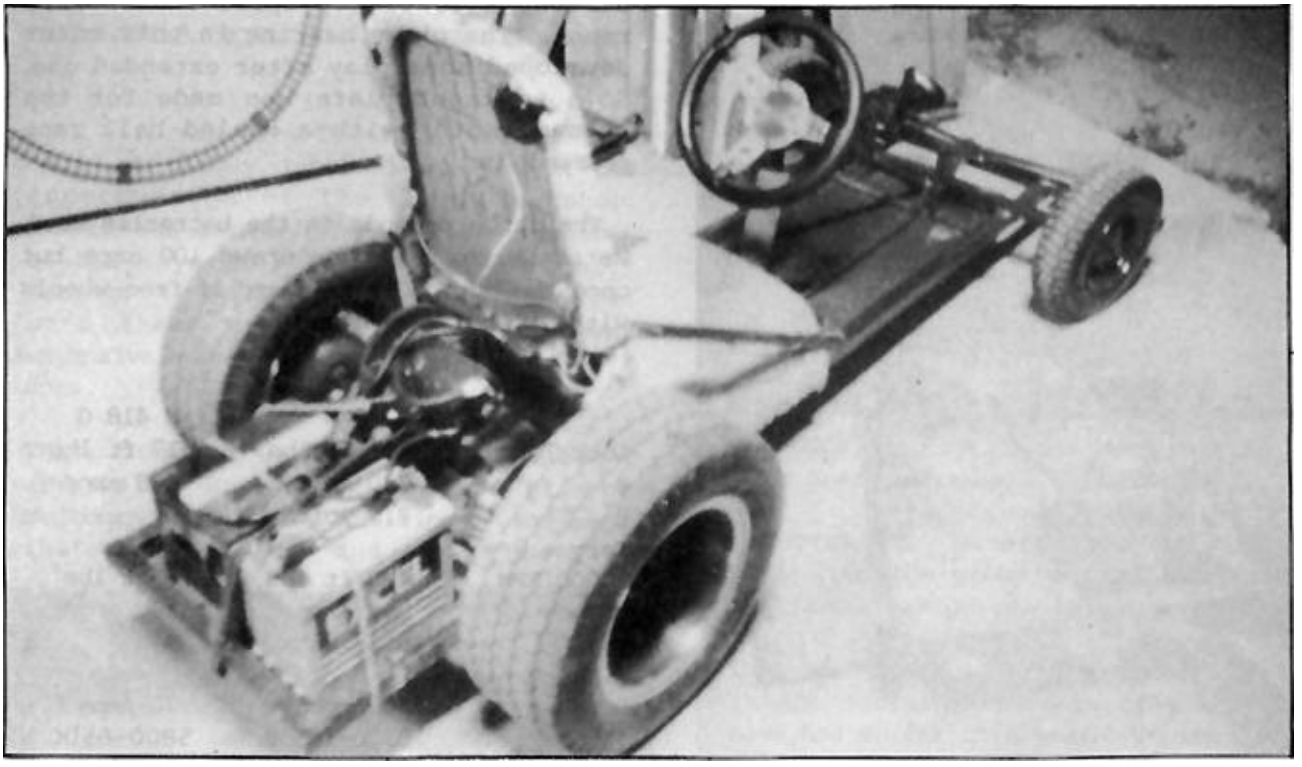
.....**POSTCODE**.....

Quantity	Item	Price
	Alternative Technology Australia	$ 7.95
	Soft Technology: Back Issues	
	* Individual copies, specify no's	$ 2.00 each
	* Full set of 13 available issues	$20.00
	The Solar Workshop Booklet	$ 2.00
	Information Kits: *Solar Electricity	$ 3.80
	*Home Retrofitting	$ 3.80
	*Solar Greenhouses	$ 3.80
	The Workshop Poster	$ 1.50

Total cost including postage $.....

Send your order to with payment to the: ALTERNATIVE TECHNOLOGY ASSOCIATION, 366 Smith Street, Collingwood, Melbourne, Australia, 3066.

An Electric Go-Cart



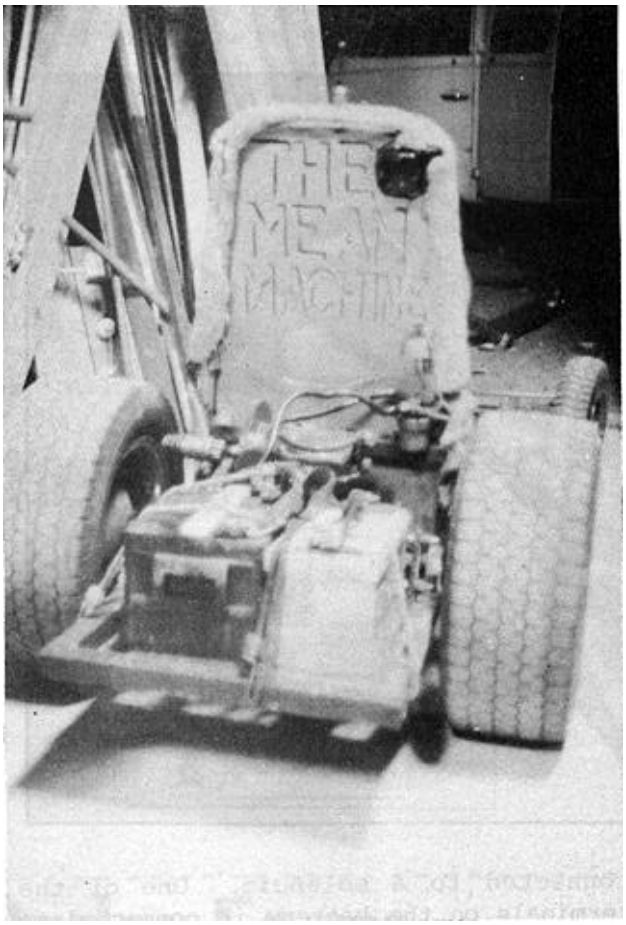
Alright you people, now you've charged up your batteries, you can have a fun way in flattening them in rain or shine. Ian and Paul Sims have built an electric go-cart.

The E.V.s (electric vehicle) main chassis is built of one and a quarter inch, 16 gauge mild steel. The rear wheels are mini racing wheels. The front wheels are go-cart hubs and ride on mower tyres. The E.V.s power source is two 12 volt car batteries driving a Lucas M35G starter motor. A Mini flywheel is attached by a boss to one half of the one inch diameter axle. On the other half is mounted a disc brake, and the two halves are joined by a sleeve with a nylon bush to allow the wheels to rotate independently. Plummer blocks are used for the axle bearings.

