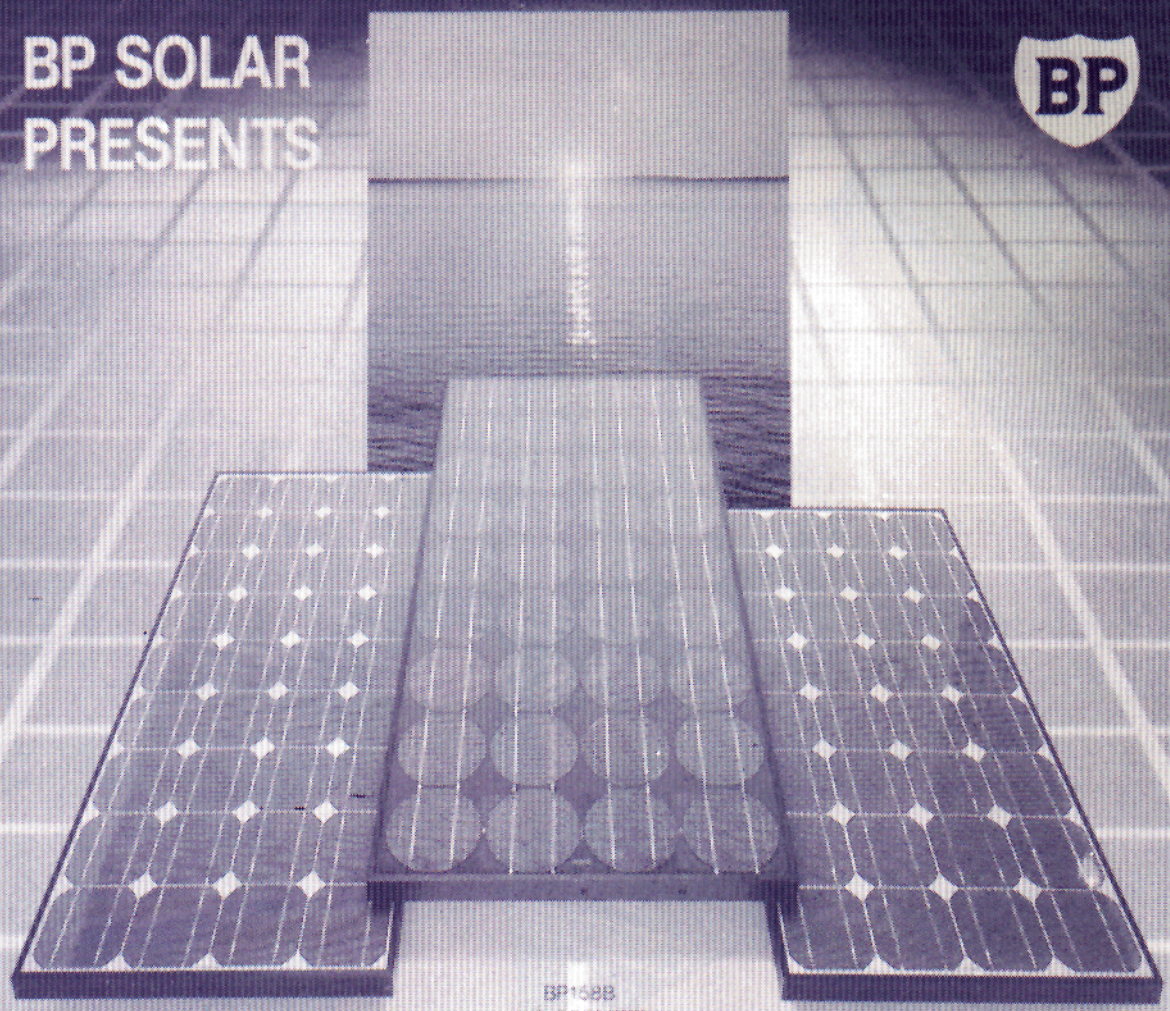
Soft Technology

Alternative Technology in Australia No 30 Dec 1988 $2.00

DOME HOME

SPIRAL STAIRCASE

BP SOLAR PRESENTS



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SOFT TECHNOLOGY

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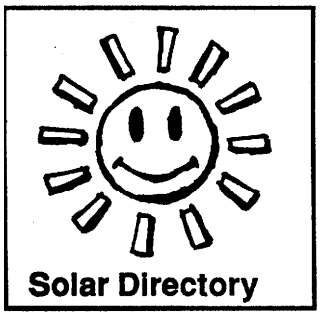
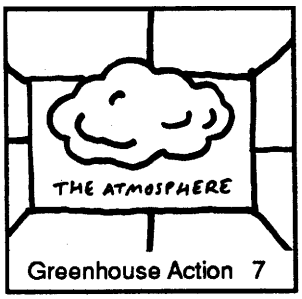
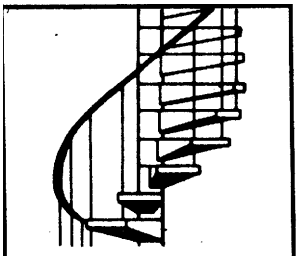


What's Inside...



Greenhouse Action 7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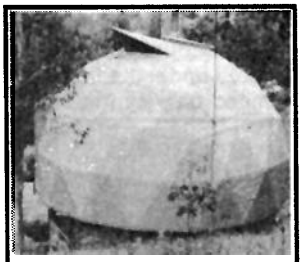
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ATA Report 6

This issue of Soft Technology was edited by Ian Scales with the help of Alan Hutchinson, Mick Harris, and others.

If you are interested in being involved in the production of this magazine, please leave a message on 419-8700.

Comments, contributions and criticisms are welcome and should be sent to the Alternative Technology Assn. 222 Brunswick St. Fitzroy Victoria, Australia. 3065.

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OCEAN ENERGY FOR ISLAND COUNTRIES

Japan's second largest steel maker is developing an Ocean Thermal Energy Conversion (OTEC) system.

OTEC uses the difference in temperature between sea water at the surface and bottom of the ocean to drive a turbine and generate electricity - ideal for island countries.

The advantages of OTEC technology are: unlimited use of seawater energy provides a constant source of power without relying on oil imports; longer life and easier maintenance than diesel power plants; and pollution free power is obtained.

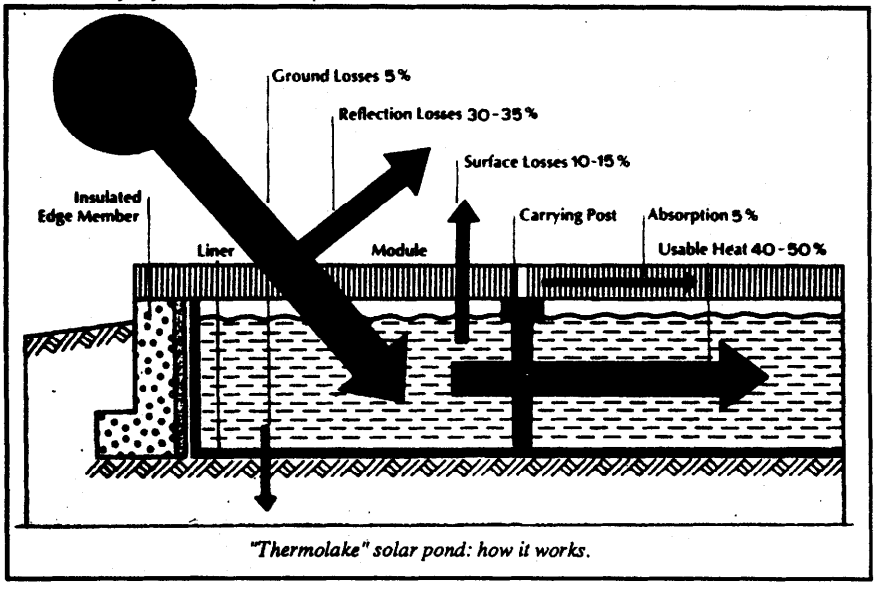
SOLAR PONDS A HIT

An Israeli firm has commercialised a reliable, economical solar pond called "Thermolake".

It is a saltless solar pond created by covering a body of water with thermal diode modules containing a special honeycomb called "Thermode".

Solar energy is easily transmitted through the modules to be absorbed by the water as heat. The heat is trapped in the water. Thermode's extremely low thermal conductivity ensures that heat does not flow back into the atmosphere. The amount of heat which may be stored under the thermal diode cover is limited only by the active depth of the pond. Solar heat storage capability can thus range from a few days to an entire season.

"Thermolake" finds application in farms, industries, residential and recreational areas, institutional buildings and community installations..



"Thermolake" solar pond: how it works.

BEAN ROCK GOES SOLAR

The historic Bean Rock lighthouse, New Zealand's oldest wooden lighthouse - well over 100 years old - stands at the entrance to Auckland's Waitemata harbour.

Despite its historic interest had deteriorated so badly it was likely to be demolished by a strong "Nor' easter". Recently the go ahead was given to restore the lighthouse and to power it with solar (PV) modules. The lighthouse should continue to send out its beams and guidance for many years to come. (Johnny Green's Journal)

NEW RENEWABLE ENERGY COURSE

A new course called the '*Advanced Certificate in Renewable Energy Technology" commences at Preston College of Technical and Further Education (TAFE), Melbourne in February, on a part-time basis.

The course is modelled on a similar course that has been running in Brisbane. Klaus Bienert, the co-ordinator, says the complete course takes five semesters to study, however, single subject enrolment is possible for those who are only interested in particular topics of the Renewable Energy field.

Bean Rock solar powered lighthouse, Auckland, New Zealand.

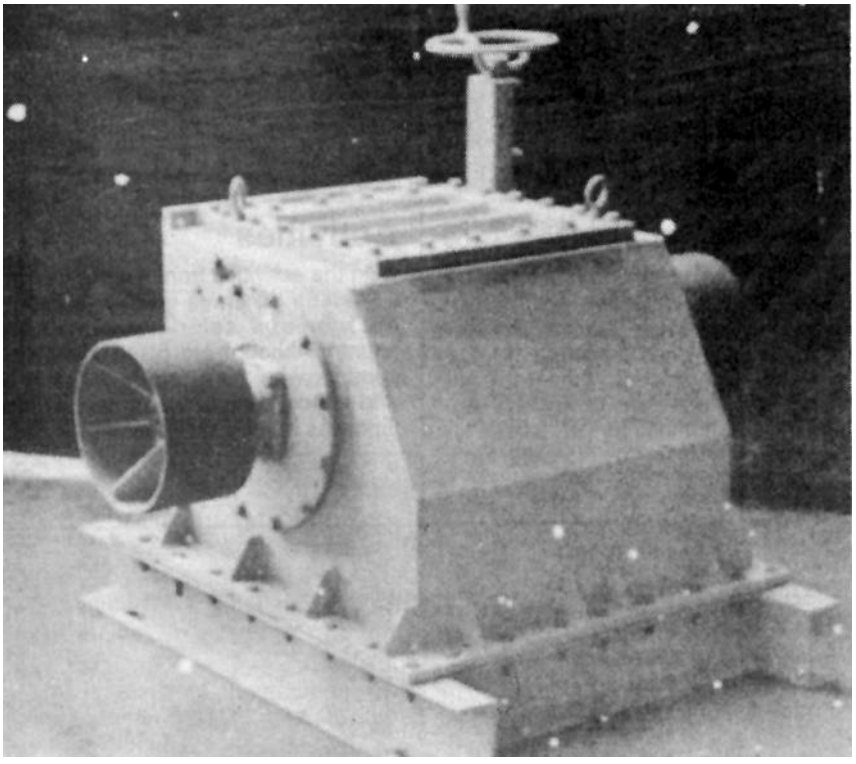
The course covers the principles of operation of renewable energy systems. This includes the effective generation, use, management, and conservation of heat, mechanical, chemical, and electrical energy from renewable sources. The course concentrates on the energy sources of:

- radiant solar used for photovoltaic electricity generation, solar water heating, solar space heating, etc.;

indirect solar used in building heating and heat shielding, heat storage and insulation;

solar atmospheric used for mechanical and electrical energy derivation from wind and hydro energy;

and solar biological - the use and reuse of animal and plant materials and waste products to generate energy.



BYS Crossflow turbine, Nepal

The aim of the course is to train people to be capable of designing, installing, commissioning, modifying, maintaining, and operating renewable energy systems. Hence the course has a good deal of practical content and some training in small business, communication and management skills.

Specific subjects covered by the course are:

- Introduction to Renewable Energy Systems,
- Electric Power Supply Systems,
- Computer Applications (renewable Energy
- Communication Skills and Small Business Management,
- Solar Efficient Design of Buildings,
- Photovoltaic systems,
- Wind Systems,
- Microhydro Systems,
- Hybrid Systems,
- Solar Water Heating Systems,
- Electronics for Renewable Energy Systems, and
- Active Solar Systems.

The last seven of these listed subjects are electives, of which three are chosen

NEPAL HOME OF HYDROPOWER

Nepal has a long tradition in utilising water power in small mills.

Thousands of ghattas (traditional Nepalese wooden vertical axis water wheels) are still in use today. Balaju Yantra Shala (BYS), a local engineering firm and mechanical workshop in Nepal worked with the Swiss appropriate technology organisation SKAT to produce a more powerful crossflow turbine. The project has become so successful that BYS turbines have been exported throughout South-east Asia and are now seeking further market expansion for their standard sized (5 - 250kW) units.

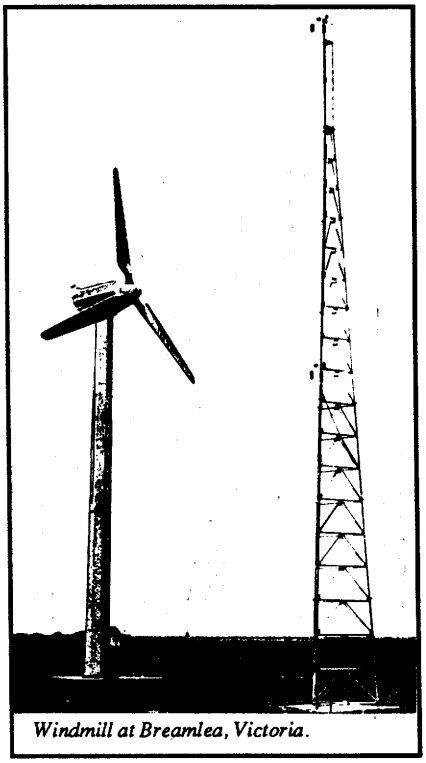
VICTORIAN WINDPOWER

The new 60 kW windpowered electric generator sited at Breamlea on Victoria's south-west coast is living up to expectations and during recent trials produced 274 kWh/day on average. The power produced by the windmill is fed directly into the S.E.C. grid. Nick Wardrop and Richard Hoy, the project managers, say that windmills may not be viable at present but need to be considered as an alternative, and that the windiest locations revealed by the Victorian Solar Energy Council's survey need practical evaluation. By Californian standards, where private developers built 1000 megawatts in 4 years, Victorian wind levels are excellent

SOLAR WATER GOES COLD IN W.A.

