soft technology

Technology for a Sustainable Future No 56 July–Sept 1996 $5.50

Inside:

- Solar boat racing
- Sydney's Green Olympics
- Portable sawmills in PNG
- How to make a torch that runs for 10 hours
- Energy-efficient landscaping
- Make a hand-powered spin dryer

Turning a rubbish tip into recycling heaven

Easy ways to keep your house warm in winter

The cars of tomorrow: electric powered vehicles

OUR NEW NAME (see page 7)

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soft technology

Technology for a Sustainable Future
No. 56 July – September 1996

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PRACTICAL & TECHNICAL

REGULARS

soft technology

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Editorial

Firstly I would like to introduce myself. My name is Michael Linke, and I am the new editor of *Soft Technology*. I have worked on a variety of publications, the most recent being *Australian Cyclist* magazine. I believe that using renewable energy and appropriate technology is one of the most important things we can do in our everyday lives, and I am excited about working for such a highly regarded publication.

Secondly, and more importantly, this is the last ever issue of *Soft Technology*. But before you howl in rage, burst into tears, or calculate the value of your outstanding subscription, rest assured that there will still be a magazine published by the Alternative Technology Association. Put less dramatically, *Soft Tech* is having a name change. The ATA knows from past efforts that the idea of a new name for *Soft Tech* stirs up strong emotions in many loyal, long-term readers. But we also know that our sales on the newsstand are not nearly as good as they could be because of confusion over the title – it is an unfortunate fact that to many people the words 'soft' and 'technology' means computing.

As of the October-December 1996 issue, *Soft Technology* will be known as *ReNew*. We have chosen a name that we hope will convey something of what the magazine is about, without getting us lumped in with the wrong grouping on the newsstand. We hope that you like the new title, which will carry *Soft Tech*'s subtitle, *Technology for a sustainable future*, and of course we hope you continue to enjoy the content of the magazine, which is ultimately the most important part. *ReNew* will cover the same material as *Soft Tech*, though there may be a few minor changes in store (for instance, the *Issues* column on page 70 — we will keep you up-to-date with government initiatives in renewable energy and appropriate technology).

I would like to thank everyone involved with putting together the final issue of *Soft Technology*, particularly Eliza Douglas, the departing co-editor, who made my job easy by leaving the magazine in a highly organised state; the publications committee for their wealth of knowledge and experience; our many hard-working volunteers; and of course Lance Turner, *Soft Tech*'s technical editor, who not only works slavishly on the magazine, but also solves all my computer hitches in the blink of a diode.

Michael Linke
Editor

An important message for all Soft Technology readers

we are changing our name to

ReNew

technology for a sustainable future

Soft Technology has been around since 1980, when it started as the Alternative Technology Association's membership magazine. The name was, and still is, a great way to describe the magazine's focus on renewable energy and appropriate technology. Unfortunately, with the ever increasing popularity of computers (and thus computing magazines), we have often found *Soft Tech* lost on the newsstand in with titles like *PC Nerd* and *Mac Affair*. To address this problem, we have decided to change the name of the magazine to *ReNew* from the October-December 1996 issue onwards. *ReNew* will still have the same *Soft Technology* content that our readers know and love, just with a different wrapper.

Existing subscriptions will, of course, be honoured, and subscription renewal notices will be sent out when your subscription expires.

We hope you enjoy *ReNew* as much as you have enjoyed *Soft Technology*.

Energy Flashes

Kids clean up

A community project in Sydney's Northern beaches was recently awarded the RiverCare 2000 Gold Award for 1995 by the Department of Land and Water Conservation. The project was initiated by local schoolchildren who were dismayed by waterway pollution in the area. With the help of Blackmores cosmetics, the Manly Environment Centre and OzGREEN, the children founded the *Kids, Companies and Creeks* project. The EPA has produced a booklet aimed at encouraging others to establish similar projects that directly reduce industrial waste contamination of waterways. To obtain a copy of the manual, contact Diana Dalton, Blackmores Limited, 23 Roseberry Street, Balgowlah NSW 2093.

Blackmores press release, April 1996

Worldwide wind power

More new wind power capacity was installed internationally in 1995 than in any other previous year. In all, 1289 MW capacity was installed, with a total capacity of 4900 MW at the end of the year.

The following table shows final standing capacities and capacity installed during 1995 for major wind generating countries. It should be noted that 'installed capacity' does not necessarily stand for a net capacity increase during the year, because the figures do not take into account turbines that have ceased generating electricity.

COUNTRY	INSTALLED CAPACITY 1995	STANDING CAPACITY DEC 1995
Germany	500 MW	1132 MW
India	375 MW	576 MW
Denmark	98 MW	637 MW
Holland	95 MW	249 MW
Spain	58 MW	133 MW
USA	53 MW	1654 MW
UK	40 MW	201 MW
Sweden	29 MW	69 MW
China	14 MW	44 MW
Italy	11 MW	33 MW
Others	17 MW	169 MW
Total	**1289 MW**	**4897 MW**

Sustainable Energy News No.12 1996

Abysmal Victoria

The Australian Conservation Foundation (ACF) rated the New South Wales government the best in Australia in terms of implementing policies to address greenhouse gas emissions, while the Victorian government has been rated as 'abysmal'.

As part of World Climate Day on May 15, the ACF presented Bob Carr with the award for best performance in their 1996 Greenhouse Scorecard.

New South Wales was rated fair, South Australia, the Federal Government and Queensland rated poor, Tasmania and Western Australia rated very poor and Victoria finished on the bottom of the scorecard with the abysmal rating.

AAP 15 May 1996

Warmer and greener

Australians spend around $2.5 billion each year on heating energy and, in colder states, can invest several thousand dollars in heating equipment. Heating also accounts for more than 45 percent of household greenhouse gas emissions.

The Green Heating Quest, a project by the RMIT Centre for Design in Melbourne, is researching the problem of energy-intensive space and water heating.

The Quest will address design, marketing, legislative and social aspects of green heating, energy efficiency and alternative fuels.

The Quest is funded by the Energy Research and Development Corporation (ERDC), and has projects running throughout the 1996 academic year.

For more information, contact Felicity Wishart on ph:(03) 9660 3980.

ERDC media release

A car that runs on metho?

A device with the potential to make electric vehicles even more appealing, practical and easy to refuel has been invented by the US Department of Energy's Argonne National Laboratory.

The Argonne methanol reformer

The device is an on-board methanol reformer that releases the hydrogen bound up in methanol (methyl alcohol). Because it is more compact than other reformers, it could enable fuel cells to power electric cars.

Unlike batteries, fuel cells produce electricity as long as they have fuel, and they never need recharging. Argonne's reformer combines methanol with oxygen from the air to produce a hydrogen-rich mixture of gases that would be injected into the fuel cell. The reformer also produces carbon dioxide and carbon monoxide. A small on-board chemical reactor would convert the carbon monoxide into carbon dioxide. The design consists of a cylinder packed with a common and inexpensive catalyst. A nozzle sprays liquid methanol into the cylinder, and an ignition source starts it.

Argonne's reformer is lightweight, compact and energy-efficient. It responds well to frequent start-ups and shutdowns and to the rapidly changing engine demands of daily stop-and-go driving.

Argonne Web site, http://www.anl.gov/opa/newsmenu.html

Solar ice maker

Researchers at Monash University's Gippsland campus have built a working solar powered ice maker capable of

producing at least 2 kg of ice per day. The sole power input is solar thermal radiation, with no use of ozone depleting CFC's.

The 'Green Fridge', as it has been dubbed, is under development for storing vaccines and other medical supplies in remote outback areas and developing countries.

SEIAA newsletter, May 1996.

Anti-DNA shampoo

According to a team of German chemists from the University of Wurzburg, *Omadine*, a commonly used antifungal and antimicrobial agent, causes DNA damage when exposed to light. *Omadine* is used in antidandruff shampoos, detergents and toothpaste.

While scientists have known for several years that Omadine (N-hydroxypyridine-2-thione) releases hydroxyl radicals when irradiated with light, Waldemar Adam and his team claim to be the first to demonstrate the thione's direct effect on DNA.

While Adam emphasizes that the results only 'imply' that Omadine represents a potential health risk, he cautions use of these materials in products for human application. He also pointed to the potential for the compound's ability to kill cells for use in anti-cancer treatments.

Toxic Network News, April 1996.

Would the real potato please come forward?

Two American advocacy groups, *The Cancer Prevention Coalition* and *Food & Water*, released a study in January which concludes that milk from cows injected with recombinant bovine growth hormone increases risk of breast and colon cancers in humans. While the milk is not available in Australia, it has been declared safe by the US dairy industry, raising concerns about industry assurances.

In Australia there are three genetically engineered food products known to be on the market — cheese rennet, baker's yeast enzyme and brewer's yeast. Genetically engineered pork, potatoes and tomatoes are also being researched in Australia, and could potentially be released on the market without any 'genetically modified' labelling requirements.

Friends of the Earth, May 1996* newsletter *& Choice May 1996

Recycling bubble wraps

If you have a compost heap and recycle your paper, bottles and cans, your rubbish bin will probably rarely need emptying. But if you build anything that involves electronic components, the chances are you will accumulate moulded plastic bubble packs in a variety of shapes and sizes. Jaycar electronics has taken the responsibility for the packs that their products are sold in, and has begun recycling them in-store. The packs can now be returned to any Jaycar outlet and placed in special collection bins.

Liberating shopping

For people who are conscious of buying products that do not involve animal cruelty, a new shop has been opened by Animal Liberation in Melbourne.

The shop sells a range of cosmetics and cleaning products which have not been tested on animals and are also packaged in bulk, which minimises the amount of plastic used and encourages recycling. The shop also sells products like egg replacement, gelatin substitute and even vegan candles. There is also recycled giftware, and a range of vegan cookbooks and Animal Liberation-related books.

The Cruelty-Free Shop is located at 419 Brunswick Street, Fitzroy 3065

This is the first installment of our new regular feature reviewing renewable resources on the Internet. And what better place to start your renewable rummaging than at the ATA home page. Aside from giving ourselves a gratuitous plug, you'll find a links page that can connect you to over 150 other environmental World Wide Web pages, including most of the sites listed below. We'll start with some useful renewable indexes and directories.

The ATA home page [http://www.suburbia.net/~claire].

The Ecomall is a big listing of eco-friendly and renewable resources, with links to online shopping malls, activist groups, businesses and non-profit groups. A good comprehensive starting point for your renewable surfing. Fancy graphics too. **[http://www.ecomall.com/]**

For anyone looking to parlay with purely commercial organisations or to join a commercial directory, the following two sites are good starting points:

The Source [http://www.rmii.com/theSource/renewableEnergy/] A directory of over 2000 international businesses who manufacture, distribute, or service renewable energy products. Organised by geographic location, business type or product type.

Gridwise [http://www.gridwise.com/] A 'yellow pages' of organisations involved with power generation, transmission, distribution and end use including lots of renewable energy companies. Many of the listings are purely text based contact information without active WWW links.

ISES is the premier international professional organisation involved in solar energy. ISES publishes abstracts of papers published in their scientific journals. [**http://www.ises.org/pages/intogate.html**]

If you are feeling a little frivolous, hang out at J's Joint and meet other eco-groovoids at the hip end of virtualsville. Lots to explore at J's — take a completely useless 3D walk through J's house or use marginally more useful 'JungleMOO' for real-time text talkies to other eco-heads. Some good links to green organisations. [**http://jay.hrc.wmin.ac.uk/J'sJoint/**]

Products

Artificial granite

ENVIRON Biocomposite has the look and feel of granite, but with the workability of wood. It is composed of a blend of recycled paper products, plant-based resins (as the by-product of soy bean flour manufacture) and colour additives. The manufacturer claims that it does not contain hazardous or toxic substances and does not give off formaldehyde.

This material can be used indoors wherever the appearance of stone and the workability of wood are desired. Obvious examples are table tops, benches and seats, as well as for many ornamental surfaces. The material can even be engraved for use as plaques.

Although ENVIRON is highly water resistant, it is not impervious to water and is not intended for outside use. Like wood, it should be sealed to repel stains and moisture. Normal wood tooling techniques and tools can be used to work it as you would with fine hardwood, as well as laser cutting and etching. It can even be bonded with wood, then sanded and finished at the same time.

ENVIRON is not flammable like wood, and is available in four off-the-shelf colours, with custom colours available.

This new version of the Rutland wind generator has increased power output.

ENVIRON Biocomposite makes a great alternative to expensive, heavy granite.

It comes in sheets from 3.2mm to 25.4mm in thickness, and is about half the weight of granite.

rrp varies according to the size and thickness, but generally costs less than granite.
For more information, contact the McCoy Global Group on ph:(02)9975 5406, fax:(02)9975 5704, or write to PO Box 368, Frenchs Forest, NSW 2086.

New windcharger

The latest release in the Rutland range is now available. The manufacturer states that the Rutland WG913 Wind charger has improved performance figures over the previous model, the WG910.

The output at wind speeds of 22 mph is 90 watts, an improvement of 25 per cent on its predecessor. It also has low startup wind speed and continuous power output in winds as low as 5 knots. The WG913 provides for smooth and quiet operation, which is complemented by the low friction, three-phase generator.

The unit is constructed from marine grade materials with stainless steel fasteners and weighs just 13kg, making it easy to use on yachts as well as small RAPS systems. To keep the cost of installation down the WG913 has been designed to be mounted on a length of 40mm medium galvanised water pipe.

rrp is $990 before tax.
Solar Charge can be contacted on ph:(03)9596 1974, fax:(03)9596 1389, or at 115 Martin Street, Brighton VIC 3186.

Intelligent globes

For all of you who forget to switch the lights off (yes, we know, it was the kids!), there is a new light bulb that will turn itself off after a preset time. SmartGlo light globes contain a circuit that allows them to turn off automatically after either twelve or 36 minutes.

There are three other globes in the SmartGlo range. The Six-Hour Timer globe turns on for six hours at the same time each day, which makes it an inexpensive security device.

For mood lighting or a child's room, the Dimming Nightlight gently dims from full brightness to night light level over a 24 minute period, then stays at a low level until it is switched off.

The Four-Step Dimmer globe provides four levels of brightness. It dims from 60 watts down to 15 watts, in 15 watt increments, at the flick of a light switch, eliminating the need for a separate light dimmer.

To increase globe life, all of the globes include soft start circuitry. The five globes are available in 60 watt pearl.

rrp $12.95
SmartGlo from Ringgrip are available from Mitre 10 and True Value stores.
For further information, contact Ringgrip on ph:(03)9212 1333, fax:(03)9212 1388.

Globes that turn themselves off. What a bright idea!

The Dowmus composting toilet system even disposes of greywater.

Recycling toilet

The Dowmus toilet uses worms, beetles and mites to turn all organic household waste into a rich compost. The process is odour free, healthy and requires no chemicals. Several options are available, basically divided into non-flush and flush systems.

The non-flush system contains a fan which keeps air circulating by drawing it through the compost bed beneath the pedestal. A flush system is available for people who still prefer that option.

The Dowmus system has been designed for modern homes with several bathrooms, as well as existing slab-based homes where the compost chamber has to be placed away from the pedestal, instead of directly under it. The Dowmus system not only takes care of all sewerage, but also provides complete onsite organic greywater disposal.

Both the flush and non-flush types offer the bonus of household organic waste disposal. Food scraps, newspapers and even material collected by the vacuum cleaner can be tipped directly into the toilet, or, in the case of the flush system, into an external compost chute. The result is a regular supply of compost that can be easily removed from the system.

rrp from $2103

For more information, contact Dowmus on ph:(074)99 9828, fax:(074)99 9688 or write to PO Box 400, Maleny QLD 4552.

Inkjet refills

Discarding inkjet cartridges adds unnecessarily to the accumulation of non-biodegradable waste. Renewable Resources Australia offers a system called Reink which enables you to refill the cartridge yourself in a safe, easy and spill-free way.

Instead of using metal needles, the Reink system uses a safe, flexible dispensing tip, which releases the correct amount of ink. A moulded cap with a leakproof safety seal does away with ink spills. Reink is claimed to be the only system that does not break the cartridge manufacturer's seal.

Savings are said to be 50 per cent or more compared to replacing inkjet printer cartridges. Most kits in the range provide an average of around four refills.

rrp from $29

Renewable Resources Australia can be contacted at PO Box 476 Cleveland QLD 4163, ph:(07)286 5590, toll free:1800 638 873 or fax:(07)3821 0000.

Reuse your printer cartridges with the Reink cartridge recharging system.

Recycle organic waste at home with the Eco-bin home composting system.

Eco-bin composter

Most waste from our kitchens comprises at least one third food waste, which can be turned into a nutrient-rich soil conditioner in the form of vermi-compost (worm poo).

The Eco-bin makes organic waste recycling easy and cost effective. Food and compostable scraps are added to one side of the bin until it is full. You then begin filling the other side. When the worms have eaten through the material in the first side, they will migrate under the centre divider to the other side. The result is rich, black, crumbly worm castings which are odour free. No soil, lime or other additives are needed, and there is no need to turn the contents over, so the worms can be left to their own devices.

Compost worms convert organic matter into compost up to five times faster than other methods and will eat anything organic, such as kitchen scraps, paper and cardboard, old clothing (not synthetic), animal manures and garden waste.

rrp $115 for a 350 litre compost bin (100cm long x 50cm wide x 75cm high) includes 125 grams of compost worms.

For further information, contact Wrigglers, PO Box 949, Bayswater VIC 3153, ph/fax:(03)9720 2271.

Products

Steam power

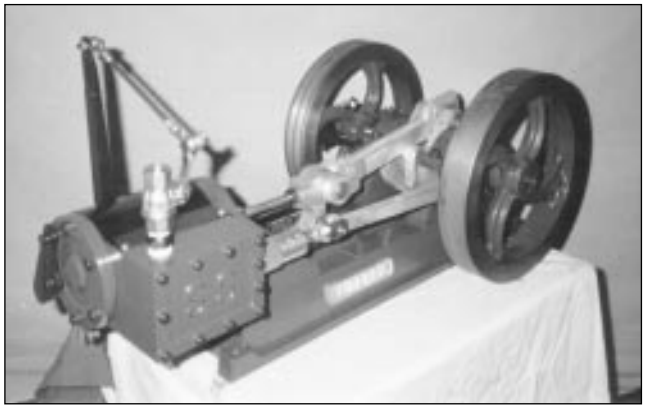
One alternative when mains electricity is not available is running a generator from steam power. The Liberty steam engine, designed and manufactured by Strath Steam, can be used to provide several kilowatts of power when connected to a generator. It can also be used to power other machines directly, such as pumps, power saws and air compressors.

The Liberty is compact, with overall dimensions of 725 x 300 x 290mm. Strath Steam supplies a choice of boilers, which are of an all-welded steel construction and conform to Australian standards. They also come with South Australian Department of Labour and Industry certification.

Although Liberty engines are manufactured as non-reversing, they can be fitted for bidirectional operation.

rrp price on request.

Strath Steam can be contacted on ph:(085)36 2489, mobile:015 391 100 or fax:(085)36 2113.



Use scrap wood to power your house with a Liberty steam engine from Strath Steam.

Home food dehydrator

Dehydration is one effective way to preserve food's nutritional value for long-term storage. The Nara food dehydrator allows you to prepare food in this way simply and cheaply.

The dehydrator consists of a rectangular cabinet containing six removable trays, a motor to keep the air moving through the cabinet and a thermostat to keep the temperature at the best level for drying, without cooking the food.

The manufacturer claims that the unit costs about one cent per hour to run and that most foods can be dehydrated overnight.

The Nara home food dehydrator is designed and manufactured in Australia. The cabinet is available in white, pine, walnut or forest green finish.

rrp $295

For more information, contact Nara Products, PO Box 512, Maleny QLD 4552, ph:(074)94 3611, fax:(074)94 3423.

Winter Windows film is a cheap alternative to double glazing that is applied with double-sided tape.

Winter Windows

Heat lost to the outside through windows can be one of the biggest causes of high heating bills during the winter months. While double glazing is one option, it is usually too expensive to retrofit an entire house.

Winter Windows is a totally transparent plastic film that is fitted to the window frame to insulate against heat loss. The flexible film is attached to the inside of the window frame with double-sided tape and shrunk with a hair dryer to form a taught skin. The small air space left between the glass and the film acts like the air space in a double-glazed window.

The thin film also helps to prevent condensation on windows, puddles on window sills and mildew on the back of curtains.

Winter Windows is tough, puncture-resistant, and can be wiped clean with a moist cloth. It can also be removed easily with no damage to window frames.

rrp $105 for a 10m x 1.6m sheet and tape

For further information, contact Winter Windows on ph:(06)251 3570 or write to PO Box 773, Jamison Centre, ACT 2614.

Prepare food for long-term storage with the Nara dehydrator.

Aussie inverters

Two new inverters are now available that can provide either 120 or 250 watts of 240 volt AC power from a 12 volt battery.

Designed and manufactured in Australia by VASS Electronics, these inverters have fully isolated outputs, low-battery-voltage cutout, over-temperature cutout, and short-circuit and reverse polarity protection.

Other features include a high surge power output (400 and 800 watts respectively) for starting colour TVs, computers, power tools and other appliances that demand large start-up currents.

The inverters can be connected to a car cigarette lighter socket or direct to a battery.

rrp $215 for the 120 watt version, $349 for the 250 watt model.

For further information contact VASS Electronics, 12 Tharle St, Dandenong VIC 3175, ph:(03)9794 5780 or fax:(03)9794 5495.

Marine battery charger

Instead of needing to remember to turn off a battery charger, or where unattended operation is required, there is a range of chargers that are designed for marine and automatic applications. The Automatic unit is fully automatic and voltage regulated and has a single power outlet, while the Neptune has three independently sensed and regulated outlets, for systems where there may be multiple isolated battery banks.

Full voltage regulation and multiple independent outlets make the Neptune charger ideal for large or small RAPS systems.

Have up to 250 watts of portable power with this compact, Australian-made inverter.

Both chargers are designed to be permanently connected to the battery, and will continually monitor the battery's voltage and charge it accordingly. The chargers also feature a float mode, which ensures that the batteries are fully charged without risk of overcharging or boiling. The chargers also feature power-on, current-limiting and voltage-regulation indicators.

The chargers are constructed with heavy duty components for durability, and they may be mounted to a bench by the base or to a wall by the back.

rrp for the Automatic $341.25 to $2,258.35 and for the Neptune $413.80 to $2,590.35 depending on the model. Woods Electric can be contacted on ph:(049)50 8499, fax:(049)50 8315 or at 19 Main Road, Boolaroo NSW 2284.

Recycled weed mats

Among the rang of interesting products, Sure Gro has a range of three weed mats made from forestry mulch, recycled paper or jute. The mats are designed to provide weed control as well as assist in moisture retention. They would assist any garden planting and are ideal for revegetation projects.

The best weed suppression is obtained from the mats made from forestry residue. This cardboard-like material is about 1mm thick, helps retain moisture in the soil and lasts between eighteen months to two years. The recycled paper mats are about 2mm thick, again assist in retaining soil water and are designed to break down to a mulch after about twelve months in normal conditions. The 100 per cent jute mats are about 5mm thick, provide moderate weed control, allow water to penetrate to the soil and last about eighteen months.

rrp forestry mulch mats 36 cents each, recycled paper mats 36 cents each, jute mats 39 cents each.

For more information, contact Sure Gro on ph:(03)9558 1060, fax:(03)9558 0505 or PO Box 499, Cheltenham VIC 3192.

Dual purpose torch

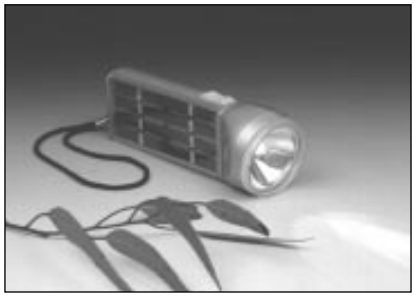
The pocket-size Little Joey solar rechargeable torch also doubles as a solar battery charger. The torch features a solar panel which is built into one side and comes with a set of high capacity nickel-cadmium rechargeable AA batteries. The batteries are removable, allowing them to be charged in the torch and used elsewhere. This also allows the torch to use conventional dry cells in an emergency.

To charge the batteries, the torch is simply placed in the sun. It takes between six and twelve hours to fully charge the batteries, depending on sun intensity and the condition of the batteries.

The batteries can also be recharged using a plugpack or 12 volt power source via the in-built charging socket. The torch has a red LED indicator to show that the batteries are being recharged.

rrp $48.80

For more information, contact Soterion on ph:(03)9764 9769, fax:(03)9764 9738.



The Little Joey torch uses the power of the sun to light your way at night. It also doubles as a battery charger.

Tasmanian Trash Transformers

Billy Willis and Sonia Chirgwin lived a romantic life travelling Australia, earning a living from classing wool and shearing. **ELIZA DOUGLAS** explains how they wound up transforming a burning, rat infested land-fill tip in Tasmania into a model recycling plant.

Photo courtesy of *The Examiner*, Launceston

Billy Willis and Sonia Chirgwin at the State Landcare Awards 1995 in Hobart.

IN 1992 the Deloraine Landfill Site was in a state of crisis. The site was often on fire and overrun with rodents and feral cats. Like many other landfill sites in Tasmania, it had unrestricted opening hours, no tipping fees, little regular maintenance and very few facilities for recycling. It was also very muddy in winter, making access difficult and resulting in the active tip face becoming large and effectively out of control. Not surprisingly, patrons were disgusted by the tip, and even feared for their safety due to the toxic fumes and explosions from burning refuse.

Frustrated by the ongoing management problems, the Department of Environment and Land Management threatened to revoke the Deloraine Council's licence if improvements were not implemented immediately. The council hurriedly advertised for an attendant to staff the site as a first step in improving management. Despite their lack of practical experience, Sonia Chirgwin and Billy Willis decided to take up the challenge.

Arriving in Tasmania

Sonia, aged 24, and Billy, aged 30, were newcomers to Deloraine. They met at Flinders University in 1986 and soon left to work their way around Australia – Billy as a shearer and Sonia as a rouseabout then a wool classer.

Photo by Andrew Ricketts

Billy spreads cover material on the tip face.

By 1991 the wool industry in Australia had hit hard times, making work scarce and sending conditions into decline. Sonia and Billy decided to try their luck overseas and lined up work in Ireland. Before leaving Australia's shores they travelled to Tasmania to enjoy some camping and bushwalking. The beautiful bush wilderness around Deloraine proved just too seductive. 'We fell in love with the area', explained Sonia, 'and instead of a plane ticket, we ended up buying land.'

Preparations

In order to gather ideas for their submission to run the tip, Billy worked for a week at Revolve, a worker's co-operative in Mugga Lane, Canberra, which salvages objects from tips for its two shops.

Recycling was of particular importance to Billy and Sonia. 'Working in rural areas made us aware of land degradation and we wanted to do something to help the environment', said Sonia. The small size of the Deloraine tip meant that they were able to incoporate full waste minimisation into their management plan.

As part of their submission, Sonia and Billy proposed to run a ten week trial to assess the viablility of the business. They extinguished the fires, provided all-weather access to all parts of the site and set up recycling bins.

Sonia and Billy fully expected there to be resistance to the new changes but the response of the locals was overwhelming. After distributing a questionnaire asking for suggestions they found 90 per cent of the tip users were very supportive and well over half of patrons wanted to recycle.

At the end of the ten week trial period, Tasmanian Trash Transformers (TTT) handed in an evaluation of the trial and a detailed business plan to the council. The council promptly awarded TTT a ten year contract and quietly breathed a sigh of relief that the whole mess was finally going to be cleaned-up.

Raising the money

TTT wouldn not have got off the ground, of course, without finance. The first stage of development was the most expensive. While the council agreed to partly fund the construction of storage sheds, sealed roads and security yards, there were also bulldozers, front end loaders, forklifts, a mobile chipper, a glass crusher and associated equipment to buy. Undaunted, TTT turned to Australian Ethical Investments, a company that invests and arranges investments in organisations and companies that help people and the environment.

Encouraging recycling

In order to encourage people to recycle, TTT waives tipping fees for those who recycle over 20 per cent of their waste. Clear signs make the separation of the different materials into two rows of wooden receptacles easy, even for those who are not accustomed to recycling.

There are crates for glass, aluminium cans, PET, HDPE, and liquid paperboard. At the end of the rows crates are also provided for sump oil, clothing,

Sonia explains how to separate material for recycling.

Photo by Andrew Ricketts

TTT's shop of recycled goods: specialising in both the practical and the hideous.

non-ferrous scrap metal and ferrous scrap metal. While the system is self-serve, Billy and Sonia are available to help people out.

Tasmania doesn't have any recycling plants of its own. This means that material for recycling must be shipped to the mainland where they are distributed to various recyclers.

Changing perceptions

In the first few months of operation TTT set out to test common theories and myths on how recycling should be achieved.

Trials were conducted in salvaging the glass and bottles that were put straight into the landfill by people who were not interested in recycling. However, TTT soon found it was unable to support this practice financially. It was also contrary to the company's philosophy which was founded on a belief that 'society must creatively find ways of reducing the impact people have on the earth and that we, as individuals, must take responsibility for our own impact'.