To make the E.V. move you simply press a button on the steering wheel which is connected to a solenoid. One of the terminals on the battery is connected to earth, the other is connected to one of the posts on the solenoid. From the second post, a lead is joined to the starter motors terminal.

The E.V. has disc brakes which came off a trailer and are operated by a foot pedal. The E.V. is easy and enjoyable to drive and started as a billy cart but was later motorised for extra fun. It is fun because if you press the starter button and put on the brakes (being a split axle) and put in full right, you can slide the E.V. right out.

The front wheels don't get much traction in the rough stuff, so it's a bit hard to turn sometimes. It's easier for me to fit into the seat being a bit skinnier. It isn't too comfortable when you go over a curb having no suspension.



The back of the go-cart with the batteries in place,

We originally used a M418G starter motor (see table) which produced **a** quicker take off but a lower top speed and shorter range. The plain bearing in this motor developed some play after extended use. So a new front plate was made for the present motor with a sealed ball race pressed in.

The range depends on the batteries used. We estimate the motor draws 100 amps but once the button is released it free-wheels without the motor running.

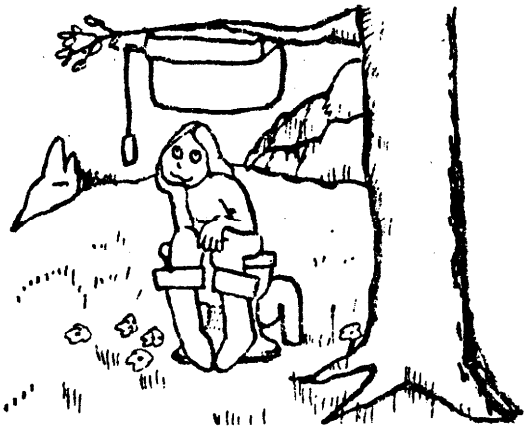
	M 35 G	M 418 G
Lock Torque	9.3 ft lbs	17 ft lbs
@	380 amps	465 amps
@	7.5 volts	
Torque @ 1,000 RPM	4.9 ft lbs	7 ft lbs
@	240 amps	260 amps
@	9.1 volts	
Lightrunning Current	45 amps	70 amps
@	8500-10000 RPM	5800-6500 RPM
Pinion	9 teeth	10 teeth
Source	Morris Major, 1100, Mini	Austin 1800

Paul Sims

For Sale

Wilderness Comfort Station.
Verify" gas incinerating toilet,
In perfect condition with all fittings and flue.
Two gas bottles included.
Ready to use.
$1,000 or near offer.

An ecological alternative to the septic system.
More info. ring Ula Kunert (03) 714 8385.

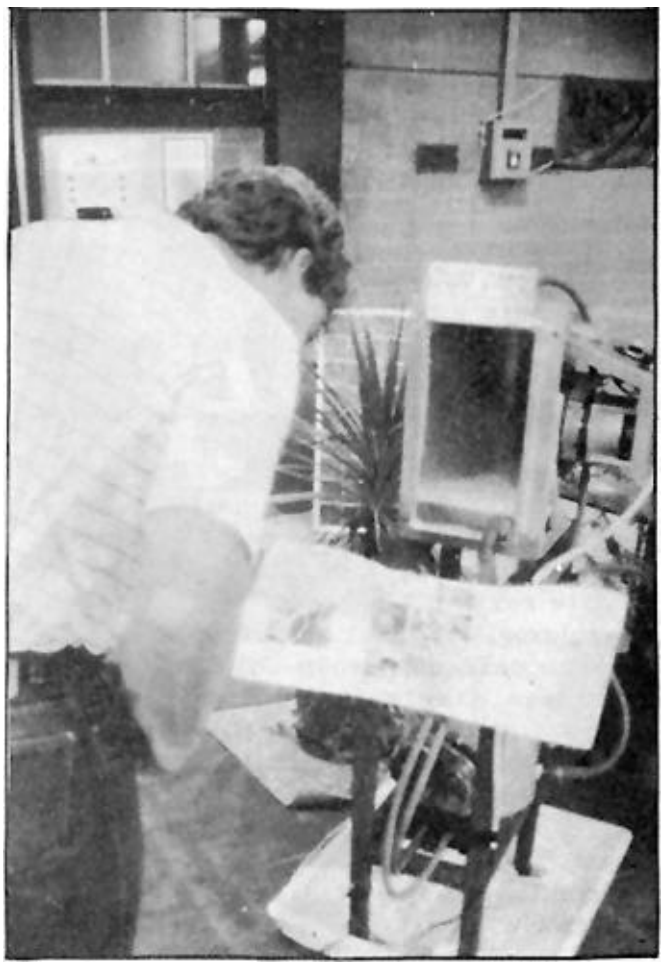


A.T.A. REPORT

ALTERNATIVE TECHNOLOGY ASSOCIATION REPORT

For the first time in years the activities of the Alternative Technology Association have not simply involved working on the construction of the Solar Workshop. Summer and autumn brought a large number of displays at a variety of community events. These were all very successful with these displays being the most extensive and well presented we have ever done.

These displays included the Wood Heating and Solar Energy Exhibition at the Melbourne Exhibition Buildings, The show lasted for 9 days and was a massive undertaking. Nevertheless it went very well with the group coming into contact with thousands of new people.



The ATA's display at the Wood Heating and Solar Energy Show.

The other area of much activity has been in the increased numbers of meetings we have had so far this year. Topics covered so far have included: homemade solar water heaters; microhydro power; solar housing and retrofitting; an electric go-cart and homemade car: the Centre for Alternative Technology in Wales; the Moora-Moora Darrieus Rotor; the Siddons Solar Heat pump; and Wood Heating. Future meetings

The ATA's Savonius rotor on display at Moora-Moora with the Darrieus rotor in the background.

The operating Pelton wheel on display at the Wood and Solar Show.