Western Australia is ideally suited to solar energy because of the State's sunny weather.

To date the main application has been the use of solar panels for residential water heating; however production of solar collectors in Western Australia has declined since the peak year 1983/84. The decline is apparently related to promotion of natural gas since North West Shelf gas has become available



Windmill at Breamlea, Victoria.

A T A R E P O R T

By now you should be starting to believe our promise of better looking, more regular issues of Soft Technology. in fact it is only a little over a month ago when we sat down to write the last ATA report.

Policy work

So what news since then? The recent "Greenhouse 88" conference brought about a flurry of activity from the ATA on the greenhouse effect issue. If you look at the article by Barbara Hall in this issue you will get some more detail on the work that we have done so far.

We are currently lobbying the Victorian Government to fund a joint group consisting of the ATA, the ACF and the Conservation Council of Victoria on this issue.

The group would work on policy issues which effect renewable energy and energy conservation in an effort to influence government policy in a way which will increase the pace at which these technologies are adopted in the broader community. If you are interested in these policy areas then drop a note to the office as we have some quite exciting projects around the corner.

Display trailer

On a more practical note the ATA's display trailer is looking better all the time. The two windgenerators on the roof have grown to three, (one working scale model of a Southern Cross windmill, a Savonius windmill and a windgenerator made from an old car alternator).

In the trailer itself the solar electric power system in now working as well as the water heater. In one of the side compartments is the Pelton wheel (microhydro), which runs a small generator. This little display uses the same epoxy Pelton wheel now being manufactured by the Rainbow Power Company. Our display produces less than 10 watts however the same wheel when set up with a proper generator and high pressure jets of water can produce hundreds of watts.

The trailer had its first airing at the Solar 88 Conference as you can see from the picture below and will next be used at the Confest on the Murray River east of Albury at New Year. We are planning to put Christmas lights on the windmill tower, and run these at night from the trailer's own power system, creating a sort of navigation beacon for lost campers trying to find their tents late at night.

Activities

On the activities front a group recently set off to have a look at some autonomous solar houses in the country. Although one of the house's occupants were busy producing a baby and hence preventing our visit a good time was had by all.

The ATA display trailer at the Solar '88 Conference.

GREENHOUSE

WHEN THE HURRAHS HAVE DIED DOWN.

by Barbara Hall

In the last issue of "Soft Technology" Chris Moss presented a review of the recent scientific evidence contributing to a picture of the process of artificial global warming now known as the "greenhouse effect".

This is a belated consequence of industrialisation induced by a build up of carbon dioxide, methane and other gases in the atmosphere as a result of fossil-fuel burning for energy and widespread global de&forestation. In this issue Barbara Hall looks at community and government response to this behemoth of environmental crises.

INTRODUCTION

Since October, an ad hoc, autonomous group of environmentalists which included ATA members has been developing a blueprint for community-based reaction to the Greenhouse Effect. The precipitating factor was the Commission for the Future/CSIRO "Greenhouse 88" conference held in early November. Members of the group were brought together by a number of factors: the readiness of the nuclear industry to exploit the greenhouse issue; that there was a real lack of political initiatives toward energy conservation and renewable energy solutions; that there was no community organisation geared to talk on Greenhouse; and that there was a general pre-"Greenhouse 88" conference mood of adaptive rather than trend-reversing thinking.

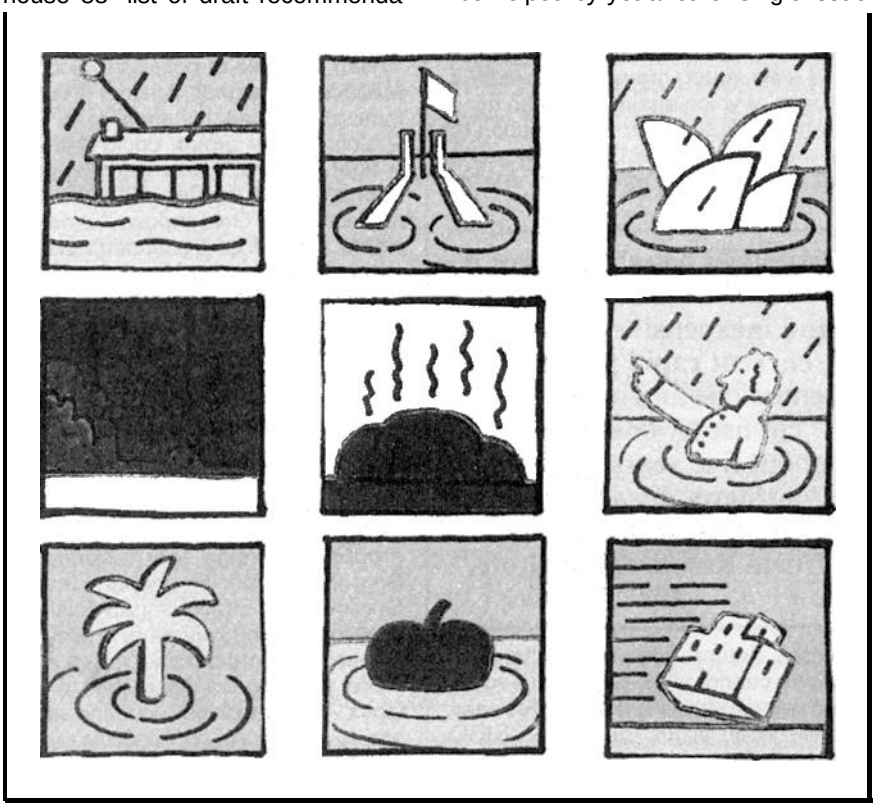
'The nuclear option was overwhelmingly voted off the "Greenhouse 88" conference list of draft recommendations . . .'

Prior to "Greenhouse 88", a leaflet, "Cooling the Greenhouse", and an anti-nuclear position paper were produced within the group in Melbourne and then endorsed by 23 environmental groups nationwide. The nuclear option was voted overwhelmingly off the "Greenhouse 88" list of draft recommendations, with a deal of help from this improvised network.

The continuing need for a network or forum on Greenhouse issues was obvious and the group, Greenhouse Action, is now fine-tuning its aims, objectives, strategies and its formal relationship with the environment movement.

INITIATIVES

In a period of economic pragmatism, declining membership and bitter campaigns to protect natural resources, the environment movement can scarcely be helped by yet another single issue



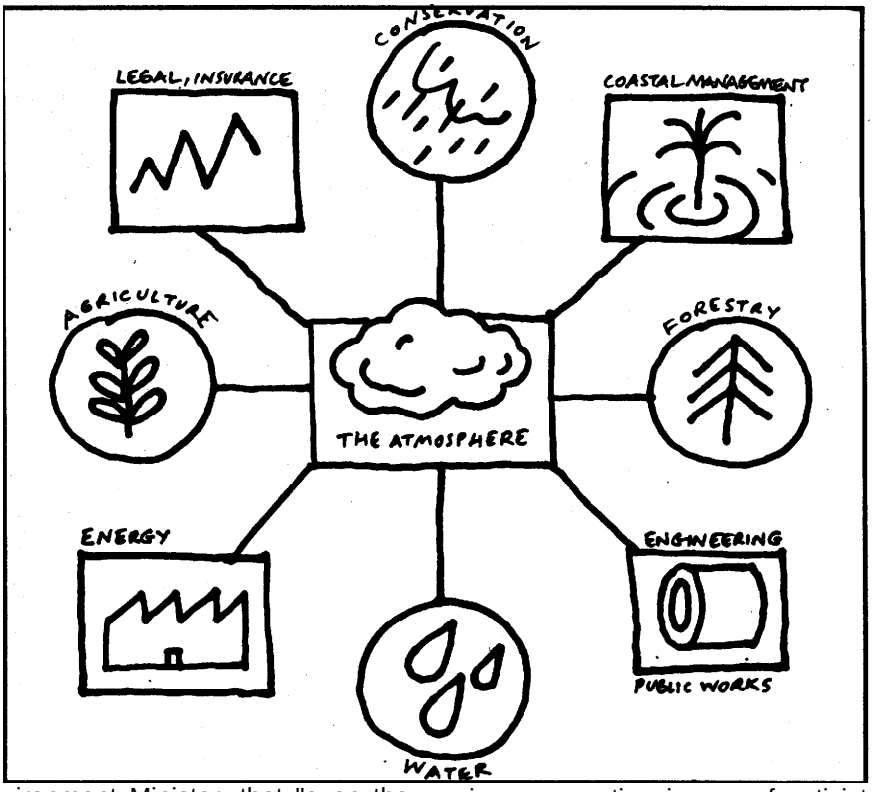
group. From the beginning, Greenhouse Action has been clear that it wishes to support and service Greenhouse issues on the agendas of established environmental groups. The next step for the group is to discuss its draft aims with each environmental organisation, to understand where Greenhouse figures on their agendas and how best to mobilise support. Indeed it is the nature of the greenhouse effect itself that dictates a forum approach. It is not a simple case of pollution as a health issue; rather, it is an umbrella of issues that add up to the greatest threat to life as we know it and the planet itself.

There have been a number of responses to the issue of global warming. At one end of the political spectrum, the Greenhouse Foundation now being set up by the Government's Commission for the Future will see a familiar union of Government and big business. At the community end of the spectrum, the Greenhouse effect raises the potential for empathetic but unprecedented alliances, and the challenge of dealing with a delicate web of issues together.

COMMUNITY ACTION

While we are opposing the multiplication of brown-coal-fired electricity supplies, we must maintain the same strength of voice against uranium mining and nuclear power as a solution to the greenhouse effect, and the same level of voice for renewable energy sources, natural gas and re-afforestation. We cannot allow our actions to be interpreted as fulfilling the prophesies of Neville Wran in his role as a CSIRO head, or Graham Richardson as Environment Minister, that "even the greenies" will find themselves supporting nuclear power.

"Analysis has shown that it would be technically easy and inexpensive to halt the current rapid growth in emissions and actually to cut use by one third in about five years" - Jessica Matthews, Vice President and Research Director, World Resources Institute, 1987.



As an example of possible outcomes, MAUM (Movement Against Uranium Mining), as one instance of a large single issue group, could find itself fighting new, more serious, more sophisticated battles with the pro-nuclear lobby. Greenhouse Action considers it could be the conduit of more support from a range of existing groups and from individual people for whom Greenhouse is their first environmental issue. Conversely, in the medium term, although it defies the logic of pre-Green house consciousness, we could find MAUM one of many groups involved in a campaign against brown-coal electricity.

There are more optimistic signs - initially evidenced by the wide range of groups endorsing the "Cooling the Greenhouse" position paper - that the Greenhouse Effect is galvanising a coalition among groups in a way that has not occurred before.

The greenhouse effect has a rural focus - in that global warming affects and is influenced by coastline, fauna, and forests - but unlike most other enviro-conservation issues of activist groups, the issue has an urgent urban focus and a strong community consciousness in the cities about our lives as city dwellers. A coalition could embrace - should embrace -wilderness groups, supporters of national parks, alternative technology groups, residents and branch organisations fighting powerlines and toxic industrial hazards as well as the pro-public transport lobby and the anti-uranium groups.

THE GREENHOUSE EFFECT IN THE PUBLIC MIND

Within a few short months, the Greenhouse issue had embedded itself into public consciousness: a Melbourne poll showed 70% of people interviewed were concerned about it and wanted action taken. Yet the high media interest (not sustained beyond the conference) and the widespread public concern (strong but at risk of atrophying into defeatism) have not been matched by informed public awareness campaigns. This could well lead to an over-concentration on easy-to-grasp aspects;

for example, a delusion that beating vehicle emissions means beating the greenhouse effect.

More crucial and complex issues may well be put in the too-hard basket without the efforts of grassroots groups and groups of concerned professionals, especially scientists, keeping the issues in the public eye. The future of Australia's electricity supply is in such a category. Victoria in particular is dependent on brown coal for electricity generation; the process is the largest local contributor to carbon dioxide emissions, and carbon dioxide constitutes 50% of the Greenhouse gases. For concerned Victorians, the need for urgent action to combat expansionist plans by the Victorian State Electricity Commission for more coal-fired or even nuclear power plants, and to support the alternative strategies for renewable sources of energy and energy conservation has never been more real. The Alternative Technology Association has been a major mover on energy issues, with its continuing lobbying over the Natural Resources and Environment Committee (NREC) electricity scenarios for Victoria.

The current absence of public awareness campaigns provides a challenging opportunity for community-based environmentalists and alternative technologists to lay claim to that role.

GOVERNMENT RESPONSE:

PIECEMEAL PLANNING OR JUST PLAIN OLD HYPOCRISY?

In the same week as the "Greenhouse 88" conference, the Victorian Government's Greenhouse Committee and the Federal Government's National Energy Consultative Council, both bureaucrats-only, held their respective first meetings. At the Victorian meeting, there was low-key consolation that the greenhouse effect was not really a serious problem, at least within the life of the current Government. The Federal body, existing to set policy rather than implement it (in particular the ALP's environmentally void "Energy 2000)", gave scant acknowledgement of the greenhouse effect-and then only to assert there was no real evidence it was happening. Similarly, although there is renewed and justified jockeying for scientific funding, the leaders at the CSIRO, though not the troops, often ap-

pear complacent about the reality of the green house effect.

There have been conflicting messages about the issue from Canberra which should make one skeptical about the real potential for the Federal Government to deal with the problem.

'The most recent Bureau of Statistics data (1984-85) shows the Australian Government's expenditure on research related to nuclear energy is still almost double the total amount spent on all forms of solar, biomass, wind, geothermal and ocean thermal energy"- Ian Lowe, "The Energy Policy Implications of Climate Change", 1988.

In the meantime, some of the most progressive moves are coming from the local government level. The Municipal Association of Victoria has indicated a new willingness to engage in environmental issues, a turnaround that is reflected in projects by individual councils. In this vein, the Melbourne councils of Brunswick and Northcote will jointly employ a conservation officer to produce a local conservation strategy. Brunswick City Council is considering changes to planning regulations which will make energy saving a priority in new flats. The Mayor of Brunswick credited the new thinking to a year long activist project by local high school students opposing pollution and the greenhouse effect.

SOLUTIONS:

MORE TALK ABOUT NUCLEAR, MORE DESPERATE THINKING AMONG OLD FRIENDS.

In setting about the task of finding a solution to the greenhouse effect, many theorists, activists and bureaucrats are displaying unimaginative thinking. Greatly and sincerely moved by the greenhouse threat, they are shedding old moral qualms about uranium mining and nuclear power, suggesting variously:

-that Australia could offset our almost inevitable coal export losses with uranium sales;

- that 'peaceful' nuclear power is a possibility and even further along the spectrum from the evils of nuclear war and terrorism than they once imagined;

- that Australia enriches its own uranium for financial gain and some degree of presumed moral international control over uranium sales.