The idea behind TTT was to get people to recycle themselves and in doing so, make them think about what they waste. According to its philosophy, TTT 'believes in playing an active role in challenging our society's perception of waste, and in working towards developing a new industry which recycles wealth within the community'.

Expansion

Inspired by the shops that Revolve had established in Canberra, TTT set up a shop of its own. According to Sonia it 'specialises in the hideous'. One of her favourite horrors is a photo of a young Queen Elizabeth II lovingly set in a frame made entirely out of matchsticks.

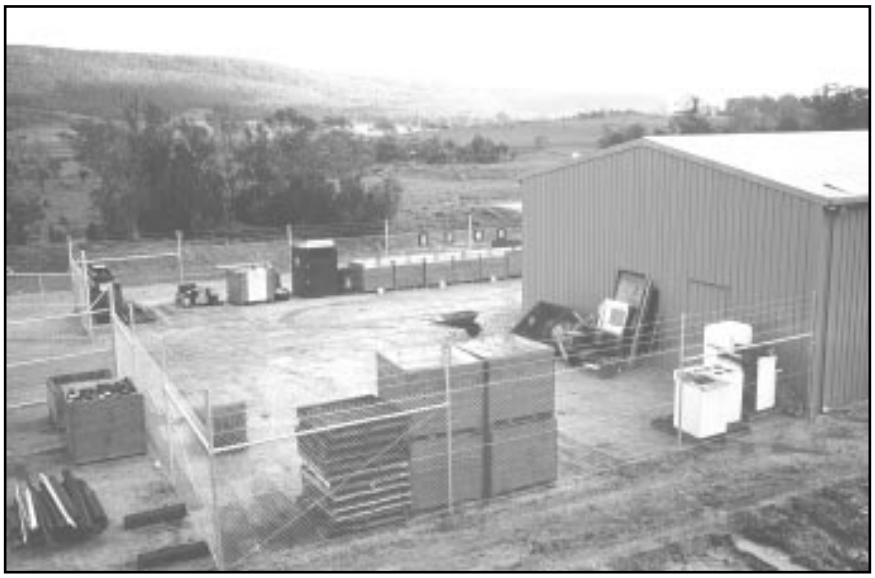
But not everything is junk. Amongst the items for sale are hardware, lighting, ever-practical tupperware, bookshelves, a number of orphaned toys, and clothes that span a century of styles. Patrons can even pick up some revitalised plants.

Working at the tip has given Sonia a number of insights into community habits. 'Every area has its own particular type of rubbish,' she explained. At the Deloraine tip plants are a premium, demonstrating just how much the people of Deloraine like gardening.

With this in mind, TTT extended its business a year ago to include the sale of landscape supplies. The location of the business at the tip was crucial to its success. People generally took their rubbish to the tip in trailers. Once the trailers were empty it was convenient for them to pick up mulch, sand and gravel while they had the trailer on hand.

It is this sort of business acumen that has helped make TTT a success. Of course, it wasn't always easy. The first two years were a bit of a struggle. 'It was not exactly life and death but it was certainly difficult and we really had to live frugally,' admits Sonia.

Photo by Andrew Ricketts



Westbury recycling area. Winning the contract to manage the Westbury site last year underscored TTT's success.

Elizabeth II in a matchstick frame. Would she be amused?

Initially Sonia and Billy had to overcome a lack of experience in operating the machinery and they also needed to rapidly become experts at purchasing and maintaining equipment. In 1993 they had to contend with a collapse in the newspaper and cardboard market, which meant that a large amount of this material had to be buried in the landfill. Some custom-made equipment also became redundant, causing a big financial loss.

However, their expansion into landscape supplies has given the business a sound footing. Winning a second con

tract earlier last year to manage the Municipal Landfill at Westbury has given the business an even bigger boost.

A tour destination

Now around 100 people bring their rubbish to the tip every day and as many as 30 come to the site just to browse through the shop. Sonia and Billy also conduct tours around the tip to promote waste reduction and recycling.

Around once a month a school class visits the site. The children see how the glass is fed through a crushing machine, how plastics and cans are condensed into large packs for transport and how the scrap metals are sorted, graded and bagged. They also go to see the landfill itself and then examine what has been salvaged. Afterwards they are asked to make suggestions as to how to prevent the landfill from filling up so fast. Billy and Sonia sometimes speak at school assemblies but prefer the children to come out to the tip so that they can experience what is happening.

More recently the visitors have been a little older, with engineers and council supervisors from other municipalities visiting the site to foster ideas for their own waste management programmes.

Green employment

TTT currently employs one person full-time and five young people part-time. In an area where unemployment runs at around fourteen per cent and the few employment opportunities available are often in the forestry industry, TTT is proof that greener avenues of employment can be created successfully and that there is value in developing sustainable employment through business enterprise.

Locals have not failed to notice this. Many of the original sceptics now bring visitors and friends out to the site to show off their tip. When TTT was given a Landcare award in November 1995, Sonia and Billy observed that the locals also felt a sense of participation in the award.

Towards the future

In keeping with their belief in the need to alter the way that society perceives waste, Sonia and Billy are planning to hold an art exhibition at the Deloraine site which focuses on advertising, consumerism, and cultural obsessions in the past 50 years using materials collected from the tip.

Billy and Sonia are happy to advise other people interested in starting a similar project but, despite showing their operation to a number of people, they aren't aware of any other site which has taken such an all-encompassing approach to landfill deferral. That's unfortunate, for more initiatives like those established by TTT would help a society which refuses to look at refuse.☼

Anyone wanting to know more about TTT can contact Sonia Chirgwin at:
Tasmanian Trash Transformers,
PO Box 184. Deloraine 7304.
Ph:(003) 623 700

Solar Sale!

3.6.9 Volt Solar Panel — with battery charger

An ideal and convenient power supply which converts the sun's energy into electrical power at 3, 4.5, 6 and 9 volts DC. Doubles as a battery charger for 2 'AA' size batteries.

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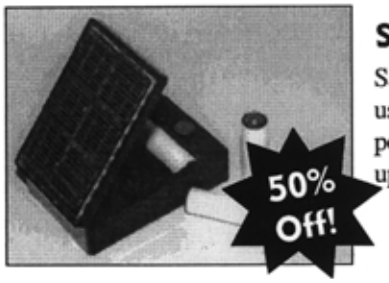
Was ~~$15.00~~, **now only $7.50**

Solar 'AA' Battery Charger



Save money when you pay only half the usual price for this money saving solar powered 'AA' battery charger! Charges up to four 'AA' batteries at a time.

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Solar Battery Charger (2 'C' or 2 'AA' batteries)

This versatile battery charger gives you the option of charging both AA and C type rechargeable batteries

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The Green Technology House and Garden Book

The alternative home improvement guide! Discover how to make your home more energy efficient and a healthier place to live. Practical information on minimising environmental impact and choosing the right materials for the job, whether you're building, renovating ... or just having fun in the garden.

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40% Off!

Avoid the 'greenhouse' effect and keep your car cooler in summer with this easy to install device. Hooks over the top of your window and automatically begins blowing hot air out of your car when the sun shines on it, while also sucking in cooler air from outside.

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Offer ends 1 September 1996. Rainchecks or substitutions are not available if stocks sold out.

ORDER FORM

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Send this form with cheque/money order to:
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247 Flinders Lane, Melbourne 3000
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What acts like double glazing... feels like gladwrap... looks like nothing... and reduces power bills...

"Windows are the weak link in the building envelope"

(Dr P Lyons, Research Coordinator Australian Advanced Windows Group, Solarch, University of NSW/ADFA)

Winter Windows

Recommended by ANZSES

Is a flexible, transparent, heat shrink film easily fitted to the glazing frame of any window with an air space between the glass and the film

Is applied with double sided tape (supplied) and a hand-held hairdryer, which shrinks the 'heat shrink' material, creating a tough, clear as glass, lightweight film and a sealed air space

Insulates your windows as effectively as glass double glazing at a fraction of the cost, 24 hours a day, 365 days of the year

- **Be warmer in winter**
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- **Eliminate condensation**
- **Reduce or eliminate drafts**
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- **Save $$$'s on energy bills**
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- **Double the R-value of your 'Weak Link'**

This is definitely NOT reflective film

Film is 1.62 m wide **ORDER FORM** **Tape is 50 m long**

Kit contains 10 metres of film + 1 roll of tape + illustrated instructions, in a padded post bag

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.....kits @ $105 per kit = $.....

Add P & P @ $5 per kit = $.....

Total = $.....

DELIVERY INSTRUCTIONS

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Address .....

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I enclose a cheque or money order payable to ***Winter Windows***, or

Please charge this purchase to credit card:

❑Bankcard ❑Mastercard ❑Visa

Card Number |__|__|__|__| |__|__|__|__| |__|__|__|__|

Expiry Date ..../.... Telephone: (.....) .....

Cardholder Name .....

Signature .....

Post to: ***Winter Windows*** *PO box 773, Jamison Centre, ACT 2614 Tel. (06) 251 3570*

ANZSES: the Australian & New Zealand Solar Energy Society

Let the sun shine in

a new angle on passive solar house design

Eve Laron

THE house Jan and Peter lived in was on a magnificent piece of land: large, in a perfect position with a gentle slope and a stand of lovely old trees.

The problem was the house: dark, cold, unlovely and impractical. They wanted a modern house filled with light and sunshine, but had misgivings about simply demolishing the old house.

'Are we being wasteful in wanting to simply bulldoze it?' Jan wanted to know. 'After all, it is a very solid big full brick house — but we hate it!'

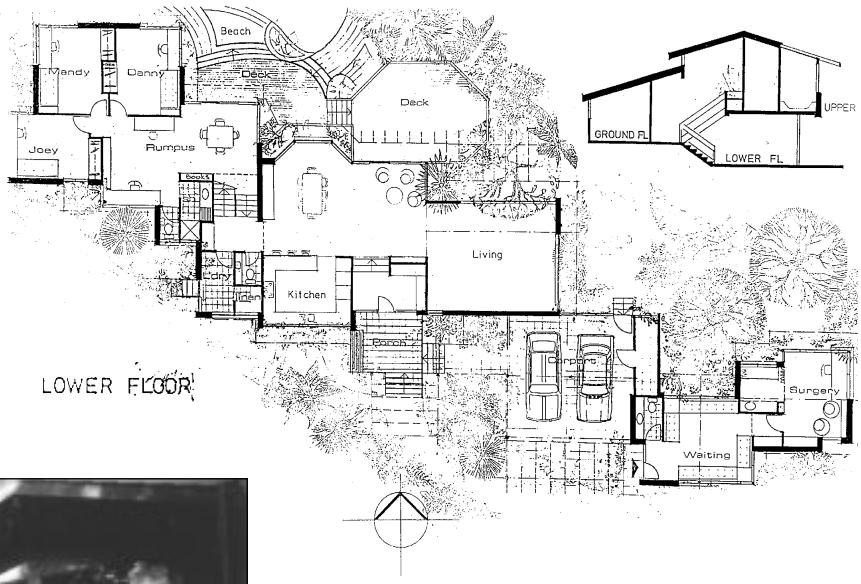
'There is nothing wrong with demolishing', I answered them. 'The house is not only ugly and impractical, but uses up an enormous amount of energy in heating and cooling and it's still never comfortable. With a new passive solar house you'll save oodles of energy and it will be delightful all year round. If you can afford a new house, go ahead and demolish with a good conscience. We can save a lot of the existing material and reuse it to better purposes.'

There was one other problem however: north was diagonally across the fairly narrow block. Far too narrow to accommodate a diagonally placed house. But I always believed that the more difficult the problem, the more interesting the solution.

And so it was in this case. We simply 'staggered' the house across the diagonal so that almost every room in the house is flooded with winter sunshine and catches all the breezes.

Jan has her own surgery connected to the house by a long double carport. Completely separate yet easily reached under cover.

The children also have their own separate area with the three bedrooms arranged around the rumpus room on the lower floor.



The parents' suite has perfect privacy and seclusion on the upper floor, and the living areas are on the ground floor half a flight of stairs from either.

The crowning touch is the large free-form pool with a 'beach' type access. It can be reached directly from both the living areas and the kids' quarters, so nobody tramps wet feet through the house.

Jan and Peter have better things to do than housework. They really appreciate their comfortable, light-filled home where housework is at the minimum.☼

Eve Laron is an architect specialising in passive solar design and is principal of Eve Laron Architects in Sydney.

Ten ways to keep warm this winter

without a heap of skill, time or money

Our slothful, stingy reporter **CLAIRE BEAUMONT** goes in search of solutions...

FEELING the cold? These simple suggestions will help you keep warmer this winter without spending lots of time and money. You won't need to go further than your local hardware store in seeking out supplies, and most of the ideas are suitable even if you're renting.

1 One of the simplest ways to block out chilly winter draughts is to put 'snakes' at the bottom of your doors. These draught excluders (also known as 'sausages') are very cheap to buy. We found a large selection in our local hardware store for only $2.95 each, but unfortunately they were all incredibly ugly.

Luckily, a snake is also easy to make; it can even be a great children's project!

The box below tells you how to make your own snake.

2 If you think snakes look untidy, or if you'd rather freeze than continually kick them out of the way, fixed draught excluders may be the answer for your draughty doors. An effective draught excluder can be a good year-round investment, as it will also keep out heat, dust and insects and — to some extent — 'insulate' against noise.

Draught excluders come in a wide range of materials, styles...and prices. The cheapest draught excluder we found — a strip of rubber attached by screws to the bottom of the door — was only $3.60.

Automatic weather seals, which cost around $13 to $15, are a popular choice because they lift up to clear floor coverings when the door opens, and drop down when door closes. A top of the range storm-proof draught excluder will set you back about $20.

The favourite with the *Soft Tech* slothful brigade is the roller variety (not unlike a furry 'snake') which comes with hooks that screw straight into the door, so it doesn't require any tools to install. They cost around $17.

3 The next step in the keep-warm campaign is to stop the wind whistling through the gaps around your window (and door) frames.

Self-adhesive foam rubber weather strips come in a variety of widths and thicknesses and are very easy to fit. They are essentially a temporary measure because the strips become uneven with time and wear, but at $4.50 to $7.50 per roll they won't break the bank. Woven pile weather strips are more expensive ($9 per roll) but also longer lasting.

Another option, for windows only, are the soft rubber self-adhesive window seals. They provide a better fitting seal for 2mm to 4mm gaps and cost around $7 to $9 per roll.

For fixed windows, you may prefer an easy-to-use caulking compound such as Selleys 'No More Gaps' (around $3.60 per tube, plus $5 to $15 for a caulking gun).

4 A huge amount of heat escapes through the windows themselves; at least ten times as much as the heat lost through an insulated wall.

Curtains are a very effective way of keeping the warm air where you want it to be, and floor-length curtains work better than the window length variety. Retail chains such as Target and Spotlight have an excellent range of ready-mades in fabrics you could bear to live with. Prices start at around $29.50 for two rod-style curtains to fit a window 120cm wide with a 213cm drop. The pleated variety start at about $49 for two curtains to fit the same size window. (Tracks or rods would be extra, of course, if they aren't already installed.)

5 Now you have the curtains, do you have a pelmet? A pelmet isn't just there to make the curtains look tidy: believe it or not, a pelmet can help to keep your ankles warm. In the absence of a pelmet, warm air slips through the 'unpelmeted' gap between the curtain top and the window, cooling itself all the way down the window, ending up freezing cold at floor level.

You need to be a bit handier — alright, a lot handier — to install a pelmet, but it is a good idea and not too costly. If you don't know one end of a hammer from the other, ask a friend to help.

Make a snake!

Cut a strip of strong fabric the width of your door (+4cm) x 24cm. Double the fabric lengthways so that the right side of the fabric is on the inside. Pin the long sides together and sew a straight seam about 2cm from the edge. Try to keep the edges straight, but remember that a wobbly snake has plenty of character — just be prepared to tell people, 'it's meant to look like that!'.

Sew straight across one end, again 2 cm from the edge, then turn the fabric right side out and stuff with sawdust, sand, pebbles, old socks, or any combination of these. Turn the open end to the inside and machine or hand stitch the end.

Children will enjoy sewing on button eyes and a felt tongue, and perhaps even decorating the snake with fabric paints.

6 Double glazing is often suggested to stop warmth wafting out the window, but who has the time, energy or money to install it? (If you had the money, you could use it for a winter holiday in a hot climate.)

However, there is an inexpensive alternative called 'Winter Windows'. This heat-shrink film can be easily installed with nothing more complicated than a sharp blade and a hair dryer, and it only costs about $19 for a 150 cm x 140 cm window. (See box below for installation details.)

The manufacturers claim that it has been in place on windows for five years without deteriorating.

Winter Windows is a quick and 'paneless' alternative to double glazing (see point 6).

7 Exhaust fans are a blessing when you burn the toast, but unfortunately chilly air can also blast through them the wrong way. A solution for a ceiling mounted exhaust fan is to fit a hinged 'lid' over the outlet which will stop draughts blustering through, but allow the fan to function normally.

All you need is scissors, a piece of heavy cardboard, a short length of string and some tape.

Climb up into the roof cavity (through the 'person hole'!) and tape a piece of cardboard over the fan outlet, on one side only, so that the cardboard will blow clear of the outlet when the fan is operating.

The next step is to make sure that the cardboard returns to cover the outlet when the fan is turned off. Tape a piece of string between the cardboard (opposite to the fixed side) and the fan housing, which will allow the cardboard to make an angle of about 60º on the fixed side of the fan.

If the exhaust fan has the motor mounted above the fan surround, you will need to fit a piece of plastic or cardboard tubing around the outlet before you follow the other directions.

8 If you have an open fireplace and use another source of heating, most of the heat will be flying up the chimney. You could install a damper, but scrunched up newspapers stuffed up the chimney are the simplest (and cheapest) solution to this problem.

The only thing you must remember is to remove the newspapers when you do get around to enjoying a crackling fire!

9 This next point may seem really obvious but, since we continually have to remind each other about it, we'll assume you need reminding too. In our controlled environments it has become almost a reflex reaction to switch on the heater at the first sign of cold.

Before you turn up the heater, put on some more clothes — nothing could be easier than throwing on an extra jumper. If you're really serious, you might even think about buying some thermal underwear, if you know that you're going to be in a coolish environment all day.

10 Make love not cold. Having sex is only a temporary heating measure, but it does get you nice and warm, costs nothing, requires no tools (generally speaking), and it provides a tenth point for my article. ☼

Installing Winter Windows

Winter Windows works in much the same way as double glazing; by using a layer of insulating air between the window and the film. The ideal air gap is between 10mm and 30mm*.

Installation is fast and easy:

Attach double-sided tape to all sides of the edge of the window frame, making sure that there are no gaps.

Cut the film to size, allowing an overlap of 5cm on each side of the frame. Press the top of the film firmly to the top strip of double-sided tape. Then work your way down both sides of the window frame, and finally the bottom. When all of the film is stuck to the tape, neaten the edges of the film with a sharp blade.

Carefully and evenly apply heat from a hair dryer so that the wrinkles in the film disappear. It's as easy as that!

* If the gap between between the glass and the frame holding the glass is much larger than 30mm, you will need to apply a 'stop bead' of timber or PVC tubing before applying the film. Sash windows can also be fitted with Winter Windows by using a stop bead.

Winter Windows is available only by mail order:

PO Box 773, Jamison Centre, ACT 2614, Ph:(06) 251 3570.

Energy efficient landscaping

Robyn Mansfield

The late twentieth century has become a period of hard work and time-saving devices. We rush off to work, stay later for overtime and rush on back home to a quick microwave meal and a video with our feet warming over the central heating vent. In the garden fertilisers encourage our blooms while pesticides instantly dispose of hungry insects. Fungicides and weedicides fight disease and undesirable plants, all with a minimum of effort required. Lawn mowers and whipper-snippers keep our lawns at a respectable length, while sprinklers encourage it to grow.

In order to surround ourselves with comfortable temperatures, fresh food and pleasant surroundings, we actually contribute to our discomfort. We spend a fortune each year on regulating the temperature of our houses, wasting precious energy resources and polluting our lungs and ears. What many people don't realise is that by carefully planning their outdoor spaces, fuel bills can be reduced by up to a third, water bills by up to 80 percent and the air around their home purified without the use of expensive appliances.

Sun and wind

When building a house from scratch you have the advantage of being able to choose the direction the building faces and the placement of windows. In the southern hemisphere the northern side of the building is always catches the most sun, and incorrect positioning can greatly reduce the effectiveness of even the best insulating materials. Choosing colours for surfaces can also play a large part. Black paving can be up to 11°C hotter than grass and a white roof can reflect up to four times more solar radiation than other colours.

Through careful placement of trees, shrubs and ground covers, temperatures may be reduced in summer while still allowing cool breezes to reach the house, and winter winds can be blocked without losing sunlight. An enormous amount of heat is lost from the surface of a building through wind. Heat loss is proportional to the square of the speed of the wind, cooling the interior of the building dramatically. A carefully placed windbreak can reduce the speed of the wind by up to 80 percent. The windbreak can also direct summer breezes toward the house to cool it. Trees planted in the correct positions near windows shade the house from the sun, and if chosen correctly will allow winter sun to get through. Exotic trees are often chosen for this reason, but for

PLANTS FOR AN ENERGY-EFFICIENT NATIVE AUSTRALIAN GARDEN

PLANTS WITH OPEN CROWN FOR FILTERED LIGHT

Tall & small evergreen

• Angophora cordifolia	Dwarf apple-myrtle
• Casuarina cunninghamiana	River she-oak
• Hakea teretifolia	Dagger hakea)
• Jagera pseudorhus	Foam bark (frost tender)

PLANTS FOR SUN & SHADE

Tall deciduous (over 10m tall)

• Brachychiton populneus	Kurrajong (summer-deciduous)
• Cassia brewsteri	Leichhardt bean (frost tender)
• Dysoxylum fraserianum	Rosewood (frost tender)
• Gmelina leichhardtii	White beech (frost tender)
• Melia azedarach (var. australasica)	White cedar
• Peltophorum pterocarpum	Yellow flame tree
• Sterculia quadrifida	Peanut tree
• Toona australis	Red cedar

Small deciduous

• Albizia lophantha	Cape Leeuwin wattle
• Brachychiton bidwillii	Little kurrajong
• Codonocarpus attenuatus	Bell fruit tree (tropics)
• Crateva religiosa	Spider tree
• Erythrina vespertilio	Batswing coral tree
• Lagerstroemia archeriana	Australian native crepe myrtle
• Lysiphyllum hookeri	Mountain ebony
• Pongamia pinnata	Poonga-oil tree (frost-tender)

SHADE PLANTS FOR COASTAL OR EXPOSED SITES

Tall evergreen (over 10m tall)

• Banksia integrifolia	Coast banksia
• Ceratopetalum apetalum	Coachwood (not for coastal sites)
• Dysoxylum muelleri	Red bean tree
• Eucalyptus globulus	Southern blue gum
• Oreocallis sp. nova	Tree waratah
• Syzygium australe	Brush cherry
• Waterhousea floribunda	Weeping lillypilly

Small evergreen

• Acmena smithii	Lillypilly
• Agonis flexuosa	Willow myrtle
• Backhousia citrodora	Lemon ironwood
• Ceratopetalum gummiferum	NSW Christmas bush
• Cupaniopsis anacardioides	Tuckeroo (good shade)
• Eucalyptus ficifolia	Flowering gum
• Macadamia integrifolia	Queensland nut (frost tender)
• Randia fitzalanii	Australian gardenia (frost tender)

GENERAL SHRUBS

• Darwinia meeboldii	Cranbrook bell
• Olearia phlogopappa (var. subrepanda)	Daisy bush
• Pavetta australiensis	(frost tender)
• Prostanthera rotundifolia	Round-leaf mint-bush
• Pultenaea altissima	Tall bush-pea
• Templetonia retusa	Coral bush

native lovers there are a few species of native deciduous trees and many open evergreen species that can still have the desired effect. One adult tree can achieve the same results as five room-sized airconditioners cooling for 20 hours. It can also absorb the amount of carbon dioxide produced by 800 homes, cleaning the air as well as cooling it. Soil and plants also absorb carbon monoxide and formaldehyde while producing oxygen.

Shrubs, ground covers and climbers also contribute to cool and insulate a building. Wall climbers shield the building from the sun and insulate the wall, preventing temperature escape from inside. In a well-vegetated area ground temperatures can be up to 15°C cooler than at the tree-tops. Plants cool not only by blocking the sun, but also by evaporating large amounts of water and generating heat, regulating humidity and balancing temperatures.

Water

One of the most relaxing aspects of growing a garden is watering it; watching it grow, bud and flourish. Unfortunately we waste far too much water, with more than half of the average household's water bill trickling onto the garden. Water use can be reduced by determining what plants should be grown, what type of soil is present and what plants can be grouped according to water needs. If watering is necessary, it should only be done in the cool of the morning or afternoon, reducing evaporation. Rain water should be collected and stored if possible, or building downpipes directed towards the garden. Water-absorbing polymers are now available on the market which store water in a gel form, allowing the plant to reach it when necessary. Mulching also helps to cool the soil and absorb and retain moisture.

When planting take note of details such as slope, shade, wind and present moisture. If planting a lawn, investigate water-saving types like weeping grass, a native Australian grass that has the added advantage of being frost tolerant. Wallaby and kangaroo grass are also drought and frost resistant, and make excellent garden features.

Recycling waste

Recycling not only saves money on mulch and fertilisers, but it reduces the amount of rubbish filling up our land. People tend their lawns to the model of a golf green which is time-consuming and encourages the use of polluting lawnmowers and toxic fertilisers and weed-killers. It is perfectly safe to leave lawn clippings where they fall, providing food and keeping in moisture.

Swept up leaves can be shredded, and woody prunings can be mulched in a chipper. Shredders and chippers are initially costly, but they can save money in the long run. Many compost bins and worm farms are available on the market, but a home-built compost heap can be just as effective

Chemicals

While initially effective, over time chemical fertilisers, weedicides, pesticides and fungicides reduce the fertility of the soil and the health of the plants. If a garden is fertilized organically and a diverse range of flowering plants are grown, natural predators will move in to dispose of pests and the quality of the soil will improve so that fertilisers are not needed. Increasing light and air circulation around plants will discourage fungus growth.

Where edible plants are grown, chemicals affect not only the quality, but also the nutrients of the food. Over a period of time they can also be damaging to our health.

It is not necessary to build your house underground or employ expensive, complicated techniques to ensure an energy-efficient household. Logical thinking and careful planning will reduce your fuel bills, cleanse the air and put you on the road to healthier living. If thought out well it will also provide you with a functional, pleasurable outdoor space that is suited to your needs.☼

There are many books available on energy efficient landscaping. Many of the ideas in this article are dealt with in detail in *Energy Efficient and Environmental Landscaping* published by Appropriate Solutions Press. The *Identification Handbook for Native Grasses*, published by the Rutherglen Research Institute, can help you to identify and propagate native grasses from your area. *Landscaping With Native Australian Plants*, published by Express Publications, is a good introduction to using native plants in the garden.

Sun ahoy!

ADRIAN OAKEY reports from Canberra on the Solar Boat Race

In the tradition of *Around the World in 80 Days* and *Those Magnificent Men in Their Flying Machines*, 30 intrepid adventurers set out on a voyage around Lake Burly Griffin in Canberra. Without the presence of any villains, most of them completed their adventures safely, though a few vessels attempted an unexpected *Journey to the Centre of the Earth*, thankfully interrupted by some vigilant marshals.

I am talking about the inaugural Solar Boat Race held on 27 April as part of the Great Australian Science Show. There were entries from all over Australia, as well as some international competitors. Two Alternative Technology Association members (Steve Downing from Canberra and Monty Russell from Melbourne) had entries in the race, and the ATA's Energymobile mobile display was also in Canberra especially for the event.

The racers and pit crews were early on the job, all set up and ready to go by 10 am for the official start of the race. The competition and commercial classes got away first, followed ten minutes later by the open, hybrid and international classes. The aim of the game was to do the first lap as fast as possible but two more laps were needed to qualify for the speed lap. Then it was just a matter of how many more laps you could do before 4 pm.

Photo: Michael Harris

Silicon Technologies' entry used a SolZ Pacific electric outboard motor to propel it to victory in the speed prize for the competition class. The boat also features a small flexible solar cell.

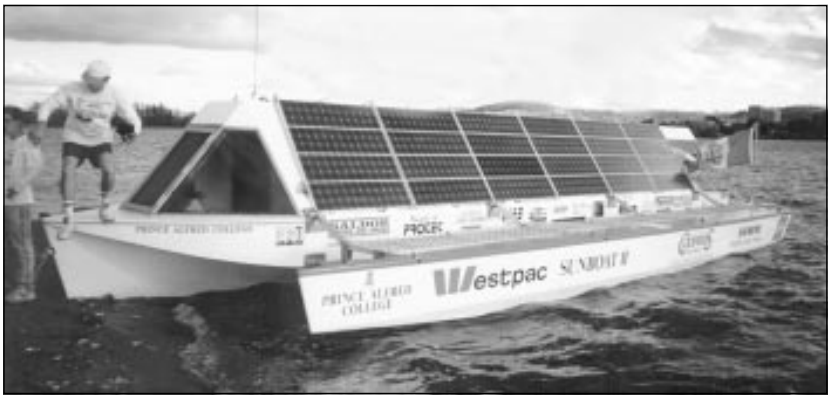


Photo: Michael Harris

Sunboat II from Prince Alfred College in South Australia took 80-100 people thousands of hours to construct. With 1,728 solar cells it is the world's largest solar powered boat, and holds a world record for a 37 day, 2,100 km trip down the Murray River.