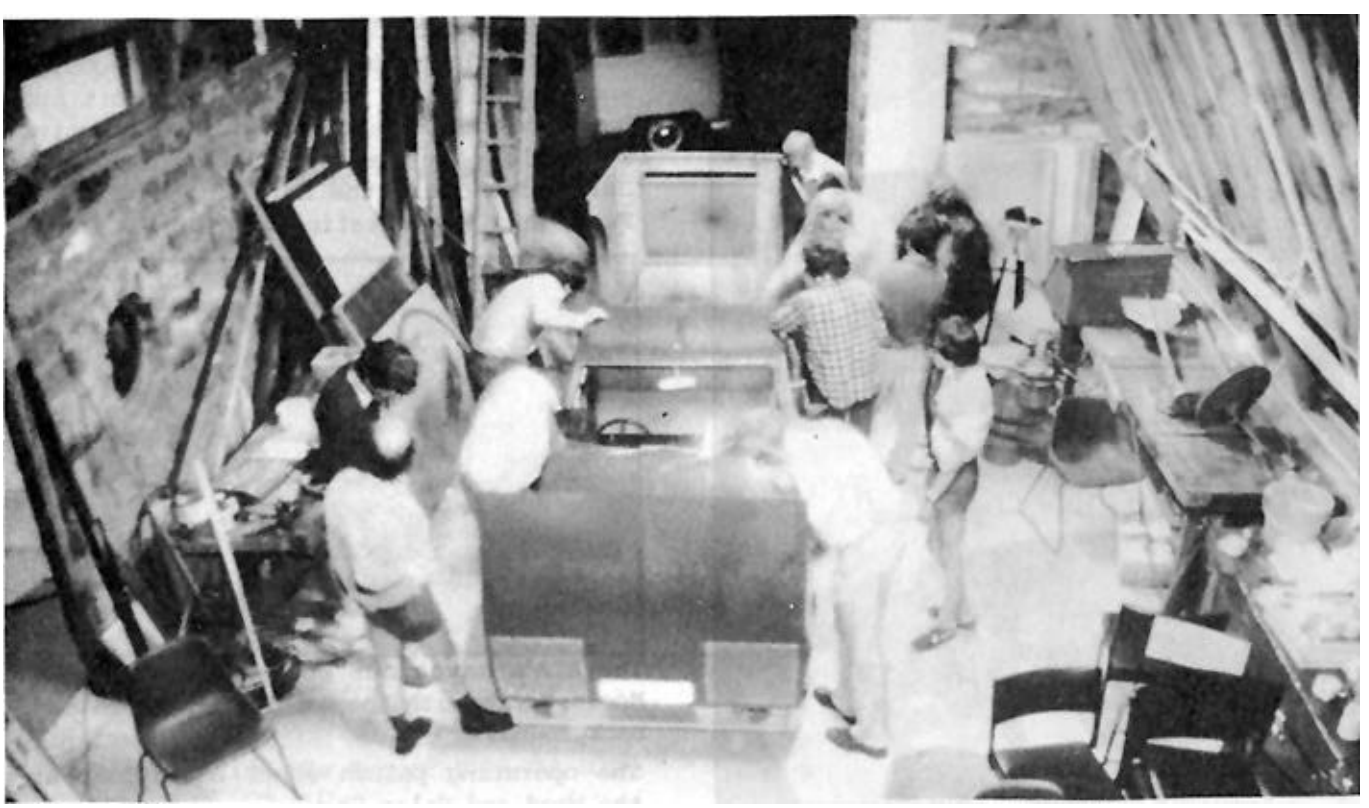
The terrible trio, Paul, Geoff and Kevin watch over the ATA's display at the Peace Picnic.

include a film night, cornposting toilets, the Suntrac Solar Water Heater and Water Pumping Windmills.

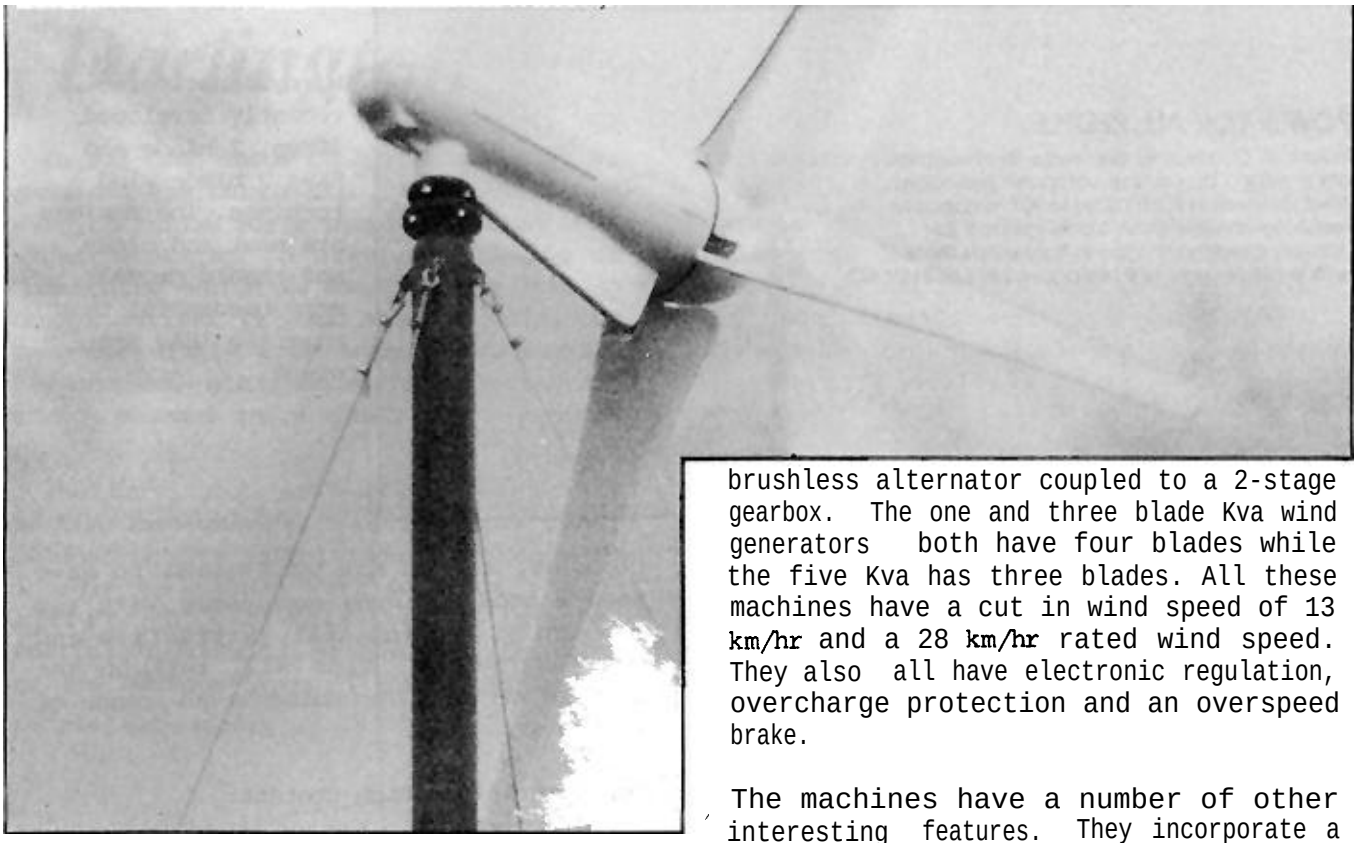
Even though the workshop is taking a lower priority this year, the finishing touches are still being put in place. The workshop is now sealed against winter winds, the wind generator is supplying power to the battery bank and the library is complete and in place above the office and store room.