The last two proposals ignore the constant nuclear hazard faced by those living near reactors (more than 700 million people live within 160 km of a nuclear power plant), and those affected through the food chain. They also ignore the nuclear waste and safety problems that continue to remain unresolved. Further, the economic arguments discussed frankly by the nuclear industry itself are not raised. Richard Kennedy, U.S. State Department adviser on nuclear affairs said in November:

"Even if there were no public pressure against nuclear plants, the United States would still not build any more for economic and fuel reasons." (Financial Review 2.11.88).

"The greenhouse clock is ticking. A substantial global warming is already inevitable. Since the rate of greenhouse gas emissions is accelerating, additional warming increments will be committed to much faster than in the past, meaning faster climate change and less time for societal and ecological adaptation" - Jessica Matthews.

Similarly in Germany, Manfred Timm of Hamburgische Elektrisch Werke AG observed that "We don't see any economically justified demand for future nuclear power plants in West Germany"

Finally, treat with extreme caution the old friends who loosely categorise uranium as a renewable energy source!

GLOBAL ACTION:

TOWARD AN APPROPRIATE SOLUTION

Dramatically changed patterns of using energy and types of energy used, plus forest management to enlarge the carbon dioxide sinks appear to be the principal strategies to limit greenhouse warming. The World Commission on Environment and Heritage concluded in 1987:

"Energy is not so much a single product as a mix of products and services, a mix upon which the welfare of individuals, the sustainable development of nations, and the life-supporting capabilities of the global ecosystern depend. In the past, this mix has been allowed to flow together haphazardly, the proportions dictated by short-term pressures on and short-term, goals of governments, institutions and companies. Energy is too important for its development to continue in such a random manner. A safe, environmentally sound and economically viable energy pathway that will sustain human progress into the distant future is clearly imperative. It is also possible. But it will require new dimensions of political will and institutional co-operation to *achieve it."*

GREENHOUSE ACTION

The Greenhouse Action group's booklet, "Cooling the Greenhouse", suggests ways in which interested readers can become involved, and contains a how- to-donate form. If you want to be on their mailing list, phone either Barbara Hall on 380 9199 or Judy McVicar at the Conservation Council of Victoria, on 654 4833 for a copy of the booklet. The group has no funding.

The author, a freelance researcher was *working for the Alternative Technology Association with the help of a grant from the Department of Industry, Technology and Resources, Victoria*

1988-1989 SOLAR DIRECTORY

THE SCOPE OF SOLAR ENERGY

Solar Energy can be utilised directly for lighting, heating and drying or through many technological means. These latter include technologies which directly receive *and harness solar radiation such as in water* heaters, passive solar buildings and photovoltaic solar ceils but they also include indirect utilisation approaches such *as biomass conversion (growing fuel crops) wind* energy conversion (harnessing air flows generated by solar radiation) and ocean thermal energy *conversion* (using the temperature difference *between the cold* depths and their solar heated surfaces).

Solar Energy, then, includes any form of *renewable energy that originates from the* sun, and the Australian *and New Zealand* Solar *Energy* Society accordingly embraces them all.

Soft Technology would like to thank the Australian and New Zealand Solar Energy Society (ANZSES) for permission to reproduce this directory.

ACKNOWLEDGEMENT

The description of the technology at the start of each section of this directory was kindly provided by the Victorian Solar Energy Council, (03) 654 4533, except for "Solar Power in the City", provided by S. Kaneff (Professor of Engineering Physics, Australian National University).

PASSIVE SOLAR SPACE HEATING

SOLAR EFFICIENT DESIGN

Houses are meant to do a lot of things for the occupant - one of these is to modify the outside climate to provide comfortable living conditions. Houses in desert, tropical and temperature areas should have different features to compensate for the different climates.

Some of the design features to be considered are:

- orientation - day-use areas should be located on the northern side of the home. Some sites are easier to work with than others, the key is to integrate the site and house design.
- zoning - the arrangement of rooms within the house is important to optimise comfort all year round.
- heat storage - concrete floors and internal masonry walls absorb winter warmth from direct sun and release it back into the room when the sun is gone. In summer these materials absorb excess heat from the room and make it more comfortable. Lightweight structures, are preferable in hot humid tropics.
- glass - window size should be designed carefully to optimise comfort. Double glazing can reduce winter heat loss but does little to lessen direct summer sun.
- insulation - insulation in the roof, walls and floor will reduce the loss of heat in winter and then take up of heat summer.
- sun control - windows that let hot summer sun into the house need to be shaded by louvres, shadecloth, pergolas or deciduous plants.
- ventilation - good ventilation will remove heat in summer particularly during the night. In winter doors and windows need to keep draughts from the house.
- landscaping - the correct planting of trees and shrubs and other landscaping features can improve conditions within the house.

There are obviously an infinity of combinations of these features. Any correct combination will provide an efficient, comfortable home as is the case with all houses having a GMI Council Five Star Design Rating.

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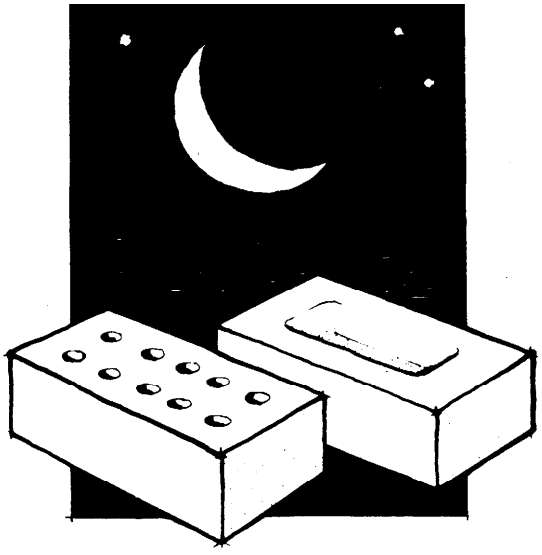
The most passive passive solar system under the moon.

Thanks to the unique thermal performance of clay brick, it's possible to use the sun's heat to warm buildings at night or cool them on hot days.

For the inner leaf of double-brick walls and the other Internal walls use pressed bricks. These have high thermal inertia to absorb and hold solar heat longer than other walling materials, so the sun's energy, taken in by north windows on winter days, is stored to be radiated back to room at night. The free solar warmth substantially reduces mechanical heating needs.

For the outer leaves use extruded clay bricks - the ones with holes in them. These have less mass but over twice the thermal resistance of your pressed brick. So this outer wall insulates against loss of free stored heat in winter and against summer heat gain. And, in summer, the inner walls with high thermal inertia absorb heat from the internal air, thus cooling the rooms.

Brick walls are key elements of passive solar systems, as well as passively serving structural, decorative and security functions. Clay bricks and good orientation enable efficient passive design without aesthetic compromise.



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  "Passive Solar Design in Temperate Climates* "
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- **Is as near as your telephone if you need advice.**

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The SOLAR PERGOLA® is made of timber with fixed scientifically angled battens to keep out the high and hot summer sun but allows the low winter sun to shine through.

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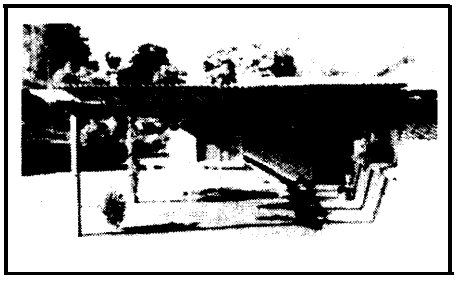
FIVE STAR DESIGN RATING

SUMMER SHADE



WINTER SUN

Design Council selection

Solar Pergola Sales

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Chatswood 2067
B.L. No. 38252

MELBOURNE
288 2822 '
78 Middleborough Road,
Burwood 3125

OR Phone (O8) 43 7090 for the name of your nearest distributor.

AGRICULTURAL & HORTICULTURAL APPLICATIONS

AGRICULTURAL ENGINEERING CENTRE, DEPARTMENT OF AGRICULTURE & RURAL AFFAIRS
Werribee, Victoria, 3030
Telephone: (03) 742 0111

Expertise in Design, construction and use of solar greenhouses, both commercial and domestic, including glazing materials and energy conservation strategies. Expertise in solar drying, particularly commercial systems for grapes and other fruit. Also domestic applications.

ZANE SOLAR SYSTEMS AUSTRALIA PTY. LTD.
P.O. Box 6318, Gold **Coast Mail Centre, 4217. (075) 399 355.**

Zane Solar Systems operate a specialised Technical Services Division staffed by qualified engineering personnel who are available to assist with every facet of solar system design.

Zane have successfully designed solar systems for many major projects including numerous 50 metre and 25 metre pools, hydrotherapy pools, indoor recreational pools and water slides. Other specialised projects have included unglazed and glazed systems for caravan parks, hotels, motels, hospitals, fish farms, plant nurseries, retirement villages and home space heating.

For further information telephone toll free (008) 07 4232 and ask for the Technical Services Manager.

SOLAR POOL HEATING

A wide variety of commercially available solar systems now exist for swimming pool applications. Copper systems have been superseded by unglazed plastic or rubber systems which are not affected by the wide range of chemicals used to treat swimming pool water.

Most of the plastic or rubber systems have been performance-tested by the Victorian Solar Energy Council (VSEC). The results show that all perform similarly for a given collector area, regardless of whether it is a tube, strip or panel system. It is more important to determine the quality, quantity and durability of a solar system, rather than be swayed by the performance claims of products.

Sized and installed correctly a solar pool system will increase the pool water temperature and so extend the use of your pool. You can enjoy your pool earlier in the season and continue swimming in comfort after the normal season has ended.

For many people the cost of heating a pool through conventional means such as gas, oil or electricity is far too expensive to be considered. Besides conserving our natural energy sources, a solar pool heating system can provide a cost effective and reliable answer for pool owners wishing to heat their swimming pool.

If you are presently using oil, gas or electricity to heat your swimming pool, a solar system could reduce your heating costs by 70% or more. Local weather conditions usually dictate how well a solar system performs.

SOLAR POOL BLANKETS

No matter what kind of swimming pool you have, a solar pool blanket can save you lots of money and effort. If your pool is unheated, you can make the water warmer and extend your swimming season.

A good way to use a pool blanket is with a solar pool heating system. The sun can heat your pool's water by day while the blanket keeps the heat in your pool where it belongs.

With most pools, 95% of the heat loss occurs from the surface of the water. The blanket forms a floating layer of insulation over the pool's surface which slows down the cooling of the pool water.

Sensible use of a pool blanket on your swimming pool can more than halve the amount of conventional energy you use to keep the water at a comfortable temperature.

Owners often state that they use less chemicals in their pool and problems with dust and leaves are reduced.

When removing the blanket from the pool don't just put it on the lawn beside the pool - use a roller if possible for convenient storage. This reduces damage to the blanket caused by scratches from the rough surface on pathways around the pool.

Cover, or store in the shade, any bubble-type of blanket when it's not in use. If this type of blanket is left folded or rolled up in the sun when not on the pool, it's possible the plastic may melt in places.

POOL HEAT PTY. LTD.
48 Ayr Street, Doncaster, Vic., 3108. (03) 857 8171.

Manufacturers and installers of Sunseeker Solar Pool Heating. Also do it yourself kits available. Call us now for an obligation free quotation. Let us stretch your swimming season.

SOLAR00 SOLAR SYSTEMS
420 Canterbury Road,
Surrey Hills, Vic 3127.
PH: (03) 830 4511

Sea our display advertisement page 26.

SOLARTHERM PTY . LTD.
P.O. Box 116, Auburn, N.S.W, 2144. (02) 648 1228.

Manufacturers of high quality solar hot water equipment, specialising in stainless steel, copper and aluminium products for domestic and commercial applications. Suppliers and installers of pool heating and photovoltaic systems and slow combustion heaters.

SOLARTHERM PTY. LTD.

AGENTS
Regd Office:
6th Floor. 107 Pitt Street,
Sydney 2000
Telex: Thomco AA70669
Fax: (02) 2214838

Victoria Office:
11 Argent Place, Ringwood,
Vic. 3134. Tel: (03) 874 1759

Showrooms:
• 111 Paramatta Road,
Auburn, N.S.W.
P.O. Box 116, Auburn, N.S.W. 2144
Telephone:(02)648 1228
• Northern Rivers Solar
Clark Street, Ballina, N.S.W. 2478.
Telephone: (066) 86 4620

SOMER SOLAR PTY. LTD.
832 Frankston-Flinders Road, Hastings, Victoria. 3195.
VIC: (059) 79 2777 NSW (02) 688 4000

Extruded synthetic solar. collector capable of being tailormade for each installation. Successfully sold in every state. Used by the Australian Institute of Sport. A leader in the field since 1975.

ZANE SOLAR SYSTEMS AUSTRALIA PTY LTD.
P.O. Box 6318, Gold Coast Mail Centre, 4217. (075) 39 9355.

A leader in solar pool heating systems since 1974. If you are a discerning pool owner who demands the best, Zane gives you a choice, Gulfstream, the premium solar pool heating system or Solarnet the truly affordable solar pool heating system. For your nearest Authorised Zane Dealer phone (008) 07 4232.

ZANE SOLAR SYSTEMS AUSTRALIA PTY. LTD.
P.O. Box 6318, Gold Coast Mail Centre, 4217. (075) 39 9355.

Sunsaver, a quality **pool blanket** designed to overcome the problems associated with other pool covers. No bubbles to burst and no glue to give way. High quality closed cell foam, flame laminated to a tough woven polyfabric, resulting in superior insulating properties and life expectancy. For further information telephone toll free on: **(008) 07 4232.**

SOLAR WATER HEATING

A domestic solar water heating system consists of solar collectors and a storage tank-connected by piping.

Four types of hot water solar collectors are currently on the market.

1. **Flat plate collector**
   Most of the collectors being sold today are of this type. They consist of a blackened absorber plate within a glazed and insulated box.
2. **Evacuated tube collectors**
   If the heat loss from an absorber plate can be reduced, higher temperatures will be achieved. One way of reducing heat loss is to put the absorber plate in an evacuated (vacuum) tube (similar to a thermos flask).
3. **Concentrating collectors**
   When collectors track (or follow) the sun, more solar energy will fall directly on the collector over the whole day. If this energy is also focussed (like a magnifying glass) onto a single point or line, then higher temperatures can be achieved.
4. Solar boosted heat pump
   A solar boosted heat pump produces hot water using the refrigeration principle. Instead of releasing heat to the air, as in a refrigerator, heat is absorbed by a collector containing refrigerant, and stored in the hot water tank.