Photo: Michael Harris

Alternative Technology Association member Monty Russell's entry, mr. hush, travelled at a leisurely speed, but successfully completed the three laps of Lake Burley Griffin required to qualify.

The Incat entry from Tasmania sprinted away from the start with the AMSA (Australian Maritime Service) entry close behind. Twenty-two minutes and 49 seconds later, Incat completed the first lap (6.23 km), though AMSA had electrical problems and had to come back to the beach before going on to do six or seven laps. Incat looked to have it in the bag until an open class entry captained by Frank Wheeler of Silicon Technologies came in at 22 minutes and 40 seconds. The difference however was that Incat went on to do another ten laps thanks to its large solar array, while the open class entry totalled just three laps.

Both ATA entries managed to qualify by completing three laps. Steve Downing managed a good pace but had electrical problems that prevented him from continuing. He also had to remove his PV array after the first lap to stop himself from being blown over. Monty Russell managed a sedate but steady pace in his well-presented *mr. hush*, taking most of the day to complete his three laps. Both learned a lot from the race and are sure to be there next year, especially with some joining of forces.

The use of the term 'Solar' in the race title may need some rethinking, as many of the solar components were fairly token, if not nonexistent. A majority of the boats were just battery-powered electric boats and achieved what they did on batteries alone. Those with three or four solar panels may have achieved an extra lap as a result. The competition class was limited in how many batteries could be used (125 kg of lead-acid) which shows the true significance of the Incat entry in achieving 11 laps.

The open class however had no limits and many of the boats were heavily loaded with batteries, allowing them to clock up a reasonable distance (from seven to nine laps). The speed winner was a sea Kayak loaded with batteries and a 10 horsepower electric motor. With minimal air resistance, it could only beat Incat by 9 seconds (which had a huge exposed area) and then only do the three laps. Even more disappointing were some of the commercial entries that had token solar cells, improperly mounted, and still marketed themselves as a solar boat.

Perhaps in future this race could be marketed as a solar and electric boat race. After all, the difference between on-board solar and battery powered electric cars is acknowledged in competition events. Still, credit should be given to the organizers for a successful day, and a great illustration of what can be achieved without a dirty, fuel guzzling two-stroke outboard. Next year's race should be an interesting event, and given the amount of media coverage it received, will no doubt attract a higher number of commercial entries.☼

Photo: Michael Harris

This pedal-powered hybrid entry from the ACT could be the ideal human-powered vehicle for people who think they are the messiah.

Photo: Michael Harris

INCAT 039 was the endurance winner in the competition class, and a close second for the speed prize. The skipper sits under the tilting photo-voltaic array on top of a sleek catamaran hull. INCAT 039 took 1,500 hours to build.

Results

Competition class

Endurance

1 INCAT 039
2 Model Farms High School
3 Australian Maritime Safety Authority
Speed Prize — Sun Pirate

Open Class

Endurance

1 HELIO DET GMBH
2 Solescist II
3 Team Denmark
Speed Prize —Team Denmark

Commercial Class

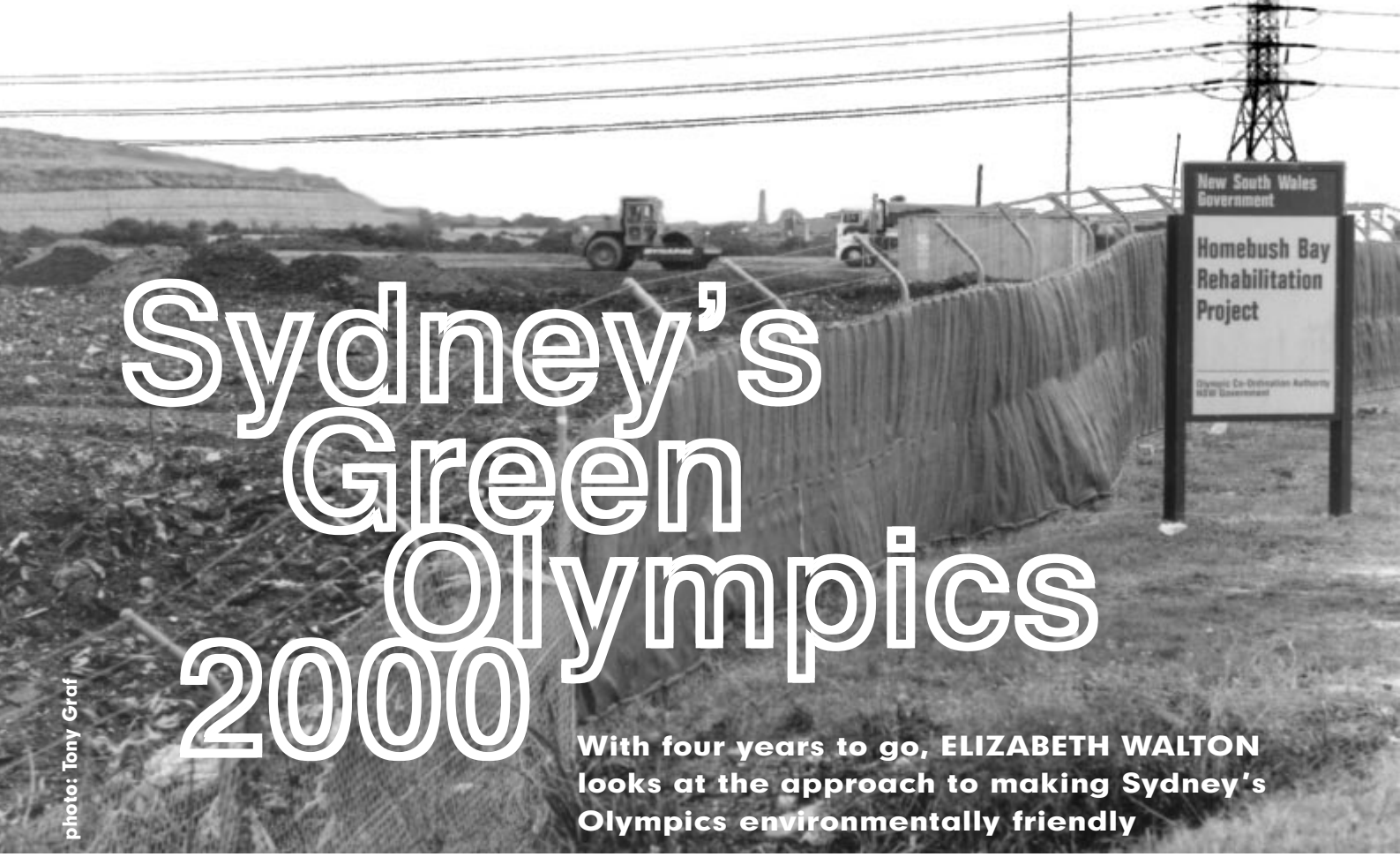
Endurance

1 Lightbeam Lakes
2 Flat Top
3 Lightbeam Bass
Speed Prize — Flat Top

Hybrid Class

Endurance

1 Aussie Dane
2 Lightbeam Snowy River
3 AMPCAT
Speed Prize — Aussie Dane



Sydney's Green Olympics 2000

photo: Tony Graf

With four years to go, ELIZABETH WALTON looks at the approach to making Sydney's Olympics environmentally friendly

IN the year 2000, Sydney will bring the focus of the world to a central stage when the flame for the 27th Summer Olympics is ignited. Sydney's staging of this prestigious sixteen day sporting event has already gained international attention for its promise to be the 'Green Olympics,' in an attempt to show the world its vision for ecologically sustainable development (ESD). But what exactly is a Green Olympics, and how did an international sporting event suddenly become tied in with the green agenda?

In 1992, representatives of many government and non government organisations from around the world met at the Earth Summit in Rio de Janeiro, Brazil. During this conference, which was attended by more world leaders than any other event in history, the need for ESD was acknowledged. The convention concluded with the signing of Agenda 21 — an 800 page document that addresses the global environment and development dilemma.

Responding to the issues raised during the Earth Summit, the International Olympic Committee (IOC) decided to incorporate Agenda 21 into Olympic ideology, which is now a three way paradigm: sport, culture and environment.

At around the same time, many countries began preparing bids to stage the 2000 Olympics — and the winner was Sydney! IOC president Juan Antonio Samaranch has since commented that Sydney's success was largely due to the strength of its world class Environmental Guidelines, which were developed especially for the bid.

The NSW Government has created two organisations to implement its vision for the Games: the Olympics Co-ordination Authority (OCA), responsible for constructing the sites, and the Sydney Organising Committee for the Olympic Games, (SOCOG), which stages the event.

To date, the OCA has chalked up an impressive slate of achievements. Around 200,000 tonnes of crushed concrete from on site demolitions will be reused, reducing the demand for raw materials in the construction process, and minimising the hazards of delivery trucks on Homebush roads. Nine million cubic metres of toxic waste have been contained on site inside high tech landfills, which use a complex water collection system to prevent materials from leaching into the Bay.

Green stadium

The OCA recently awarded Multiplex, the Australian construction company, the contract to build the main Olympic stadium. The design includes features such as underground rain water storage; a unique lift shaft design which reduces air conditioning requirements, and the use of light scoops that reduce the energy needed to light the building.

The OCA has received awards from RiverCare 2000 and Clean Up Australia for its work at Homebush Bay. These awards formally acknowledge OCA's outstanding work in restoration of the land. Many other organisations, including the Australian Heritage Commission and Greenpeace International, have

praised the OCA for its environmental achievements.

Locally, Greenpeace Australia have acknowledged Multiplex's PVC free stadium design as a world class move, and commented on the outstanding achievements of the OCA to date. There are pollution problems surrounding the site, however, and Greenpeace's Olympic Project Coordinator, Michael Bland, has expressed concern regarding contaminated water in nearby Homebush Bay. 'The problem at Homebush Bay,' Mr Bland says, 'is that the people of New South Wales have been left an environmental liability. We've found new chemicals, seemingly discharged locally by ICI...we could be wrong, but they're one of the only companies in the country who produce phthalates. Now they've decided to move from the area. We have already seen Union Carbide leave behind a toxic legacy for the people of Sydney to clean up. Inevitably it's OCA's responsibility to address this,' Mr Bland said.

Games watchdog

In order to address such community and environmental concerns, the NSW and Federal Governments set up Green Games Watch 2000, (GGW2000), for the purpose of liaising with green groups. According to its coordinator, Peggy James, GGW2000 is the Olympics watchdog. Its purpose is to make sure the OCA adhere to the Environmental Guidelines. 'At the recent community workshop held by GGW2000, the clear message was that members of the community felt left out of the planning process. Inclusion of the people of Sydney in preparation for the Olympics is extremely important,' Ms James said.

One Sydney-sider concerned with Olympic issues is Martin Byrne, a member of Auburn Greenspace, a group formed to protect community interests. 'Our main concern is for the Newington armaments depot, which has been identified as the best remnant bushland of the Cumberland Plain. It must be protected by a buffer zone. We're also concerned about transport issues', Mr Byrne said.

Concerns about transport are understandable, as trains will deliver up to 50,000 people per hour to the Homebush Bay site, which can also accommodate 100 coaches and allow 38 buses to set passengers down simultaneously. By OCA's estimation, the Olympic Games will attract half a million visitors per day. These spectators will all be travelling by public transport, since private vehicle access will be banned whenever a large event is being held at the sports centre.

In addressing local air pollution issues, the OCA has already provided a Diesohol operated shuttle. Given the OCA's consideration of the Environmental Guidelines, are we to expect a higher commitment to low-emission vehicles?

Dr Grant, the OCA's Environmental Executive Director, says the organisation will be trialling low emission buses over the next few years. 'However,' he says, 'buses have to be purchased with the public purse, and integrated into the fleet as money and technology allows'.

Unless the Government is about due to replace its fleet, the locals of Homebush Bay might not be as lucky as Atlantan residents, where the Department of Transport has borrowed 300 alternative fuel vehicles to be used during this year's Games. Unfortunately, this resource is not as readily available in Australia as it is in the US, where there is a large national fleet of alternative fuel vehicles to draw upon.

Making comparisons

Comparison between Atlanta and Sydney is regarded by GGW2000 as essential to implementing the Environmental Guidelines. Peggy James says environmental benchmarking is critical to achieving objectives outlined by Michael Knight, NSW Minister for the Olympics.

'In his speech to the Lillehammer Forum on Sport, Environment and Development, the Minister said that the Government's aim was to ensure that Olympic developments set higher environmental benchmarks for future development,' she explains, 'To achieve this, the Government must determine the environmental performance of existing comparable facilities, in order to make fair comparisons between competing tenders, and to demonstrate in the year 2000 that the Minister's vision has been realised.'

According to Minister Knight's staff, however, benchmarking can be ineffective. 'Competitive Best Practice is our benchmark', Dr Grant commented. The point is, he says, if a 20 percent improvement on energy use is dictated, then the likelihood is that 20 percent will be achieved. 'If, on the other hand, we ask for the best possible environmental standard, the competitors don't know what the others are doing. So they go full bore to produce the very best, and what we get is 30, 40, 50 percent.'

This stance is not exactly welcomed by Ms James, who feels it would be in-

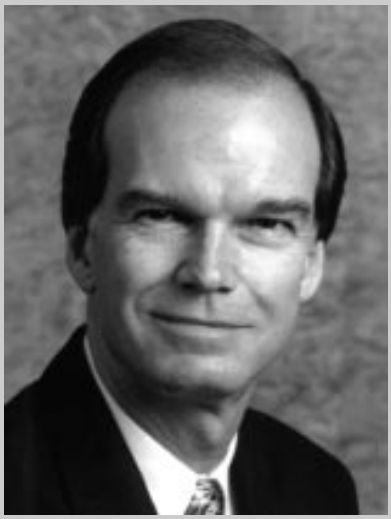


Photo courtesy Olympics Coordination Authority

'We are taking a rubbish dump, an abattoir, and a munitions depot, in the middle of the city, and turning it into the jewel in the crown, with environmental standards better than most in the world...'

DR COLIN GRANT
Environmental Executive Director
Olympics Coordination Authority

appropriate for the OCA to rely purely on competition in the market to provide environmental quality, 'Market theory recognises that competition alone cannot guarantee high quality environmental outcomes. The process of setting environmental standards itself can help to stimulate development of the innovative technologies that the OCA is seeking'.

Another of Dr Grant's cautions against benchmarking involves consideration of the level of development in host countries. 'It's all relative to what's there at the place', he says. For example, a country without a high level of technological sophistication may host the Olympics in the future. 'Say that country has limited sewerage infrastructure, but it offers to develop and run a stadium which has standard sewerage, and in developing that standard, it takes it to a nearby village and treats it, rather than having it run into a nearby river. That's clearly not at the level of development that we are doing, but it's better for that country'.

Solar power struggle

This is true, though we must surely be careful not to miss opportunities for demonstrating excellence in environmental management for the future. As an example of how we could achieve ESD, the ACF's National Biodiversity Campaigner, Peter Wright, has suggested that suitable roof spaces could be installed with solar collectors. This would demonstrate how wasted space can help reduce national greenhouse gas emissions, in a country which has one of the worst per capita uses of greenhouse gasses in the world. This initiative is not a move welcomed by the OCA. 'Why say it's got to be solar?' Dr Grant asks. 'Government is about balance and cooperation. It is not about dictatorially picking one winner, one product, one approach over alternatives which may be equally as good. It's called competition, and that's how our society operates.'

There is another key factor to consider when implementing the Environmental Guidelines. Paul Orton, Manager of Policy at the Australian Business Chamber, says innovations must not only be environmentally sound, but also economically viable. 'We don't want to move so far ahead of current commercial realities that we are compromised. We have to give consideration to tax payers and other funding bodies...at the end of the day, somebody has to pay if there is a cost penalty. We must also ensure that Australian product is used,' Mr Orton said.

Australia already has world class capabilities in many areas of sustainable technology, though sometimes it makes bad economic sense to use these products because they are too expensive, or not yet commercially available.

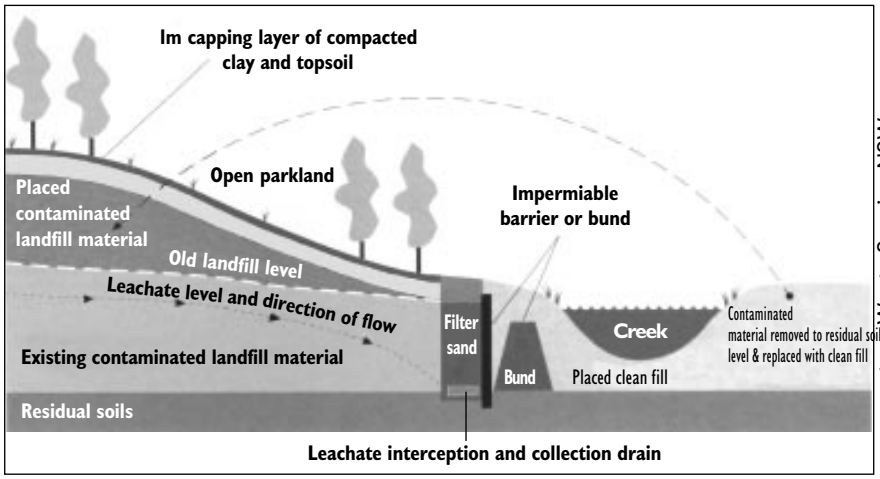
On the other hand, using these technologies could be a sound long-term investment, if sales follow interest generated in Australian products during the Games. To help promote local manufacturers, Atlanta has built a permanent education centre which demonstrates new environmental products. Solar equipment, heat pumps, alternative fuels, and power management techniques will be showcased with a view to maximising the advertising potential for technology displayed at the centre.

Mr Orton says he certainly likes the idea of exploring new opportunities, however he adds that using new technology in the Olympic site will not necessarily convert products to commercial viability.

Bicycle access

Another interesting initiative has been put forward by the bicycle lobby. Ian Mackendoe is the convenor of Bicycle New South Wales' Cycling 2000 team. He says the group would like to see Homebush Bay become the hub of a cycling network stretching between Newcastle in the north, to Wollongong in the south, for the benefit of cyclists both during and after the games. 'The Government hasn't taken into account the safety of cyclists', he said. 'When they arrive at a destination, people need to be able to leave bikes in a secure lockup.' His vision is for a cyclists' venue which could operate like a club, with facilities such as showers and lockers, similar to the aquatic centre at Homebush Bay. This would allow visitors to cycle to Homebush Bay, attend footy games, have a picnic, return after five or six hours, change back into their cycling gear and cycle home again, without burning any fossil fuels in the process. 'Now that would be really imaginative,' he says.

Other environmental groups have suggested using alternatives to plastic takeaway food containers at the site. SOCOG's spokesperson Richard Palfreyman says these are all decisions which will be made at a later date. 'However, if we decide we don't want glass bottles used for example, we're



courtesy Waste Service NSW

This diagram shows the principles used for removal, relocation, capping, waterway cleansing and revegetation at the Homebush Bay site, where over 9 million cubic metres of toxic waste have been contained

photo: Tony Graf

This PV array powers a pumping station at the site.

free to put that into the caterers' contracts...it can be written in.'

Since SOCOG can write specifications into its contracts to exclude materials it deems undesirable, can the OCA specify that contractors, who were awarded tenders on the basis of their promise to purchase electricity from renewable sources, must continue doing so? Dr Grant puts it simply: 'No. In the market place, they are free to operate those facilities as they see fit, within the context of making them a viable operation. We are calling for innovative design which might not call for so much energy in the first place.'

As indicated by the praise the OCA has received from many international bodies to date, the tendering process is encouraging outstanding efforts in environmental design. But does this necessarily represent the highest achievements possible, when seen in context of the opportunity to show the rest of the world how ESD can be practised? After all, it was Sydney who designed and recommended the Environmental Guidelines. It would be disappointing to fall short of what some believe to be a full interpretation of them.

'Remember, they are guidelines', says Dr Grant. 'We are taking a rubbish dump, an abattoir, and a munitions depot, in the middle of the city, and turning it into the jewel in the crown, with environmental standards better than most in the world...what other benchmark do you want to judge us by?'

As part of its extensive restoration efforts, the OCA has created an environment strategy for Homebush Bay, which makes recommendations for the protection of the wetlands, which were almost destroyed during years of industrial abuse. The report advocates that the use of HCFCs and CFCs should be minimised throughout the site, and that all contaminated groundwater seeps should be intercepted and contained. It also says that there will be a call for diversity of plant species in order to encourage natural means of pest control.

Yet with all of this sound expert advice, the OCA still appears capable of making comments conflicting with their advisors, on issues such as the effects of artificial lighting on surrounding wetlands.

Dr Grant says 'Lights are unlikely to have any great effect. We tend to anthropomorphically suggest that animals are affected in the same way that we are...but studies the world over are tending to show that animals don't have the same level of sensitivity to things that cause us concern. So for example, quite a number of birds roost in cities in busy places, and it doesn't seem to bother them.'

The environment strategy, however, says light pollution should be minimised. The OCA's advisor on this matter, The Royal Australian Ornithologists Union, says artificial lighting can adversely affect bird life during nesting periods, by highlighting young birds to potential predators.

Peggy James feels that this is exactly the sort of issue her watchdog organisation is there to address. 'Provision of clear, reliable, and accurate information to the public, as well as opportunities for participation in decision making about the environmental management of the Games implies nothing more than entering into the Olympic Spirit — the spirit of mutual understanding, friendship, solidarity and fair play.'

Dr Grant says his vision isn't any different. But within that context, other objectives exist, such as delivering facilities on time and within budget. 'There are limits to time, money and technology, and that will always leave somebody with a view that something better could have been done. But on what model is that based? A hypothetical, a vision. Visions have to be turned into operational realities. The reality is always much more complex to achieve than carping from the sidelines.'

'suitable vacant roof spaces could be installed with solar collectors, a move which could show how wasted space can help reduce national greenhouse gas emissions'

'When we're judged', he says, 'we're either getting a brickbat, or a bouquet. So far, we've had bouquets. I don't believe there will be a case for brickbats. Are we going as far as a few interest groups might want? Perhaps not — someone might want solar arrays on every roof. It won't happen. Have we achieved that person's ideal? No, I don't believe so. Are we wrong? I would argue we are not. Anyone can say throw another million at it and give me this! I am quite convinced we are doing our best. I'm prepared to be judged by it, and I'm proud of it.' ☼

Photo courtesy of Solectria Corporation, USA

Cars of Tomorrow

There has been a lot of activity on the electric car front in recent times. **NICK VAKRINOS** and **LANCE TURNER** look at some recent developments.

IMAGINE walking along the streets during peak hour in the city – it's noisy, dirty, choking and there is a brown haze in the sky. The older buildings are covered in disgusting grime, and after ten minutes you can feel a carbon monoxide headache coming on.

But it doesn't have to be like this. Internal combustion engine vehicles, the single largest polluter of the air in our cities, are completely replaceable by clean, silent electric vehicles (EVs), and the technology for these cars of tomorrow is available today.

Greater efficiency

Electric vehicles offer many advantages over internal combustion engine vehicles besides no exhaust emissions. They are cheaper to run and maintain and create less noise pollution. Solectria Corporation, an American EV manufacturer, claim that their Force EV costs just 1.5 cents a mile (0.9 cents per kilometre) to drive, compared to 5 cents a mile (3.1 cents per kilometre) in a super-economical petrol-powered Geo Metro, from which the Force is derived.

Electric vehicles require less energy because they have a much greater overall efficiency than an internal combustion engine vehicle. This greater efficiency is due to many factors. One of those is that an electric vehicle doesn't need to idle when the car isn't moving, thus no power is used when the car is waiting in traffic. The main reason, though, is that the efficiency of an internal combustion engine vehicle can be as low as ten per cent – 90 per cent of the energy is lost as heat, noise and vibration.

On the other hand, electric vehicles have an efficiency closer to 60 per cent. This is why a well designed electric vehicle can still achieve usable ranges despite not having anywhere near the energy storage capacity of its internal combustion engine equivalent.

Less waste

Another advantage of the electric vehicle is that less waste is generated compared to petrol- or gas-burning equivalents. The electric motor is a very simple device. As a result, there are no air, oil and fuel filters, mufflers, catalytic converters, waste oil, hoses and belts to be

Above: *Solectria's Force EV. Converted from a car commonly available in the US, it has a range of 80km and a top speed of over 110km/h.*

disposed of. The need for lubricants is eliminated in the engine altogether, except for minute quantities in the motor bearings. The massive reduction in the need for crude oil products in an EV greatly reduces the risk associated with transporting oil across oceans and continents.

A few problems

Many current-day problems associated with conventional motor vehicles, such as traffic congestion and safety, will continue to exist with electric vehicles. Inroads made at easing traffic congestion in urban centres like Chicago through the successful promotion of alternative forms of transport, such as bicycle, rail and pedestrian travel, are likely to be jeopardised if people are drawn back to electric car transport.

Safety may become an even bigger issue as electric vehicles operate very quietly, and the advantage to the pedestrian and cyclist of hearing oncoming traffic will be lost to a degree. At least one European manufacturer has already addressed this problem by designing a small warning buzzer for their EVs.

While EVs will eliminate noxious vehicle exhaust, air pollution will not be altogether eliminated. Electricity is still required to charge the batteries powering the car. This power often comes through the mining and burning of fossil fuels, which still releases noxious gases into the atmosphere, although in much lower volumes than those emitted by conventional cars. Of course, if the power used to charge the vehicle comes from a renewable source such as wind or solar power, then the car really will be a zero emissions vehicle.

Replica Porsche Spyder produced by MendoMotive in the US. The car shown belongs to GNB Pacific Dunlop, Australia, who use it as a demonstration vehicle for their batteries.

What makes it go?

As its name suggests, an electric vehicle is powered by an electric motor rather than an internal combustion engine.

The fuel is in the form of electricity stored in large batteries similar to those used in remote area power systems. The electricity is fed to the electric motor via a controller that allows the driver to vary the amount of power precisely. This motor then drives the wheels either directly or via a transmission system. In some EVs, the controller can also feed power back into the batteries to recharge them during braking.

In contrast, an internal combustion engine vehicle burns fuel in the engine to produce the power that drives the wheels via a gearbox and differential.

Batteries

There are many types of batteries that are being used or tested for electric vehicles. The most common type is the

Photos courtesy of Lanette Racine, Phoenix, Arizona USA

The EV1 from General Motors, US. It uses an AC induction motor drive system and has excellent performance while still maintaining around a 150km range.

Pushing the boundaries

The Solectria Sunrise (powered by nickel-metal hydride batteries) set an electric vehicle range record by completing 375 miles (600km) on a single charge in the third day of the 1996 NESEA American Tour de Sol, the national solar and electric vehicle championship. 'This success proves to the world that clean zero emission vehicles can provide range and performance comparable to or better than that of a typical gas car', commented Solectria CEO James Worden.

A *Force* NMH sedan, one of Solectria's standard road vehicles, travelled 244 miles on a single charge in mixed city/highway driving, edging out a Ford *Ecostar* which completed 227 miles.

deep-cycle lead-acid, either of the flooded cell or sealed type. The main advantages of lead-acid batteries are their low cost, widespread availability in most countries and their ability to be almost completely recycled. In fact, more than 97 per cent of the material used to make the battery can be reused.

Lead-acid batteries do have the disadvantage of having a fairly low energy storage capacity, usually no more than 50 watt-hours per kilogram of battery weight, although advancements continue to be made in this area. For most EVs, lead-acid batteries really are the only option at present.

Nickel-metal-hydride (NMH) batteries are becoming more popular, and they are more environmentally friendly than lead-acid batteries. While they have a higher storage density than lead-acid and require replacement less often, they are also more costly. As an example, the Solectria Force with lead-acid batteries retails for US$33,995 (AU$42,495) while the NMH version costs a whopping US$74,495 (AU$93,118). The cost of NMH batteries is expected to drop considerably as demand for them increases, although it could be a long time before they come close to being as cheap as lead-acid.

There are other disadvantages with the current breed of EV batteries, not the least of which is their sheer mass. Indeed, in some smaller cars, the batteries can compose nearly half of the entire vehicle weight.

There are also differing opinions on the subject of range in EVs. An expert panel appointed by the Governor of California said last year that significant improvements in batteries will not occur until the turn of the century.

However, with prototype vehicles travelling 600 kilometres on a single charge, it appears that viable batteries are already here. Indeed, many EVs using lead-acid batteries are capable of ranges of more than 100 kilometres.

Motors

There are two common types of drive motors being used in EVs today, the brushed DC and the AC drive. While DC motors and controllers cost less than their AC counterparts, they do require their brushes to be replaced. This also makes them more vulnerable to breakdown, as the brushes can overheat, although this doesn't seem to be a problem with the most commonly available motors today. AC motors, while not having brushes, do have considerably more complex and expensive power controllers.