The next step with the workshop will be to equip the building with tools and equipment, after which a program of practical courses and activities will be taking place from the building.

The home made car being examined by an @miring crowd after being driven straight into the Solar Workshop. The car was made with plywood panels and a conventional engine and other mechanical parts.



WIND TECHNOLOGY



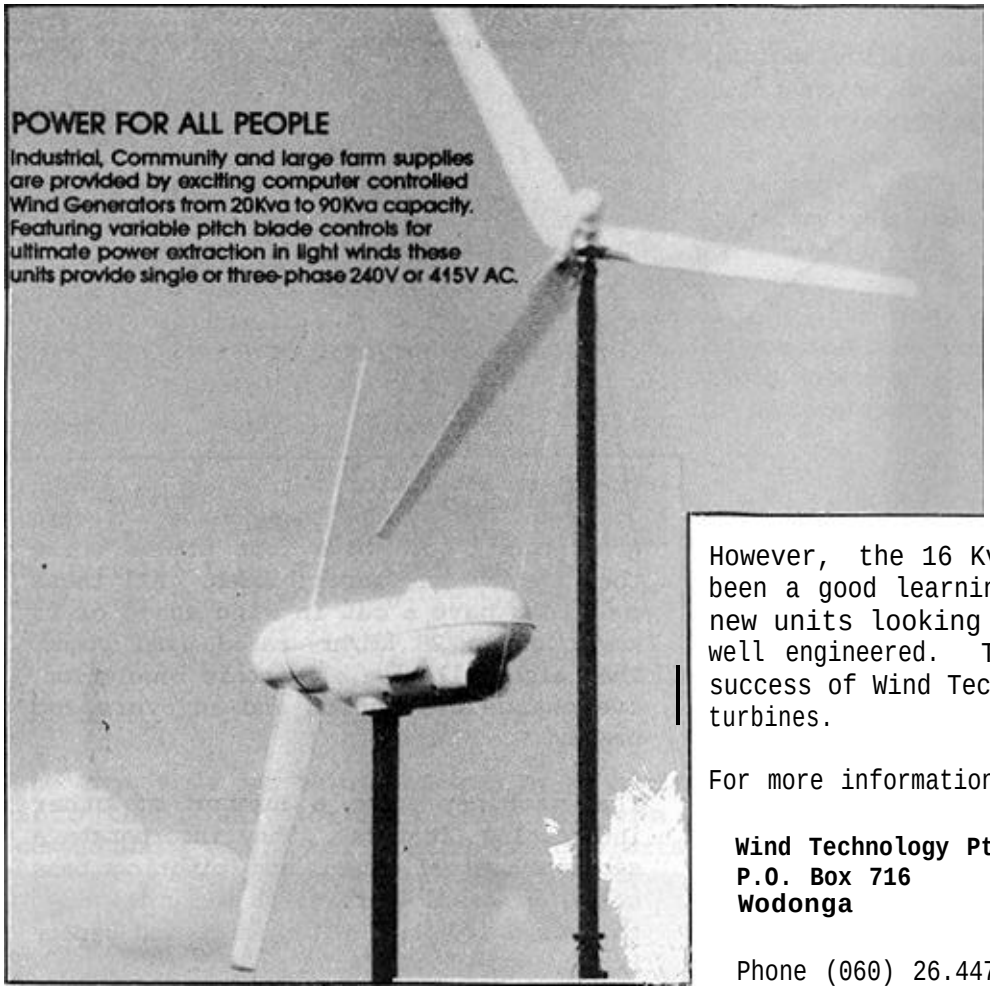
Over recent years a small company in Wodonga, Victoria has been conducting research and development work into a range of wind machines ranging from 1 to 20 kilowatts. Wind Technology Pty. Ltd. managed by Rob Clarke now has a range of turbines available and this is a brief run-down of the machines they are producing.

Wind Technologies' largest off-the-shelf unit has an output of 20 Kva. It uses a 3-phase brushless alternator with a hollow shaft coupled to the gearbox. The two blades have a diameter of 12 metres with a variable pitch control and an electricyaw drive. The wind generator also uses a computer control system with multiple alarms. It has an 8km/hr cut in speed,a 28 km/hr rated wind speed and 80 km/hr furling wind speed. With the brake applied the machine has a 160 km/hr survival wind speed.

The other off-the-shelf units have outputs of 1,3 and 5 Kva. They all use a 3-phase brushless alternator coupled to a 2-stage gearbox. The one and three blade Kva wind generators both have four blades while the five Kva has three blades. All these machines have a cut in wind speed of 13 km/hr and a 28 km/hr rated wind speed. They also all have electronic regulation, overcharge protection and an overspeed brake.

The machines have a number of other interesting features. They incorporate a sectional steel tower and pivoting base making it possible to winch the units down to ground level so maintenance and repair is simple and straight-forward.

The turbines operate downwind with the gearbox and alternator housed in a neat fibreglass nacelle (housing) at the top of the tower.



Wind Technologies recently developed 20Kva, 2 blade and 5Kva 3 blade wind turbines. The designs are neat and clean and should prove more successful than than the 16Kw prot-otype .

However, the 16 Kva unit seems to have been a good learning experience with the new units looking neat, attractive and well engineered. Time will tell on the success of Wind Technology's new range of turbines.

For more information contact:

Wind Technology Pty. Ltd.
P.O. Box 716
Wodonga 3690

Phone (060) 26.4477

The prices of the basic wind turbines are approximately $4,000 for a 1 Kva, $5,000 for a 3 Kva, $7,900 for a 5 Kva and $10,000 for the 20 Kva unit.

The current machines represent a second generation for Wind Technology. The first prototypes of Wind Technology were much less attractive with the first 16 Kva machine being more like a platform perched on top of a tower with a propeller sticking out.

Wind Technology had difficulty selling the 16 Kva unit probably because it was too big and expensive for a remote domestic installation, and too small to warrant a large grid interactive system. The fact that it didn't look good was probably another disadvantage.

The Wind Technology 16Kw experimental wind generator. The unit worked well but did not sell. Appearance could have been a problem.