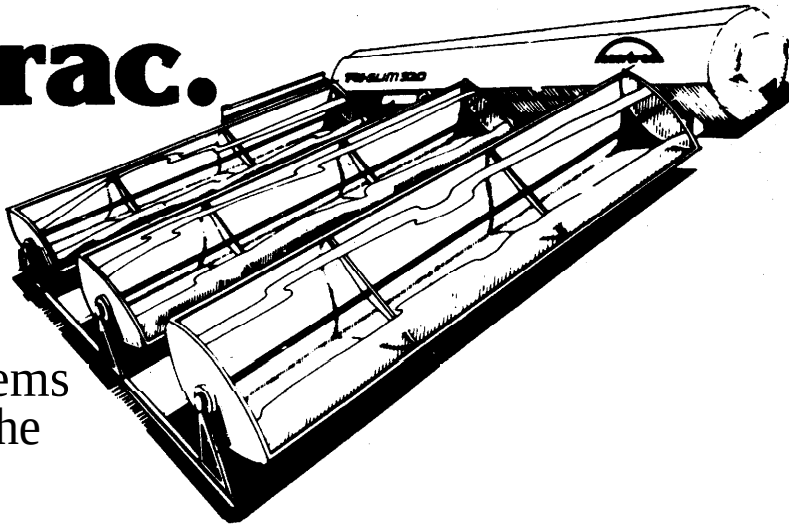
The storage tank is an essential part of a domestic solar water heating system. A good collector connected to a poorly chosen tank will make a poor system. The construction and size of the tank and collector chosen are equally important.

Solar tank designs include:

- vertical and horizontal types;
- **low and mains pressure;**
- gas, electric or solid fuel boosting;
- off-peak or continuous tariff electric boosting; and
- internally or externally mounted tanks.

There's one solar hot water system that leaves all others standing still.

Suntrac.



Other Solar hot water systems simply sit on the roof and sun themselves.

Imagine how much more effective a Suntrac system is. It actually moves to follow the sun throughout each day.

It's a concept that's won many awards, but your reward will be more hot water. More hot water and even greater savings on your water heating bills; in your home, industry, commerce or horticulture.

Suntrac, the leaders in solar heating technology, match their unique concept with the finest of materials to ensure quality, performance, and capacity to suit your needs.

suntrac

More energy, more hot water

13 Johnstone Road, Brendale, Brisbane, Qld, 4500, P.O. Box 368, Strathpine, Q. 4500. Telephone (07) 205 7144; Fax (07) 205 7352

NORTH WEST HEATING AND COOLING. 13 Hill Street, Tamworth, N.S.W., 2340. (067) 66 5868.
Specialising in solar and solid fuel heating, hot water systems, central heating, spa and pool heating, home lighting and power incl. inverters, pumps etc. Phone us for a no obligation quote anywhere in the North West.

SOLAHART.
112 Pilbara Street, Welshpool, W.A. 6106.
(09) 458 6211.
Manufacturers and distributors of a complete range of solar hot water systems, domestic and commercial models. Other products include solar pool and spa heating and solar space heating. Solahart exports to over 70 countries worldwide.

Regional offices exist in Adelaide, Melbourne, Hobart, Sydney, Brisbane and Darwin. World headquarters: Perth, 112 Pilbara St., Welshpool, 6106. (09) 458 6211.

SOLAROO SOLAR SYSTEMS
420 Canterbury Road, Surrey Hills, Vic 3127
PH: (03) 830 4611
See our display advertisement page 26.

SOLARTHERM PTY. LTD.
P.O. Box 116, Auburn, 2144.
(02) 646 1228.
Manufacturers of high quality solar hot water equipment, specialising in stainless steel, copper and aluminium products for domestic and commercial applications. Suppliers and installers of pool heating and photovoltaic systems and slow combustion heaters.

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Regd Office:
6th Floor. 107 Pitt Street.
Sydney 2000
Telex: Thomco AA70699
Fax: (02) 2214938
Victoria Office:
11 Argent Place, Ringwood,
Vic. 3134. Tel: (03) 874 1759

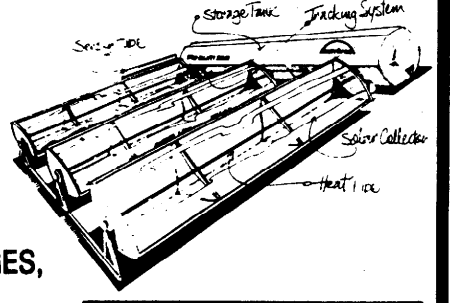
Showrooms:
* 111 Paramatta Road,
Auburn, N.S.W.
P.O. Box 116, Auburn, N.S.W. **2144**
Telephone: (02)648 1228
*** Northern Rivers Solar**
Clark Street, Ballina, N.S.W. 2476.
Telephone: (066) 66 4620

SOMER SOLAR PTY LTD
832 Frankston-Flinders Road, Hastings, Vic. 3915.
VIC: (059) 79 2777
NSW: (02)688 4000
Victoria's largest manufacturer of spectrally selective surface domestic solar hot water collectors. We manufacture a complete range of collectors, tanks and components to suit all types of hot water applications. Somer solar hot water systems have won Australian Design Award and are successfully exported.

ZANE SOLAR SYSTEMS AUSTRALIA PTY LTD.
P.O. Box 6318, **Gold** Coast **Mail Centre, 4217. (075) 39 9355.**
Manufacturers of the Zane - Magnum bulk pre-heated hot water system. Economic solar hot water designed for use where a large volume of hot water is required. Ideal for Caravan Parks, Motels, Retirement Villages, Hotels, Hospitals and Laundries. For further information phone the Technical Services Manager Toll Free (008) 07 4232.

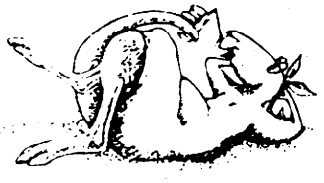
SOLAROO SOLAR SYSTEMS

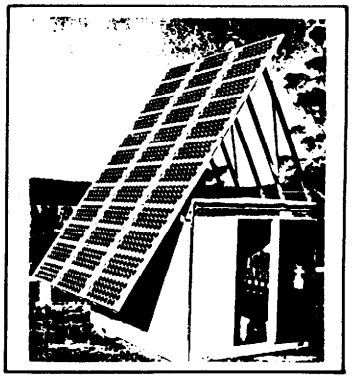
VICTORIA'S FOREMOST SOLAR DEALER



SOLAR POOL BLANKETS & ROLLERS POOL HEATING
SOLAR HOT WATER SERVICES
WE STOCK A FULL RANGE OF LIGHTS, PUMPS, INVERTERS, FRIDGES, AND COMPONENTS FOR COMPLETE SOLAR SYSTEMS
EDUCATIONAL KITS AVAILABLE
ASK ABOUT OUR PHOTOVOLTAIC SYSTEMS FOR . . . WATER PUMPING, LIGHTING & POWER GENERATION

SOLAROO





Telephone (03) 830 4511
420 Canterbury Road, Surrey Hills, Vic. 3127.

SOLAR ENERGY EQUIPMENT, SALES & INSTALLATION, DESIGN-ENGINEERING

SOLAR POWER IN THE CITY

Hard evidence from a decade of research, development and demonstration programmes indicates that solar thermal power is becoming cost-effective for large-scale grid connection and for providing substantial quantities of industrial process heat.

Installation and overall generation costs have dropped by an order of magnitude in the last five years, with the three different technologies now being developed expected to meet the following targets:

	Installed Cost*	Overall Generation cost'
Paraboloidal dish systems	$1400/kWe	6c/kWhe
Central receiver systems	**$3000→2000/kWe†**	**15¢→6¢/kWhe†**
Parabolic trough systems	$4000-3000/kWe†	20c-10c/kWhe†

(*For systems larger than 5MWe; † the lower figures apply to systems **above 50 MWe.)**

(N.B. kWe = kiloWatt of electricity; kWhe = kilowatt hour of electricity)

Coal based electricity in New South Wales ***costs 4c/kWhe*** at power station terminals. As transmission increases this figure significantly, strategically placed solar thermal stations are becoming competitive especially at sunny sites distant from present generating stations.

Early commercial application of solar power in California has followed the reverse order of potential costaffective systems listed above, since parabolic trough electric power systems have the longest history of development, and have increased in size from 13 to 30 ***MWe (total of 200MWe*** installed); future ***80MWe*** systems are expected to add a further 400MWe and be cost effective without tax incentives.

Ongoing developments will further improve overall efficiency (especially overall collection efficiency), simplicity and increase reliability and robustness (of all systems) - factors which, together with the economy of size and scale, promote cost-effectiveness. These developments are meeting the constraints imposed by the low energy density of sunshine. Problems posed by the intermittent nature of insolation are being addressed by economical storage - short term (hours) by heat storage in phase change materials (at temperatures 400-1000°C); short to long term (even months or more) by thermochemical systems whereby heat energy is converted to chemical energy, allowing storage and transport at ambient temperatures. Phase change and thermochemical systems hold great potential to improve system capacity factors in the near to medium term and reduce costs still further.

Thermochemical systems also allow:

- collection of solar energy from vast areas at low loss; transport of energy to distant locations; long term storage - collectors can be located in sunny areas, storage in pipelines or underground, and utilisation where needed.
- provision of industrial process heat, electricity, synthetic fuels, chemicals, fertilisers - using the sun as the energy source;
- reduction of CO_2 and reconstitution into various hydrocarbons;
- detoxification of toxic wastes in closed systems at medium temperatures and conversion to useful or benign substances.

The above research and development is truly able to bring solar power to the city and represents one of the very few options for reducing the greenhouse effect as well as providing potential for vast new industries by 2000.

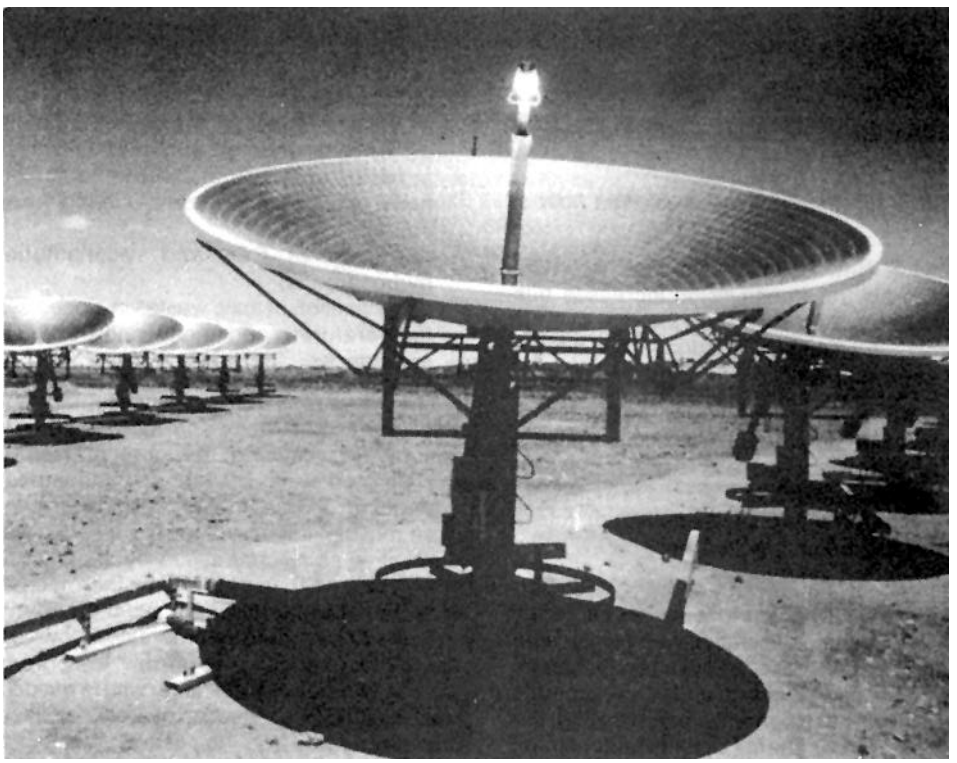
Ongoing developments are producing simpler, robust, more reliable, larger and more cost effective collector arrays. Storage is being addressed by short term heat storage in phase change materials and by thermochemical conversion of solar heat energy to chemical energy.

Thermochemical systems also allow: collection of solar energy from vast areas at low loss; transport, long term storage and use of this energy where needed; use for process heat, electricity, production of fuels, fertilisers and chemicals; conversion of CO_2 to useful hydrocarbons, and safe detoxification of toxic wastes in closed systems.

ALLCO-ANUTECH

Industry and Research
working in partnership to develop . . .

FUEL FOR THE FUTURE



SOLAR COLLECTORS TRACKING NEAR MID-DAY IN SUMMER

The ALLCO Group of Companies is proud to support the
AUSTRALIAN NATIONAL UNIVERSITY'S ENERGY RESEARCH CENTRE
as it advances solar thermal and thermochemical technology
for the future benefit of all Australians.

ALLCO

ANUTECH

ALLCO LIMITED
570 Blaxland Road
EASTWOOD 2122
Telephone: 02 804 6077
Facsimile: 02 804 6169
CONTACT: Mr. Bill Motteram, Business Development Manager

REMOTE AREA POWER AND PUMPS: PHOTOVOLTAIC (SOLAR) CELLS

Solar cells (photovoltaics) provide clean, silent, efficient power for a multitude of purposes. Photovoltaics are a viable form of electricity generation for portable and mobile power needs, including battery powered applications, as well as providing electric power for areas off the SEC grid.

Photovoltaics are often used in solar-powered watches, calculators and other portable equipment. They are also highly suited to remote power supply needs such as communications systems and navigation beacons.

If the cost of mains power connection to a rural property is high, a photovoltaic system will provide an alternative to the power grid that shouldn't be ignored.

There are three types of photovoltaic modules on the market. They differ in the form of the silicon used to make them.

1. **Mono-crystalline silicon modules**
   Thin wafers are cut from a large single crystal of silicon to form the individual cells. This type of cell has the best efficiency for a given module **area** and well-made modules have **a** proven long life.
2. **Poly-crystalline silicon modules**
   Thin wafers are cut from a block of multiple crystal silicon. The crystal faces of the silicon can be seen in the speckled lustre on the surface of each cell. Modules made from these cells have efficiencies and lifetimes slightly lower than mono-crystalline modules.
3. **Amorphous silicon modules**
   These are made from an uncrystallised form of silicon. They are often called thin film silicon (TFS) modules as the silicon is deposited in a thin layer or film on a variety of surfaces, usually glass.

ABA ELECTRICAL SERVICES.
6 Downer Avenue, Belair, S.A. 5052. (08) 278 4538.
Remote area power is our business. Water pumping, solar/generator combination, electric fencing, communications, including domestic (RAPS). We are S.A. Distributors of B.P. Solar Australia. See us first for sales, service and installation.

BP SOLAR AUSTRALIA,
98 Old Pittwater Road, Brookvale, N.S.W. 2100.
(02) 938 5111.
Australian made solar cells and solar modules. Other products include regulators, inverters, batteries, lighting, refrigerators, freezers, pumps. Remote area power systems, standard and customised available. Engineering and design services. Suppliers to retail, government, O.E.M., export.
Distributors:

Vic. Going Solar	(03) 328 4123
NSW. BP Solar	(02) 938 5111
Qld. Alternatives	(07) 371 6994
NT. Delta Electrics	(089) 84 4033
SA. Natural Technology	(08) 344 7298
WA. Atkins Carlyle	(09) 277 0511

CATT BROS PTY LTD.
30 Bear Street, Inverloch, 3996.
Phone (056) 741 354.
Gallagher Electric Fencing Systems. Agents, suppliers, advisers and installers of Gallagher Solar Powered Electric Fencing Systems and Photovoltaic Cells.