With as few as three moving parts, compared with up to 1500 for an internal combustion engine, the cost of maintaining an electric motor is negligible. This almost complete lack of motor maintenance costs can offset the cost

Pros and cons of electric vehicles

Advantages

- greatly reduced need for oils and other lubricants
- quiet running
- no localised pollution
- reduced servicing and maintenance costs
- reduced running costs
- no handling of messy and dangerous flammable fuels required

Disadvantages

- difficult for pedestrians to hear vehicle due to lack of engine noise
- still produce some pollution if charged with non-renewable generated power
- limited driving range
- long refuelling times
- slightly higher vehicle masses
- initially there are few charging stations available for EV users

of battery pack replacements to a large degree.

What is an EV made of?

Electric vehicles come in many forms. The most common are converted conventional vehicles, which have a high body weight because they are made of steel. However, for an EV to be as efficient as possible, and to achieve long ranges, it should weigh as little as possible. This is where the new breed of materials called composites come into their own.

Vehicles such as the General Motors EV1, due to be released in the US later this year, are made from composite materials such as fibreglass, carbon fibre, honeycombed aluminium and many other strong but lightweight materials.

One of the most promising cars is the Solectria Sunrise, a purpose-built vehicle that has already been setting records for driving range. In a recent competition it covered a distance of 600 kilometres on a single charge. This amazing vehicle, which is powered by nickel-metal-hydride batteries, is expected to be available in the US as soon as 1998, for as little as US$20,000 (AU$25,000).

While composite materials are very light, they are generally stronger than the metals they replace. Carbon fibre and *Kevlar* composites have up to ten times the strength of steel for the same weight. They also have the advantage of not suffering degradation due to rust and other rotting problems.

This sexy looking beast is the Model Z from Zebra Motors Inc. in the US. It costs only US$19,500!

Also important is the fact that composites can have the colour included in the material itself, eliminating the need for painting, thus reducing the amount of pollutants produced in manufacture.

The potential for EVs

So, why hasn't the EV been embraced with open arms? Put simply, it seems to be the lack of understanding in the general community of what EVs really are and what they are capable of.

The biggest problem that electric vehicles suffer from is not limited range or the lack of small, lightweight batteries. Their biggest hurdle is their public image. Most people still see EVs as nothing more than glorified golfcarts; uncomfortable clunky machines with little practical use.

In fact, nothing could be further from the truth. Modern electric vehicles have all the mod-cons and safety features of their internal combustion engine cousins. What's more, the performance of EVs has been improving steadily to the point that they now have acceleration and top speeds to equal many fossil-fuel powered cars.

The General Motors EV1 has a top speed of around 160km/h, with a 0-100km/h acceleration time of just 8.5 seconds – on par with many sports cars on the road today.

It is a simple fact that a great many cars on the roads today average less than 30 kilometres driving per day. It has been estimated that up to 50 per cent of all vehicles in countries such as Australia and the US never travel long distances, but instead are only used for commuting to work and driving down to the local shops. This means that around half of the vehicles in this coun-

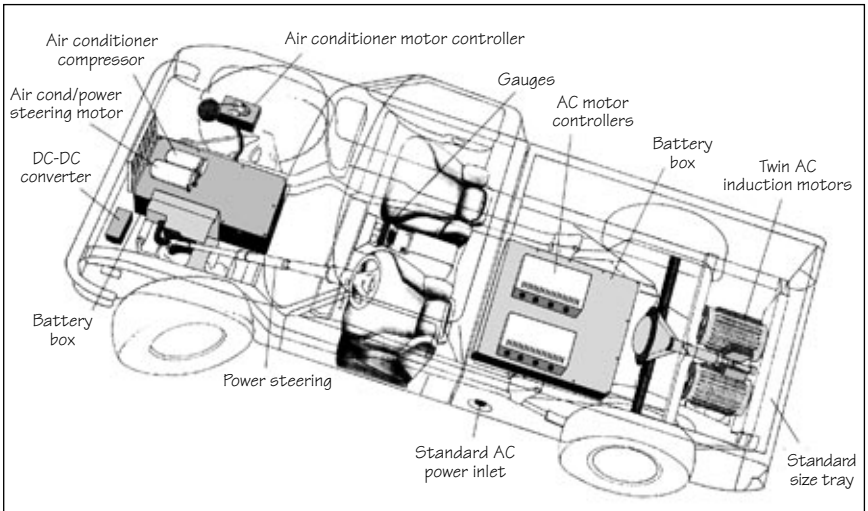


Diagram courtesy of Solectria Corporation, USA

A cut-away view of Solectria's E-10 utility. By splitting the battery pack into two smaller packs, the vehicle still has a full-sized tray.

try could be electrically powered with no inconvenience to their owners.

What's out there

Now that you have been convinced that your next car should be electrically powered, what choices are available and where can you get one?

If you live in Australia, you have few choices. Since the only manufacturer of EVs in Australia, Huntington Electric Vehicles in Sydney, have ceased production of road vehicles, you could either import one from overseas or make your own by converting a petrol-powered vehicle. Converting a car to electric power is a fairly involved process, but with careful planning can produce very satisfying results.

Currently there is considerable range of EVs to choose from in the US. There is the four-seater Force from Solectria and the electric version of the S-10 utility, sold by a number of manufacturers. Or you may want a sports car, such as the sexy Model Z from Zebra Motors or the two-seater Porsche Spyder replicas from MendoMotive, both in the US. GNB Batteries here in Australia own a Spyder replica, using it as a demonstration vehicle for their sealed-lead-acid batteries.

There are also numerous European models, such as the Peugot 106, the Renault Clio Electrique (of which two a day are being produced) and the new, all-plastic-bodied CityBee, which is also soon to be manufactured in the US. The CityBee comes equipped with dual airbags and airconditioning, can reach highway speeds and has a range of around 100km per charge. This car is expected to retail for less than US$10,000 ($AU12,000) when manufacturing in the US begins in late 1996 or early 1997.

Photo courtesy of BAT International, California USA

A utility from Battery Automated Technology (BAT) International. A top speed of around 130km/h and a range of up to 140km makes it an ideal general workhorse.

Asian manufacturers

By far the greatest number of EVs may come from Asian manufacturers. Almost all have an electric or hybrid vehicle planned for release in the US in 1997 or 1998. Toyota plans to sell an electric version of its popular RAV4, while Honda has a vehicle almost completely designed from the ground up as an EV. Hyundai have been developing an electric version of their Sonata which is also expected to be released soon.

It should be noted that all of these manufacturers have extensive distribution bases in Australia, making it just as easy for them to sell their new electric models here. This is great news for the potential EV buyer.

Other vehicles

So far we have looked at all manner of electric cars, but there are many other types of electric vehicles available. Some of these you may already be familiar with, such as electric trams and trains.

Other, less-common vehicles include electrically powered buses, which are finding favour in many countries, including the US. A number of companies are producing electric buses there, with some amazingly advanced designs being developed.

Electrically power-assisted bicycles and motorbikes are also becoming popular, and in the first issue of ReNew* we will take a look at what is happening with this form of alternative transport.

In coming issues, we will also look at in more detail many of the different systems used in EVs, including battery technology and the different types of motors and controllers.☼

** see page 7 for details*

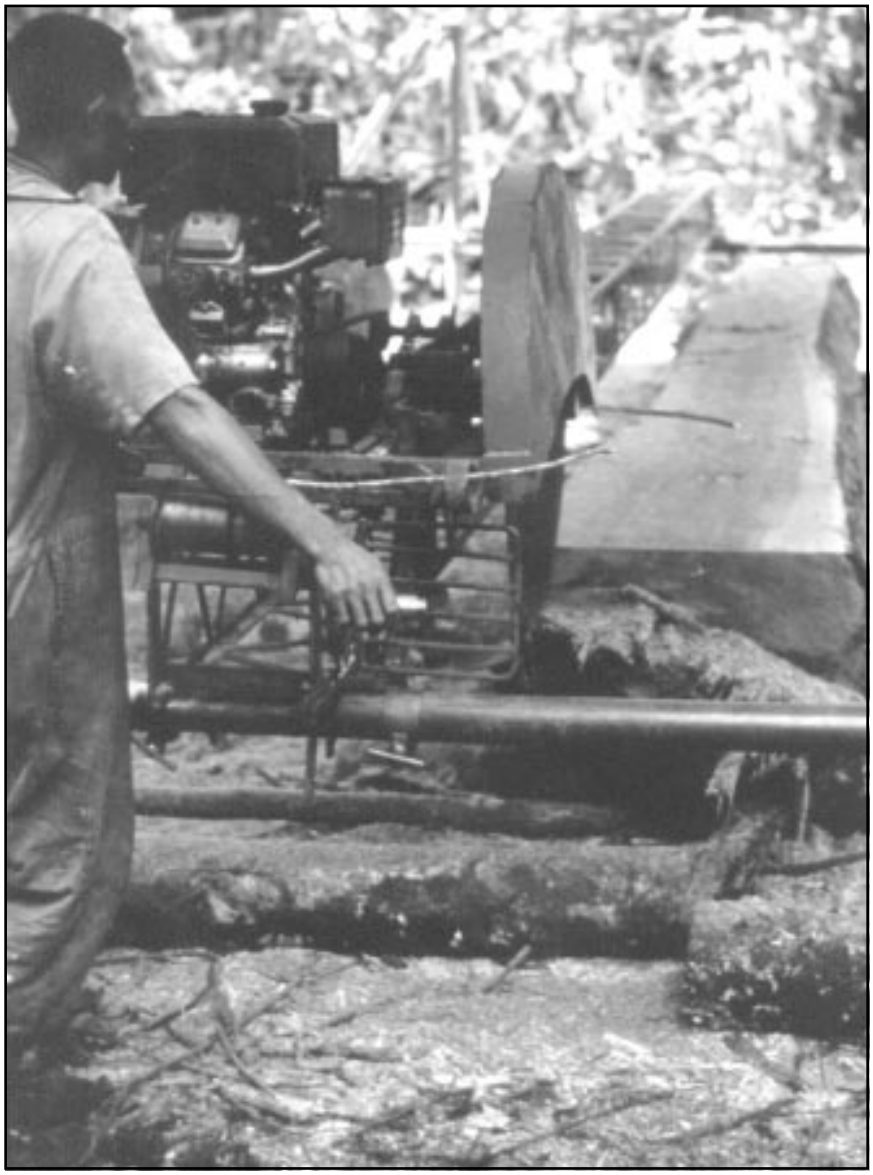
Photo courtesy of Lanette Racine, Phoenix, Arizona USA

This is the prototype from Honda, due to be released in the US next year.

Portable sawmills
ecotimber in Papua New Guinea

Conventional logging is well known for destroying large tracts of forest, but it also creates a culture of dependency among indigenous people. **MICHAEL MOYNIHAN** explains how some Papua New Guinean villagers are tackling the problems of dependency and sustainability.

Photo: Ron Martin



Rather than dragging logs through the forest, making great swathes in the wilderness, the Wokabout Somil *cuts the timber so that it can be carried out.*

THE western media has recently been full of alarming accounts of the destruction of Papua New Guinean rainforests by international logging companies. While news items have concentrated on regional conflicts, political corruption and images of splintered stumps, less has been said about equitable solutions. There are economically, environmentally and socially sustainable alternatives to these logging operations, and they are being exercised by local community groups.

One such group has been formed by landowners of the Bainings tribe on the island of New Britain in Papua New Guinea (PNG), which has succeeded in establishing an environmentally sensitive timber industry using portable sawmills.

Instead of dragging logs to the sawmill, a portable sawmill can be carried by four men on foot into the forest to set up a milling site next to the felled tree which can then be sawn into a tidy stack of timber. The returns are such that the local landowners only need to cut down two or three trees in order to earn the same amount as a month's royalties from one of the foreign logging companies.

The chairman of the Bainings group, Mr George Metpes, is adamant about the success of the enterprise. 'We own this forest, so we are the ones who should work it. The logging companies are paying just $4 or $5 per cubic metre of timber they take out – and even that

Photo: Ron Martin

Thanks to the portable sawmill, local landowners only need to cut down two or three trees to earn the same amount as a month's royalties from logging companies.

they often don't pay. Like this we are getting $160 per cubic metre.'

Deforestation in PNG

Spurred on by strong demand and rising prices for tropical logs caused by widespread export bans elsewhere in the world, the logging companies have dramatically increased output. The volume of uncut logs exported from PNG has more than tripled in the last four years. Independent estimates place the current felling rate at three times the ecologically sustainable rate.

One Malaysian company, Rimbunan Hijau ('Green Forest'), controls 80 per cent of all logging licences and accounts for 86 per cent of exports of uncut logs from PNG. The company emphasises that it uses selective logging methods and its felling rate is sustainable. CSIRO researchers, however, have found that up to 79 per cent of trees in a logging coupe are either removed or so severely damaged that they do not survive for more than ten years after logging. Logs are usually dragged out of the forest by bulldozer, leaving deep muddy scars criss-crossing the forest which facilitates soil erosion in the rainy season. Some companies are also disregarding their contracts and not replanting trees after logging, allowing Kunai grass and vines to take hold, which alters the forest ecosystem permanently.

Logging companies are making huge profits, yet the local people are seeing few benefits from the destruction. In 1994 Rimbunan Hijau earned an estimated A$500 million from its PNG logging operations. Some companies do not pay royalties to the landowners and evade tax. The former Minister for Forests, Mr Tim Neville, estimates that PNG is losing up to A$1.5 million a day through transfer pricing, false declarations and illegal logging.

Despite these environmental and financial transgressions, local landowners are still entering into agreements with logging companies. In remote regions social infrastructure and government expenditure is almost negligible, so logging and mining companies' offers of roads, health and education services as well as royalties and jobs are irresistable

In contrast, the Bainings Community Forest project in East New Britain has shown that remote villages, using a portable sawmill, can promote their own development. Mr Metpes' village has already experienced significant change. 'We had one store before, now we have four. Everyone gets a chance to work so the benefits are distributed throughout the village.'

'We had one store before, now we have four. Everyone gets a chance to work so the benefits are distributed throughout the village.'

George Metpes — Papua New Guinean villager

Ms Tahereh Nadarajah, a research fellow at PNG's National Research Institute, sees the portable mills as a means of empowerment for the villag-

ers. Rather than receiving hand-outs, they are able to earn an income. They also retain control of the forest resources which they own under customary title.

Portable sawmills

Three types of portable sawmills are being used in PNG. The locally produced *Wokabout Somil* (Melanesian pidgin for 'walkabout sawmill') was developed by the South Pacific Appropriate Technology Foundation in the late 1980s in combination with Natequip, an engineering company based in Lae. Over 600 Somils were built before the company folded in 1993. The other two sawmills, Zeacan and Petersen Saw, are both imported from New Zealand.

These portable sawmills consist of a single or twin-edged saw with an air-cooled diesel engine and a bridge type carriage which runs along two transoms. Rather than the log being pushed across blades in a fixed position, the saw moves along and across the trunk, cutting timber to exact dimensions.

While the Wokabout Somil is capable of milling up to one cubic metre of wood a day, the Zeacan and the Petersen Saw can cut as much as three and six cubic metres a day respectively. Indeed, there is now concern among some observers that the community forestry projects will no longer be small-scale and as environmentally sensitive.

Sawmill misuse

For all their advantages, it is clear that portable sawmills are open to misuse. In order to produce truly environmentally sensitive timber (or ecotimber), strict guidelines have been established by the Village Development Trust in PNG and the Rainforest Information Centre in Lismore NSW. These guidelines govern the number of trees which can be logged and milled per hectare of forest. Where tracks are made, these need to be replanted, and a variety of species should be selected for logging after taking an inventory of the coupe.

As co-author of a marketing strategy for the Village Development Trust, a voluntary organisation which is promoting the use of the Wokabout Somil in villages on the southeast Morobe coast, Ron Martin emphasises the need for the development of an infrastructure to ensure efficient use of portable sawmills.

European timber buyers are willing to pay a premium for accredited ecotimber and this is where PNG's future in forestry could lie. But in order to achieve this, communities need to follow the guidelines set down by the Village Development Trust. According to Ron Martin, 'some portable sawmill operations around Lae were "picking the eyes" out of the forest by concentrating only on the most highly valued species.'

The use of a portable sawmill is only the first step in producing eco-timber. The sawn timber must then be transported out of the forest, stored and dried and then marketed and shipped. The Bainings project, backed by another voluntary organisation, the Pacific Heritage Foundation, has established the required infrastructure and has been internationally accredited as a low environmental impact timber producer. According to Max Henderson, head of the Pacific Heritage Foundation, demand for their ecotimber now outstrips the supply eightfold.

Lack of support

Despite this unprecedented success, support for the small-scale community forestry projects has not been forthcoming from the PNG Government. Funding is coming exclusively from aid and development organisations.

Given the strong link between vegetation clearance and the build up of greenhouse gases in the Earth's upper atmosphere, it is imperative that these community forestry projects receive greater support and recognition, both within PNG and internationally, as a viable alternative to the ecologically destructive industrial logging operations.☼

Chainsaw mills in Australia

A simplified version of the portable sawmill is the chainsaw mill. As its name suggests, this mill is comprised of a chainsaw which is guided by a cutting gauge or rested on a rail carriage.

Because the blade of the chainsaw mill is thicker than that of the portable sawmill, the timber produced is rougher and there is greater wastage of material. However, suburban timber salvage experts are finding them useful for cutting fence posts, rails, slabs and planks from trees which, despite their good quality, would normally be sacrificed as firewood. They are also being widely used to reclaim timber left on the forest floor years ago.

A further use for chainsaw mills lies in the realm of shire councils. Chainsaw mills could mill planks cut from trees lopped in public parks, roadside reserves and private gardens. This timber could then be used to renovate bridges and make park benches and bollards. This would keep the harvest at a local level, providing an alternative to rainforest timbers.

A Westford Rail Mill. The portability of chainsaw mills such as these allows us to harness suburban timber resources rather than destroy more forest areas. The mills cost from $450. Westford can be contacted on ph:(09) 350 5555.

Photo courtesy of Westford Enterprises, WA.

Good fire wood

Current estimates indicate that a massive 6.1 million tonnes of firewood are collected each year in Australia. This is more than the 4.1 million tonnes we take out of our forests for woodchips. **BARRY TRAIL** clears the air on wood as fuel.

RESIDENTIAL wood stove emissions are a large source of pollution that can cause a range of environmental and human illnesses. Some stoves burn more cleanly than others and many people still have old wood stoves that don't burn efficiently. Emissions from a burning wood stove include:

• **Carbon monoxide**, a leading cause of poisoning deaths, is colourless and odourless and may not be properly vented from the stove.

• **Carbon dioxide**, inhalation of which can lead to fatigue, chest pain, irregular heartbeat, headaches dizziness, weakness, nausea and disorientation.

• **Sulphur dioxide**, which can aggravate symptoms in people with asthma and bronchitis.

• **Particulates** (tiny fragments of airborne matter) and other emissions formed from incompletely-burned wood carry toxic substances such as creosols, aldehydes and phenols to the lungs, as well as carcinogens such as benzopyrene, dibzezanthracenes and dibenzo-carbazoles.

If you need to burn wood

Instead of trying to save money by using a wood stove, it might make more sense to properly insulate your house, put in new, tight-fitting windows and doors and upgrade your existing heating system.

If your heart is set on buying a new wood stove, or if you already have one, the following guidelines should help you make the best choices about your heater.

• Replace your older, polluting model with a newer, cleaner-burning one. See that it is equipped with technological advances, such as a catalytic converter, to improve air quality. The newer wood stoves will produce little or no creosote buildup in your chimney, lessening the chance of chimney fires and the need for cleaning. The best stoves can reduce firewood consumption by one third or more.

• If you choose to stay with your older wood stove, see that it burns at a high heat, there are no leaks in the system, and your chimney is cleaned yearly to prevent creosote buildup. You may want to purchase a carbon monoxide detector to ensure that stove fumes are not leaking into your home.

Check up on your State pollution control laws to ascertain whether or not your stove conforms to emission standards.

NB: Do not burn treated wood, wrapping paper, coated paper, rubbish, or plastic in any wood stove. Use only seasoned hardwood. The best burning woods are the denser varieties, which burn more slowly.

When collecting firewood

• Do not remove dead trees, standing or fallen, as they provide important habitat for animals. Similarly, ask commercial suppliers whether or not they are removing standing trees and encourage them to stop if they are.

• Scavenge timber from building sites, warehouses and factories that dump scrap timber.

• Find out if your council is encouraging residents to use the wood 'waste' which can be collected at local rubbish tips. At the very least, there should be a stockpile of pallets or crates available for a modest sum.

• Avoid purchasing Box (Grey, Red, Yellow and White), Ironbark and Red Gum firewood, unless these have been sourced from a plantation. These species make great firewood, but they are considered 'vulnerable' at present, and are better left to provide habitat.

• It is important to avoid burning salvaged timbers that have been painted, varnished, or treated with other preservatives, as the fumes are toxic.

Using firewood efficiently

If you already own a wood-burning stove, then one of the best ways to overcome the problems of firewood scarcity and associated forest depletion is to make the most efficient use of the wood you burn. For example, firewood that has not been dried (usually called 'green' wood) has only about 40 percent of the heating value of dry wood. Stacking cut firewood onsite for six to ten months is a simple way to dry it and save on your haulage effort.

If you are not sure that burning wood isn't going to damage yours or someone else's environment, use natural gas. Until enough fuelwood plantations are established, this is the environmentally preferable option. Only buy a wood-burning heater if you are certain that you have a supply of local firewood from an environmentally suitable source of supply.

This article is an extract from the upcoming second edition of *The NSW Good Wood Guide*, produced by the Rainforest Information Centre, PO Box 368, Lismore, NSW 2480.
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Green Jobs

by Marish Mackowiak

Creating employment while saving money and the environment.

ALTHOUGH environmental strategies such as recycling are an established way of life in the Australian home, it has taken longer for similar commonsense to prevail in the business world. Although there are dozens of firms in Australia concerned with environmental management, the process of environmental auditing of companies is relatively new.

The Green Jobs Unit, established in 1993 as a joint venture by the Federal Government, the Australian Conservation Foundation and the ACTU, is an independent non-profit organisation. The Unit is responsible for a number of initiatives aimed at reducing industry's negative impacts on the environment, and has so far helped find work for 100 JobSkills people.

One of the unit's major achievements is the Green Jobs in Industry report, which identifies a niche area of employment opportunity that assists industry to reduce waste and energy use. Overseas studies suggest that by developing renewable energy products and energy efficient services, up to 100,000 new jobs could be created in Australia. Many companies have discovered that employing staff to monitor waste output and energy usage can mean considerable financial savings for a small capital outlay.

Considerable savings are possible for small and large companies alike. One case study shows how Westpac's Energy Unit expects to save $11 million on energy consumption and water usage by the end of 1996 in programs brought about by employing waste auditors. On a smaller scale, Kathy Kermanidis from Oxford Panels, a panel-beating company, carried out an environmental audit and established strategies for cutting waste and improving disposal. The results include a 30% reduction in the purchasing cost of new materials and a saving of $900 in yearly tip fees.

Green Jobs create a 'win-win' relationship between industry and the environment. By reducing and recycling waste, companies save money on materials while keeping local air and waterways clean.

Fletcher Construction Australia has incorporated green measures into its national policy, aiming to reduce waste on every site by 25%. Such measures range from using recycled materials in

construction through to eliminating disposable cups and stirrers for workers. Construction plans are now distributed to each contractor and consultant on computer disk instead of the usual bulky roll of drawings, and any printouts are reduced in size. The result is an astonishing $25,000 saving, with few initial financial outlays.

The success of the Fletcher program prompted the Master Builders Association in Ballarat to encourage all builders in the region to separate waste into timber, metals, masonry, plastics and plaster for centralised collection by recycling agencies.

Broad approach

The Green Jobs Unit assists companies in several ways, including access to a Federal Government wage subsidy, the providing information about environmental management and promotion and publicity for participating companies.

According to Helen Shortell, Executive Director of the Green Jobs Unit, almost half of environmental cost savings flow from raising staff awareness and workplace change. 'It is only when workers in a company "own" the new practices that they will be implemented,' she said. One participating company, Penfolds, have agreed that where workers cut water usage the company will pass on the resulting financial savings through pay bonuses.

Fletcher Constructions have successfully employed waste management officers on their building sites, with huge savings in waste and money. These workers are sorting scrap metal for recycling.

A major program of the Green Jobs Unit is the Cut Waste and Energy Initiative, which includes the Environmental Change Management Certificate 3, a three month accredited training course funded by DEET, from which the first graduates recently emerged. These 'Environmental Savings Officers' were then placed on a six month JobSkills wage subsidy to implement environmental management strategies within industry. Job placements involve on- and off-the-job training and include a city legal firm, hospital, local council, youth hostel and a large paper recycler.

A selection of courses aimed at landing a 'green job'

NSW & ACT

Environmental Science/Management degree courses at Australian Catholic University, Australian National University, Charles Sturt University, La Trobe University (Albury/Wodonga), University of Canberra, University of New England, University of New South Wales, University of Newcastle, University of Sydney, University of Technology (Sydney), University of Western Sydney, University of Wollongong.

QUEENSLAND

Bachelor of Science - Australian Environmental Studies: Griffith University.

NORTHERN TERRITORY

Environmental Science/Management Associate Diploma: Northern Territory University.

SOUTH AUSTRALIA

Environmental Management degrees: University of Adelaide, Flinders University and University of South Australia.

VICTORIA

Environmental Science/Management degree courses: Deakin University, La Trobe University, Monash University, RMIT, Swinburne University of Technology and Victoria University.

Graduate Certificate in Cleaner Production: TAFE division of Swinburne University of Technology.

Associate Diploma in Resource Management: various metropolitan and regional TAFE colleges.

Certificate IV in Renewable Energy Technology: Northern Melbourne Institute of TAFE and Swinburne Tafe Division.

WESTERN AUSTRALIA

Environmental Science/Management degrees: Curtin University of Technology, Edith Cowan University, Murdoch University and University of Western Australia.

More thorough coverage of relevant courses can be found in the *Directory of Environmental Courses in Australia*, published by the University of Queensland, the EPA & the Federal Environment Department, 1995. The Environmental Education Courses Database is another comprehensive listing, and is available on the internet through the EPA's Environet Web site: **http://www.erin.gov.au/net/environet.html**

The results of the program so far are extremely encouraging. Victor Istanto, a civil engineering graduate, was employed by Fletcher Constructions, and after sucessfully completing his Green Jobs placement, was offered a full-time position as Project Engineer.

Mr Istanto's supervisor, Bruce McDonald, has also praised the success of the Green Jobs program within his firm, saying that Mr Istanto had initiated $15,000 worth of savings in an energy audit of the office. In an industry notorious for waste, Mr McDonald said the Green Jobs program had provided a job that otherwise wouldn't have existed.

Obstacles

There are several obstacles to overcome, however. Some business people have very entrenched ideas, and while many large companies have undertaken environmental audits, only five percent of the 2,073 small-to-medium firms in one survey had taken this first step. It is essential not only that a company is willing to fund any capital costs, but that an environmental policy is embraced at all levels of management. Many companies fail to follow up environmental assessment with adequate human resources or effective staff communication.

Environmental planning can also be a long-term proposition and will differ in its effectiveness according to the size and nature of specific businesses.

The future of the Green Jobs Unit is uncertain since the recent change of government. Jan Talacko, Manager of Strategic Development at the Green Jobs Unit, says 'A number of consultancies and existing projects should ensure funding until the end of the year, but there is no certainty about the longer-term future'. Meetings with government officials have been scheduled but a decision is unlikely before the federal budget is announced in August. In the meantime, says Mr Talacko, the Green Jobs Unit is working at broadening its funding base, including evaluating the potential of creating green jobs on a regional basis.

Westpac's Energy Unit expects to save $11 million on energy consumption and water usage by the end of 1996 in programs brought about by employing waste auditors

For people interested in environmental management, Helen Shortell lists persuasive interpersonal skills, vision and a dynamic, flexible approach as key attributes for prospective Environmental Savings Officers. Beyond these attributes, relevant education is valuable, and an increasing range of specialist studies are available to meet the new opportunities.☼

Tully Millstream on again Off again

The Tully Millstream dam proposal, Queensland's flirtation with large scale hydro-electricity, has met with strong support and fierce opposition both locally and across Australia. **ERIKA CHAROLA** enters the fray...

The Tully-Millstream dam, if it is built, will span the Herbert River south of Cairns and would provide Far North Queensland with an enormous capacity for hydroelectricity generation. Designed to cater for projected power demand increases, the 550 megawatt (MW) plant was initiated by the Queensland Electricity Commission in 1986: its cost was estimated at $550 million. In 1990 this figure was revised to $799 million, with no corresponding estimate of a performance increase.

There have been many reviews, reports, assessments and independent evaluations since the first feasibility study. Most recently, a government commissioned taskforce report drew eleven volumes of submissions from concerned parties. The report dealt with issues like detriment to world heritage areas, threats to rare species, effects on local tourism ventures, Aboriginal land claim issues, meeting a highly variable power demand, provision of short-term employment, alteration of the water table affecting irrigation of sugar cane crops, adverse effects in terms of rising carbon dioxide levels, increasing expenditure estimates and lack of public support.