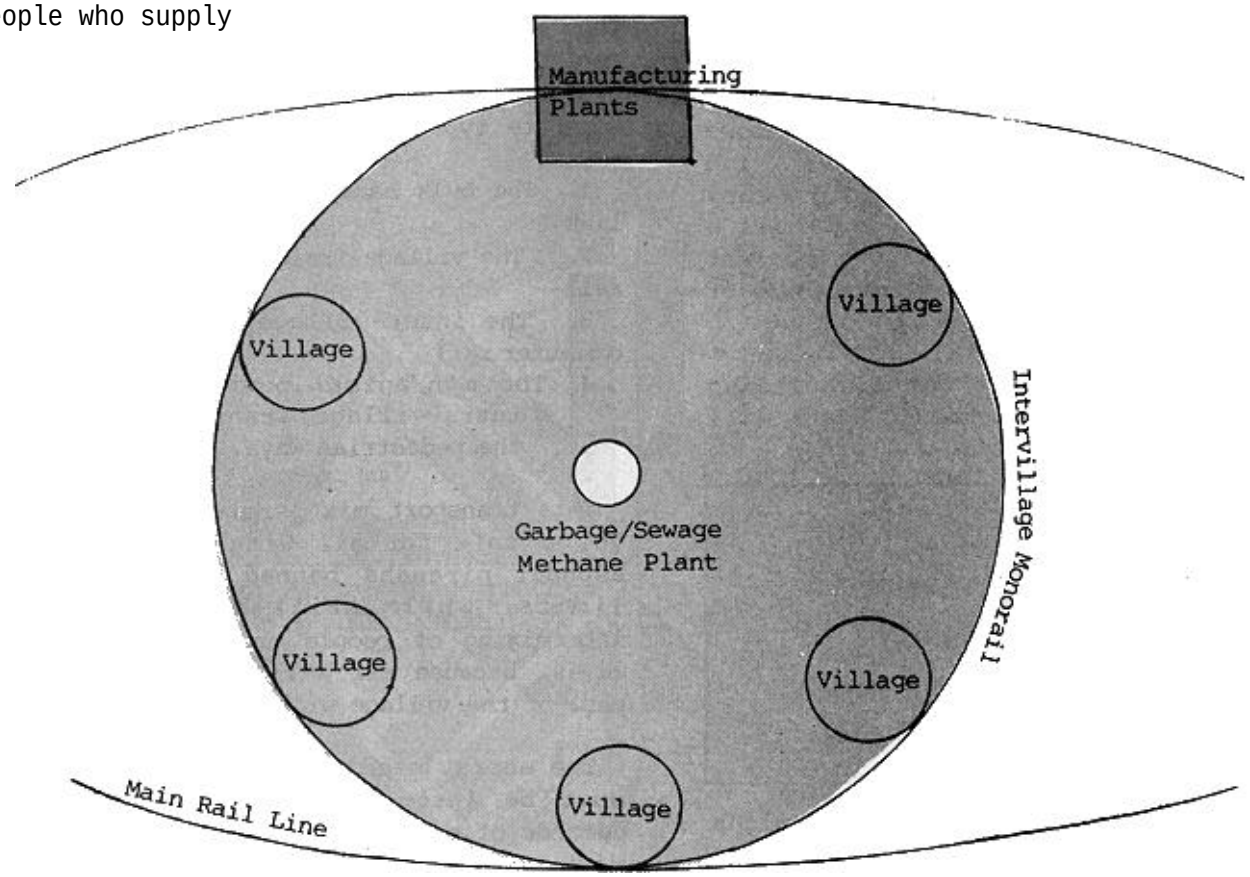
The Australian Alternative to Dartington

In the last issue of Soft Technology we examined the Dartington project. This was a British idea for a people oriented town which attempts to create a feeling of "community" which we seem **to have lost in todays cities. It also aims at using our resources wisely with energy conservation techniques, alternative technologies and energy sources and a careful management of the environment.**

In this issue Ian Grey explores some ways in which the Dartington concept might be applied in the Australian situation. These ideas are intended to act as a basis for thought and discussion rather than a firm path for the development of such a project in Australia.

The Dartington project assumes a very middle management, middle class group living in its model town and tends to ignore the manual worker group. In an effort to fit this model into an Australian context, account will be taken of the various types of labour inputs and people who supply the different types of this labour.

The theory that all people are equal just does not hang together in reality, so realising this reality we must provide the ability for people of like outlook, skill or education levels to live in areas together, The differing demands each of



CITIES FOR PEOPLE: Part II

these groups of people make on services, entertainment etc. must be provided in each area which then presents a separate development of each area.

Within the Dartington concept this cannot be practical because of the resulting physical size of town required, but by creating different towns these could be both practically answered and practically possible. This separate development may seem like an intellectual apartheid, but by creating a series of environments which would attract each type of person and directly interconnect them by a reliable high speed transport link, like outlook would live with like irrespective of the actual employment each undertook, but an enforced separate would create as much illwill on problems as enforced collectivity.

As the Fig.1 shows, each town in the circle assumes a particular outlook group of people living in that town, but allows a process worker who likes Vivalia and greek philosophy to live within easy access of his/her skills usage, while a senior management person who likes beer and daytime T.V. can live within people of similar outlook.

Each town must have common building types even though the actual use will vary, these would include:

1. the personal houses
2. the central hall
3. the market/retail centre
4. the entertainment centre
5. crop/grazing land - personal
6. " " " - community
7. part-work workshops
8. computer centre.

This building grouping will permit a very wide range of employment types. These would allow the home-based office concept to actually work for management, remote machinery control and design and development. This would require a home computer set of a fairly sophisticated type which not all users could afford, so to permit this to expand, a community time-sharing multi-terminal centre (or community office) must be built as part of the community.

This is only part of a workforce, but workshops making parts for one or more central assembly plants which are partly or fully automated, would provide some employment within the community area, while others would travel to the central assembly plant,

Craftsmen would have their own workshops which could employ small numbers, while service industries like the plumbing, electrical and repair industries would have workshops and probably employees, thus allowing people to walk to work.

Transport would be seen in four totally separate types:

1. The bulk haul - long distance rail link
2. The village freight/passenger mono-rail
3. The inter-village assembly plant commuter rail
4. The man/animal powered personal intra-village transport sharing the pedestrian ways.

This transport mix permits the village to be safe for all with no polluting asphalt piranahs banned to the outer limits, while still permitting the intermixing of people and their working lives, because all will pass every other part of the village within a week.