CHOICE ELECTRIC CO. (AUST.) PTY. LTD.
3 **Prospect** Street,
Bowen Hills, Qld. 4006.
PH: (07) 252 4909 FAX: (07) 854 1038
* Ultra high efficiency D.C. lighting & components
* RFI suppressed power inverters.
* Microprocessor controlled solar trackers.
. BP solar wholesaler to Queensland.
. SANTECH registered trade mark.

THE ENERGY SHOP
173 Auburn Street, Goulburn, N.S.W., 2580. Phone (048) 21 9966
Offering a total range of independent power systems and complementary equipment - photovoltaics, wind generators, batteries, inverters - slow

combustion stoves gas refrigeration. Solar hot water - We even specialise in high powered remote area TV receptors and amplifiers.
Contact Tony Egan on (048) 21 9966.

GF SOLAR,
34 Reginald Street, Rocklea, Qld. 4106. (07) 277 9688.

- ❑ Solar modules S.C.A. (Aust. made)
- ❑ Solar battery charging/fencing
- ❑ Solar home power systems (RAPS)
- ❑ Water pumping systems.

Distributors for: Showa Arco Solar, Solar Cells Australia.
Servicing: Queensland, Northern Territory, Northern N.S.W.

LIBENS MANUFACTURING,
46 Babbage Road, Roseville, N.S.W. 2069. (02) 407 1477
Makers and suppliers of Electric Elements for water and heating appliances both AC/DC applications.

NATURAL ENERGY CENTRE.
147 King William Road,
Hyde Park, S.A., 5061. (08) 272 8536.
Power systems for all applications. Pumping, RAPS, communications etc. Complete systems designed, manufactured and installed. Swimming pool heating, woodstoves and wood cookers also manufactured. Full range of energy systems.

PHILLIPS ELECTRICAL COMPONENTS & MATERIALS.
11 Waltham Street, Artarmon, N.S.W. 2064. (02) 439 **3322.**
Australian Manufacturer of Photovoltaic Solar Cells and Modules. Supplier of Photovoltaic Components to system specialists.
Sales Office Melbourne (03(542 3333, Adelaide (08) 243 0155, Perth (09) 277 4199, Brisbane (07) 844 0191.

ONE STOP ENERGY SHOP PTY. LTD.
Unit 11, 2 Paton Pl., Manly Vale, 2093.
Phone: (02) 948 0215, 948 0216
Fax: (02) 949 3710
Supplies equipment for ENERGY SUPPLY and ENERGY CONSERVATION. Gas, Solar, Electric, Fire Insulation, Glasshouses, Double Glazing etc.

QUIRK'S VICTORY LIGHT CO. PTY. LTD.
13 Albemarle Avenue, Rose Bay, 2029.
(02) 371 0014
Arco solar modules, wind turbines from 5 watts to 450 watts, full range 12v/24v inverters, fluorescent/quartz halogen lights, appliances, batteries, power efficient refrigerators to suit domestic or portable use, deep cycle batteries.

RAYWARD ENERGY SERVICES PTY LTD. 8 Wyatt Avenue, Regents Park, N.S.W. 2143. (02) 93 5313, 649 7603.
Electrical and solar contractors.
Air type collectors for space heating. Heat store, duct, and insulation installation. Also all types of electrical work LIC 35047. Take advantage of our free heat loss and payback assessments.

SOLAR APPLIANCE SYSTEMS.
P.O. Box 40001, Casuarina, N.T. 5792. (089) **27 4549.**
Proprietor Ann Wellard. Agent for Solarex 12V Solar Panels (solar battery chargers).

- ❑ Communications ❑ Boats, caravans
- ❑ Navigational aids ❑ Water pumping
- ❑ Lighting ❑ Remote homesteads.

SOLAR CELLS AUSTRALIA Pty. Ltd.
382 Canterbury Road, Surrey Hills, Vic. 3127
Phone: (03) 838 9966
Manufactures mono-crystalline modules in Perth under license to SHOWA ARCO Solar. 30 cell, 33 cell and 36 cell power modules are accepted by the NSW Department of Energy for use under the Remote Area Power Assistance Scheme.
Thin Film Silicon modules are sold from 1 to 30 watts. Thin Film completed circuits are available for electronic equipment.
See our display ad this section for agents and distributors.

SOLAR GENERATION,
Whites Road, Landsborough, Qld. 4550. (071) 94 1144.
Specialising in the design, manufacture and installation of solar electric systems. We offer technical expertise, quality equipment, professional installation and personal service.

SOLAREX PTY. LIMITED,
P.O. Box 204, Chester Hill. N.S.W. 2162 (02) 727 4455

Photovoltaic systems for all applications. Remote area power system specialists. Solar modules for refrigeration, water pumping. lighting, etc. PV regulation and control equipment. Water pumps, inverters, battery chargers. Exporting to the Pacific and Near East.

STH BURNETT SOLAR POWER SYSTEMS. P.O. Box 52, Nanango, Qld. 4315. (071) 63 1959.
For all your solar requirements, informa-

tion and installation, solar water pumping 12v/24v/240v, solar power systems and appliances, low voltage lighting, electrical fencing, etc.
Write or call Mal Morphew.

SOLAROO SOLAR SYSTEMS
420 Canterbury Road,
Surrey Hills, Vic. 3127.
PH: (03) 830 4511
See our display advertisement page 26.

SOLATHERM PTY LTD.
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Fax: (02) 2214838
Victoria Office:
11 Argent Place, Ringwood,
Vic. 3134. Tel: (03) 874 1759

WILDWOOD WIND & SOLAR,
'Wildwood', Tinderry Road,
Michelago, N.S.W. 2620.
(062) 35 9172.
Advice, supply and installation of small scale solar, wind, hydro systems. 12-24 volt appliances. Mail order catalogue available. We live off grid - we know what works. Ring for appointment to visit - see it working.

REMOTE AREA POWER AND PUMPS: WIND ENERGY CONVERSION

Wind power continues to provide power for pumping in the form of the familiar farm windmill, but windmills are becoming increasingly common in applications which generate electricity.

Wind turbine generators, sophisticated cousins of the old farm windmill, are springing up all over the world, from small units on sailboats (which provide essential electrical power for radio and navigation) to domestic sized turbines providing household power to large machines providing power for national electricity networks.

Wind power is not usually economic for anyone within easy reach of existing power supply.

However, if your home is distant from the line, and your connection fee looks like exceeding $8,000, a wind electricity system is well worth considering.

Because the wind is erratic and unpredictable, you cannot count on a steady supply of electricity from your installation, unless you provide for storage. Storage allows you to save electricity in battery banks when the wind is strong, for use in periods when it isn't blowing at all.

Siting your Windmill

- Pick a site which is clear of obstacles.
- Ensure that windspeeds are adequate for economic operation (check local meteorological records, and assess local windspeeds yourself, preferably over a year).
- Don't locate the windmill at too great a distance from your home (long connecting wiring consumes power in transfer, particularly at the low operating voltages of modern windmills).
- Ensure that turbine is at least 6m higher than obstacles within 100m (obstacles create turbulence, which buffets machines and increases the likelihood of damage).

QUIRK'S VICTORY LIGHT CO. PTY. LTD.
13 Albemarle Avenue,
Rose Bay, 2029.
(02) 371 0014
Arco solar modules, wind turbines from 5 **watts** to 450 watts, full range 12v/24v **inverters, fluorescent/quartz halogen lights, appliances, batteries, power efficient refrigerators to suit domestic or portable use, deep cycle batteries.**

SOLAR00 SOLAR SYSTEMS
420 Canterbury Road,
Surrey Hills, Vic. 3127.
PH: (03) 830 4511

See our display advertisement page 26.

WESTWIND TURBINES
Jeff Hill, 29 Owen Road,
Kelmscoff, 6111.
Phone: (09) 399 5265
Fax: (09) 497 1335
Manufacturers of grid connected wind turbines in the range 5 to 60 kilowatts. Stand alone systems under development. Installers of Australia's first wind farm at Esperance (6x60 kilowatt turbines).

WIND ENERGY AUSTRALIA
Lot 20, Homestead Drive,
Bangholme, 3175.
PH: (03) 773 2935.

Manufacturers of WEA inverters for all input voltages, Run 100VA to 6000VA, constant potential battery charges, control panels, regulators etc., for wind and solar powered remote area power supplies. We have everything you need for a complete system.

BIOMASS CONVERSION

There are hundreds of different models of heater on the market, which, by their main technical features, can be grouped into six broad categories:

1 Open fires
2 Non-airtight heaters
3 Simple box heaters
4 Improved controlled-combustion heaters
5 Catalytic heaters
6 Central heating furnaces.

Open fires and fireplace inserts

The traditional open fire is made from brick or stone. These fires radiate heat from the flames and hot embers, creating a zone of comfort immediately in front of the fire. Once the fire has been burning for some time the brickwork of the chimney will warm up and provide some heating as well.

Open fires can create a very pleasant atmosphere but they lose a lot of heat up the chimney.

The efficiency of open fires is only 0 to 15%.

Non-airtight heaters

There are several types of non-airtight heater including some pot-belly heaters, some box heaters, and most of the glass enclosed fires. The common feature of these types of heaters is that air enters the heater through small gaps between joins in the metal, around the glass panels, or around doors and ash removal trays.

The non-airtight heaters are typically 30 to 40% efficient. The glass enclosed fires are usually at the lower end of this range.

Controlled-combustion heaters

Controlled-combustion heaters are heaters in which the rate at which the fuel burns can be controlled and limited by the amount of combustion air entering through an adjustable air inlet. When the air inlet or inlets are fully opened there is ample air for combustion and the fuel burns vigorously. As the air is reduced the fire does not receive enough air to sustain a high combustion rate and combustion dies down until it is burning at a rate suited to the air supply. This gives good control of heat output.

Improved controlled-combustion heaters

Most of the improved controlled-combustion heaters are technically advanced refinements of the heater discussed previously. Through careful design the efficiency is improved, although at slow burn rates efficiency is still less than at medium and high burn rates. The efficiency is 30 to 80% with about 60% being typical for sensible operation.

Catalytic heaters

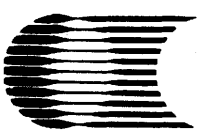
Some wood heater technology includes the use of catalysts. A catalyst is something which speeds up a chemical reaction without being used up itself. In wood heaters the catalyst (which is usually a noble metal such as platinum) means that the smoke and gases given off by the wood will burn at much lower temperatures than if the catalyst wasn't present. This means cleaner burning, less creosote and higher efficiencies at slow burn rates.

Tests carried out in the United States have shown that the efficiency of catalytic heaters can be up to 10% higher than heaters without catalysts.

Central heating boilers and furnaces

Wood may also be used in some central heating boilers and furnaces. Boilers are used with water-filled 'radiators and in-slab floor heating and furnaces are used for ducted warm-air systems. A few models are designed to run on oil, gas, or electricity in addition to wood.

Some central heating boilers are combined with slow combustion cooking stoves (all of these rely on water for the central heating). Others are stand-alone appliances intended for installation in a. kitchen, laundry, basement, or boiler shed.



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PH: (002) 20 2642
Environmental Studies' Home Heating Laboratory. Contract testing of heating and cooking appliances burning firewood and other solid fuels. Safety, efficiency and pollution measurement, Firewood analysis and firewood supply studies. Contact Dr. John Todd for details.

INFORMATION AGENCIES

ALTERNATIVE TECHNOLOGY ASSOCIATION
222 Brunswick Street, Fitzroy, Victoria 3065. Phone: (03) 419 8700
A community association involved in the promotion and practical use of renewable energy and appropriate technology. Activities include field trips, meetings and workshops where actual equipment is constructed. The group publishes regular newsletters, Soft Technology magazine and reports of its research work.

APPROPRIATE TECHNOLOGY DEVELOPMENT INSTITUTE
Unitech PMB, Lae, Papua New Guinea 43 4781
Researches and develops appropriate technologies for the benefit of rural communities, rural areas and energy small industries food technology and agriculture. It publishes A.T. books and disseminated information through the Lik Lik Buk Information Centre. ATDI. Has interest in exchange of information with similar groups.

APPROPRIATE COMMUNITY TECHNOLOGY ASSOCIATION
Big Scrub Environmental Centre, 88a Keen St. Lismore, 2489. (066) 89 1431
Voluntary association of rural people with hands-on experience of a wide range of technology (from toilets to nuclear reactors). Activities include: monthly newsheet and meetings, field days, one published booklet "Backyard Electrical Systems" $5.

CITY OF BRUNSWICK
8-10 Lee Street, Brunswick Vic. 3057
PH: (03) 387 2609
Activities for Schools. Energy Studies, Low Energy Display House, Environmental Activities, Pond Studies, Horticulture, Worms, Bees Animals, and more!!!

CSIRO ENERGY INFORMATION SERVICE
314 Albert Street, East Melbourne, 3002. (03) 418 7333.
The Energy Information Service provides information on all aspects of renewable energy and energy management, conservation and planning. It is available on demand for a fee and covers material from countries in Asia and the Pacific. Two publications are the Renewable Energy Index and the Energy Directory.

CSIRO DIVISION OF ATMOSPHERIC RESEARCH
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DEPARTMENT OF ENERGY
GPO Box 485, Sydney, N.S.W. 2001
PH: (02) 234 4466
The Department of Energy provides policy advice covering the supply and use of energy in N.S.W. Promotes awareness of energy efficient appliances and technologies to industry and the public. Awards the Five Star Design Rating to energy efficient houses. Publications available. For information, telephone **(02) 234 4466.**

DEPARTMENT OF MINERALS AND ENERGY
PO. Box 352, Konedobu, National Capital District Papua New Guinea
PH: 21 4011/22 7631
FAX: 213701
Government Department responsible for National Energy Policies and Planning, renewable energy project implementation, energy conservation, information dissemination.

ENERGY INFORMATION CENTRE
139 Flinders St., Melbourne, Vic. 3000. (03) 650 1195.
The Energy Information Centre provides free unbiased advice on a broad range of energy topics for the general public. Free pamphlets about solar energy utilisation and low energy housing principles, etc., are available upon request.

GEOTECTURE INTERNATIONAL ASSOCIATION
Dr. S. Baggs Ed., 4 DeVilliers Avenue, Chatswood, N.S.W. 2067. (02) 419 4694.
'Geotecture' journal of Geotecture International Association. Subscription (A)$16.00 annually (two issues). Worldwide network of professionals and laypeople interested in energy conservation and improved visual quality from earthcovering buildings, papers of scientific and general interest.