Of particular concern was the report's failure to investigate alternative options in fulfilling power needs; a criticism levelled by the consultancy group Ewbank Preece Sinclair Knight (EPSK). This organisation conducted a study of a range of alternative power supplies which could complement the implementation of demand management programs, but was itself criticised for failing to investigate detailed costings and cost uncertainties which would elucidate the comparative advantage of each option. The taskforce used the EPSK report and forecasts by the National Institute of Economic and Industry Research (NEIER) as major sources.

Far North Queensland has a power demand problem particular to tropical regions; a disproportionate peak in the wet season, caused mainly by the use of air-conditioners, but also of clothes-dryers and other appliances. This is exacerbated by variation in seasonal population caused by tourist influx, and results in a maximum power demand which is inordinately higher than the average requirement.

Another factor which contributed to high forecasted power needs is a surplus generation margin (an insurance factor) of 28 percent, described as 'an embarrassing surplus generating capacity' by Dr Ian Lowe, director of the Science Policy Research Centre at Griffith University.

coal technology receives almost 100 times more funding in government research grants than renewable resources

A reduction of this margin to 24 percent would be a significant step in demand management, while retaining internationally accepted supply standards. Success of power supply is gauged by Loss of Load Probability (LOLP) and a 28% figure means approximately four hours without power per year, the worldwide accepted standard is between five and ten hours per year (number of customers affected were not figured into these equations).

The EPSK report found that solar energy was the largest available resource in Queensland with thermal projects, currently at a developmental stage, showing proven viability for a grid connection of more than 1000 MW by 2005. Commercial uses were projected for solar photovoltaic technology, but grid connection was deemed doubtful.

Biomass (sewage gas) could provide between 10 and 100 MW, and is also mentioned as a possible contributor to the seasonal peak. Garbage burning and garbage-derived fuels were found to be unviable for grid connection, although landfill gas could increase the scale of gas fired turbines, already using natural gas and connected to the grid at Barcaldine in Central Queensland.

Wind generators are already operational on a commercial scale in various locations throughout Australia, but ESPK deemed Queensland's wind resources 'moderate compared with electrical needs'. Australia's southern states can harness the roaring forties for large scale power, but northern areas are not subject to the same consistency of winds; reliability also being an important factor in the taskforce report.

The taskforce report takes on queries concerning the financial viability of wind turbines and solar thermal projects in the United States, but not in Queensland. It explains that the US provides tax incentives to renewable resources whereas the Australian Federal and Queensland Governments afford no

subsidies to any kind of generating plant. While these statements are technically true, one could be misled into believing that coal mining companies, determinants of a major cost factor in coal-fired power plants, operate without tax breaks and this is clearly not the case. Exploration costs are tax deductible and many companies have guaranteed pre-sale arrangements. Furthermore, coal technology receives almost 100 times more funding in government research grants than renewable resources.

Other renewable resources, already operational elsewhere on a commercial or experimental scale, reputedly have insufficient generating potential in Queensland to allow expansion for grid usage. Amongst these are wave power, ocean thermal tidal, geothermal aquifers and hot dry rocks.

Photo: David Johns

The Gordon below Franklin hydroelectric power development in Tasmania as it appeared on the cover of Soft Tech #39 in 1992. The dam is one of the largest in Australia, and the Tully Millstream dam would be on a similar scale.

Interstate power system trading, decades old in the United States, is another option that could feasibly deal with seasonal demand peaks. Kolson's Briefing Paper on Economics and Forecasts of the Tully-Millstream Project for the Wet Tropics Management Authority points out that construction of a link with NSW is a solution that is inexplicably considered by EPSK as irrelevant to the construction of the dam, an opinion shared by the taskforce. Furthermore, NSW electricity suppliers were not even asked for price indications of a theoretical connection.

The Wet Tropics Management Authority is a board comprising two Federal and two State ministers as well as regional representatives. The Wet Tropics Act provides for a Wet Tropics Management Plan and commissioned yet another report; a review of the taskforce report. The review was undertaken by H.R. Outhred of the School of Electrical Engineering and Computer Science at the University of New South Wales. The review likened the taskforce's procedure to an ad hoc inquiry and specifically criticised it for the insufficiency of alternative option detail. In particular, natural gas possibilities and the potential of Queensland's solar energy resources 'which dwarf the energy output of the Tully-Millstream and correlate well with summer air-conditioning demand', were highlighted. Coal-fired plants and gas turbines were suggested as interim measures while urgent energy planning issues were addressed.

Demand management, historically a weak spot in QEC policy planning, is now at the forefront of Far North Queensland's new and progressive planning agenda, FNQ 2010. Nineteen ninety-three saw a 700 MW success in power demand reduction programs; a turnaround after Outhred's 1991 report stated that standing financial arrangements between the Queensland Electricity Board and Regional Electricity Boards were then precluding such a success. Members of industry, government and localities now regularly meet to plan

resource management and evaluate possible development projects. October 1995 saw the Tully-Millstream project, already drifting into irrelevance, removed from its draft strategy; a victory for the environmental movement, it was allegedly partly due to a shift in focus to development issues in the Daintree region. A draft issue of the Wet Tropics Management Plan became available in October last year to endure four months of public comment before its final presentation for approval in June/July 1996.

Cairns residents generally discount the dam as unnecessary and the issue as passé. Younger residents with whom I spoke had not heard of the project, but various regional chambers of commerce have clutched it as a symbol of power. A member of the Central and Far North Environment Centre explained the pro-dam contingent's attitude as a case of blinkered vision, 'They can't face up to the fact that this is a lost issue — it has come to represent what they stand for, development'. The Cairns Chamber of Commerce representative I spoke to was a flurry of statistics on the telephone, but no number of cajoling pleas on my part, or promises of cooperation on hers, would result in hard copy.

The Tully Millstream issue is writhing with spin-off considerations, not the least of which is proper assessment of alternative energy sources. At the time the first draft of this article was completed it seemed that plans for the dam had been shelved for good, though there have since been reports that it is up for consideration once more.☼

Buying back the bush

Private land contains much of Australia's biodiversity, including plants not found in any reserves. Whilst many environmental groups lobby to protect public land, the Australian Bush Heritage Fund works to acquire private land with outstanding ecological significance. Fund coordinator **JANICE BIRD** explains how.

In September 1995, The Australian Bush Heritage Fund announced its latest purchase: 120 hectares of native bush in the Bega Valley in south-eastern NSW. The Bega Valley was one of the first areas in Australia to be widely cleared by European settlers and today only eight percent of this farming region retains its natural vegetation: clearing and fragmentation of natural habitat still continue. Most of the remaining areas of native bush in the Valley (more than 80 percent) are less than five hectares in area, and very few exceed 20 hectares.

The Australian Bush Heritage Fund has bought one of the largest and best preserved of the remaining bush remnants, a forested area on the Brogo River, northwest of Bega. The undulating land is dotted with large granite boulders and slopes down to river banks lined with old riverine she-oaks and other native vegetation. The bushland mainly consists of grassy woodlands and dry rainforest. The area covered by these vegetation types has diminished dramatically throughout Australia in the past 200 years, and several of the plant species and communities found here are at the southernmost limits of their natural range.

Grassy woodlands have understoreys of native grasses, herbs, orchids, legumes and shrubs. The tree canopy is dominated by lowland red gum (*Eucalyptus tereticornis*), and other species of eucalypts and wattles. Red gum grassy woodland is not protected in any Australian nature reserves and is considered to be of national importance.

Originally the Bega Valley contained groves of dry rainforest, with a canopy

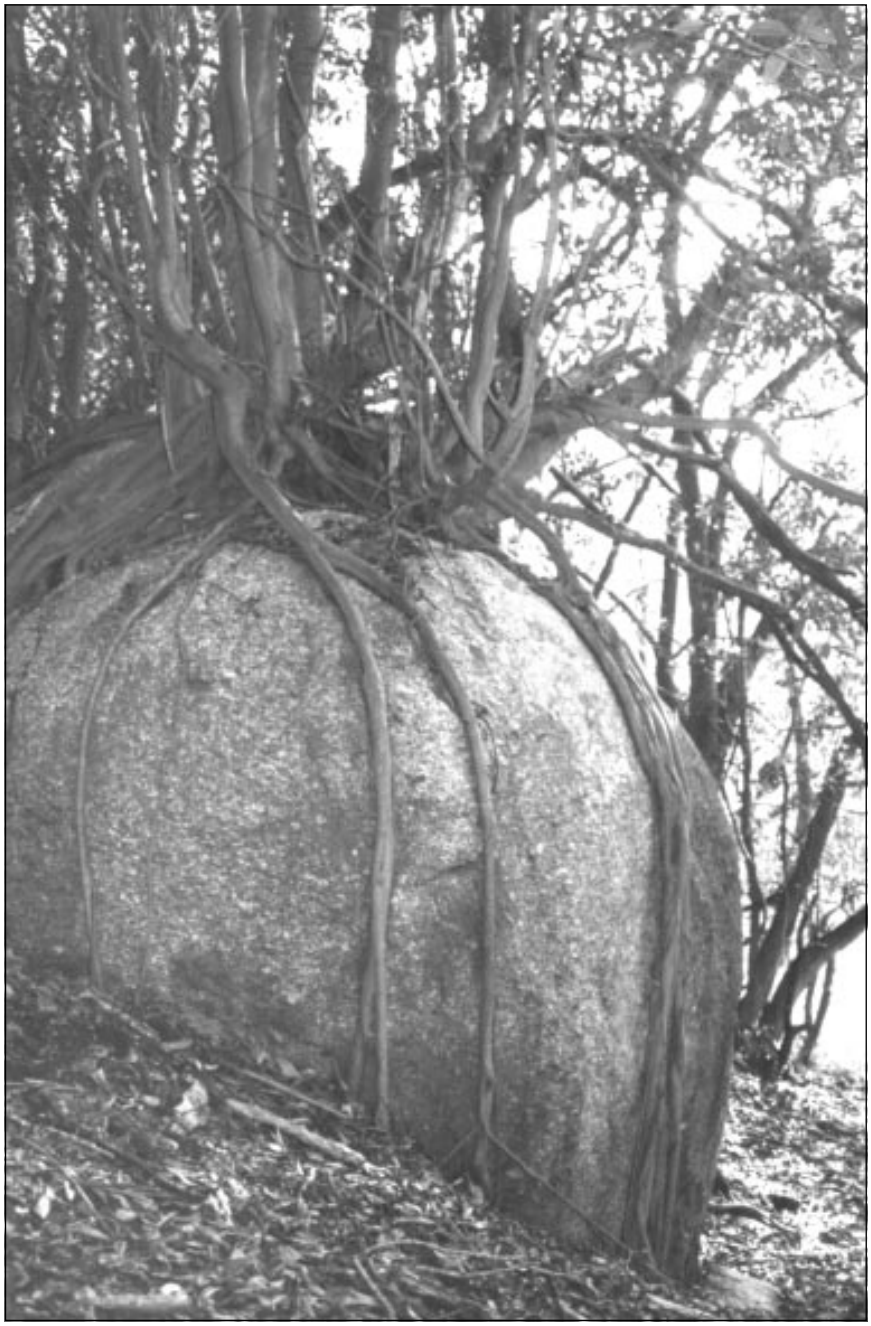


Fig roots cling to granite boulders in the dry rainforest groves of Bega Valley.

of broad-leafed trees such as Port Jackson figs and an under-storey of shade-loving plants, vines and creepers. This vegetation recovers very slowly from the effects of fire and most has disappeared from the valley due to frequent burning. On the Bush Heritage land, the roots of figs have been protected from fire by immense granite boulders, which also host masses of rock orchids and are a favourite spot for the local lace monitor lizards.

Maintaining biodiversity

The valley's naturally fertile soils produce plants high in nutrients, a valuable food source for the local fauna, which includes wallabies, wombats, echidnas, bandicoots, eastern grey kangaroos and, in adjoining Brogo River, platypus and water dragons. More than 45 species of birds were identified in a survey of the block, including wedge-tailed eagles, boobook owls and powerful owls. One of the main threats to the powerful owl's survival is habitat loss and the preservation on this property of numerous old trees with hollows will be important to them as well as other tree dwellers such as parrots, bats and sugar gliders.

Establishing the fund

The Australian Bush Heritage Fund was established in 1990 when 241 hectares of forest in the Liffey Valley, adjoining the Tasmanian Wilderness World Heritage Area, were to be auctioned. The threatened Tasmanian wedge-tailed eagle, white goshawks, duck-billed platypuses, Tasmanian devils and Tasmania's rarest fern *Asplenium hookerianum*, all live in this valley. Hearing that these forests were likely to be woodchipped. Bob Brown, the Tasmanian environmental campaigner and now Australian Greens senator, used his Goldman environmental prize of $39,000 as a deposit for the purchase and, together with friends, established the Australian Bush Heritage Fund.

Support grew quickly and in 1993 Bush Heritage was able to make its second purchase – 8.17 hectares of spectacular fan palms (*Licuala ramsayii*), adjoining the Wet Tropics World Heritage Area north of the Daintree River. This is the habitat of many tropical species of flora and fauna including the cassowary, a rare large flightless bird. The CSIRO reported only 54 adult cassowaries remaining in the whole Daintree region and one of the threats to their survival is habitat loss.

Selecting land

The Brogo Land is Bush Heritage's third purchase and the fund is already planning its next acquisition. Biodiversity, viability of extant populations and land management issues are important considerations in Bush Heritage's selection of land. Potential purchases are assessed by the board of directors with advice from a panel of prominent experts. There is no shortage of land for sale which is worthy of protection but the organisation's ability to act is dependent on its funding, which comes entirely from public donations.

Bob Brown used his Goldman environmental prize of $39,000 as a deposit for the purchase of 241 hectares of forest in the Liffey Valley

Bush Heritage's Land Management Officer organises local committees of volunteers to coordinate planning and land management for each location, and works in consultation with government conservation bodies and those responsible for fire-fighting and management of nearby World Heritage areas and reserves.

The US model

Bush Heritage, the only Australian organisation taking this non-confrontational approach to conservation on a national level, was inspired by the United States organisation, The Nature Conservancy (TNC). Starting with the purchase of 60 acres in New York State in 1955, TNC now owns more than 1600 reserves (over one million acres) in the USA, and has protected a further seven million acres through other means such as land management agreements, covenants, and selling land to government conservation bodies.

A fan palm on Bush Heritage land north of the Daintree River

Although it is a nonprofit organisation with tax deductible status, the Australian Bush Heritage Fund is registered as a limited company and details are lodged with the Australian Securities Commission. Its Memorandum of Association lays out the organisation's objectives and makes provision, in the event of the organisation being wound up, for property to pass to another institution with similar aims. However, with a growing number of regular donors and three freehold properties under its belt, the fund fully expects to be around the for the long haul.

Bush Heritage is attracting support from across the social and political spectrum and fills a 'gap in the market': landowners now have the choice of selling or bequeathing their land for conservation rather than clearance, and anyone who loves the Australian bush can contribute to the preservation of these important places that don't have government protection.☼

Janice Bird is the National Coordinator of the Australian Bush Heritage Fund. For more information contact the fund at :
GPO Box 101, Hobart TAS 7001
Ph (002)31 5474 or 1-8000 67 7101
Fax (002)31 2491

WASTELINE
REPORTING RECENT DEVELOPMENTS IN ENVIRONMENTAL ECONOMICS

Future computer mouse

Rob Jolly

THE computer mouse has made the personal computer more user friendly, and like all computer products, has undergone many improvements in style and accuracy. Despite its undoubted benefits, the mouse is not the perfect tool for navigating computer software. Mice can become clogged with dust, and with heavy use can wear out.

Dead mice

Many computer users with 'dead' mice complain that they could fix them easily if low cost components such as rollers and wheels were available.

As a good quality computer mouse can cost in the order of $60 or more, the cost of replacement can become significant. There is also the frustration of throwing out a seemingly durable product. Unfortunately, though, a producer of remanufactured mice has yet to emerge.

Another mouse trap

A significant by-product of the heavy use of the computer mouse is the need to replace computer mouse mats. Millions of computer mouse mats are sold in Australia each year. The quality and price of these mats varies enormously, from around $2 to $20 or more.

Low cost mouse mats are generally made from wetsuit type material and do not have a good life expectancy. In a heavy-use environment they may last as little as three months.

High quality mouse mats that are far more durable can be made from recycled materials. The Eco-Mouse mat is made from recycled tyres and is reported to last more than two years in a heavy-use environment. This mat is currently available on the Australian market and retails at around $15.

While using a durable mouse mat made from recycled materials instead of a cheap mouse mat is preferable from an environmental standpoint, ultimately even the Eco-mouse mat will end up in the waste stream.

A better alternative?

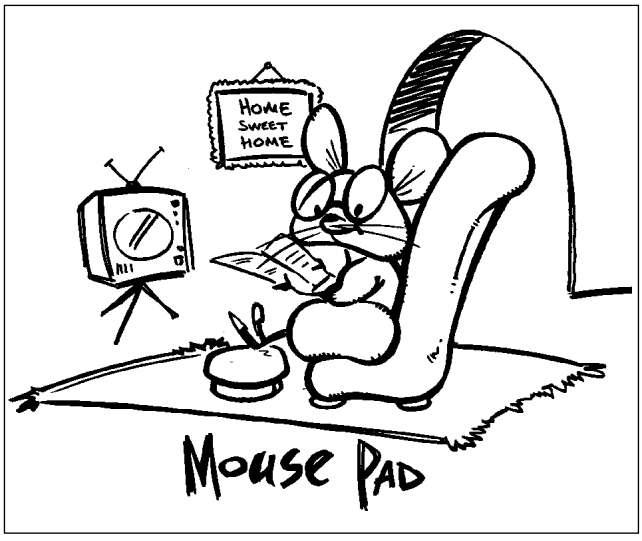
A new computer tool has just entered the traditional computer mouse market in the USA. This product may put an end to the waste by-products associated with using a computer mouse.

The product, developed by Alps Electric Company in Japan, is known as a Desktop GlidePoint. The GlidePoint mechanism has already been incorporated into a number of IBM compatible and Macintosh laptop computers, and is attached in the same way as a mouse. The GlidePoint requires less desk space than a mouse, with the total area required to operate it being only 11cm by 10cm.

The GlidePoint does not have any moving parts, thus there are no components to become clogged, eliminating the need for regular cleaning. Instead of rolling around a mouse or trackball, you use your fingers to touch the place on the GlidePoint pad that corresponds to the point on the screen that you want to move the cursor to.

'Clicking' the GlidePoint is done with a light tap of the finger, or by pressing one of the three programmed buttons. While the GlidePoint takes some getting used to, this is no different to the time taken by a new computer user to get the feel for a mouse.

The Desktop GlidePoint is designed specifically for PC or Macintosh desktop use. It is available in the USA for around US$80 (AU$100). The GlidePoint is a significant product from an environmental and computer users point of view, and should be available in Australia during 1996.



Cartoon by Zelco Zalac

Recycling with the Internet

THE rapid growth of the Internet and the World Wide Web has the potential to dramatically reduce office waste. However, the Internet is not yet recognised as a major source of information on how to reduce waste.

On the topics of waste reduction and recycling, the Web has become a rich source of information over the past few years. There are a number of specialist organisations that provide quality reports, analysis and data that are not readily available from other sources.

The Internet and the Web are possibly the most environmentally friendly means of communication available to the human race. There is also little doubt that the Web will become one of the most important means of communicating ideas and information on waste reduction and recycling.

Publication and communication

One of the world's leading recycling publications, *Resource Recycling*, is beginning to reap the benefits of the Internet, gathering US Government data and corporate information. They also transfer articles and files through email and receive subscription orders electronically.

Resource Recycling is taking three specific initiatives to interact with the Internet. The first is to produce a monthly column that will provide advice on how to use computers to gather recycling and composting information and to transact business.

The second initiative is the publication of *The Directory of On-Line Resources in Recycling and Composting.* This document lists hundreds of World Wide Web sites, email addresses, bulletin board systems, discussion groups and other resources relating to the recycling and composting.

The final initiative is to publish a detailed guide to Internet recycling resources. This guide will show the best ways to gather data and will also be a critique of the most popular information services on the Web.

Finding the best sites

Soft Technology also transfers articles via email as well as gathering information from the Internet. The ATA also has its own Home Page. This is full of fascinating information and has great pointers to other environmental sources on the Internet.

While there are many home pages on the Internet dealing with recycling, only a small number of these are particularly informative.

Two very comprehensive Home Pages are the New York based Global Recycling Network and the United Kingdom based Recyclers World. There are also a number of other Home Pages providing interesting recycling information. Some of the more informative are listed below.

Free software

While there is some excellent information available directly from numerous web sites around the world, some sites also have software that you can download. One of the best sites of this type is Planet Ark, which can be found at the URL below.

The main drawcard of this site is a piece of software called *The ARK Earth Disk.* This program is a great educational tool and can teach both adults and kids about the environment.☼

Wasteweb sites

Planet Ark
http://www.planet.ark.com.au/

Global Recycling Network
http://grn.com/grn

ATA
http://suburbia.net/~ata

Recyclers World
http://www.sentex.net/recycle

GreenDisk
http:imagelinc.com/greendisk

Remote Area Power Supplies

LANCE TURNER looks at the components that make up a renewable power system.

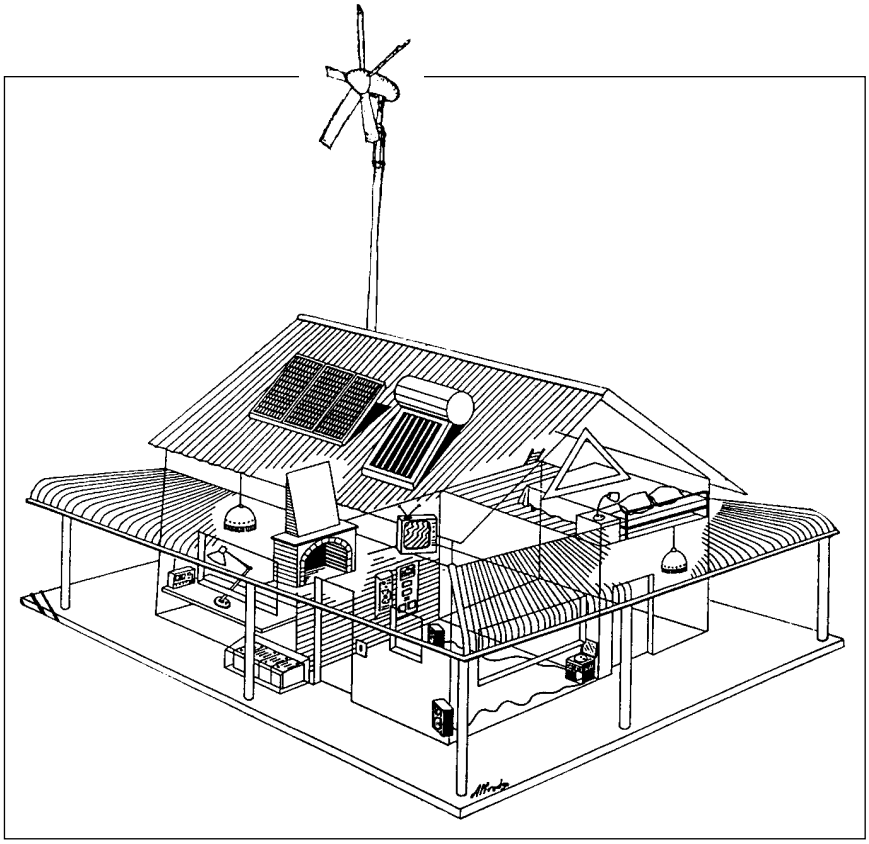
MANY people living in remote areas, and even some people in urban areas, rely on their own power generation systems to provide them with the electricity they need for everyday life. Power systems of this nature are generally known as remote area power supplies, or RAPS systems.

A RAPS system consists of a number of sections, all of which must work together to produce power reliably. A diagram of the various components can be seen opposite.

Firstly, there must be some means of generating the electricity. The simplest way is to use a solar panel (sometimes called a photovoltaic panel or PV panel). When exposed to sunlight, a solar panel will produce electricity – as simple as that.

Solar panels are rated in both voltage and the power they will produce at full sun. Most panels are designed for 12 volt power systems, and range in power from a few watts up to nearly 100 watts. Of course, by using many panels, higher voltages and power outputs can be achieved.

Solar panels are not the only type of power generation, though. Many RAPS systems use wind generators. As their name suggests, these convert the power of the wind into electricity. They are essentially a set of blades mounted on a central hub which is connected to a generator, either directly or through a gearbox. When the wind strikes the blades, it causes them to turn, thus turning the generator and producing power.



Water power

A third method of producing power is the micro-hydro generator. A micro-hydro generator consists of a turbine, such as a Pelton wheel or overshot water wheel, connected to a generator, similar to that used in a wind generator. Water under pressure is used to turn the turbine, thus producing power from falling water. This is the same system used by the huge machines that provide Tasmania with all its power, only much smaller, hence the name micro-hydro.

Storing electricity

While it is possible to use the power from the various power sources directly, it is usually more convenient to store the electricity for later use – particularly if you are dependant on variables like sun or wind. There are a number of different types of batteries that can be used for storing power in a RAPS system, although by far the most popular is the lead-acid battery. Cars use lead-acid batteries, but the batteries designed for RAPS systems are much larger and

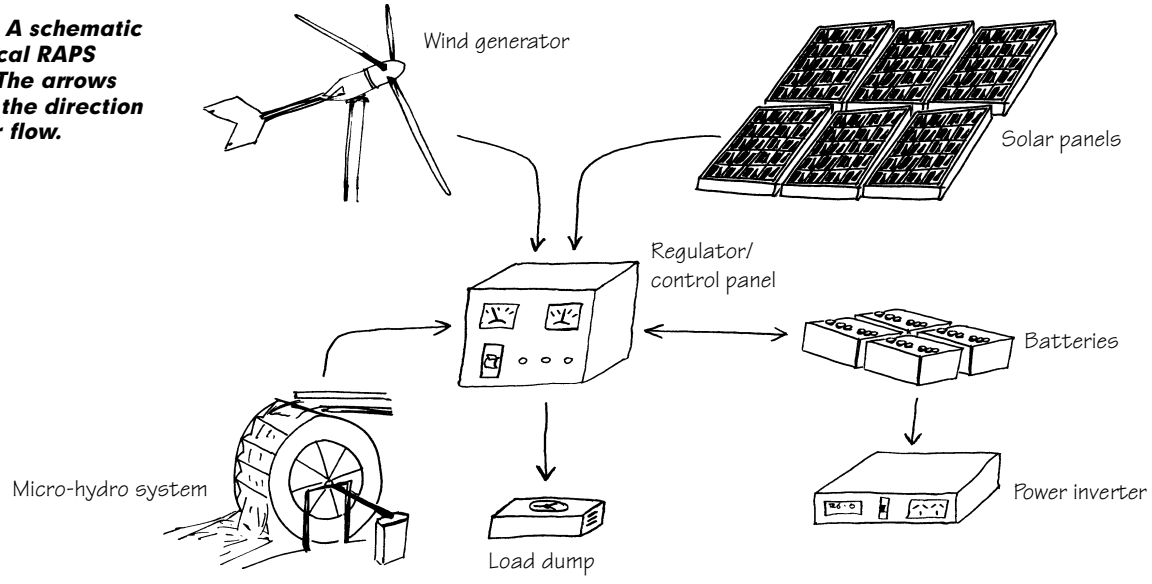


Figure 1. A schematic of a typical RAPS system. The arrows indicate the direction of power flow.

more powerful than the average car battery, and are far better suited to the task of storing large amounts of power.

Because the output voltage of most forms of power generation can vary considerably, a device called a regulator must be used so that the batteries are not damaged by excessive voltage. Regulators come in many sizes and types, but all basically do the same thing – they control the flow of power from the charging source into the battery, in some cases dumping the excess power elsewhere when it's not required for charging.

In some smaller power systems, the power is often used directly from the battery bank to power low-voltage DC (direct current) appliances. In many systems, however, the electricity is converted into 240 volt AC (alternating current) like the power found in mains grid-connected houses.

The device that does this is known as an inverter. Inverters come in different sizes and types, with power outputs of as little as 40 watts, right up to 5000 watt or larger monsters capable of running every appliance in the average modern home.

Hybrid systems

As its name suggests, a hybrid power system is one that generates its power from more than one form of energy. In the case of RAPS systems, a power system is considered to be a hybrid when it has electricity generated from both renewable and non-renewable sources.

The most common form of non-renewable power generation is the petrol generator. These are often used to supplement the power from the inverter when large appliances need to be run. In systems that have inverters large enough to cope with all loads imposed by the users, the generator is usually used to charge the batteries via a large battery charger.