The energy needs of the total complex must be inter-related as the energy demands of each area will vary enormously with the time of day. Many industrial needs are too high for on-site renewable energy generation, so an inter-connected industrial non-renewable/renewable mix

central generation grid while the village will use interconnecting renewable energy with a central sewage methane plant, individual village wind/solar generation and the total energy demand kept low by building design practices.

This concept is kite flying we know but the changing demands of society, the pressures to spread employment more equitably, and the desire of many to move away from the dehumanising city to a more relaxed environment could well create the practical environment.

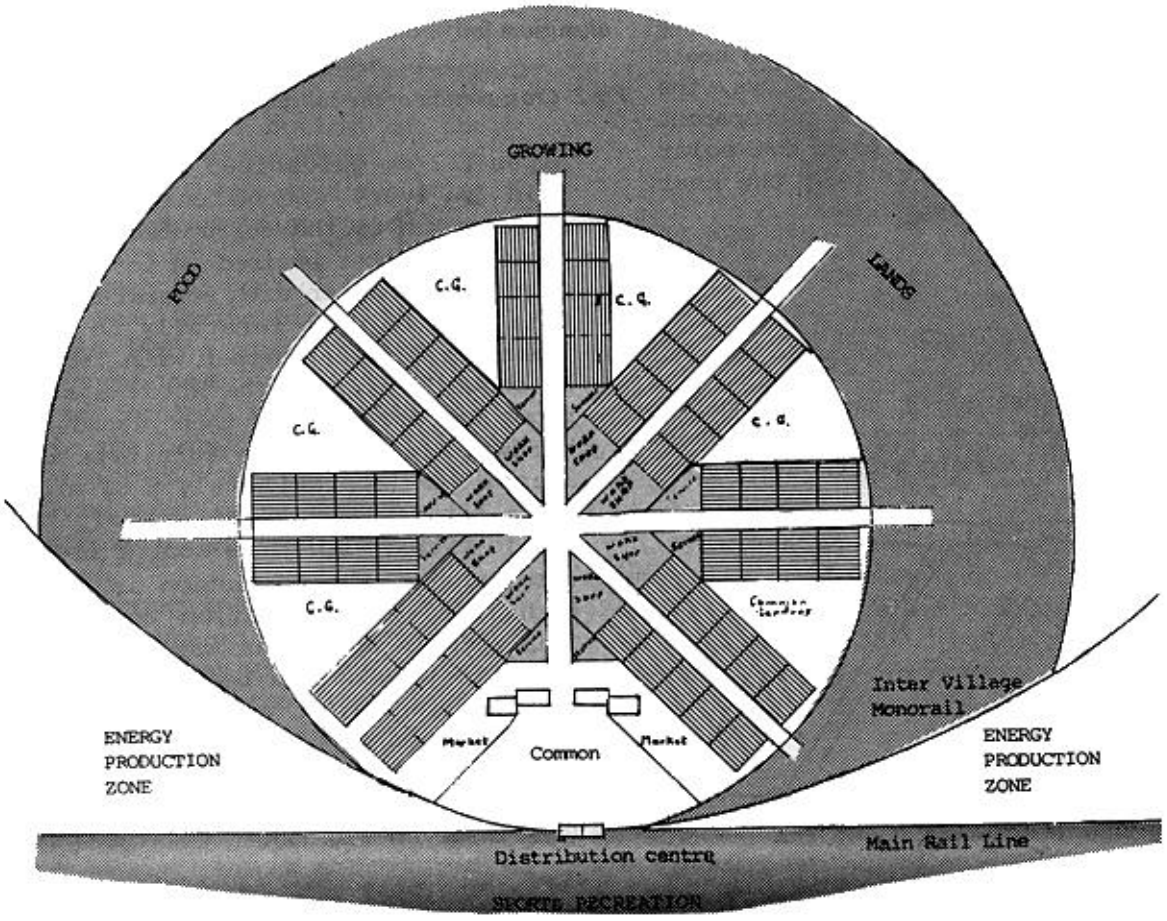
For those who like a practical assessment of a blue sky concept, here are some figures:

10,000 Ha	$ 30,000
5 towns with amenities and services distribution	$1,220,000
6 wind generators and solar p.v. cell arrays	$1,200,000
rail services	$2,200,000
3 central factories	$1,500,000
basic construction costs	$16,950,000
housing for 500 family units	$25,000,000
Total potential outlay	$41,950,000

or $83,900 per family or $92 per week per family for 25 years at basic bank interest with financial return after 5 years of about $320 per month above income of employment.

If this dream sounds good to you, contact the writer via this magazine.

Ian Grey.



Solar Water Heater from Botswana

We now see an increasing number of commercial hot water systems on houses but the high capital costs with small power cost savings at present prevent their spread. Here is a simple version which is easy to construct and is suitable for non mains pressure situations. The unit cost about $100 in 1978. This information came from Appropriate Technology Magazine, Vol 7 no2. (originally from Link.)

THE WATER HEATER

This water heater consists of a number of pipes (made of plastic or PVC) through which water flows. The pipes are in contact with an *absorber', in this case corrugated iron painted black. The sun's rays heat the absorber which in turn heats up the pipes, To prevent heat loss, the whole system is insulated. A transparent cover (usually glass) allows the solar radiation in and helps to trap the heat inside the insulated box.

CONSTRUCTION

1. **The collector** (Fig.2)

The absorber consists of two corrugated iron sheets about 2 m long painted black with ordinary blackboard paint. The water

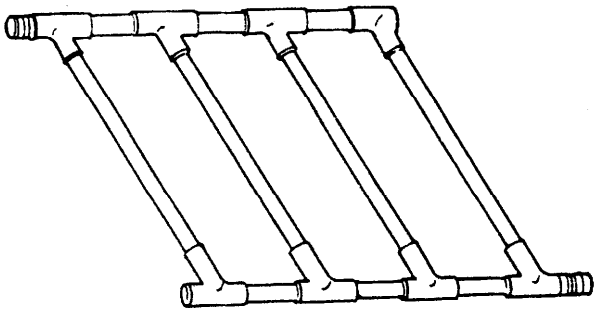


Fig.l. Pipes with T-fittings.