SOLARENERGY
570 Blaxland Road, Eastwood, 2122.
Tel: (02) 804 6077
Fax: (02) 804 6169
Working with the Energy Research Centre, Australian National University in researching and developing solar thermal and thermochemical technology.
Contact: Mr. Bill Motteram, Business Development Manager.

The Government of South Australia

EIC

SOUTH AUSTRALIA ENERGY INFORMATION CENTRE
233 North Terrace, Adelaide, S.A. 5000 (Opp. Adelaide Univ.)
Phone: (08) 232 2300
Fax: (08) 232 2511
The Energy Information Centre provides an unbiased technical information service on energy use and efficient appliance selection. A free house plan advisory service is also available as is a Five Star Design Rating appraisal service.
Hours: Monday-Friday 9.00am-4.00p.m.

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Christchurch, New Zealand.
(3) 66 7001.
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UNIVERSITY OF MELBOURNE
Mechanical & Manufacturing Engineering Department, Faculty of Engineering, Parkville, Vic. 3052.
(03) 344 6619 or (03) 344 6726.
Solar Thermal system design and perfomance testing; solar energy research and development; solar **undergraduate and postgraduate** courses; solar training courses; solar consultancy.

UNIVERSITY OF OTAGO - PHYSICS DEPARTMENT
PO Box 56, Dunedin, New Zealand
(024) 79 1100.
University research into wind energy. Wind data records for remote sites in southern New Zealand.

UNIVERSITY OF QUEENSLAND
St. Lucia, Qld., 4087, Australia.
Contact: Dr. S. V. Szokolay
Architectural Science Unit
Phone: (07) 377 2412
Telex: 40315
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Information can also be **obtained from:** A.N.Z.S.E.S. **PO Box 124, Caulfield** East. (03) **211 7557. See enclosed brochure and publications listing pg. 38.**

UNIVERSITY OF TASMANIA
P.O. Box 252C,
Hobart, Tasmania, 7001
PH: (002) 20 2642
Environmental studies centre offers postgraduate courses and research in some fields of renewable energy and conservation. Contact the coordinator of environmental studies for details of courses and publications.

UNIVERSITY OF WESTERN AUSTRALIA
Nedlands, W.A., 6009
Australia.
Contact: Mr. P.G. McCormick
Dept. of Mechanical Engineering
Tel: (09) 380 3838
Fax: (09) 382 2885
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To set up your building design in CHEETAH is so simple! You may draw from a library of common building elements or construct custom elements to suit your particular design. All communication with CHEETAH is via simple easy to read menus. The package allows you to study hourly temperatures, monthly summaries of temperatures or monthly heating and cooling loads. The output can be viewed in colour on the screen or sent to a printer (black & white).

We know that once you have tried the demo and seen for your self how user friendly it is. you will want to have your own copy.

The price, with one location of weather data is $300 + sales tax where applicable (20%); additional weather data disks are available for $25 each (+ 20% tax where applicable). Your package will include 'after sales' help by phone or by mail and any updates in the first year of your license. Data is currently available for the following locations: Brisbane, Sydney, Melbourne, Adclaidc, Pcrth, Hobart, Wagga and Canberra. Other locations will come available shortly, (the next on the list are likely to be Williamtown NSW and Mildura).

The user manual has been prepared both 'on-line' within the program and in hard copy, which will be supplied at time of purchase.

CHEETAH can be used on a variety of PC computer configurations with at least 512K of memory, two floppy disk drives **and** an 8087 co-processor. The recommended combination is an AT machine with 640K of RAM, a maths co-processor, a colour monitor and a hard disk. The program will not run without a maths co-processor installed!

The price of this package has been set an extremely low figure to allow **as** many people access as possible. The package is the result of many **years** of work by the CSIRO Division of Building Research and in that sense is priceless.

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We know from our own experience that this is an easy and effective package to use. We believe that you will want to enjoy the experience of a very pwerful user friendly package such as this too. To receive a copy of CHEETAH, please send your purchase order to Unisearch Limited. P.O. Box 1 Kensington, NSW, 2033.

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Wide experience in passive solar designed housing in Melbourne and country areas.

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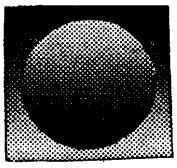

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See our display ad page 19.

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WILDWOOD WIND & SOLAR,
' Wildwood', Tinderry Road, Michelago, N.S.W. 2620. (082) 35 9172.
See *listing page 31.*

PUBLICATIONS

AUSTRALIAN AND NEW ZEALAND SOLAR ENERGY SOCIETY PUBLICATIONS PRICE LIST

Title	Members	Non-Members
"Symposium on the Physics of Solar Energy Utilisation" Sydney, 1974.	**$5.00**	**$7.50**
"Architecture, Energy and the Sun" Univ. of New South Wales, 1976.	$5.00	**$7.50**
"Industrial Applications of Solar Energy" Melbourne, 1976.	$5.00	**$7.50**
"Solar Energy Collection at Temperatures above 100%"	**$2.50**	**$4.00**
"Solar Air-Conditioning Systems Melbourne, 1978.	**$2.50**	**$4.00**
"Mechanical and Electrical Applications of Solar Energy" Melbourne, 1979.	**$5.00**	**$7.50**
"Solar Realities in Western Australia in the 1980's" Perth, 1979.	**$5.00**	**$7.50**
"Solar Energy at Work" Sydney, 1981.	**$5.00**	**$7.50**
"The Technology and Economics of Solar Electricity Generation" Melbourne, 1982.	**$5.00**	**$7.50**
"Solar Energy Coming of Age" November, 1982. - Proceedings	**$5.00**	**$7.50**
"Selling Solar" Sydney 1985. - Proceedings.	**$5.00**	**$7.50**
"At Work in the Community" Adelaide 1986 - proceedings.	$10.00	$12.50
"Creating the Future" Canberra, 1987 - Proceedings. Vol I "General"	$10.00	$12.50
Vol II "Buildings"	$10.00	$12.50
Both Volumes	$15.00	$20.00
"Pentax World Solar Challenge" Souvenir booklet.	**$2.00**	**$3.00**
"Solar Progress", quarterly journal, back issues	**$2.00**	**$3.00**
"South Wind", quarterly journal, back issues	$1.50	**$2.00**
"Appropriate Engineering Technology for Developing Countries" 259pp A.J. Francis & D.S. Mansell	**$25.00**	**$30.00**
"Wind Energy Guide for Australia" Brisbane, 1988	**$5.00**	**$7.00**
"Environment Improvement Through Solar Energy" Melbourne, 1988 - Proceedings	**$40.00**	**$50.00**
"Solar Progress - Incorporating South Wind" Subscriptions		$40/year

All prices include packaging and surface mail within Australasia. Orders with remittance in Australian dollars to:
ANZSES Administrator, PO Box 124, Caulfield East, Victoria, 3145.

GEOTECTURE INTERNATIONAL ASSOCIATION
Dr. S. Baggs Ed., 4 DeVilliers Avenue, Chatswood, N.S.W. 2067. (02) 419 4694.
'Geotecture' journal of Geotecture International Association. Subscription (A)$16.00 annually (two issues).

GRAPHIC SYSTEMS
37 Cashel Way, Waterford, W.A. 6151. (99) 313 1168.
LOW ENERGY BUILDINGS IN AUSTRALIA, A design manual for architects & builders. (Baverstock & Paolino). Covers Australian continent. Gives data on maximum performance in each region, glass areas, insulation, thermal mass, aux. systems, sun angles, etc. 340pp. $45.00.

PRECAST CONCRETE MANUFACTURERS
See listing page 19.

SECOND BACK ROW PRESS,

LEURA, NSW, 2780.
(047) 82 3588
AUSTRALIAN SOLAR HOUSES (Matthew Parnell and Gareth Cole) $30r.r.p. This practical book includes an overview of solar systems and techniques, and a survey of solar houses in all Australian states, with plans and photographs. 235pp.

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PH: (03) 830 4511
See our display advertisement page 26.

SOUTH AUSTRALIAN INSTITUTE OF TECHNOLOGY
Computer Applications Centre, The Levels, S.A. 5095. (08) 343 3168.
We supply solar radiation data in a machine-readable form:
- tables from *Australian Solar Radiation Data Handbook* (floppy disks - $60/set),
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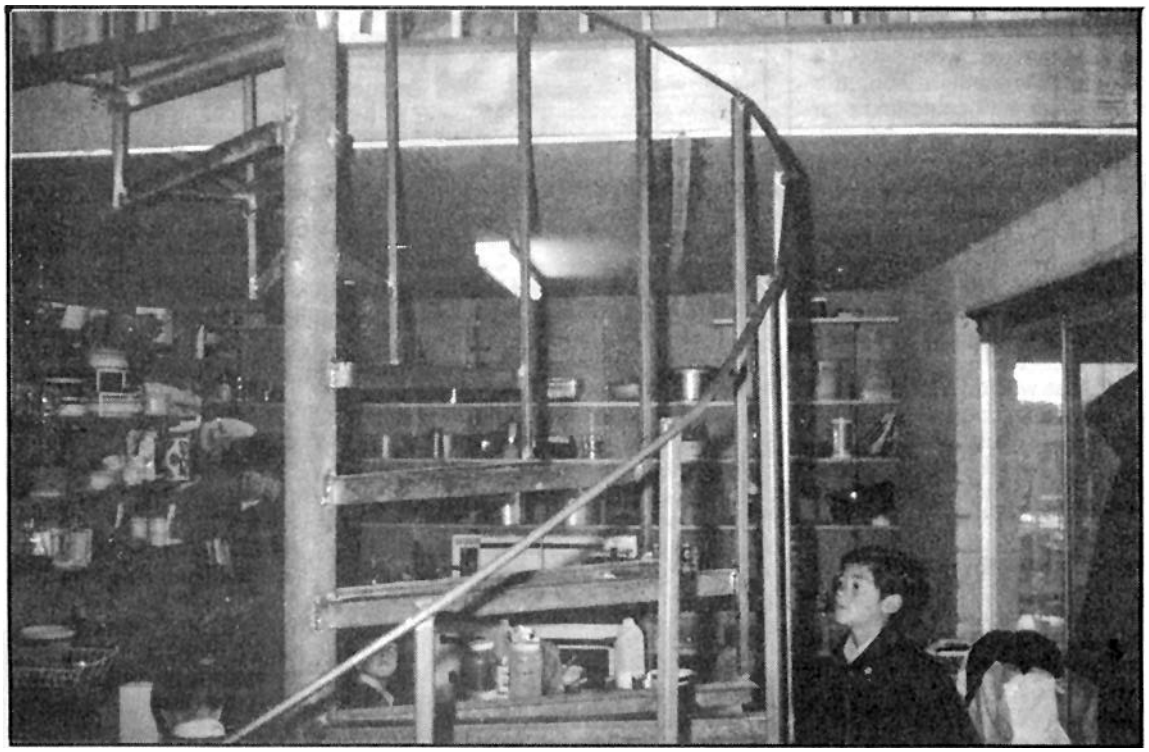
Write for an order form.

MY SPIRAL STAIRCASE



By Gary Newman

After building my two-storey mud-brick house I was left with only four hundred dollars to build my spiral staircase.

Before commencing to build the staircase, I visited the Melbourne Home Show and various manufacturers of spiral staircases. Needless to say, I took a tape measure and note pad with me.

REGULATIONS

With the knowledge I thus gained, I visited the local Shire office and got the nitty gritty on balustrading, handrails, stair widths, etc. The regulations (Victoria) were:

(a) Head height - 2.1 metres from top of tread to ceiling or stair directly above.

(b) Spacing -each stair is angled at 22.5 degrees to the previous stair; therefore there are 16 steps to a full circle.

(c) Handrails - must be strong and of a size and shape that they are easy to grip.

(d) Balustrade - balusters must be spaced a maximum of 100mm apart and a minimum of 900mm in height (a natural height is best). Balustrades should be sufficiently strong and rigid to withstand side pressure and support the handrail.

(e) Width of step - steps must be a minimum of 750mm wide (i.e. 750mm from the central support post to handrail). The run (i.e. the horizontal distance between the leading edge of two consecutive steps) must be a minimum of 240mm wide at a distance of 600mm out from the central support post.

(f) Rise (height) of step - minimum unfixed, maximum of 190mm. Note, that the comfort of using a stair depends largely on the relative dimensions of the rise and run of the steps. These dimensions should remain constant along the entire flight of steps.

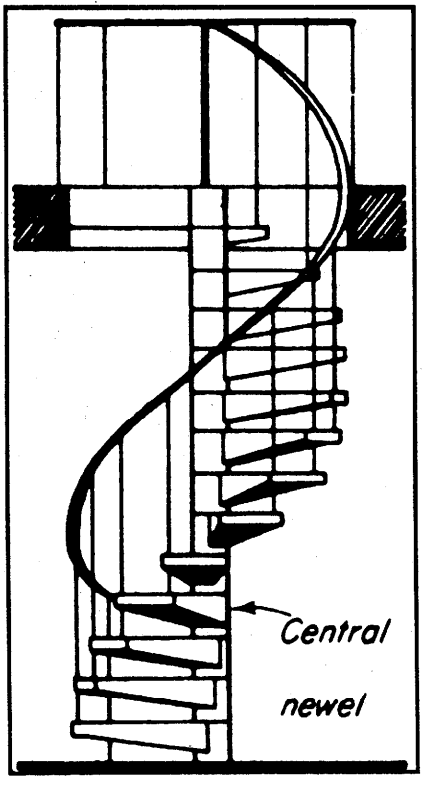
MATERIALS

This staircase can be built quite simply. You can use any materials you can get cheap. My materials list is only a guide. All the materials used were second hand. For the newel post (the central supporting post) I used second hand steel bore casing with a minimum bore of 80mm (cost $6); for the tread supports I used second hand 32mm mild steel angle ($28). For the

balustrade I used 19mm square tube steel ($35). The handrail, 12mm steel rod, cost $8. The baseplate was made of flat steel 12mm thick and 300mm square ($1). Second hand Oregon for treads, 32 x 350mm cost $65. Adhesive, bolts, etc. cost $10. A professional tradesperson to build to my design (I am a terrible welder) cost a further $250. The total cost was $403, $3 over budget. For comparison, the cheapest kit staircase I could find cost $2200.

CONSTRUCTION

The tools required were: a level, hacksaw, drill, spanners and an arc welder. The first step was to pre-cut all materials prior to welding by the boiler maker. All angle iron was cut to step width (750mm). Half-inch steel rod 240mm long was welded in 600mm out from the newel post to set the correct run of the step. Next the base plate was welded onto the newel post; the newel post was then bolted into place on the ground floor, plumbed to vertical and held in place with timber blocks temporarily fixed to the floor of the second storey.



Having calculated that each step should rise 189mm and that I would need 14 steps, I divided the circumference of the newel post into 16 equal parts and marked these divisions along the length of the newel post. Care is needed in step spacing so the staircase ends up abutting the landing you have designed. The spacing now set, we started to weld. The leading edge of the bottom step was lined up with the appropriate mark on the newel post, set level and welded into place. The following steps were much easier to weld. I cut two pieces of timber for use as spacers to set the rise of the rest of the steps. I still used a level to keep everything square. It took about 8 hours to cut and weld the staircase up.