Chargers used in RAPS systems are similar to those used to charge car batteries, but usually much larger and more sophisticated. They often contain features that prevent them from overcharging the battery bank, as well as from causing themselves damage by allowing too much current to be drawn from them. ☼

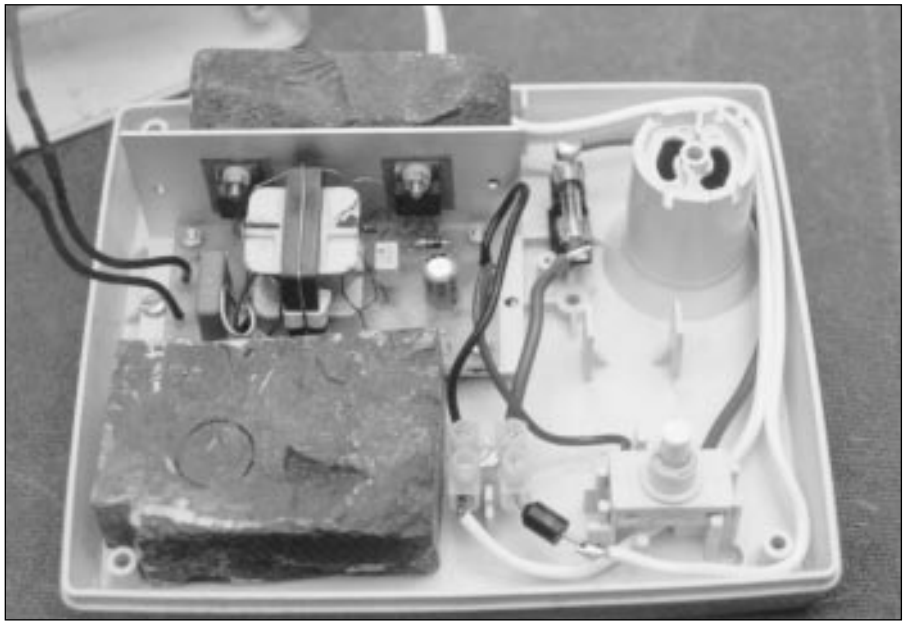
Convert a desk lamp to low-voltage

In this latest in the series of 12 volt home office articles, **LANCE TURNER** looks at converting the humble desk lamp.

THERE are three common forms of desk lamps: fluorescent, incandescent and quartz halogen. For an office that's powered from a renewable energy system, the first of the three is the best option. While most desk lamps are made to run from 240 volts AC, the conversion to low-voltage DC is simple and inexpensive.

To convert the lamp (or any fluorescent fitting) it is just a matter of replacing the 240 volt ballast and starter setup with a more efficient low-voltage fluoro inverter. These are available in many forms, both good and not so good quality. You can also build one from a kit of parts, available from many electronics component shops, which is what I did.

The first step is to unplug your lamp and then disassemble it to get to the ballast. For my lamp, a Hanimex brand model, I just had to remove four screws from the base.



This is the inside of the lamp. Note the blocks of lead used to keep the lamp stable and the diode at the front of the lamp (near the switch), which is used for reverse-polarity protection.

Once you have the lamp apart, you remove the original ballast (a big, heavy thing that looks like a flatpack transformer) and the starter. After doing this you will find that your lamp is considerably lighter. Indeed, you will probably need to add some weight to the base to prevent it from falling over. I did this by cutting two blocks out of a large block of lead and fixing them in place with screws through the base of the lamp.

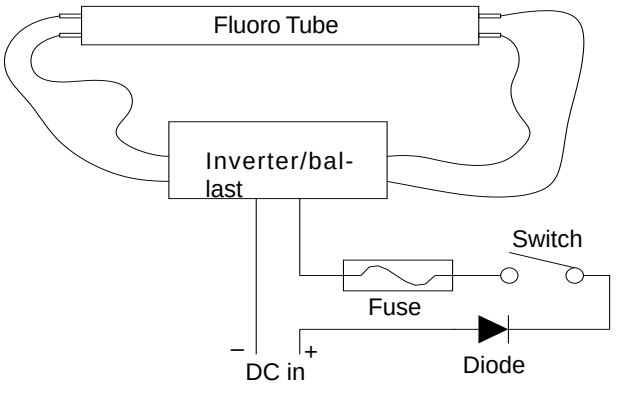


Figure 1. The circuit diagram for a typical low-voltage fluoro lamp. As you can see, there is very little to it. Note that the fuse is vitally important and must not be left out.

The next step is to fit the new low-voltage ballast into place and complete the wiring. The wiring diagram can be seen in figure 1. You connect the input power lead to the ballast via the lamp's original switch and a 2 amp fuse.

The fluoro tube can connect to the ballast in two ways, depending on what type of ballast you have selected. Some units will only have two wires, one for each end of the tube. In this case, you only need one each of the two original wires that run to each end of the tube.

Most of the more powerful ballasts will have two wires for each end of the tube, and you need to connect both for proper operation.

Warning

This project requires that you have a good understanding of the safety procedures associated with working on electrical power systems. If you have any doubts as to your ability to complete this project safely, we suggest that you get help from a suitably experienced person.

The publishers of Soft Technology take no responsibility for injury or damage caused by inexperienced people attempting this project.

If you have to make these connections by joining wires together, you must make sure they are well insulated in order to prevent shorts – there are high voltages present in these wires when the lamp is on.

Finally

The final step is to replace the original 240 volt plug on the end of the power cord with one that suits your power system. **You must never use 240 volt fittings for low-voltage systems – it is a disaster waiting to happen if you do!** Note that you could use a fused plug on your power cord, thus eliminating the need for a fuse inside the lamp itself.

Once you have finished, you simply reassemble the lamp, plug it in and turn it on. If it doesn't work, then you may have wired it incorrectly inside the lamp. The most common mistake is that you have transposed the positive and negative power wires, either in the lamp or in the plug. This is most likely if you use the original AC power cord, because it will not be marked with a trace for identification.☼

Parts list

- ☼ a fluorescent desk lamp
- ☼ low-voltage fluoro inverter to suit your system voltage
- ☼ fuse holder and 2 amp fuse
- ☼ a suitable low-voltage plug
- ☼ small blocks of lead or other heavy material
- ☼ connectors, solder, insulation tape, screws etc

Build Your Own

Hand-powered spin dryer

Lance Turner

WITH winter approaching it can be very difficult getting the washing dry on rainy days. Washing dries more quickly if you can remove as much of the water from the clothes as possible, before you hang them on the line. Wringing clothes can be difficult, even for the strongest person, especially when it comes to items such as blankets.

A hand-powered spin dryer would be the ideal solution, but there seems to be none available commercially. The only option is to make one.

To build a hand-powered spin dryer a number of things are required. Firstly, there is the spinner drum itself, which needs to be strong yet lightweight, as well as being completely corrosion-proof. This drum must sit inside an outer drum, which catches the rapidly flying water as it is spun from the clothes.

A recycled cycle

Of course, you also need some sort of mechanism that allows the inner drum to be driven easily and at higher speeds than you could normally turn a hand crank. This means that some sort of gearing is necessary.

Some other bits and pieces will be needed, such as bearings, shafts and assorted fasteners. All of these can be found in old equipment, or can be purchased new for little cost.

Parts list

- a front-loading washing machine (past its use-by date)
- an old bicycle or two different sized bike sprockets, chain, derailleur mechanism and pedal crank
- a piece of wood for the lid, about 500 x 220 x 30mm
- four wooden blocks for the bearings, 65 x 100 x 20mm
- four ball-race bearings, such as alternator bearings from a car mechanic or wreckers
- two steel shafts to fit the bearings
- four pieces of aluminium plate 50 x 40 x 3mm
- four furniture legs, about 150mm long
- two strong strap or 'T' hinges
- rubber doorstop, about 70mm long
- assorted wood and metal screws, nuts and bolts etc
- waterproof paint
- silicone sealant

Design overview

Figure 1 is a cut-away view of the machine. On top of the outer drum you have a lid that incorporates the drive and gearing system. Here you can see how everything fits together.

The spin dryer consists of the inner and outer drums and the bearing baseplate from an old front-loading washing machine (I used a Hoover Zodiac 12). These are assembled as they were in the original machine, but are mounted on four short legs so that the clothes are placed in from the top of the drum.

The lid containing the drive system sits on the top of the outer drum. It is hinged at one end so that it can be swung out of the way for easy access. The other end of the lid has a rubber doorstop attached that sits on the outer drum when the lid is closed, allowing the lid to sit at the correct height.

On the underside of the lid are two bike sprockets, a chain and a chain tensioner. On the top of the lid is the hand crank that is turned to provide the power to rotate the inner drum.

A close-up of the chain tensioning system. The small gear and arm were taken from the old chain derailleur.

The two shafts that hold the sprockets run through the lid and are supported by four bearings, two for each shaft, which are held in place by wooden bearing blocks mounted each side of the lid.

At the end of the shaft at the centre of the lid there is a metal bar that connects with notches in the lip of the inner drum when the lid is closed. This is how the drum is driven. While it sounds crude, it actually works quite well, with virtually no noise or vibration.

A bit of demolition

Now that you know how it works, we will look at putting it all together. This is a fairly long and involved process, but well worth the effort once you have used the finished product.

The first thing you must do is dissassemble the old washing machine. This involves removing the back panel and any other removable sections of the case. The internal components are then removed one by one, starting with whatever is easiest.

For the Zodiac 12, I removed the back panel, unplugged and unbolted the motor and removed it from the case.

I then removed the top cover, giving me access to the rest of the workings. Next to go were the control panel and front door. (The glass from the door was cleaned and put into service in the kitchen as a mixing bowl.)

The outer drum in this machine is held in place with two long shafts that mount to it via rubber blocks. The drum also has attached to it a large and heavy chunk of concrete that is used as a counterweight for unbalanced loads. This was removed, as were the drum supports, top springs and front seal; and the drum assembly was removed from the case.

The drum assembly

The next step is to separate the outer drum from the baseplate, by removing the twelve or so bolts around the flange and pulling them apart. This could take some force, as the seal will be stuck fairly tightly.

The outer drum will need some preparation before it is reassembled. If you wish your spin dryer to win points for presentation, you will need to remove the many brackets on the outside of the outer drum, which will require drilling out the spotwelds and chiselling the brackets off.

Now you must prepare the drum for sealing and painting. To make the paint stick, you have three options. You can have the drum sandblasted, sand it down yourself (this will take forever) or use a priming solution like *Easy Surface Prep*, available from hardware stores. This is the easiest way, you just wipe it on, leave for it a few minutes and wipe it off, leaving the whole thing to dry for a couple of hours.

Once you have done this you will need to fill any holes by soldering them up or using some paintable sealant and metal sheeting to make patches. When this is done you can prime the surface and leave to dry. The top coat is put on after all of the other modifications are finished.

The baseplate must also be modified so that water doesn't sit in it and go stagnant. I did this by cutting a sheet of plastic to fit inside the lip of the baseplate and sealing it into place. This effectively gave the plate a flat inner surface. The plate also had a hole and rubber tube for drainage.

The drive system

Now comes the hard part. You will need to start with a piece of board the same length as the outer drum is wide at its widest point (the outer drum is slightly oval-shaped to allow for the washing machine's original heating element). Starting from one end of the board, measure in the same distance as the drum's radius, and mark this point.

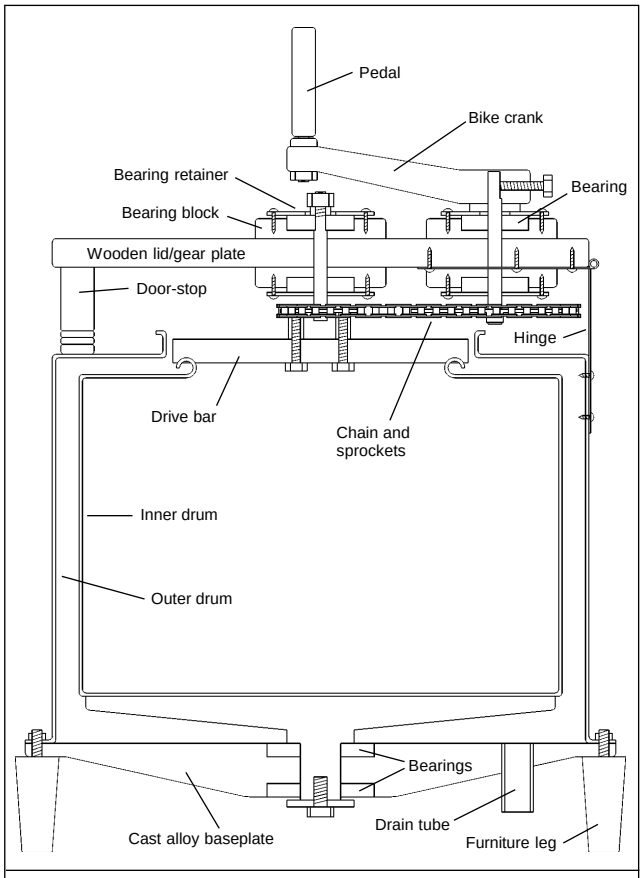
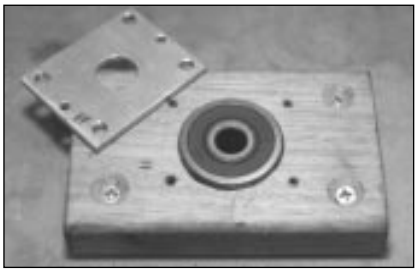


Figure 1. Cutaway view of the spin dryer. Note how the drive bar sits into the notches in the inner drum.



A close-up of a bearing block, with bearing in place. Note the aluminium bearing retainer plate.

Measure the radius of the larger cog and then measure in this distance plus 30mm from the same end of the board. Repeat these measurements on the other side of the board.

Mount the four bearing blocks, two on each side of the board, so that the centre of each one covers the centre marks that you have just made.

Drill two holes the same size as the shafts through the centre of the bearing blocks and board and push a shaft through each one. Place a bearing over each end of each shaft so that they rest on the bearing blocks. Mark around the bearings with a pencil and remove all bearings and shafts from the wood.

One end of the shaft that holds the small gear was threaded and had a smaller diameter than the rest of the shaft, allowing me to use two different sized bearings. The shaft is placed through the top bearing and a small spacer and locking nut secures it into place, preventing any movement up or down.

You will need to machine out some of the wood so that the bearings sit most of the way into the bearing blocks. I did this by removing most of the material with a drill bit in a series of holes and then finishing each hole off with a reamer bit. A router would work just as well. Be sure to make the holes just big enough to take the bearings without slop. Note that you may have to remove a bit of extra wood near the centre of the hole to prevent the centre section of the bearing from rubbing.

The bearing retainers are just pieces of 3mm thick aluminium plate large enough to cover the bearings. They have a hole in each corner and a large hole in the centre to clear the shaft. These are held to the bearing blocks with four self-tapping screws.

Gears and things

The next step is to attach the gears to the shafts. For the large gear I used a 40 tooth gear and hub after removing it from the pedal crank assembly. For the smaller gear I used a seventeen tooth gear removed from the bike's rear gear cluster.

I attached both of these gears to their respective shafts by first attaching them to a flanged plate that I salvaged from the washing machine. I silver soldered the small gear to the plate and bolted the large gear to its plate. I then attached the flanged plates to the shafts by silver soldering them into place.

The chain tensioner was made from a small gear, a plate and pin assembly and a spring and retainer clip salvaged from the bike's derailleur setup.

Nearly finished

The two final parts to be made are the drive bar and the crank handle. The bar is made from a piece of 16mm square metal tube. It is attached to the smaller gear with two 6mm bolts that screw into two tapped holes in the gear plate. I used two 10mm high spacers to give the bar adequate clearance for the chain.

I drilled and tapped the pedal crank to take a 6mm bolt to allow it to be attached to the drive shaft. The handle was made from the plastic pedal cut and filed to be a comfortable handgrip.

At this stage you will need to cut two notches in the rim of the inner drum, wide enough for the drive bar to sit into, as well as drilling about a dozen small holes in the lowest point of the drum for drainage. You must also attach the two hinges to the lid board, as well as the doorstop to the other end.

Final assembly

The lid and drive system needs to be fully assembled and checked to make sure the chain runs smoothly.

Put the two drums and baseplate back together, omitting the seal between them. Place the lid assembly on top of the outer drum and position it so that the drive bar sits in the notches properly for all positions of the inner drum as it rotates. Now drill holes in the outer drum for the hinge screws, and screw them into place. You may also have to adjust the length of the doorstop at the other end of the lid by cutting it down.

Once everything is in place, you can test the spin dryer by holding down the lid with one hand while turning the hand crank with the other. The inner drum should turn quickly and smoothly, with little vibration. If it shakes or vibrates, then the centre of the drive shaft is not in line with the centre of the drum.

If all is well, it is just a matter of disassembling everything and painting the wood and outer drum with two or three coats of waterproof paint. You will also need to paint the shafts and drive bar with some sort of metal paint where they were cut and soldered. I used a zinc-based paint for rust protection.

When the paint is dry, it is just a matter of reassembling the whole thing and getting to work on those wet clothes.☼

These are the components of the drive system. Some bike parts and a few other components are all that's required.

Build your own MEGA-LED Torch

A rechargeable battery and a powerful array of LEDs (light emitting diodes) make a torch that really does outlast all the others. What's more, the light output won't decrease as the battery discharges.

Lance Turner

THE MEGA-LED torch, as it has been christened, consists of a conventional 6 volt lantern-style torch body that has been modified to take new components. In place of the standard light there is a high-brightness LED array, while the 6 volt zinc-carbon or alkaline battery is replaced by a 12 volt sealed-lead-acid unit.

Also, by including a circuit breaker between the battery and the charging jack, the torch is able to be used as a small 12 volt power supply.

However, the best part of the design is a clever little circuit that takes the steadily decreasing voltage from the battery as it discharges and converts it to a fixed voltage to drive the LED array.

What will you need?

Firstly, you will need a torch. The one I bought from McEwans was a very robust sort of beast, made of high-density polyethylene or a similar unbreakable plastic. What's more, the torch was a waterproof model, similar to a *Dolphin*. The price was the best part, however, setting me back less than six dollars.

The next thing I purchased was the battery. *Jaycar Electronics* sells a 12 volt, 1.2 amp-hour sealed-lead-acid battery for $28.50. This battery proved to be ideal for my purposes, being the same length as the 6 volt unit it was replacing.

As mentioned earlier, the LED array (which we will discuss in a moment) is driven by a DC to DC converter circuit that provides it with a stable voltage. Unfortunately, this type of circuit is not so readily available off-the-shelf. But after a quick flick through some of my electronics catalogues I found a design that was published by *Silicon Chip* magazine a few years back. This circuit was actually designed to charge a sealed-lead-acid battery from the varying voltage of a car's electrical system. However, I saw no reason why it could not be used for the purpose I had in mind, so I bought the kit of parts, also from Jaycar Electronics. The cost was $24.95, not bad really.

Also required were a charging socket and a small 4 amp circuit breaker. The socket costs about $2, while the circuit breaker costs around $6.

An alternative design

If all of this is starting to sound a bit expensive for a torch, it should be mentioned here that you can in fact leave out the DC to DC converter circuit if you wish, although your torch will suffer from decreased light output as the battery discharges. Remember also that

Warning

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The publishers of Soft Technology take no responsibility for injury or damage caused by inexperienced people attempting this project.

the torch doubles as a power supply, so you're not just paying for a torch.

The only thing left that I required was the LED array itself. There are two ways that you can get one of these. You can either buy one directly from *Jade Mountain Inc* in the US (the only source I know of at the moment) or you can assemble one yourself. Because I already had one, I used an array from Jade Mountain. This is actually quite a compact device that is designed to directly replace incandescent globes in 12 volt power systems.

Making an array

If you don't want to buy the array ready-made, you can assemble one from a series of high-brightness amber LEDs and a few resistors. These LEDs are now available from *Oatley Electronics* for $2.50 each. How many you use is up to you, but before deciding this you will need to decide whether you are going to use the DC to DC converter circuit to drive them.

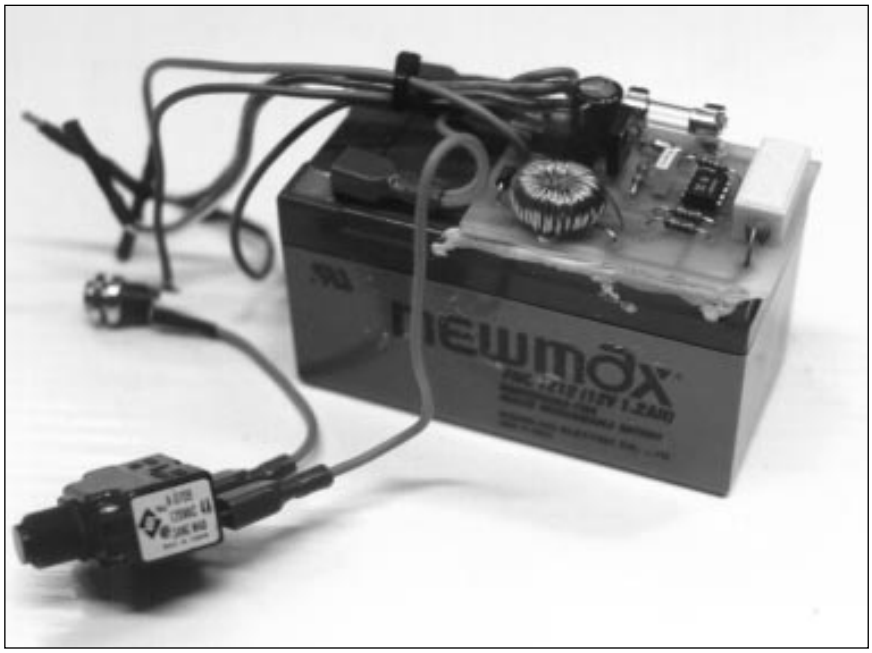
If you are not going to use the converter circuit, then in order to have reasonable light output over the entire discharge range of the battery you will need to use a number of strings of three LEDs wired in series, each string having its own current-limiting resistor.

If you are using the circuit you can use five or possibly six LEDs in each series string with smaller value resistors. This means a more efficient use of your power and less drain on the battery.

Once you have decided whether to use the converter circuit, you will be able to decide how many LEDs you wish to use. The array I used has eighteen and puts out a good level of light. The easiest way to make the array is to use a small, roughly circular piece of veroboard or matrix board and solder the LEDs in place.

Parts list

- a Dolphin style torch
- 1.2 amp-hour, 12 volt sealed-lead acid battery
- voltage step-up circuit (optional)
- LED array
- 4 amp miniature circuit breaker
- 2.1mm DC coaxial socket (charging jack)
- styrofoam for packing of battery
- assorted connectors, heatshrink tubing, solder etc.



Here is the 'guts' of the MEGA-LED torch. The circuit board is attached to the top of the battery. The circuit breaker can be seen at the bottom left of the photo. As you can see, the circuit board has its own fuse.

The resistor for each string can be soldered to the back of the board to save space. Once all of the connections have been made, the cathodes of the last LED in each string can all be joined together, as can the free end of each of the resistors. Two wires can then be soldered to these two points for connection to the battery or converter board. I made the wires in my torch about 15cm long, to allow for twisting when the reflector is screwed onto the torch case.

Putting it all together

I started by fitting the LED array into the reflector of the torch in place of the bulb. Because the array is larger than the original bulb holder, I had to remove the metal plate that the holder screwed into and then enlarge the hole in the reflector with a tapered reamer. If you don't have one of these, then a series of increasingly larger drill bits or a round file should do the trick. Just be careful not to damage the reflective coating.

The body of the array will also need to be modified to reduce its length. I unsoldered the brass screw section and prised it from the body of the array, being careful not to damage the leads inside the unit. I then cut the plastic body down, removing as much of it as necessary to allow the array to clear the battery when the torch was assembled. The modifications were finished by connecting two wires to the leads inside the array and sealing the whole thing with hot-melt glue.

If you are using a homemade LED array you probably won't need to enlarge the hole at all. You would simply pass the wires through it and then glue the array into place in the reflector.

Either way, the array will need to be positioned as far back into the reflector as possible.

The converter

The next task is to build the converter circuit, if you are using one. If not, then move onto the 'Final assembly' section.

The converter circuit is assembled on a circuit board that is small enough fit inside the body of the torch when com-

pleted. I will not describe the construction of the circuit board here as you get full instructions with the kit. However, in order for the circuit to fit properly you will need to make a slight alteration or two.

You must make sure that all of the components are as close to the board as possible. You will also need to clip the component leads on the solder side of the board as close to the board as possible without weakening the solder joint too much. This keeps the board small enough to fit into the space inside the torch body.

The only other modification that needs to be done to the circuit board involves the positioning of the high-speed switching diode. If left standing upright it will be too high to fit inside the case. On my board I just bent it over until it was low enough, being careful not to damage it.

Final assembly

Once the board is completed (with connecting wires already soldered into place) it can be attached to the battery. I did this by positioning it on top of the battery at the opposite end from the terminals and gluing it into place along its edges with hot-melt glue.

Buying the parts

6 candela amber LEDs are available from Oatley Electronics for $2.50 each. They can be reached at ph:(02)579 4985 or PO Box 89, Oatley NSW 2223.

Jade Mountain, of Colorado in the US, have amber LED arrays. They also have a new array that contains three blue and nine red LEDs that combine to produce a whitish light. Both of these arrays are priced at around US$50 plus postage. You can contact them on fax:0011 1 303 449 8266, PO Box 4616, Boulder CO 80306-4616 or email: jade-mtn@indra.com.

The inverter kit, battery, charging socket and circuit breaker etc can be bought from Jaycar Electronics. For mail order, call ph:1 800 022 888. In Melbourne call ph:(03)9663 2030, for Sydney call ph:(02)743 5222.

Once the glue had set I connected the two input wires to the battery (which will also need two wires for connection to the charging socket) via the original switch. I fitted miniature insulated plugs and sockets to the various wires to make assembly and disassembly easy. You could use automotive 'bullet' connectors if you have them.

The type of charging socket you use is your choice, but it will need to be small to fit inside the case, as will the circuit breaker. I used a standard coaxial DC socket. The negative wire from the battery is soldered to the outer terminal of the socket, while the positive wire is connected to the centre pin of the socket via the miniature circuit breaker. You can then insulate the connections with some hot-melt glue (handy stuff really).

I then slid the whole assembly into place, making sure that the wires were positioned correctly. The circuit breaker and socket were then fitted through holes drilled in the case.

To make the battery and circuit board assembly a snug fit inside the case I used five layers of corrugated plastic board that I cut from an advertising sign that the local real estate agent had hung on our fence without permission. I laminated them together and pushed them into the case between the battery and the side of the case, underneath the circuit breaker and socket. Styrofoam is also ideal for this purpose.

The last step is to connect the wires from the board to the switch, and also to the LED array. If you have not used the converter circuit board then the connections are much easier. You just wire the battery directly to the LED array via the switch.

Once this is all done, the torch is just about finished. All you need do is give the battery a full charge up and you're away.

Charging up

A few things need to be mentioned before we finish. Being a sealed battery, it must be charged by a voltage of no more than 14.4 volts. This means that you should not charge your torch directly from a plugpack or solar panel without a regulator. You could charge it directly from a 12 volt power system if it also uses sealed batteries, as mine does. If it uses flooded cell batteries, which charge to 15 volts occasionally, then you could charge the torch via a power diode, which will drop the voltage by the necessary amount.

Finally, if you are really clever, you could fit a switch so that in one position it allows the battery to run the LED array via the converter circuit, and in the other position the connections could be such that the battery is charged via the converter board (remember, this circuit was originally designed for just this use). This would make the torch about as clever as it could be!

Performance

How does this torch design perform? Well, as you would expect, the light doesn't look quite as bright as the globe it replaced because of its orange-yellow colour. However, I have found that it is easy to get used to this colour of light, and the level of illumination is more than adequate for general use. What's more, the orange light does not cause you to lose your night vision like white light does.

What sets this torch above most others is its running time. Depending on whether you use the Jade Mountain array or your own that is more tailored to the circuit you have used, and whether or not you have implemented the converter circuit, you should get between eight and sixteen hours of light per charge. If you use the torch only intermittently, the running time will be extended due to the ability of the battery to 'recover', as most batteries do.

So there you have it. While not cheap, this torch is not only a rugged and reliable replacement for many conventional torches, but has the advantages of unlimited globe life, no throw-away batteries to worry about and the ability to run all night if required. What's more, you will also have a 12 volt power supply for running small low-voltage appliances. ☼

'Softer' Garden Lighting

You can build a simple solar garden lighting system that can be used in any garden and won't cost the Earth.

Brian Bartlett

MY inspiration to construct this garden lighting system came from a trailer full of goodies bound for the local tip. I decided to sift through the 'junk' to see what might still be useful. At the end of my rubbish rescue I discovered that only about ten per cent of the contents needed to be thrown out, with the rest either being suitable for mulch or for reuse elsewhere.

Amongst the reusable items were four plastic legs from a childs desk set. These were ideal for my project. Unfortunately, the legs were yellow, but a quick coat with some heritage green paint made them more garden compatible. Offcuts of 50mm plastic pipe would be equally well suited. Also found in the junk was a selection of empty glass jars. Looking through these revealed two different types that were perfect for the weatherproof light cover that was part of my design. To improve the appearance of the jars, they could be etched or lightly frosted. This also lets you add that personal touch to the look of your lighting system.