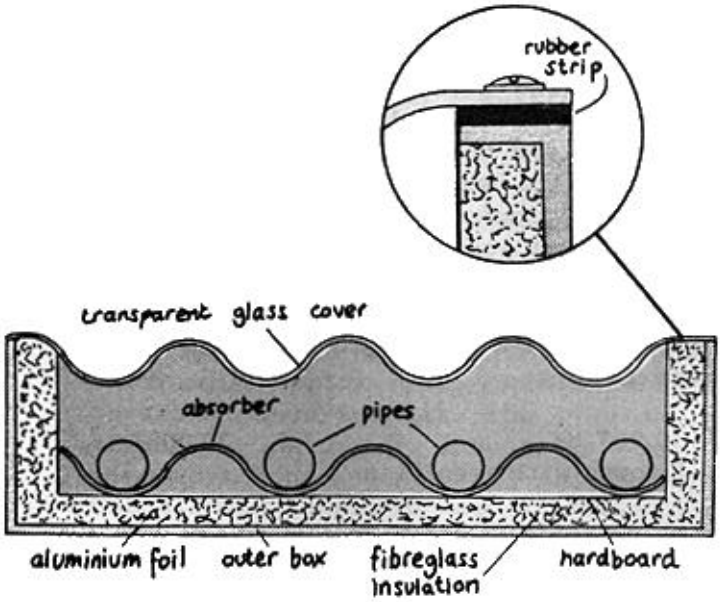


Fig.2. Cross-section of the collector.

pipes (12 cm galvanised iron pipe), are laid in every second corrugation and soldered on to the corrugated iron. The pipes are either braised on to a manifold (a pipe or chamber with several openings): this must be done carefully to prevent leaks, or fitted together with T-fittings as shown in Fig.1. The whole system of pipes and absorber is then placed into a hardwood box which in turn fits into a larger box (approximately 2 x 1 m). The space between the boxes, approximately 5 cm, is filled with glass wool (fibre-glass insulation). The insulation is lined on both sides with aluminium cooking foil. This acts in a similar way to a thermos flask to prevent the heat from escaping. For the transparent cover, fibreglass is used, screwed on to the top of the double box. A rubber strip acts as an airtight washer to prevent the heat inside escaping (see inset on Fig. 2).

2. The storage tank

The tank used here is a 20 litre galvanised drum (galvanised because of a better resistance to rust). The tank should be raised at least 60 cm above the collector for the water to circulate properly. The piping connecting the collector to the tank and back again is 4 mm black PVC pipe, insulated with glass wool and wrapped in black plastic. The hot water inlet is at two-thirds the height of the drum. It is necessary to make a hole in the drum through which the hot water runs from the collector to the tank, and to attach pipe fittings for the hot water inlet and outlet (Fig.3). For the cold water inlet, use the screw-cap fitting which is part of the drum.

The water circulates itself from the collector to the tank without a pump. This principle, called thermosyphon circulation, is based on the fact that hot water rises and cold water sinks. Because of the thermosyphon circulation, the cold water inlet is placed at the bottom of the collector and the hot water outlet at the top. The water will then keep circulating through the collector, getting hotter each time it passes through.

Another essential part of this water heater is the ventilation pipe. If cold water is pushed into a closed system and hot water syphoned out, pressure differences are created which result in loud bangs in the drum, The ventilation pipe eliminates this. Because this solar heater is never under mains pressure, it is much less complicated than other solar heating systems.

It is important that all pipes slope upwards, without downward bends, otherwise air bubbles in the water will cause blockages which will prevent the thermosyphon circulation.

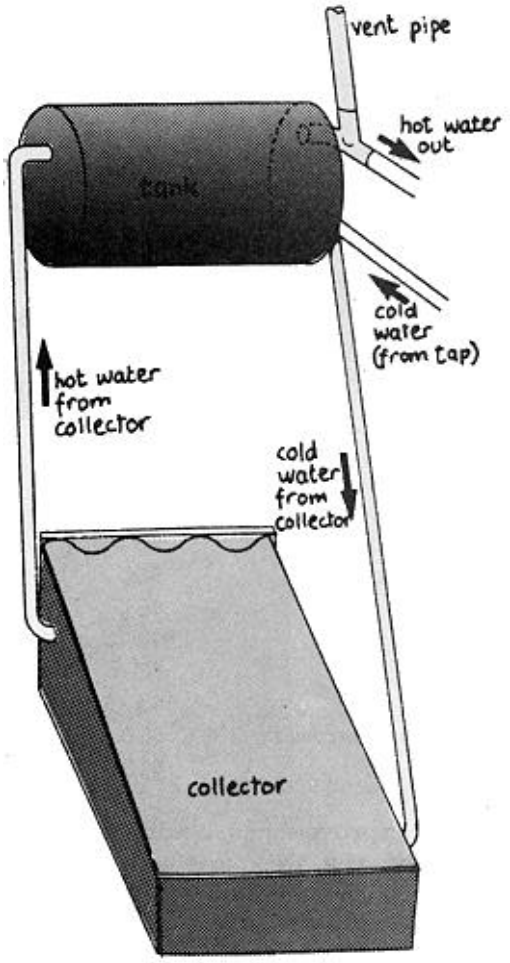


Fig. 3. Tank and collector.

USE

The whole system can be mounted on a roof (Fig.4a) and connected to a topa, or to bathroom plumbing. Alternatively, the collector can be mounted on the ground, and the tank raised on a stand above it (Fig.4b). The collector should face north and be tilted at an angle of 30° (40° in Australia).

This system has been operating in Botswana for two years, and has given no trouble. It heats water to over 60°C, that is, about 35° higher than the temperature of the cold water.

COSTS

galvanised pipe	$12
PVC pipe	$12
fibreglass sheet	$9
galvanised drum	$15

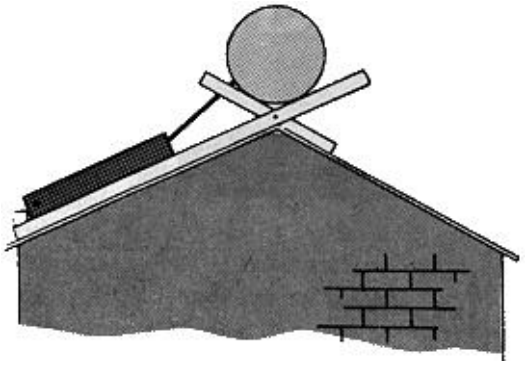


Fig 4a. Mounting on the roof.

plumbing and taps	**$15**
corrugated iron	$6
wood and hardboard	$6
insulation	**$5**
paint	$2
solder	$8
plastic	**$3**
miscellaneous hardware	$10
	$103

Some improvements could include the insulation of the tank and a low pressure non-return valve in the collector-tank circuit.

Ed.- The fibreglass cover is a simple solution to the problem but will only have a life of 2-5 years before it begins to discolour and break down. Also, unless the galvanising is pretty good, the absorber pipes will. probably be attacked fairly quickly.