Construction of the landing was easy because after the last step was welded on I built the landing to the step. I fixed the top step to the landing using wood screws, the leading edge of the top step abutting the landing. I then cut the wooden treads to suit and fixed them on with adhesive ('liquid nails'). The balustrade was then welded in place, keeping plumb of course (see photo). The handrail was then welded onto the top of the balusters and worked into shape.

The staircase has been well tested during the past ten months. It has had six kids and two adults running up and down it and it still works without any patch-up job being done.

DOME HOUSE

by Colin Anderson

Almost five years ago in the Christmas/New Year period of 1983/84 we arrived here in the northern NSW bush with everything that can be packed into a ute, a trailer, and some more coming on the rail, for in good measure; determined to make a new life for ourselves.

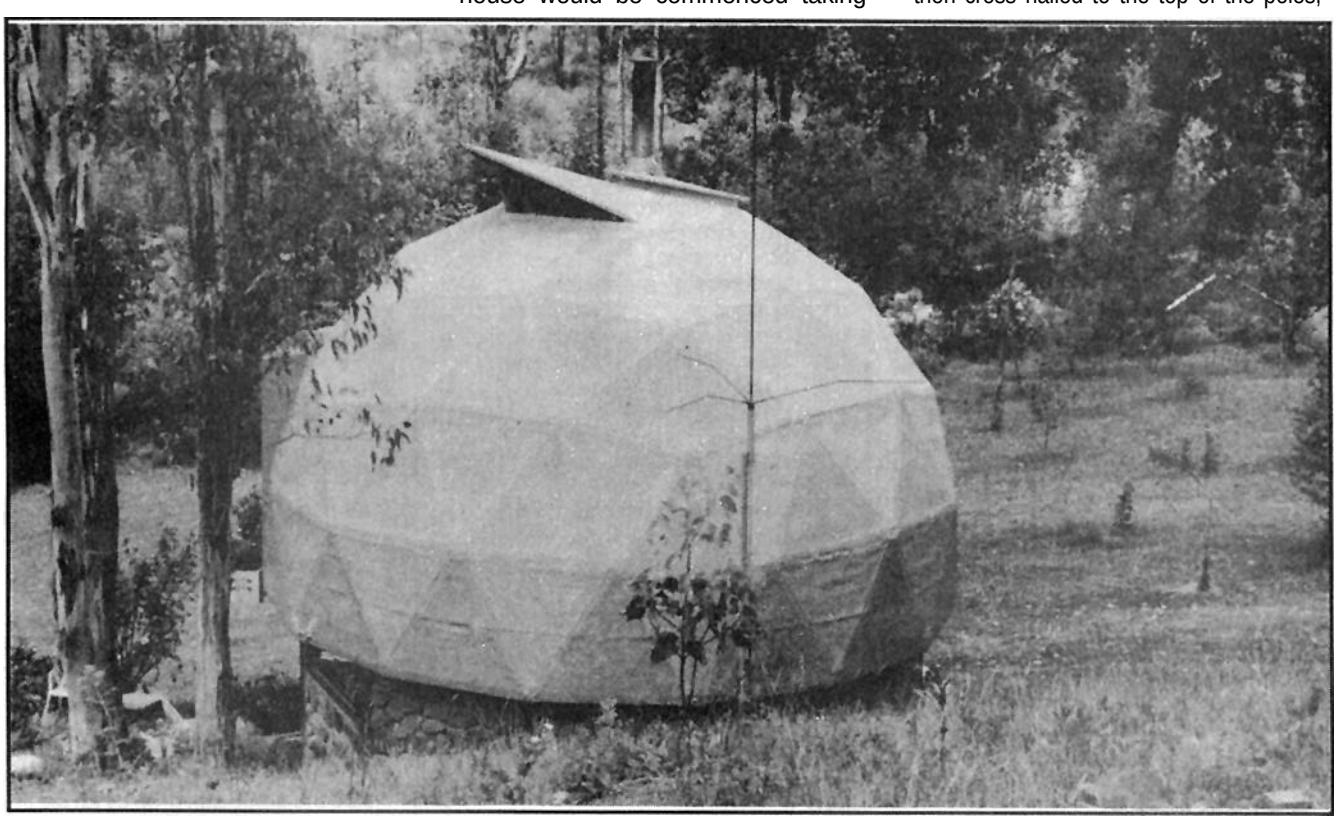
During our long stay in the city (we were both originally from rural central Victoria) we had formed certain ideas about what it would be like to live in the country and "do our own thing". We had made many plans but soon discovered that country living alternative style is a lot different to country dreaming alternative style. Whilst in Melbourne I had mapped out an itinerary which included building, gardening and alternative energy projects. With hindsight I would say that we may have kept to the itinerary if there had been twenty of us and we had worked with the single minded dedication that we had in those first few months after arriving.

The Dome...

The dome which I had planned in detail in Melbourne was to be built first as a temporary residence. It would take six weeks to build; other things would be attended to and then our permanent house would be commenced taking about six months to finish! The dome would later be converted into a workshop. The dome was eventually built and a smattering of other things were achieved. Most of the other dreams are still just that. This melancholy preamble to a vaguely technical description of what we have actually achieved is good therapy for me; if you ever build a dome you too will need therapy.

Construction

Where we live is very hilly, there was no option but to build on the side of a hill. Consequently, the dome was built on poles, yellow stringy bush poles to be precise. Milled 6 x 2 bearers were then cross nailed to the top of the poles,



the bearers are approximately one metre apart and are supported every 1.8 metres. The bearers directly support the floor which is made up of merch grade 3 x 2 pine. These 3 x 2's were glued one to the other, to form a supposedly solid wooden floor. For the benefit of those who have never seen a dome or any dome literature I shall just clarify a few things.

Domes I guess could be described as three dimensional, positively curved surfaces, e.g. a hemisphere. Geodesic domes, which are the type we are talking about here, are obtained by selecting the points using whatever method you prefer, on that three dimensional positively curved surface and joining the points with straight lines to adjacent points. The straight lines are called struts, (and in this dome are made of a mixture of 5 x 2 pine and Oregon) and the points where the struts fix together are called hubs (here reinforced with 17mm 5 ply). Anyone who is really interested in the details of dome design and construction should read Domebook II, it's got everything for the "techno" freak. For the record, this dome is a 5/8 3V alternate design.

After constructing the vaguely circular floor it is cut so that it now has 30 sides and obviously 30 corners. A strut is glued to each side and a hub is placed at each corner. From there it is just a matter of joining the appropriate struts to the appropriate hubs until the dome closes and finally the last hub is inserted to form the top.

Second Thoughts....

At this stage the dome is looking as though it won't take long to complete. Domes can be deceptive; if you remember, it was going to take six weeks to complete the dome, six weeks had already elapsed half way through the construction of the floor. I had this crazy idea that we would cover the dome with paper mache; it seemed like a good idea when we were in Melbourne, but in a rare fit of sanity I decided that it just wouldn't work. We started thinking of alternatives; in the meantime we wrapped a roll of building foil round the dome, stapled it on and tied a blue tarp over the top. After experimenting with shingles as a covering material, we settled for fibreglass. We had previously made a car canopy out of fibreglass, and had read that it was one of the only coverings for a dome which didn't leak. Many other problems had to be solved which were unique to dome construction, i.e. air ventilation, chimney exits, translucent panels for lighting, french windows, etc.

We eventually did succeed in covering the dome using fibreglass, 200 litres of resin and 60 kg of chopped-strand mat. By this stage we no longer viewed the dome as a temporary dwelling, because it had taken so bloody long to get to this point. We gradually became more and more committed to making it a permanent abode. Rock walls were constructed around the perimeter, incorporating those stringy bark poles. The rock work was done using a form (actually more of a concrete wall with rock facia either side) - after the rest of the dome it was a delightful building method, easy and straight forward.

Insulation

The dome has since been insulated with rockwool and lined with ply. The insulation is 100mm thick which has considerably improved the thermal performance of the dome. Previously the thermal performance had been somewhere between terrible and horrendous. A major and on going problem is lack of thermal mass.

Natural lighting

Top opening clerestory windows at the peak of the dome allow exceptionally good airflow which keeps the temperature at an acceptable level in summer (whilst the dome framework had its building foil and tarp covering, ventilation was virtually non-existent; one summer day the temperature inside the dome had reached a point where it melted candles). Natural lighting is provided by the french windows, the clerestory windows, an opaque fibreglass panel (lined with plexiglass) which faces south, and light which enters from the stairwell below. The amount of light is adequate, but the only view is through the french windows; while this is better than living in a basement it is limiting.

All in all, domes are not easy to build and are such highly structured and inflexible buildings, as far as design goes, that they don't lend themselves readily to the the incorporation of solar design principles or the creation of a space which is sympathetic to your aesthetic appreciation of the environment.

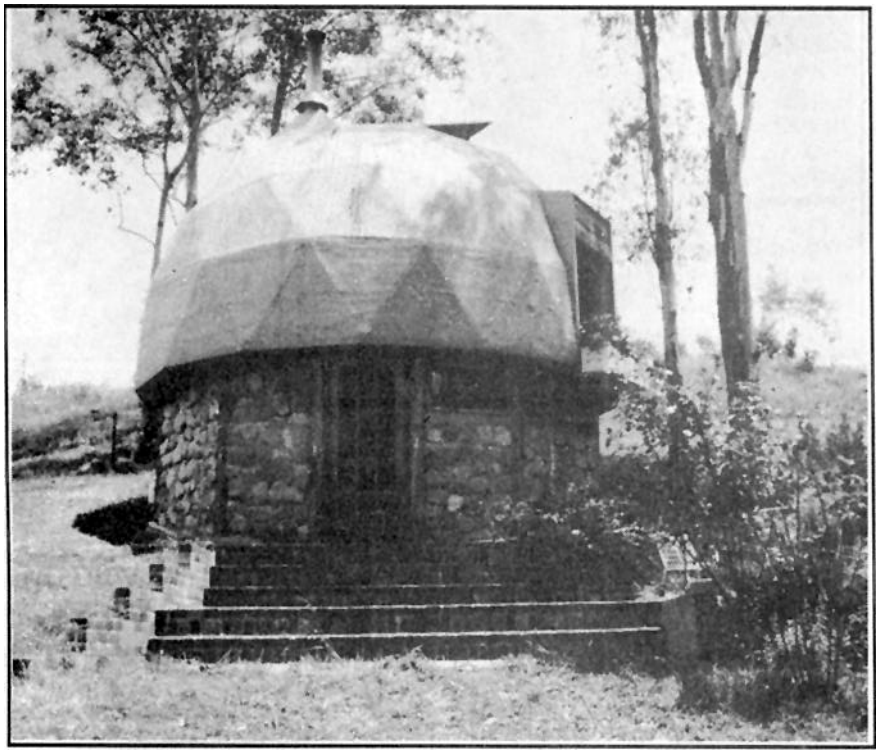
Temperature control

A small slow combustion stove (Everhot 150), supplies our heating, hot water needs (storage of 200 litre tank) and cooking facilities (in summer gas is used for cooking and solar hot water system comes into operation). Although serviceable the stove has one shortcoming, this being, you cannot stoke it up to run for more than about four hours without refuelling. Consequently, winter night time temperatures inside the dome can drop by 20 degrees

celsius between bedtime and sunrise. Fortunately the french windows face ENE, affording quick relief from the cold winter mornings by allowing the early sun to reach deep into the dome. Three gum trees on the north side do not obscure the winter sun which provides welcome warmth but fortunately their high crowns do block the summer sun around the middle of the day. The situation is however far from ideal and large deciduous trees would probably prove to be much more effective.

Solar panels

Electricity is provided by four M55 Arco panels - I have owned various panels, initially Solarex which proved to be good, then the self regulating GL32 BP panels which I bought because I was involved in a bulk purchase / distribution deal using these panels and finally with the Arco M55's. Without being inclined or really qualified to write pages on the pros and cons of self regulating panels versus high voltage panels, I will just say that in my view self regulating panels are only for el cheapo stand alone minimum power requirement systems, and are generally to be avoided. I have the M55's configured such that they produce about 6 amps at 24 volt in full sun; no matter how hot these panels get there is virtually no reduction in their output at charging voltages. There are undoubtedly many good panels currently on the market, but I have no complaints about the M55's.



Batteries

My storage system is not lead acid, it consists of 2 x 12 volt banks of second hand L302's which are nickel cadmium battery produced by Nife Jungner. These batteries are prohibitively expensive when new and I got them for about 30% new price which makes them almost prohibitively expensive. From memory I think they have a capacity of 68AH at 5H discharge when new. They were actually sold to me as having a larger capacity than this, where as the actual capacity was probably more like 30 to 40 AH. They have remained in similar condition since I bought them but they require regular 'burping' (a couple of charge, heavy discharge cycles) to maintain their capacity. The good thing about these cells is their ability to take the full output of the panels (i.e. 6 amps) without reaching their armageddon voltage, which for this configuration is approximately 34 volts. So no regulator, no hassles, just top them up occasionally with water. I don't know what taking them past their critical voltage causes in the way of permanent damage, but I have a strong suspicion that this is the reason for their lost capacity. As good as this system is, I could definitely use a few more AH; and I am planning on coming by some ex Telecom monsters which a good friend of mine will be supplying at cost if I write a wordy article for his magazine.

Back-up power

Because of limited storage capacity it is occasionally necessary to charge the cells with a generator powered battery charger. If I was a religious person who was looking around for icons to worship, this particular generator, a Honda ex650, would definitely be on my short list. The 650 part of the model's name relates to its peak power output in watts at 60 Hz. Its continuous power output is 450 watts at 50 Hz. We have had this little gem for about 18 months now and I cannot fault it. It runs our automatic washing machine (General Electric 600N) as well as various power tools (not simultaneously). It is fuel efficient as generators go and very, very quiet (now that's what I call a free plug).

Battery charger

The battery charger consists of two toroidal coils, each having a 240 volt primary and an 18 volt secondary. These coils are connected in series to effectively supply a nominal 36 volt AC. There is also a bridge rectifier which changes the AC voltage into DC so that it can be fed into the batteries. This relatively simple configuration produces a mass of wires and connections which will drive you crazy. The box has to be large and well ventilated because there is quite a lot of heat produced. The toroidal coils come with a very solid mounting system; however in the end I dispensed with this system in favour of hanging them, to allow for maximum cooling.