To ensure all-night operation of the system, it is critical that you choose the right type of light globe. I found a model available from the Rainbow Power Company that was ideal for my needs. Their 12 volt 'night light' uses a mere 60 milliamps, or roughly 0.75 watts each. It also fits into a standard batten holder (which ordinary 240 volt globes use). Rainbow also have 12 volt, 5 watt halogen globes with adaptors to suit the same fitting for situations where more light is needed.

System design

I decided to base the system on a 15 watt solar panel. The output of this size of panel would be sufficient to provide enough power for a four-light system similar to those sold in supermarkets. However, the design presented here is far

Warning

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Parts List

- 4 x plastic pipes, 600mm x 50mm diameter, or bamboo torch poles
- 4 x glass jars to fit the pipes
- 4 x 0.75 watt 12 volt globes
- 4 x batten holder light globe bases
- Twin core 1mm² cable
- 1 x 12 volt or 2 x 6 volt, 10 amp-hour or larger rechargeble batteries
- 1 x 15 watt or larger, 12 volt solar panel
- voltage regulator to suit battery
- timer or light-controlled switch
- insulation tape
- waterproof paint of your choice
- 1 x fuse holder and 2 amp fuse
- assorted connectors to suit wire

less energy hungry than commercially available models, which use globes in the 4 to 9 watt range.

If we assume that the solar panel will receive an average of around five hours of sun per day, then we have around 75 watt-hours of energy to play with. In winter, and in far south locations, a fifteen watt module may not be sufficient. In these cases, a 20 watt module would be more suitable, or a timer limiting the operation of the lights to between four and six hours per night could be installed. Arlec make a unit designed for outdoor use which would be suitable for around $29.

My intention for the system was to allow the 0.75 watt lights to run all night and allow an additional (optional) light of 5 watts to be added at a strategic location. This would be controlled by a movement detector to illuminate a set of steps or similar area for periods of 30 seconds or so.

To find our total power consumption per day, we must do a bit of arithmetic. If we multiply 0.75 by four (the number of lights) we get a load of 3 watts. Allowing fourteen hours of operation per day we get a resulting power requirement of 42 watt-hours per day. This is well within the power provided by our solar panel, even after battery charging losses are accounted for.

A 12 volt, 3 watt lighting system draws 0.25 amps. So our battery would need to supply 0.25 amps for 14 hours per day. This means a total drain of 3.5 amp-hours per day. Our 15 watt solar module supplies, on average, about 0.9 amps for five hours per day, which equates to 4.5 amp-hours per day. This provides enough power to allow for losses which occur during the battery charging process and ensures a full charge is delivered, promoting long battery life.

Storing the sunshine

The choice of battery to store the solar energy for night time use is not especially critical, but I would recommend using a 10 amp-hour gel cell sealed-lead-acid battery for a low maintenance installation. You could use either one 12 volt or two 6 volt batteries connected in series, although a cheap car battery could also be used.

A regulator to prevent overcharging will also be required. A simple shunt-type regulator would be sufficient for the task, although almost any type of solar panel regulator would suffice. If using a sealed-lead acid battery, you must make sure that the battery voltage is limited to 14.2 volts. A simple regulator that will do the job was described in Soft Technology #49.

A timer or light-controlled switch, to allow operation only at night, is a must. These can be bought from a number of sources. A commercial model is available from Arlec. Jaycar Electronics sells pre-built modules, without cases, for around fifteen dollars. There are other alternatives, such as the simple light detector kit from Dick Smith's *Funway 2 series*, which costs around ten dollars.

A low-voltage cutout device may also be a good idea to protect the battery. These are available from renewable energy installers, or in kit form from electronic component shops.

Notes

The fuse is the most important component. Do not leave it out. A 2 amp fuse should be sufficient.

The lights connect between the positive (after the timer/light detector) and negative battery wires.

If you wish to connect a set of commercial garden lights, a much larger solar panel and battery will be needed. A 75 watt panel and 100 amp-hour battery would be suitable. Components this size would be good investments, as they would have other uses, such as for camping. You would also require a correspondingly larger regulator and fuse.

A 'self-regulating' type solar panel should still have a regulator fitted. A simple shunt regulator is fine.

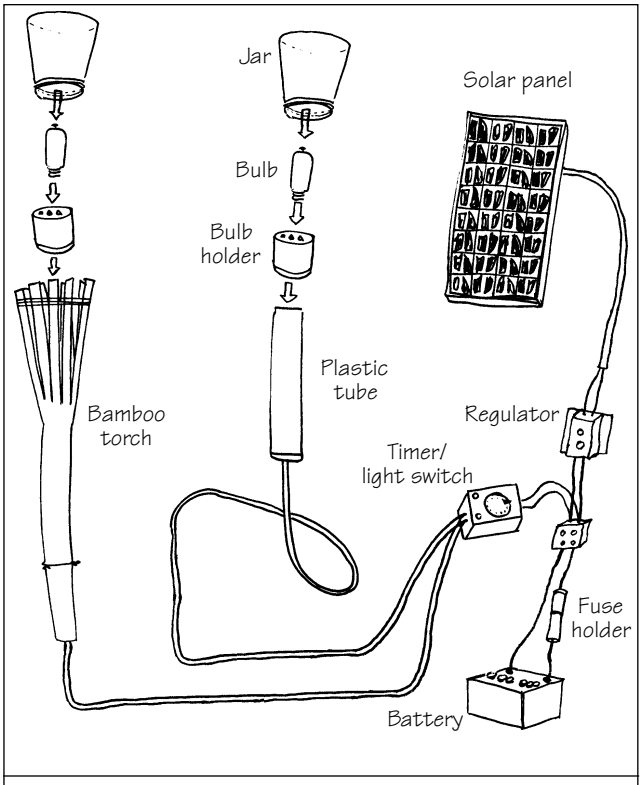


Figure 1. Wiring diagram for the garden lighting system. As you can see, it is very simple. The fuse must not be omitted, as it protects the wiring and battery should a short circuit occur.

Constructing the system

If you're using a length of poly pipe for your light posts, you will need to cut it into suitable lengths (450 to 600mm). I also found a perfect alternative to plastic at our local supermarket – some 40mm bamboo poles (hollow) about 1.8 metres long, each topped with a torch designed to be filled with kero. These are ideal for this project and only cost about $3 each.

The centre piece of the batten holder is removed from the base (which is not used) and the retaining collar screwed back on. The collar is then enlarged by wrapping sufficient insulation tape around it so that it's a snug fit inside the top of the pipe. Now thread a length of twin-core, double-insulated cable (long enough to run from the lights final position in the garden to the battery), with a conductor area of at least 1mm² or larger, through the pipe and connect it to the light socket. Push the light socket into the pipe so that the top is level with the top of the pipe. The light globe can then be fitted.

Place one of the glass jars that you will use as the cover over the pipe, lower it so that it clears the globe by at least 25mm, and mark where the end of the jar comes to on the pipe. Wrap insulation tape around this point so that the neck of the jar fits snugly onto the pipe. More tape can then be wound over the pipe and thread section of the jar to keep the jar in position. For my system I then fitted a painted coffee can lid (from a 200g tin) upside down on top of the jar to improve the appearance of the light. Once that was done, my lights were ready to be installed.

Wiring Details

To finish your system, the lights need to be placed in appropriate parts of your garden. You then simply run the cables underground to the battery enclosure and connect them and the other components as per figure 1. Once this is done, the system is complete.

The solar panel needs to be placed in a position where it is not shaded for any significant part of the day, otherwise it will not provide the power expected of it.

Other ideas

The wonderful part about solar energy and low-voltage DC wiring is its simplicity, reliability and relative safety compared with 240 volt AC. The calculations shown above are almost identical to those used in designing a system big enough to run a whole house. It's just that the numbers get bigger.

This article should show you how simple solar power can be. So, why not design a few other small power systems for your house, such as a system of emergency lights for when blackouts occur? There are also many other possibilities, such as shed power systems and garden water features. In fact, just about anything electrical can be powered from the sun. What's more, using solar power in place of mains electricity is not only safer, it can save both your money and the environment. ☼

Q and A

All gas or boosted solar?

Under Melbourne conditions, is a solar water heater more efficient than a gas-fired, instant-heat water heater system? That is, does boosting a solar hot water storage tank use more energy than heating only the water you use, when you use it?

Ken Machin, Blackburn VIC

Different types of water heaters have different heat input and heat loss mechanisms. A storage water heater, be it electric, gas or solar, will lose heat from the storage tank (standing losses). This heat loss is proportional to the surface area of the tank – bigger tanks have a greater heat loss.

A gas heater will also have some losses in the combustion of the gas and in the transfer of the heat from the gas to the water. This is the only significant inefficiency in an instantaneous gas heater.

A good-quality boosted solar water heater will provide the hot water required for a typical family in Melbourne using 60 per cent less conventional energy than a non-boosted storage water heater. While most solar water heaters use electricity to boost the water temperature, there are now some that use gas.

Therefore, a good-quality gas-boosted solar water heater, which uses about 60 per cent less gas than the average gas water heater, will use about 35 per cent less gas than an instantaneous gas water heater.

Ken Guthrie, *Energy Victoria*

BP SOLAR, manufacturer of solar cells, modules and systems for ten years in Australia, have added their skills and experience to ours to help answer your questions about solar power systems.

Bill Slade and Lance Turner are here to answer your general technical questions.

We do our best to answer all questions sent in, but space is limited, so try to keep your questions short.

Please keep in mind that every situation is different, so the answers given here may not necessarily be perfect for you. If you are in any doubt, we advise that you seek the services of a qualified person who can come to you.

Send your questions to:
Soft Technology
247 Flinders Lane,
Melbourne VIC 3000

Solar downlights

I have just finished extending my house and, all-in-all, I think I did a fairly energy-efficient job, with windows, eaves and material selection.

The one small problem is that the kitchen is fairly dark and we end up having the three 50 watt, 12 volt lights going most of the day. The lounge room is also lit by three similar lights.

I have a north-facing roof that would be perfect for solar panels, which I'm sure could collect enough energy to drive at least one set of the lights.

The problem is that I have the lights on dimmers and I have no idea how to combine dimmer switches, a 12 volt battery bank, solar panels, mains-powered 240 volt to 12 volt transformers and the lights.

The dimmers operate on 240 volts AC and time slice the power into the transformers. I'd need a control unit that observed the feed from the transformers, looked at the battery bank and/or solar feed to see if it could get the same power from them, and did so if it could. All the time preventing the batteries from being charged from the mains, which is just a waste of energy.

Greg Wilkins,
mortbay@ozemail.com.au

Unfortunately, halogen downlights are inefficient by design. They throw the light in only one direction and you have to rely on reflection to disperse it. The best bet is to replace them with compact fluoros, in either standard battenholder or long downlight fittings if you want the same effect as the halogens.

By doing this you will have to provide no more than 60 watts of power to the lights instead of the 150 watts that the halogens draw. This is a huge difference, especially if you are thinking of powering them from solar.

Solar panels still cost about nine to ten dollars per watt. This means that if you want to power 150 watts of lighting for ten hours (1500 watt-hours), you will need about 300 watts worth of solar panels, or upwards of $2700 worth! (300 watts multiplied by six hours of sun per day multiplied by 0.8 for battery losses gives 1440 watt-hours).

You mention that your transformers are connected to light dimmers. This can be a bit of a risk, as some of the cheaper ones can overheat when run on non-sinusoidal waveforms such as the chopped waveforms from light dimmers.

It would be very difficult to combine the AC output of the transformer with the 12 volt DC from a battery bank, even after rectification, as the transformer's voltage varies greatly but the battery's doesn't. The best solution would be to charge the battery bank from solar panels and a 12 volt battery charger that kicks in when the batteries get low. The halogens would be fed directly from the battery bank. Dimming would be done using a simple pulse-width-modulation device, similar to the one in ST#55.

Lance Turner.

Noel's Treasures from Trash

Build a Cretan Windmill

This is a very different type of windmill. It is made in the same way as the windmills of ancient Crete, using fabric sails instead of rigid blades, although the materials used are a little bit more modern.

WINDMILLS of this design were originally used to grind grain to make flour. They were made from simple materials and were used in Crete and the Greek Isles, where the wind usually blew from the same direction. For this reason, the windmill design didn't have a tail.

If the wind was too strong, the sails were reefed (made smaller) by wrapping them around the radial arms of the windmill.

Construction

Start by cleaning the bicycle spokes and then bending the hooked end of each one into a loop about 10 millimetres in diameter. Next, mark the centre of each end of the cork and push one of the spokes through the centre until the loop stops against the cork.

Now mark six evenly-spaced points around the cork, about 5mm from one end. Make a small hole at each point and screw each of the spokes into the cork, making sure that they lean slightly towards the other end of the cork.

Thread the twine through each of the loops in turn, pulling it tight enough to be firm but not so as to bend the spokes, and tie it into place. Now tie a piece of twine across each opposite pair of spokes, passing the twine through the loop in the centre of the cork as you do so. After making sure that the spokes are evenly spaced, you can fix the twine in place with a dab of glue at each spoke.

You will need

- a large cork
- 7 bicycle spokes or 300mm lengths of stiff wire
- 5 metres of string or twine
- some light cloth (old sheets), about 720 x 400mm
- a drinking straw
- some fencing staples or 'U' nails
- a needle and thread
- sewing pins
- 6 paper clips

Tools

- strong pliers
- scissors
- glue
- a biro

Making the sails

Cut the cloth into six triangles. These will be equilateral, ie all three sides are the same length – in this case 240mm – with the corners each having an angle of 60 degrees.

Position one of these sails into the corner made by one of the radial arms and the circumferencial twine, folding about 10mm of each edge of the sail over the spoke and twine. You can fix these into position on the spoke by sewing or glueing them.

If you don't require adjustable sails, you can fix the other edge to the twine the same way as to the spoke. If you want your sails adjustable, use one of the paperclips to hold the sail in place. Now use the same method to attach the other five sails.

Finishing touches

Slide the straw over the centre spoke and screw on the spoke retainer with the flat side towards the straw. The Cretan windmill is now finished. You may like to mount it in the garden on top of a pole. You can do this by hammering a couple of fencing staples into the pole over the straw, making sure that they are loose enough to allow the windmill to turn freely.

This type of windmill will turn in the same direction, regardless of whether the wind comes from the front or the back of the windmill. Why do you think that is?☼

Issues

This new column will keep you up-to-date with news on renewable energy and appropriate technology developments in government and industry

National market gives green light to renewables

Massive changes are underway in the Victorian electricity industry. The privatisation push is associated with the Kennett Government, though it was preceded by corporatisation reforms under previous Labor Governments.

The process of setting up a 'national grid' in the eastern states has been underway for about four years and is now gathering pace. The proposed market structure is being defined and refined by policy developers from state and federal jurisdictions. They are each represented on the National Grid Management Council (NGMC), the engine for creating the national electricity market.

The market code, although still the subject of hot dispute by the different sectors of the industry, has been refined by an extensive industry consultation process to the point where the market will soon be open for business, albeit in a transitional mode. The market will be operated and administered by NEMMCO, the National Electricity Market Management Company.

So what relevance does this have for potential renewable energy producers? Surprisingly, the answer is 'quite a lot': with a bit of prodding from the Federal Department of Environment, Sport and Territories, the NGMC has broadened the definition of electricity generators in the industry code to acknowledge a role for intermittent small-scale production from sources such as wind, solar and micro-hydro.

In trying for eighteen months to formalise financial arrangements for grid connection and sale of energy from the Breamlea wind generator, it has become apparent to me that the Victorian market rules are lacking in detail on how to handle small-scale generators. It is to the credit of CitiPower and Powercor that they have allowed network access and energy trading from Breamlea in the absence of formal arrangements. However, this is not the sort of commercial environment to encourage the development of large-scale wind farms: there is too much uncertainty for any new proposal to get off the drawing board.

The national code could be in force as early as 1 October 1996, at which point it will be theoretically possible to write to a local distribution company and propose connecting your renewable energy system to the national grid.

Not surprisingly, there is a raft of technical requirements for meeting acceptable standards of power quality. There are also requirements for generator protection and system security. Presumably, if you are not an electrical power engineer, you may need a consultant to check your system and assist you in negotiations with the distribution company.

The recent amendments to the national code seem to give a free hand to the networks to determine your technical requirements. The goodwill of your local distribution company will therefore be crucial. The value of your energy to them will depend on how far you are from major population centres (the further the better), and how much it is worth as a public relations exercise to be seen to be promoting renewables. The national market may well be providing another stimulus to the value of renewable energy: any Victorian distributor wishing to compete in the New South Wales market will have to comply with the NSW Government's requirements for reduction of greenhouse gases.

What scenarios are likely to be economic? If you have an existing three phase induction generator being powered by hydro and are currently dumping large amounts of energy into a dummy load, you probably have the ideal setup for feeding power into the grid. Just about any other scenario, short of a full-scale wind farm in remote coastal locations, is something you would only do for its value to you in reducing the greenhouse effect. This is because all photovoltaic and most small wind turbine systems require a very expensive grid-interactive inverter to be able to feed excess energy back into the grid. If your distribution company is willing to pay a price for your excess energy similar to the price they charge your neighbours, then the benefit of not having to have a large battery bank replaced every 5 years or so, and indeed, not having to buy one at all, would eventually repay the cost of your grid-interactive inverter.

— Michael Gunter
Manager, Breamlea Wind Turbine

NSW reforms

The Australian Electrical Supply Industry (ESI) has been through a considerable shake-up in the last few years. In NSW and Victoria, former monopoly state-owned entities have been split into a bewildering array of bodies responsible for generating, transmitting, distributing, selling and buying electricity. While in Victoria this has almost killed off the SECV's innovative programs, the reform process in NSW has placed far more emphasis on lowering greenhouse gas emissions caused by electricity generation.

The electricity reform statement released in May 1995 by the NSW Minister for Energy – Mr Michael Egan – states as one of its three major aims 'to recognise the major impact that the electricity industry has on the environment and to ensure that the reforms maximise environmental outcomes, support environmentally friendly technologies and promote energy efficiency'. Heady stuff from a state that has traditionally generated almost all of its electricity from black coal and which, at one stage, overestimated demand growth to the point of needing to mothball the A$1800 million Mt Piper power station for several years.

The statement goes into some detail about why we have large coal-based power stations rather than more renewables and more efficient use of energy. It also identifies the role for government as 'markets cannot always be

relied upon to fully incorporate environmental considerations.'

Feeling virtuous about market intervention, the State Government has taken two welcome steps.

The first is Schedule 2 of the Electricity Supply Bill 1995. This sets out the licence conditions for electricity distributors under the new regime. In what is believed to be a first for Australia, this requires the licence holder to develop strategies to achieve the reduction of greenhouse gas emissions and publish annual reports on its progress in this area. The utility must also develop 1, 3 and 5 year plans for energy efficiency, demand management and the purchase of energy from sustainable sources including cogeneration, renewables, buy-back schemes from grid-connected PVs and remote area power systems.

The state government also set up a Sustainable Energy Fund Working Group tasked with – quoting from its final report – identifying how to 'intervene where market failure is raising barriers to the economically efficient utilisation and application of sustainable energy technologies.' As well as inviting representatives from environmental groups including Greenpeace and the ACF, the working group also considered 55 submissions received from the public. The group's final report recommends the establishment of a body to be called the Sustainable Energy Development Authority (SEDA) that should receive funding for four portfolio categories: energy efficiency and fuel substitution, cogeneration, renewable energy and core programs. Initiatives developed in these areas will build on current NSW projects such as Pacific Power's A$45 million contribution over five years to the A$64 million joint venture with the University of NSW aiming 'to develop and commercialise low cost, high efficiency thin film photovoltaic cells.'

The minister has announced that he is broadly in agreement with the report's recommendations. A spokesperson for the Ministry said that funding would start in 1996-97 financial year and should be broadly in line with what is suggested by the report. This starts at A$7 million for the first year and rises to A$45 million in the fifth. Cathy Zoi, formerly of the American energy company PG&E and the US EPA, has been appointed as the organisation's head.
— David Coote

King Island wind power

During the last 30 years Tasmania's Hydro-Electric Commission (HEC) has been the target of vociferous criticism for flooding many magnificent wilderness areas. The HEC has stated that the era of building large dams is now past and that any major addition of electricity generation capacity is likely to focus on wind power. The King Island Wind Power project shows this may be more than mere puff.

King Island is poised to install large capacity wind turbines.

King Island lies in Bass Strait between Victoria and Tasmania. The HEC currently generates power for the island's population of 1800 using diesel generators. Keen to reduce the money spent on subsidising the price islanders pay for electricity, in 1993 the HEC examined a variety of options including cogeneration, wave and mini-hydro before selecting wind as the most economic. The HEC knows wind power works, as since 1988 it has purchased power from a privately owned 55kW wind-turbine on Flinders Island, also in Bass Strait. Monitoring at several sites on King Island has shown excellent prospects. Rob Stewart, HEC Project Engineer for the proposed system, says 'the average wind speed at the Huxley Hill site is 7.3m/s at 10m and 9.2m/s at 30m.'

Stewart says 'the Huxley Hill wind farm is expected to save $360,000 per year' in fuel costs. King Island customers currently pay 'a network charge of 36 cents per day and an energy charge of 14.48 cents per kilowatt-hour.' Even at these high prices Stewart says 'the customers on King Island are supplied electricity at a subsidised rate.'

Stewart says the windfarm will provide 18 percent of the total energy used within the grid, although this 'may be increased to 21 percent after further research and development.'

The HEC hasn't ignored potentially troublesome aspects of a windfarm, including bird-strike, residents' concerns, archaeological and visual impact. A consultant called in as part of the Environmental Impact Assessment (EIA) concluded 'that the turbines are not considered to be a significant hazard to birdlife.' Tasmanian Aboriginal Land Council consultant Darrell West indicated that the areas proposed for the development were not of significance to the Aboriginal community. The EIA doesn't mention any serious objections from local residents and the turbines will be marketed as a tourist attraction.

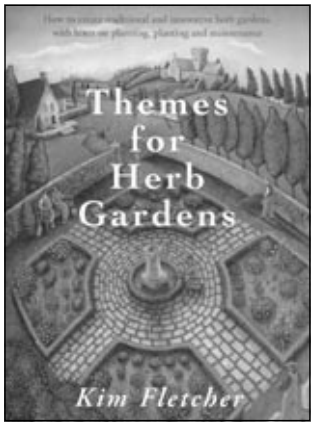
Stewart says the Tasmanian government has formally approved the project and is expected to issue tenders 'in either June or July 1996.' The project should be completed in late 1997.

Wind-diesel hybrid systems may have a bright future in island and remote grids generally. As well as large reductions in emissions of carbon dioxide – 750kg/MWh from the distillate used on King Island – they offer significant cost savings. Certainly there seems scope for a much wider adoption of hybrids in the many Australian small grids in areas such as inland Western Australia and the resort islands off the Queensland coast.
— David Coote

Book reviews

Themes for Herb Gardens

Kim Fletcher,
Viking, 1996
162pp, rrp $29.95
ISBN 0 670 90675 1



Themes for Herb Gardens is a refreshing guide to the creation and maintenance of aesthetic and practical herb gardens. Apart from being beautifully presented, the book is also methodical in its dissemination of the various aspects of this specialised type of gardening. It is clearly written and could be read both for its practical gardening content and its coverage of history and good storytelling.

Fletcher describes the garden themes and also the herbs themselves with real warmth and interest, highlighting their progress through history. Discussion of aspects such as cultivation dates, uses, colours and historic importance, together with selected sketches and colour photographs add an even fuller dimension to an already interesting book.

Themes for Herb Gardens should appeal to a wide scope of garden enthusiasts. Herb gardens can be as small or as large as desired, and Fletcher also caters for the full range of garden budgets.

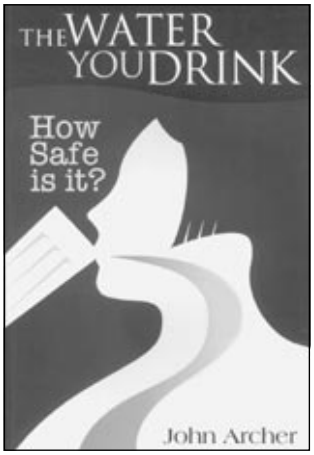
Kris Lakusa

The Water You Drink: How Safe Is It?

John Archer
Pure Water Press, 1996
120pp, rrp $13.50
ISBN 0 646 26524 5

This book focuses attention on the quality of tap water and urban water supplies. It comprehensively examines many aspects of the management of drinking water. Archer is concerned that substandard urban water quality is the cause of a range of problems in society and presents convincing evidence to support his claim.

The text is tightly written, and although it deals with scientific concepts, is presented in a way that won't intimidate the layperson. Archer investigates specific cases of harm caused by water toxicity and carefully examines them.



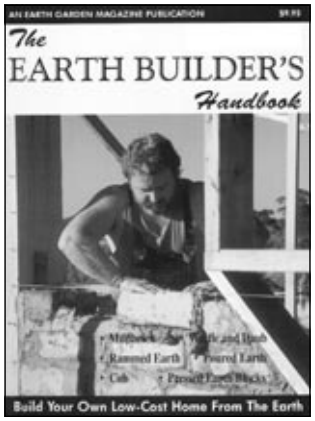
As well as describing and identifying the problems, Archer also provides expert advice on how best to tackle the problems of inferior water supply through purification treatment, selecting bottled water as an alternative and construction of water tanks.

Water You Drink is an important and informative book which acknowledges that solutions are possible, a constructive stance that helps it avoid the 'alarmist' label.

Kris Lakusa

The Earth Builder's Handbook

Edited by Greg Simmons and Alan T Gray
Earth Garden Books, 1996
80pp, rrp $9.95
ISBN 0 9595889 4 9



Many *Soft Tech* readers will no doubt be familiar with *Earth Garden* magazine and its practical, do-it-yourself approach to living more sustainably. *The Earth Builder's Handbook* takes several of *Earth Garden*'s best accounts of building with earth and combines them in one volume, along with some previously unpublished owner-builder experiences.

The Earth Builder's Handbook covers six different styles of earth building: mud brick, wattle and daub, rammed earth, poured earth, cob and pressed earth blocks.

The conversational style of the *Handbook* has many advantages over a straight instructional manual. One is that the information is more believable, because it is coming straight from people who have built their own earth homes. Another is that it is more inspiring, because it starts to become clear that building with earth is accessible to anyone.

A particularly inspiring story is that of Neil, who became disenchanted with city living and ended up building a charming two-storey mud brick cottage in Victoria's Central Highlands. Neil writes not only about the practicalities of designing and building, but also about the underlying philosophies behind many of his decisions. His discussion of mistakes he made along the way lends a particularly human touch, and his account is complimented by a list of costings for the cottage, which totals only $4,800.

Overall, *The Earth Builder's Handbook* concentrates mostly on the best known form of earth building in Australia (mud bricks), but still manages to give a useful outline of rammed earth, cob and other earth-building techniques.

Michael Linke

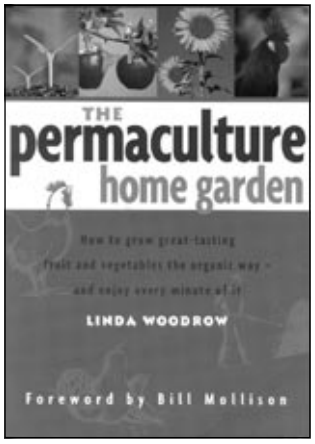
The Permaculture Home Garden

Linda Woodrow
Viking Books, 1996
183pp, RRP $24.95
ISBN 0 670 86599 0

The Permaculture Home Garden by Linda Woodrow is a guide to growing plants for food based on the author's years of experience as both a small-scale backyard permaculturalist and a large-scale organic producer. Woodrow maintains throughout that the principles for either are the same, and it is only sizes and quantities that differ.

The book is fairly evenly divided into two parts: the first involved with preparing the garden, from design and layout through to fertilising the soil. The second part deals with growing the plants.

The case for mandala designs is very well put in *The*



Permaculture Home Garden. Mandala's (circles) are economical on space, and the designs advocated in this book use them extensively, with one large mandala containing seven circular areas: a 'chook dome', compost heaps, and garden beds. There are detailed instructions on how to get the most out of these areas by rotating and maintaining each of them.

While the mandala design advocated requires a fair amount of space (about 14 metres in diameter) and a large structure (the chook dome, which is 3.8 metres in diameter), there are many ideas that can be adapted to suit smaller gardens. Woodrow devotes a chapter each to worm farming and composting, including an easy-to-understand scientific account of why compost is better for your garden than mineral fertilisers.

One of the most interesting ideas outlined in the book is the amount of land required for varying degrees of self-sufficiency.

Woodrow claims that one mandala will fit into the average suburban backyard and provide a family of four with all the fresh vegetables, herbs and eggs they need, as well as a good proportion of the fruit, all for four or five hours' work per week. A seven mandala system, which fits into a quarter of an acre, will require 25 to 30 hours work per week, and should provide enough food for the family as well as a reasonable cash income.

The Permaculture Home Garden is logically presented and includes useful information on guild planting, integrating fruit trees, herbs that are good micronutrient accumulators, and even using human urine to turn sawdust into compost.