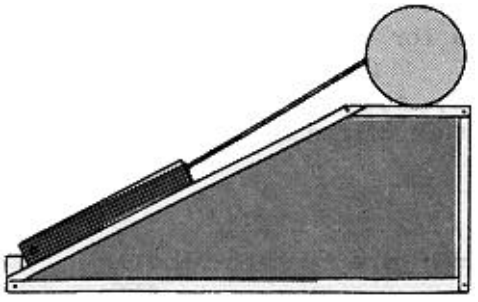


Fig4b. Mounting on the ground.

Next Issue

A preview of the contents of our next exciting issue of Soft Technology

*Home made alcohol to run your car.

*A pedal powered generator.

*The 1,100 titles of the ATA's new Alternative Technology Resource Library.

*An Amazing portable wind farm.

*The Sunbottle solar water heater.

TALK TO US !!

Soft Technology relies on its readers, for fresh exciting and interesting **information.** We are always on the lookout to find out what you the reader has been doing and would like to hear about. So talk to us! Let us know about the fresh, exciting and interesting things that you are doing so we can let other people know. Don't worry about being able to write we have trained experts who can decipher the most obscure scrawl.

Remember Soft Technology is a non-profit magazine produced by unpaid volunteers. To function it must have the support of its readers. So make the job of those hard working souls who produce Soft Technology a little easier by sending something in ....anything.... as long as it isn't dirty or smells bad

Talk to us!!

WESTWIND

For a number of years a company in Western Australia has been constructing wind generators larger than anything the companies in the eastern States have been able to comes up with. The company called Westwind is managed by Geoff Hill and now has a number of wind turbines erected and operating.

Westwinds 6OKw wind turbine has now been up and operating for nearly two years. It has been going well and has been functional for 99% of the time since it was erected.

The 60Kw on test near Freemantle.

Westwinds 30Kw windgenerator,

A more recent machine is Westwinds 30Kw. This machine is more refined than the 60Kw with improvements in a number of areas including the tower. Another recent machine is the 11Kw which has now been operating for a little over a year.

If you have some spare cash, prices for the turbines (as at Spring 85) were; 60Kw-$59,000, 30Kw-$32,000 and llKw-$18,000. For more information you can contact write to: **Westwind Turbines**

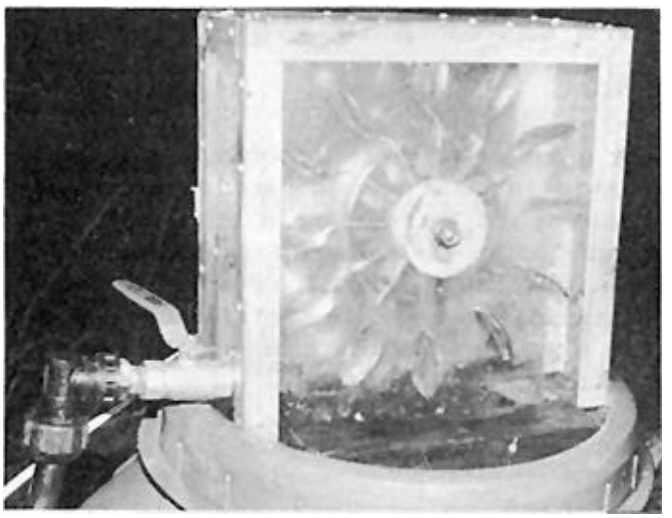
GP&GF Hill Pty Ltd,
2 Kilburn Way,
KELMSCOTT,
W.A. AUSTRALIA, 6111.
Ph (09) 3995265.

PEDAL'S PELTON WHEEL

Some time ago some members of the ATA where up in northern New South Wales and decided to drop in on Peter Pedals (Peter Van der wick). Peter has a reputation for ingenious small scale alternative technology gadgets and a visit was a must. Unfortunately Peter wasn't in, however they did manage to take a snap of his home made pelton wheel.

It's made up of a bicycle dynamo hub with a number of tea spoons fixed evenly spaced around the outside of the hub. A jet of high pressure water strikes the spoons making the dynamo hub spin and generating electricity.

While this little pelton wheel only generates a small amount of energy and may have a limited life it costs next to nothing which is important when you consider its full size cousins cost thousands.



Book Review.

ENERGY WORKS!

by KEITH SMITH

Nelson 1985 rrp $19.95

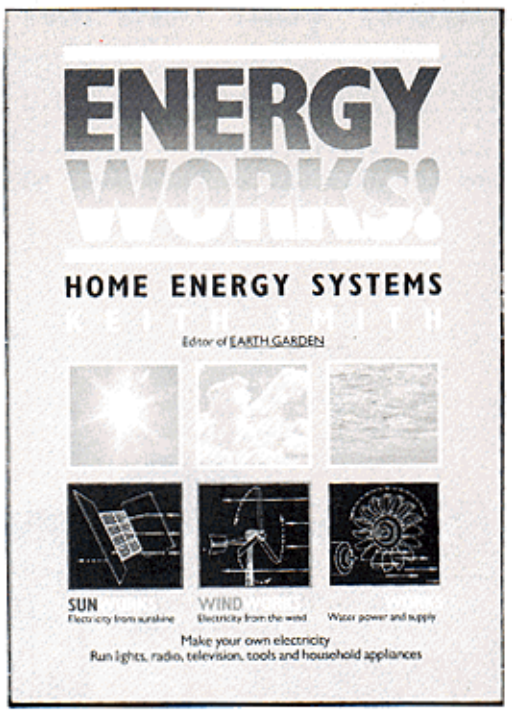
Energy Works! is a new book on home energy systems by Keith Smith who is probably better known as an editor of Earth Garden magazine. Its a good comprehensive collection of Australian information on setting up your own solar, wind and water powered energy systems.

The list of contributors is something of a whos who of the Australian alternate energy scene. There are also many short accounts of personal experiences with the practical problems in setting up your own system. Readers of Grass Roots will probably have seen some of these before somewhere.

This is an enthusiast's rather than an engineer's book. It begins with a general 'lets understand the basic concepts' rave about energy and then has separate sections on solar, wind, water. Batteries, wiring and appliances are then covered. There is even a section on computors! The information is simple, practical and diverse with plenty of illustrations and includes a list of suppliers.

A good book with local information and a practical orientation but somewhat on the pricey side at $19.95

Alan Hutchinson



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

MEMBERSHIP

Members receive Soft Technology, our newsletter and have access to the Solar Workshop.

Rates: $18, $10 Concession

SUBSCRIPTION

Subscribers receive Soft Technology four times a year.

Rates: $10 (everyone)

Year begins in July. (From December to June pay only half rates.)

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