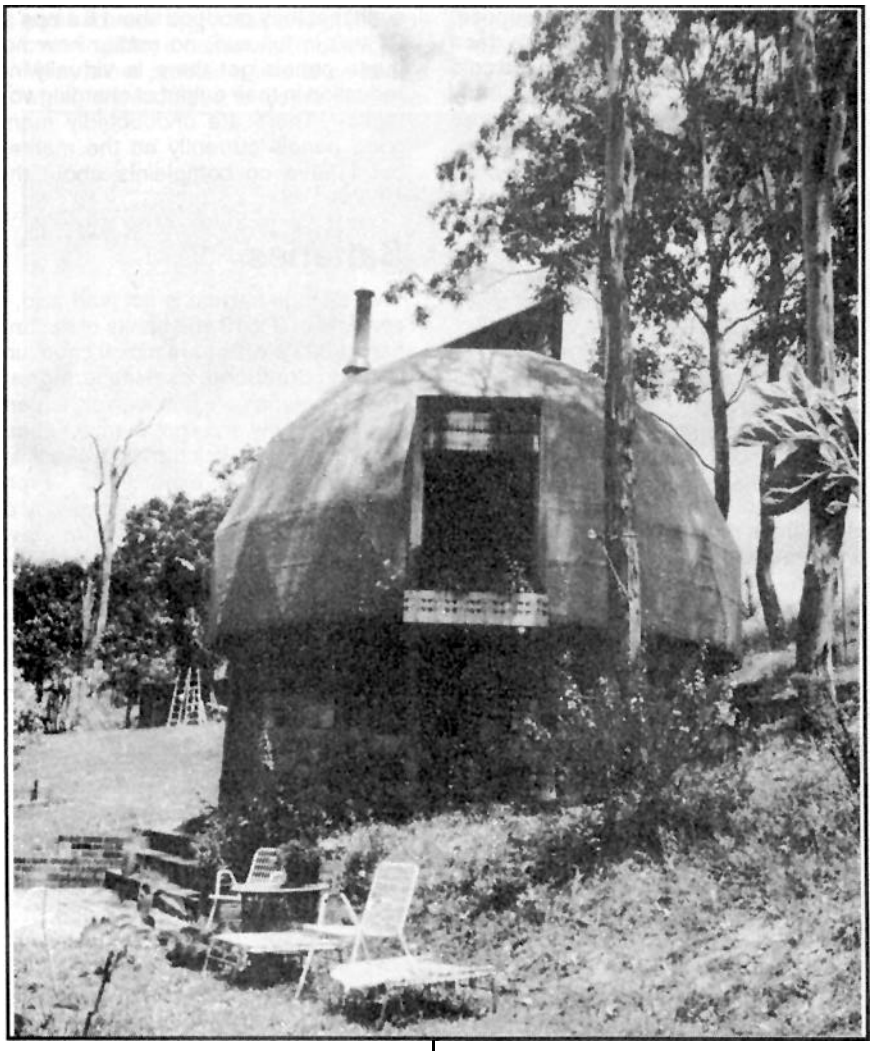
A rather elegant solution to the problem of controlling charging rate at a given voltage was provided by a light dimmer. This chops the incoming AC

voltage up to a greater or lesser extent depending on where you set the knob. Unfortunately my dimmer blew up after a while, probably because I was exceeding its power rating a few hundred percent. Inside the dimmer is a triac which is probably the critical part. This triac can handle the power but it needs a proper heat sink attached to it. This battery charger is crude but very effective. It isn't intelligent in that it doesn't taper the charge in response to a given battery state, but it does supply a lot of amps per dollar when compared with commercial models which in some cases are no more sophisticated. Virtually all the components used in this charger can be obtained from electronic supply houses. The coils are 300 watt, the bridge rectifer is 35 amp.

Power conversion

The inverter is a Selectronics 1100 watt continuous 24 volt unit. The way things have worked out, I don't think this size inverter is appropriate to my needs. I have an old 2 kVA generator (which has seen better days) so on the rare occasions when I require more power than can be supplied by the smaller generator I could use this rather than the inverter. The inverter is mostly used to run the stereo and 'Bamix' type hand held blender. It could be used to run the washing machine, but isn't because the washing machine is 30 metres away and it's a hassle running out the cord. The other hassle is that the inverter won't sense the load of the washing machine or blender. This means something else has to be switched on as well for it to work. Finally, because of the relatively small battery capacity, if the washing machine is run off the inverter, it will more times than not be necessary to use the generator to charge the batteries later on. Even if I did use it to run the washing machine, I still feel that a smaller inverter would be adequate, perhaps one around 500 watts.

The T.V., fridge and the pump for the solar hot water system all require 12 volts. The way this is obtained is by an electronic device (designed and made locally) which alternatively takes the power from one battery and then from the other with a ten minute turn around cycle. This device has been working successfully for 2 years; the relay in the device did give trouble for a short time by sticking however, since I hit it, it has been working well. Unlike the commercial 24V DC to 12V DC converters, this device is very efficient, it must approach 100%.



Refrigeration

The fridge is a Teknika 1401, top opening 12V DC compressor type. I wouldn't recommend this fridge to anyone. Firstly, I am doubtful of the value of a top opening fridge, things are just too difficult to access. If a fridge really must be top opening to be efficient then it should be much wider and must less deep, possibly built into a bench. Unfortunately, the greater surface area would probably increase heat gain substantially. Of course, the way out of this dilemma is to increase the wall thickness thus increasing the insulation. The Teknika is a freezer body with a 12 volt compressor attached. The freezer body was designed with non-discriminating consumers in mind who only have to pay approximately 10 cents per kWh for their power. Up here the nett cost if more like $1 kWh. In this situation it is very cost effective to have better insulation in your fridge. The manufacturers also managed to dispense with that age old and to my mind very effective system of having the compressor heat sink at the back of the fridge in the form of a stand off grill. They managed to make things very neat and tidy installing the sink underneath the exterior sheet metal skin; presumably the insulation is even thinner in those places where the heat sink is wafered beneath the skin.

At this stage you may be asking why I bought this fridge, well things got a bit misrepresented. I had read a bit about the Danfoss compressors and was suitably impressed, for instance there is provision for a fan to be attached to the electronic control box of the compressor, this is to facilitate cooling of the heat sink and when used in conjunction with the well insulated box the power consumption averages 1 amp continuous. When I bought the fridge I just assumed there was a sink underneath and a fan to cool it. I checked on the figures for quoted are very optimistic. I don't feel that the Danfoss compressor itself has been misrepresented. I am quite prepared to believe that the compressor when matched to an appropriate box would make an efficient fridge. Almost 2 years ago the dome was struck by lightning and one of the casualties was the fridge. It turned out in the end that the malfunction lay in the electronic black box which controls the compressor. The people at Danfoss were very helpful and I managed to get the whole thing working again, for not too much

power consumption and was told the same figures for this configuration as I had read for the compressor with a well insulated box. I bought the fridge, I got it home, turned it on and regretted it. I could not honestly say how much power it uses on average, but the figures I was money.

Artificial lighting

Artificial lighting in the dome is a combination of technologies, it is all powered by 24V DC. The main light used for food preparation and other domestic activities, is a 4 foot fluoro which consumes approximately 30 watts. This light is a little harsh and is consequently not used during times of attempted relaxation. I don't really feel that this is the fault of the fluoro but rather of the type of tube we currently have in it. A more mellow tube with the consequent loss of efficiency may be a good compromise. This light does not interfere with radio reception and is the only lighting we have that does. When we tire of the fluoro or generally when we are watching TV we use a 25 watt incandescent housed in an opaque glass light shade. I would prefer a brighter light but we cannot really afford the power. We did have a halogen globe which has much stronger light of similar quality however, the globe burnt out and I have not got around to replacing it. It may be my imagination, but I think halogen lights are even more sensitive to voltage drop and the consequent loss of light output than incandescent globes are. This incidentally is not a problem at all with the fluoro.

The only other light in the dome is a halogen spot which we virtually never use. This would be more suited to a workshop situation where you may need a lot of light in one small area. Underneath the dome near the shower area is a 60 watt incandescent globe. It provides light for people entering or leaving the dome as well as people showering. I really like big incandescent lights, unfortunately they like lots of power but this is not a problem in this situation because it is not used for long periods.

Television

The TV is a Phillips 12/240V 10" colour set. It uses about 28 watts in 12V mode. The TV has performed flawlessly and I would definitely recommend this model. This is a very poor reception area, however, we found a good spot on the hill behind us and installed a high gain channel 2 antenna, a mast head amp and 100 metres of coaxial cable to bring the signal to the dome. The mast head amp is not to improve the quality of the signal, it is to provide an increase in signal strength to make up for the large losses experienced with the run of coax this long. 24 volt power is provided to the mast head amp along

the coax. Actual power usage is minimal.

Solar hot water

The summer hot water system is solar heated. It is a mixture of some very basic and some quite high technology. Seven coils of half-inch poly-pipe forming a circle about one metre is diameter with the central half-metre diameter section missing, act as the heat collectors. These coils are connected in parallel. The water in these collectors forms a closed system with a 200 litre plastic drum (buried and insulated from the ground) as storage.

When the water in the coils is warmer than the water in the bottom of the drum, a pump turns on and circulates the water until there is no difference in temperature; at which time the pump turns off. The present pump is way oversized for the job. It is 40 watt submersible. The original was an inline 2.2 watt Laing circulating pump. This unit failed after one season. The hot water in the drum is not actually used but the heat is extracted from it by passing domestic pressure cold water through three parallel coils of half-inch poly, each about 85 metres long (an account of that is how much poly I could stuff into the drum). The by now hot water is then channelled by 3/4" poly into the hot water network in the dome. This system is isolated from the network by a gate valve when not in use i.e. during winter when the stove provides hot water. Near the shower is a small temperature gauge which is wired to a probe in the drum. If there hasn't been much sun then you know just how long your shower can be without depriving the next person of theirs.

Currently there is no covering over the solar hot water collector coils. Last summer I put some clear plastic over the coils and held it down with bricks. It was one of those temporary jobs. Unfortunately the plastic rapidly disintergrated but not before I realised that some sort of preferably permanent covering will lift the performance of the system by 5-10 degrees Celsius. Last summer with the plastic cover in place I measured on a very good day a water temperature of 68C at the hot water tap in the dome. Poly pipe is truly marvellous stuff.

Conclusion

The last 5 years have certainly been an experience. We've learnt a lot and it's been a great confidence building exercise actually getting out and doing things for ourselves but it has been hard work with some extremely frustrating times. With hindsight I can say we would have achieved a lot more if we had done a lot of things in a more conventional way. Then again we would have learnt a lot less. I hope this article provides some ideas for people to throw around and some insight into this style of life.

Soft Energy in Society

Dear Editors,

Barriers to the widespread use of soft energy technologies are mainly associated with non-technical (social and political) issues. Such issues must be confronted if we are to achieve a transition to a soft energy path. However, the socio-political dimension of energy supply and use traditionally receives limited attention in magazines such as Soft Technology. It is therefore pleasing to read (in the August 1988 edition) of the formation of the Energy Research Group, which aims to focus on community attitudes and energy policy-Congratulations to ERG on achievements to date. I, for one, look forward to further reports of their activities.

Regards,

John Foster, Queensland.

Don't blame us!

Dear Sir,

Australia is a world leader in the banning of chlorofluorcarbons (CFC's) as a propellant in aerosol cans. Our company has always favoured alternative propellants, not only because of ecological reasons, but also due to the fact that non-CFC propellants are also cost-effective.

On the 1st November, 1988, Aerosol Packers ceased totally to use CFC's as a propellant, an action that, in fact, cost this company several hundred thousand dollars in lost business per annum, but, as we see it, it is a small cost to pay to be able to say that we are probably the first aerosol contract packer to cease totally using chlorofluorcarbons and protect our environment.

In the coming year, we will produce approximately 35 million aerosol cans. This is about 20% of the total production in Australia. These cans may be used with confidence.

The next time you go to the supermarket, check the back of the can and see what the propellant statement reads. If the propellant is hydrocarbon, CO_2 or dimethyl ether, then you can buy that product with confidence, as the propellants are biodegradeable totally. Should the propellant statement read chlorofuorocarbon or chlorofluorohydrocarbon, then those products are considered environmentally undesireable.

The few remaining CFC products will be medical sprays and some crack detection sprays used by the military and industry. These will probably get exemptions from the appropriate regulatory body. As previously stated Aerosol Packers will not pack any of these products.

Regards,

R.M. (Bob) Rossall,

Aerosol Packers Pty Ltd.

ENERGY FROM NATURE

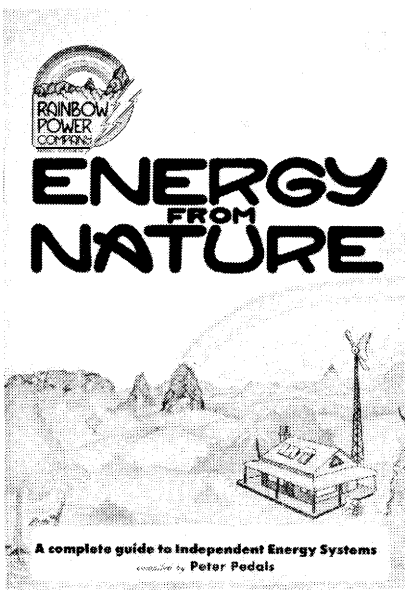
compiled by Peter Pedals.

Back one hundred years ago in the great rural heartlands of an emergent mass-industrial nation, the one and only U.S. of A., stood a book revered and respected by all from the lowliest immigrant to the most upstanding Republican pillars of society. Written in a folksy vernacular by the self-proclaimed "personal friend" of millions, Montgomery Ward, and distributed by the "Barnum of merchandising", a.k.a. Richard Sears, a man reputed to be able to "sell a breath of fresh air"; used as a modern reference on the nascent mass-material culture by rural schools; and eventually known by the tag "The Great Wish Book", the Sears, Roebuck mail-order catalogue became as American as Ollie North.

Zapping back into the present, there issues from the hippie heartlands of alternative rural Australia the new social movements' answer to its hoary predecessor; the Rainbow Power Company's 64-page, card cover "Energy from Nature" which itself could well become known as the Wish Book. This book caught my attention not so much for the comprehensive range of practical information relevant to the use of the products catalogued - ample, sound and well-considered though it is -than for the illustrated collection of equipment from the prosaic 12-volt light bulb to hi-fis and all the techno-junk that goes to make up the well-tempered autonomous appropriate energy system. This book is a seductively attractive compendium of dreams that got me turning my pockets out.

Definitely an entertaining read, and a sign of welcome developments in the establishment of an alternative economy. However, this publication lacks the glitz that could lead me to consider Peter Pedals as the Rainbow Region's "Barnum of merchandising". It could also be argued that the Rainbow Power Company has the interests of the consumer too much at heart to qualify for any award for "incentivation".

reviewed by Ian Scales



CLASSIFIEDS:

Due to the inclusion of the solar directory, we have held the classified ads over to the next issue.

ERRATUM:

Soft Technology 29 - the article on the bicycle rack recorded an incorrect weight for the rack - it should read 1.4 kg.

Tower mill, North Sea region, Europe circa 12th Century.

Soft Technology is produced by the Alternative Technology Association. We are a group of people interested and involved in alternative technology and our activities include meetings, film nights, workshops and field trips.

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