Michael Linke

Vital Signs 1995 – 1996

L R Brown, N Lenssen and H Kane, 1995
Boobooks, 178pp,
ISBN 1 85383 276 6

When reading this book I experienced a range of emotions that surprised me. I was expecting to read a book full of dry facts, but instead found myself fascinated. The book *is* full of facts (and graphs, tables and other statistics), but the insights are both exciting and frightening.

I found myself concerned about two issues: our future as a species – given our explosive and uncontrolled population growth – and the imbalance between the haves and the have-nots.

It is humbling to read that 'those of us born before the middle of this century have seen more growth in population during our lifetimes than occurred during the preceding four million years of existence.' Or to experience both astonishment and a heavy feeling of injustice when told there are 'some two billion people still without electricity'. This is an ironic contrast to the fact that computers are multiplying rapidly. In 1981, there was one computer for every thousand people in the world, but by 1993 the figure was 31.

The book is easy to read, and needn't be read from cover to cover. It is divided into two parts: 'Key Indicators' looks at trends in areas such as food, energy, and transport, while 'Special Features' deals with issues like homelessness, soil erosion and cancer.

This book is highly recommended to anyone who wants to know what is going on in our world.

Tony Stevenson

Plants That Never Say Die

Jackie French
Lothian Books, 1995
64pp, rrp $12.95
ISBN 0 85091 718 2

Just when you thought she had nothing left to write about, Jackie French has come up with yet another volume for the gardening section of your bookshelf. *Plants That Never Say Die* is a guide to gardening for people whose thumbs are not so green, but also addresses genuine problems, such as poor soil, low rainfall, windy sites, frost and almost any other trouble gardening situation you can imagine.

The book is written in Jackie French's characteristic no-nonsense style, and deals with ornamentals and indoor plants as well as herbs, vegetables and fruit trees. Each problem gets a chapter, and includes detailed listings of plants with a description of each one's requirements, strengths and weaknesses. For the modern city dweller, there is even a listing of plants that tolerate air pollution.

Michael Linke

Ethical Investment in Australasia

Edited by Trevor Lee
Ethinvest Ltd, 1996
37pp, rrp $7.50
ISBN 0 646 27463 5

Did you know that if you invest in plantation timber you can claim up to 95 percent of your investment as a tax deduction in the first year? Australians are becoming more conscious of how their investments are being used, and there is close to $100 million worth of ethical investments in Australia.

Ethical Investment in Australasia gives an outline of how 'ethical investments' have evolved to their present meaning, and demystifies the jargon surrounding financial investment generally. There is a listing of ethical investment organisations in Australia and New Zealand, and a description of various types of investment.

If you are considering an ethical investment you should read this book.

Michael Linke

Letters

Anything for a laugh

It has been reported in the local press that a whole new pastime has arisen in Kalbarri since the installation of the solar panels and trackers.

Just before sundown, locals and tourists begin to gather at the site to wait for sunset, when all of the trackers turn over from the west to the east to wait for sunrise.

It is said that quite a few dollars change hands on estimating the exact time this happens, which array will commence its journey first, as well as which array will complete its journey first.

Kalbarri completely relies on the tourist dollar, and what a novel way to increase the town's income.

Chris Harris, Coolbellup WA

Protect the Daintree

As you may be aware, the Daintree Remote Area Power Supply (DRAPS) scheme was announced on 14 December 1995 in conjunction with the then Queensland Government's decision not to extend mains power north of the Daintree River.

In combination with the existing Householders Remote Area Power Supply (HRAPS) scheme, residents north of the Daintree River became eligible for a total of $15,000 in rebates for renewable energy systems.

Subsequently, in the period 22 to 28 January 1996, the Solar Energy Industries Association of Australia (SEIAA) members participated in an exhibition of renewable energy systems and equipment, and provided system designs and cost quotations to eligible residents.

Unfortunately, despite strong community support for the scheme, recent indications are that the current Queensland Coalition Government is likely to either severely limit or completely abandon the DRAPS scheme.

Not only would such a decision be unfortunate for the residents of the Daintree area, it would be most unfortunate for Australia.

In failing to establish the Daintree World Heritage Area as a model in the use of environmentally appropriate energy systems, Australia has lost a great opportunity to demonstrate and enhance its international reputation as a leader in renewable energy technology.

The Daintree Rainforest Task Force (DRTF), a community-based group, fully supported the decision not to extend mains power, primarily since it would almost certainly compromise the natural wilderness qualities of the region and result in environmental degradation with the increased development associated with mains power extensions.

While the DRTF hopes to preserve the DRAPS scheme in its current form, we realise that in order to achieve maximum community acceptance of environmentally appropriate energy systems it may be necessary to provide a viable alternative to individual stand-alone systems.

Based on preliminary investigations, one such alternative would appear to be 'Green Grids'.

In order for the DRTF to more fully assess the potential of Green Grids, we would be most grateful if the Alternative Technology Association would provide any relevant information and/or reference sources, particularly in regard to its availability and application within Australia.

We would also encourage the ATA to make representations to the Queensland Government to actively promote and support the use of renewable energy systems in general, and in the Daintree region in particular.

Daintree Rainforest Task Force, Mossman QLD

Do it yourself!

The article 'Power for the People' in the Australian Women's Weekly, March '96, has inspired me to attempt to correct some gross misconceptions contained in it and also to try and offer some practical assistance to the community in the Barcoo. It is of utmost importance that the misunderstandings indicated in this article are addressed and truthful advice be given.

The 'pioneering spirit' regrettably is not present out there if this article is anything to go on. Our forefathers were renowned for using innovative ideas and grasping new technology firmly with both hands if they were able to. What is

the saddest thing is that these people are prepared to let their children soldier on without adequate lighting and educational tools such as computers just because they are waiting on the government for a handout to solve their energy needs.

The fact is, the government in Queensland does have a subsidy specifically designed for these areas where it is uneconomical to extend the grid. This subsidy is available to people who have been quoted a connection fee greater than $30,000 and a free phone call to 1800 175 518 is all it takes to get full details. I am sure these people know about it.

The view expressed by 'Peter' that a $77,000 solar system would only run his lights is the one I find disappointing. I can assure your readers that for this amount of money a system capable of running two average houses using standard 240 volt appliances would be possible. If they chose to purchase super-efficient versions of refrigerators and freezers (made in Queensland), continue using gas for cooking (which a huge number of suburban Australians do) and install a solar hot water system (a separate additional government subsidy is payable for this) then around three homes could be supplied for this investment. Amanda can most definitely have ice and a cold drink if she wants. So can her children! Computers and TV as well.

I'm sure that our pioneers would have jumped at an opportunity to obtain a power system independent of the notoriously unreliable power lines currently used on long distance grid systems. Power failures are frequent, brownouts (which blow up appliances) and mains quality that is generally unsuitable for the reliable operation of computers, faxes and other expensive electronic equipment. CAPELEC knows all this, which is the reason they suggested a solar system. The high maintenance costs associated with these power lines is a huge burden to them and the taxpayers of Queensland.

So, good people out in the Barcoo district, show that some good Australian pioneering spirit still exists in the 1990s. Stop whingeing and take control of your situation. You chose to live there, now choose a sensible alternative for your power needs. For about half the price of a new Toyota Landcruiser wagon (made in Japan) you can install a power system using modern Australian-made equipment and enjoy the necessities of life you desperately want.

The added bonus is it will be better quality power than what you will get from a long mains line and you will be independent of strikes, blackouts, etc. You will be supporting Aussie technology and keeping our foreign debt down. Solar systems are tax exempt. Solar modules will last almost a lifetime and repay their cost by producing electricity and eliminating ongoing power bills.

Footnote: I spent my childhood, until I left school, on a farm which, for the first nine years, had no electricity, running water or hot water system. I have chopped wood, studied by kero lamp and had icecream made in a kero fridge. I have spent almost twenty years living and working (with remote power systems) in outback areas of Queensland and the NT. I know the conditions the people of the Barcoo endure. I have been to the Jundah area also. I am prepared to offer as much free advice as their phone bill can withstand.

Brian Bartlett, Aspect Solar, QLD

Help for self-sufficiency

Every two years since 1984 the Permaculture Association has held a two-week International Permaculture Conference, which covers design strategies and features Australian and international speakers, workshops, forums and site visits.

The Sixth International Permaculture Conference 'Designing for a Sustainable Future' is to be held in Perth from 28 September 1996.

The three basic ethics of Permaculture are:

1. Care of the earth
2. Care of the people
3. Dispersal of surplus time, money and materials towards these ends.

With the conference only months away, a group has been formed to raise $200,000 to sponsor 100 overseas delegates.

Letters

These delegates come from third world countries, and do not have the luxuries of running water, electricity and sometimes even food for their families, but rely on charity for their existence.

Our goal is to bring these delegates to the conference in Perth, so they can make friends and contacts, and learn how to make use of what little resources they have.

I am writing to see if human kindness and charity for the less fortunate still exist. These people are not asking for your money, they just want the chance to learn so they can teach their people how to help themselves.

Your donation could change whole villages' lifestyles and ways of thinking to make them self sufficient and independent, so they, their children and their grandchildren do not have to rely on hand-outs for the rest of their existence.

With every donation of $25 or more, we are offering a chance to win $25,000. Unfortunately this is through the Lotteries commission and cannot be put towards direct sponsorship.

With every donation of $100 or more you will also receive a limited edition booklet compiled at the conference.

It is our belief that we will be able to learn a lot from these delegates' future efforts, and will be able to use them as models for projects in other countries and in Australia.

People wishing to donate, please make cheques or money orders payable to: PAWA (IPC Six Fund) and post to Gary Barker, 3 Glamorgan St, East Cannington, WA 6107, Ph:(09)458 7938.

Gary Barker, East Cannington WA

Smelly solar cooker

I noticed that in ST#52 you described the making of a solar cooking box in which a woman used polystyrene foam as the insulator inside the box. You then stated that the box became so hot internally that the foam began to melt.

I was going to use foam in a similar system myself since it's so common and easy to get. However, to my knowledge, when polystyrene foam melts it gives off very poisonous fumes. If this is correct then these fumes could be inhaled by a person opening the top of the box to remove a pot. They could also be absorbed by the food when you open the pot to check on the cooking.

It may be safer to use polystyrene for the outside casing of the hot box and shielding it with two or three inches of other insulating material on the inside. I think you would have to be careful even doing this. Keep up the good work.

B. L. Thomas, Wembley Downs WA

Like Minds

People laugh at me and think I'm a loose wheel because I hate waste and want to build gizmoes that help me save energy and resources.

There's fabulous stuff around these days but not everyone has or wants to spend the money.

My interest is in converting easily obtainable or home made equipment into useful technology whenever possible.

With some successes already to my credit, I am keen to do more. Maybe some of my work will be seen in these pages, but for now, I crave the company of others with similar inclinations, so please publish this in your fabulous magazine.

Wind-powered electricity production has been a long held fetish for me but my interest and enthusiasm are boundless. So, whether you are from far away or just down the street, please contact me. I have much to say, much to learn and there's so much to be done.

Tom Kadar, 10 Koondara St, Camp Hill, Brisbane QLD 4152

Interesting suggestions

I have no problem with the quality of your magazine but I feel that you are pushing a heavily loaded barrow up a hill with no end. In other words alternate power systems are generally too expensive or require special site attributes such as running water, a windy site or fossil fuel back-up from diesel etc.

I accept that many of your readers have successful systems in place but I have seen many where everyone sits in gloom till it is almost impossible to see before switching on the precious free energy which is in short supply in our southern climate.

I would like to see you run with stories on the Takahashi engine and other like products which promise us free energy from the earth's magnetic field and the latest in cold fusion in which there have been recent breakthroughs.

Perhaps a comparison of prices of solar panels and wind generators between Australia and the US would be easy to run and I suspect an eye-opener for all. The Earth certainly seems to be undergoing climatic changes and there have been reports of storms with hail of significant weight which surely would demolish solar panels.

I believe that your mag would be of much better service to its readers and that they would increase in number if you could broaden its scope.

PS: Further comment which you may already know of! Motors similar to the Takahashi are currently being developed in Australia and elsewhere, as is other technology and cold fusion. *Nexus* magazine has dealt with much of this, but as yours is a specialist alternative technology magazine, surely we should expect you to be informed of these developments and keep us up to date.

The February Nexus was due to release details of a water-fuelled motor in its pages and on the Internet but death threats for the inventor's family kept details off the streets. Perhaps printing these comments would bring more info to your desk or are you tied to the corporate line of existing technology?

Ian McInerney, Wartook VIC

Letters

Ian's statement about people with RAPS-powered houses where everyone sits around in the gloom because they don't have enough power is one that I have heard a number of times.

Situations such as this occur due to two reasons. The first is that a system has been installed that was not sized or designed properly, and the second is that the system is inadequate due to a lack of working capital.

The simple fact is that you get what you pay for. Cut corners on the installation and you will be inconvenienced. If you can live with that inconvenience, then the cheap solution may be ok. If you can't then you should have the installation done properly. It's as simple as that.

I must admit that I am unfamiliar with the Takahashi engine, so I cannot comment further, but taking power from the earth's magnetic field sounds dubious at best. The field surrounding this planet is of very low intensity, making any attempts to tap it a pointless excercise, in my opinion. While these sorts of devices are interesting from an academic point of view, the usefulness of such machines has yet to be proven.

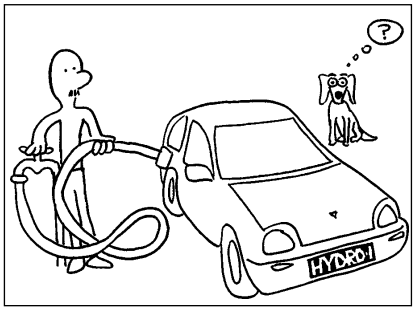
Here at the ATA, we have a file full of such ideas, all of which have either proven to be unworkable or are just too complex to even bother trying to build. Solar panels are about the simplest power source available, and when combined with a secondary source of power such as wind, they work very well.

Of course, if anyone in Australia has a motor or other similar device that can actually produce usable power from the earth's magnetic field, or any other 'inexhaustable' source, we would love to see a working model.

Solar panels are indeed considerably cheaper in the US as compared to Australia. Much of the difference is probably due the much higher demand for the technology in the US. Hopefully, as demand here increases, the price will start to fall.

As for hailstones destroying solar panels, if it really worries you that much, shield them with a sheet of plastic or wire mesh.

L.T.



Letters are edited for length and clarity – please try to keep your contributions brief.

In order for us to publish your letter, we require that you supply your name and address. You can, of course, request that your details not be printed with your letter if you wish.

While it is not possible for us to publish every letter that we receive, we try to select letters covering a broad range of topics.

The views and opinions expressed in these letters in no way represent those of the Editors of Soft Technology or the Alternative Technology Association, and we accept no responsibility for the accuracy of statements made by any contributors.

Behind the Scenes

New name for Soft Tech

This issue of Soft Technology, number 56, will be the last. From now on, the magazine will be known as ReNew. With the new name will be a whole new look, but the content of the magazine will stay the same. The variety of interesting stories and information you are used to will remain and continue to be improved upon.

For more information on this exciting change, turn to page 7.

Hi's and goodbyes

Once again, there have been many changes here at the National office. Eliza Douglas, former co-editor of Soft Technology, has gone on to explore other avenues.

Alex Zafirelis, long-time administration angel, has also left the ATA to continue her work with the disabled.

We wish both Eliza and Alex the best of luck with their new positions, they will both be greatly missed.

Technical editor Lance Turner has been joined by the talented Michael Linke, formerly of Australian Cyclist and Beat magazine.

With his considerable design and layout skills, we expect Michael to be able to give the magazine a whole new look.

Also new to the scene is Libby Anthony, our General Manager. Having been pilotless for some time, the rest of the crew welcome her with open arms.

The Solar Shuttle and its displays. The Queensland tour starts in June.

Free member classifieds

The new magazine will also bring some other benefits to members. These will include free classified adverts in ReNew and The Sun newsletter for non-commercial members.

Classifieds of 30 words or less can be sent to ReNew, 247 Flinders Lane, Melbourne 3000. Adverts larger than 30 words, and adverts from non-members, will be subject to the normal charges. There will also be a limit to the number of free adverts that can be placed, subject to space constraints.

Alex has gone on to other ventures, while Libby Anthony joins the ATA team.

Solar Shuttle tour

The ATA's display trailer, the Solar Shuttle, will begin a tour of Queensland during June. The tour is sponsored by the Queensland Energy Advisory Board, and we would like to thank them for their support.

The Solar Shuttle demonstrates a range of interactive renewable energy technologies, including low-voltage appliances and solar, water and windpower. It's great fun for the kids, and a good source of ideas for adults planning a low-energy household.

For further information, contact: The ATA ph:(03) 9650 7883, fax:(03) 9650 8574.

Solar Shuttle tour dates

- June 13-17 – Great Australian Science Show, Brisbane
- June 22 – Rosewood Show
- June 23 – Ipswich Market
- June 29 – Laidlay Market
- July 7 – Ipswich Market
- July 10-15 – Ag-Grow 2000, Emerald
- July 20 – Gatton Country Fair

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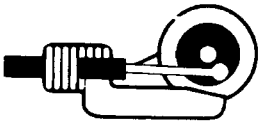

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What's on

Send your *What's on* event listings to *ReNew* (formerly Soft Technology), 247 Flinders Lane, Melbourne 3000, or Fax. (03) 9650 8574

Solar Shuttle Queensland tour

The Solar Shuttle begins its Queensland tour on 13 June. See page 78 for details.

SEICA seminar

☼ **28 June, 9am – 5pm**

Venue to be announced

A networking seminar bringing together energy service companies with providers of sustainable energy products and services. An opportunity to develop business relationships, explore joint ventures and learn about using the Internet in business. SEICA member discounts.

Contact: SEICA, PO Box 411, Dickson ACT 2602, fax:(06)241 9266.

Students & Sustainability

☼ **1 – 5 July, 1996**

Southern Cross Uni, East Lismore NSW

This national conference has become established as the main forum for Australian students to deal with environmental issues.

The conference aims to use creative, challenging and constructive activities to help develop clear strategies for the building of a sustainable Australian society.

Contact: Southern Cross University, ph:(066)22 2755, fax:(066)21 8214, or email:s&s@firestorm.scu.edu.au.

Country Living Show

☼ **9.30am – 5.30pm, 12-14 July, 1996**

Caulfield Racecourse Exhibition Centre, Melbourne, VIC

Covers land selection, building options, energy, crafts, furniture, clothing, wine making and land care. The ATA's Energy Mobile will be present.

Contact: ph:(059)83 2400.

Environment exhibition

☼ **Until 14 July, 1996**

Museum of Victoria, 328 Swanston St, Melbourne

The major themes of the exhibition include air, energy, land, water, population and living things.

For information and bookings, call ph:(03)9669 9864.

Composting toilet info day

☼ **10.00am, 27 July 1996**

International Development Technologies Centre, Faculty of Engineering, University of Melbourne, Parkville VIC

Speakers from Melbourne Water, Victprian Health Department, EPA, and composting toilet owners. Displays of commercially available and home-built composting toilets. Concludes with a tour of CERES environment park.

Contact: Stuart Downs, ph:(03)9388 0186, Bob Fuller, ph:(03)9344 6879, or leave a message on ph:(03)9344 7839.

Inventex

☼ **22 – 25 August, 1996**

Sydney Showgrounds, NSW.

An exhibition aimed at promoting international ideas and inventions. An ideal opportunity for inventors and designers to get their message across to a wider audience.

Contact: Inventex, 7 Vincent St, Balmain NSW 2041, ph:(02)810 6645, fax:(02)818 5694.

Architecture + Green conference

☼ **24 – 27 August, 1996**

RMIT, Storey Hall, Melbourne.

A public conference exploring recent trends in sustainable architecture. Held at the Centre for design, RMIT.

Contact: further information and bookings ph:(03)9660 2362, fax:(03)9639 3412.

Eco-village Design Workshop

☼ **16 – 22 September, 1996**

Permaculture Village, Maleny QLD

Focuses on projects such as land trusts, co-housing, group title or multiple occupancy housing. Walking tours of homes, residential lots, wood lots and gardens.

Contact: Green Harvest, 52 Crystal Waters Permaculture Village, MS16, Maleny QLD 4552, ph:(074)94 4676, fax:(074)94 4578.

World Solar Summit

☼ **16 – 17 September, 1996**

Harare, Zimbabwe

This year's summit marks the initiation of the 'Solar Decade', from 1996 to 2005, which will focus attention on solar energy, with particular emphasis on its possibilities for supplying energy to rural areas of developing countries.

Contact: World Solar Summit Secretariat: UNESCO Engineering and Technology Division, att. Boris Berkovski & Richard Wyhn, 1 rue Miollis, 75732 Paris Cedex 15, France, fax:+33 1 4065 9535, ph:+33 1 4568 3900.

SRD Talk

☼ **6.30pm, Thursday 19 September**

Institute of Engineers Australia, ground floor, 118 Alfred St, Milsons Point NSW

This talk, 'Revolutionary Furniture and Textiles', is subtitled 'Reforming the manufacture and design of office furniture and textiles by utilising new processes and recycled materials.'

$10 SRD members, $20 non-members, and $5 & $10 for member and non-member concessions respectively.

Contact: SRD on ph:(02)564 0721, fax:(02)564 1611.

Electric Vehicle Field Day

☼ **20 September, 1996**

Amaroo Park, Anangrove, NSW

Demonstrations of road-going cars, suppliers' displays and more.

Contact: Pat Berry on ph:(02)488 8423.

International Permaculture Conference

☼ **28 September – 7 October, 1996**

Perth, WA

The theme is 'Designing for a Sustainable Future', with a focus on 'Earth care', 'People care' and 'New economic strategies'. Includes a two-day convergence for Permaculture Design Certificate holders.

Contact: International Permaculture Conference, PO Box 568, Kalamunda WA 6076, ph:(09)291 9306, fax:(09)291 9978 or email:ipc6-1996@iinet.net.au.

Ararat Alternative Farm Expo.

☼ **19 – 20 October, 9.30am – 5.00pm**

Ararat Harness Racing Complex

Displays of alternative farming techniques and equipment.

Contact: Andrew Gubbins on ph:(053)52 1495.

1996 World Solar Challenge

☼ **27 October, 1996**

Darwin, NT

The world's most highly regarded solar vehicle race is on again. Six classes, with entries costing as little as $30,000 expected.

Contact: Hans Tholstrup, ph:(02)9988 4255 or Jo Pocklington, ph:(055)93 9277.

World Solar Cycle Challenge

☼ **Sunday 27 October 1996**

Darwin, NT

To be held in conjunction with the World Solar Car Challenge. Includes recumbent cycles and production three and four wheel classes.

Contact: Energy Promotions on ph:(02)9988 4255, fax:(02)449 8767.

Velo Australis

☼ **28 October – 1 November 1996**

Fremantle, WA

Features renowned speakers from around the world, dealing with the conference theme of 'Bicycles: A global solution to local problems.'

Contact: Promaco Conventions, ph:(09)364 8311, fax:(09)316 1453, email:promaco@cleo.murdoch.edu.au or Internet http://www.dot.wa.gov.au/Velo-Australis-1.html.

Great Southern Sunrace

☼ **24 – 28 January, 1997**

Adelaide to Melbourne

The first annual Australian solar car race runs an exciting 1357 km route from Adelaide to Melbourne via Elizabeth, Peterborough, Broken Hill, Mildura and Bendigo.

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Contact: Sustainable Energy Enterprise Developments, ph:(03)9820 9032, fax:(03)9820 2027.

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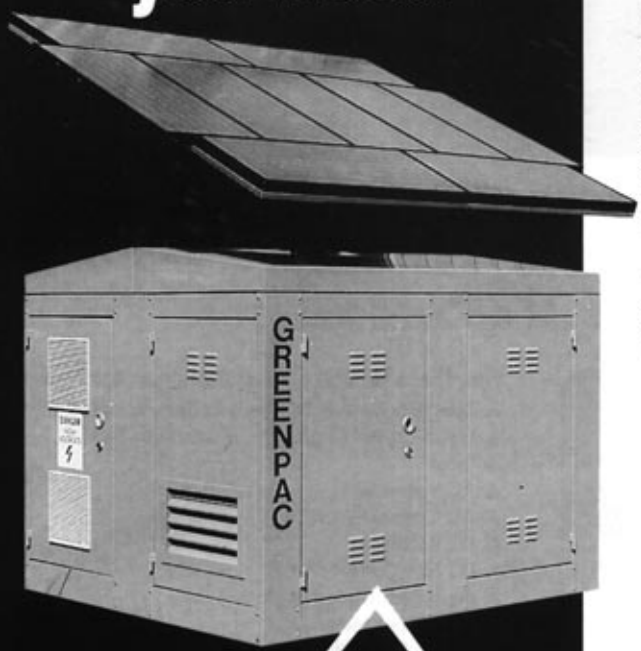

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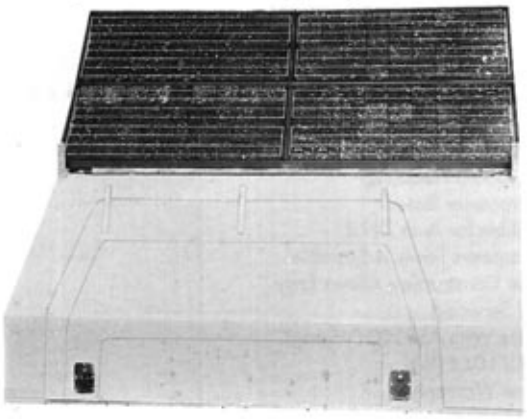

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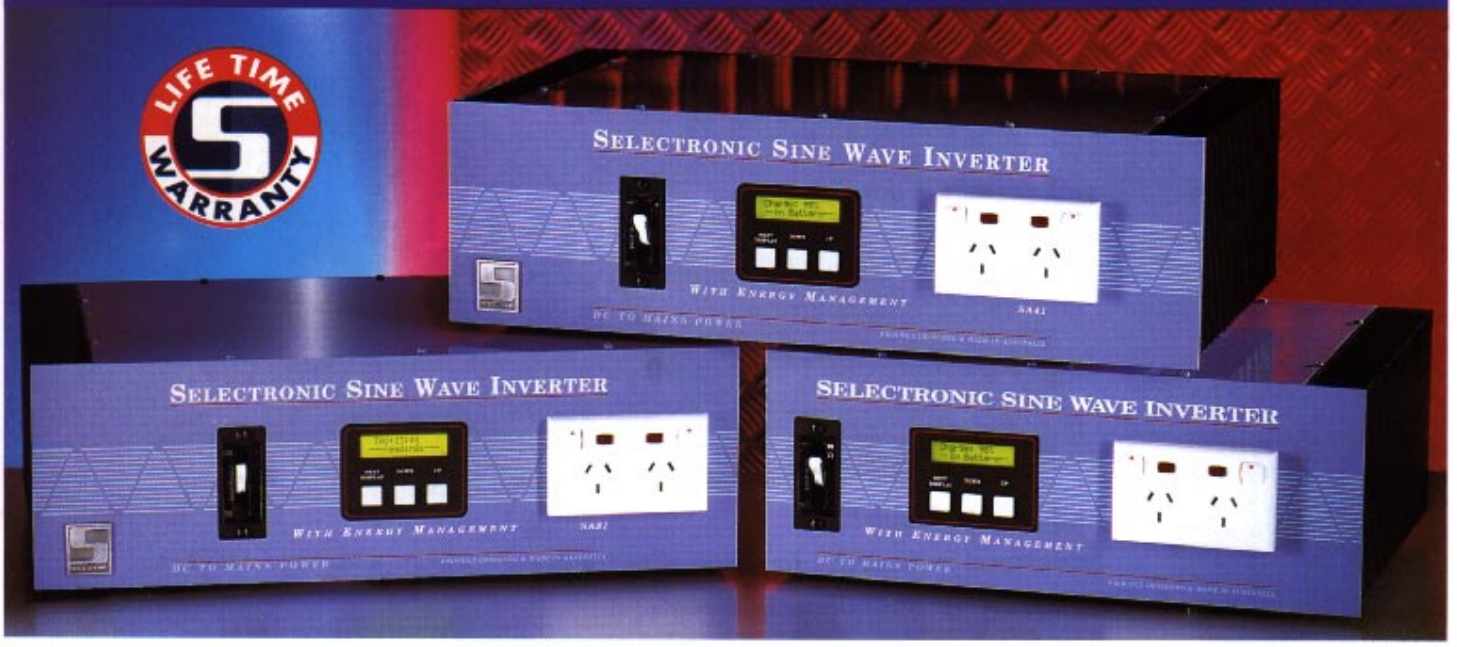

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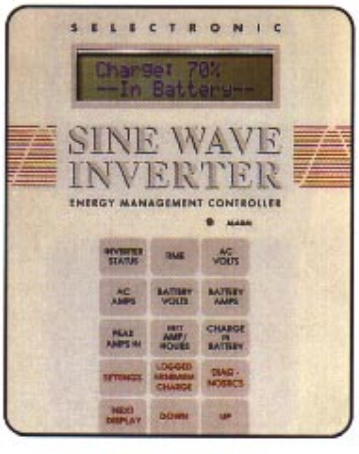

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