RAPS BATTERY CHARGER BUYERS' GUIDE

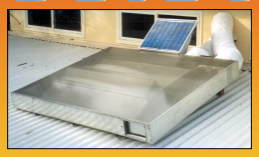
ReNew

Technology for a sustainable future

Passive solar homes

This beautiful home overlooks the Pacific Ocean

WIN!



One of two Sun Lizard solar air heaters
Valued at $1980ea
See page 5 for details
Conditions apply

Lift-out: Over 50 ways to reduce your energy costs

Save money with an eco mortgage

How to renovate your home sustainably

Large-scale solar power station for central Australia

DIY AC power meter

Make your own LED bulbs

A solar cooker to feed an army

Issue 85 Oct-Dec 2003
AU$7.15 (inc gst) NZ$7.95
ISSN 1327-1938
04
9 771327 193010

LATRONICS®
A NEW WORLD POWER

Your independent Power source

LS SERIES SINEWAVE INVERTER

outstanding performance

Unmatched power & reliability, the most dependable inverters on the market

4 exciting new models

* 12V 800W cont, 2800W surge $1485
* 24V 1000W cont, 3500W surge $1540
* 12V 1200W cont, 4000W surge $1892
* 24V 1500W cont, 5000W surge $1980

* Wall Mount Installation
* Australian Made & Designed
* Power Saving /Standby Mode
* DC circuit breaker
* Hardwire Junction Box

www.latronics.com

Ph 1300 550 204

100% AUSTRALIAN MADE

Contents

Issue 85
October–December 2003

features

Solar concentrator technology is taking off. See page 16.

This beautiful Victorian terrace house has an energy efficiency rating three times greater than a five-star home. Story page 22.

Cover photo: This stunning passive solar house is one of two houses on the Clifton Hill site open for Solar House Day 2003. Story page 38. Photo: Roger Buck

Make these LED bulbs and try out LED lighting in your home, caravan or boat. See article page 50

regulars

This building material looks like stone, but is far lighter and much more thermally efficient—and it's made from waste sawdust! Products page 88.

Bees may be cute little fuzzy things that sting, but they can make great livestock.

This power meter can show you how much electricity your appliances are using. Find out how to build it on page 70.

From the Editor

Exciting times Donna, exciting times!

It is with great excitement and weary eyes that I bring to you my first edition of *ReNew*. Since returning to Melbourne from the lush and reasonably pristine environs of northern Australia, I am more aware than ever of the natural resource pressures that we are currently facing in Australia. In the middle of winter I have to water the pot plants in my backyard, and when the sun does come out the house is still 10 degrees colder than outside. Entirely unlike my tropical experiences where the walls were basically louvres which allowed the fresh air to flow freely.

Experiencing my first winter in five years, I can see why Australians are the highest producers of carbon dioxide emissions per capita in the world. So much energy is spent keeping our homes, offices and recreational spaces warm—why Melbourne cafes still encourage al fresco dining with those outside gas guzzling heaters is beyond me—while the majority of living spaces are not designed appropriately for their environment. I hope some of the articles in this edition give you some inspiration and ideas on how individuals can address some of these issues.

However, the responsibility for reducing the amount of CO_2 emissions and the effect of climate change should not lie solely on individuals. The government must play a pro-active role in the development of a cleaner and environmentally sustainable power industry, and encourage energy and water saving policies across the board. With the Federal Government still staunchly against Australia's ratification of the Kyoto protocol, in the next few months we will see what is the Howard government's commitment to reducing the effects of climate change. Before the end of the year, the government will announce its climate change forward strategy as well as the outcome of the Mandatory Renewable Energy Target (MRET) review and the numerous other inquiries and reviews that will shape future government direction. It is a pivotal and busy time, and here at *ReNew* we will keep you updated on future developments. As an associate in the film industry would say, 'exciting times Donna, exciting times'.

I would like to say thank you to Kulja Coulston for her excellent work on the magazine over the past three and a half years. With her editorial guidance, she has helped place *ReNew* as the leading magazine in Australia for quality information on renewable energy and sustainable living. My first issue of *ReNew* has been a pleasure thanks to the encouragement and support of Kulja and *ReNew's* Technical Editor, Lance Turner and the rest of the ATA team. Also a big thank you to all the contributors for your inspiration and time.

I hope you all enjoy this edition, and I am already looking forward to working on the next issue of *ReNew*, which will be a 'water special' in the lead up to what looks to be another long, hot and dry summer.

Donna Luckman

About ReNew

ReNew is published by the ATA (Alternative Technology Association), a non-profit community group concerned with the promotion and use of appropriate technology. *ReNew* features solar, wind, micro-hydro and other renewable energy sources. It provides practical information for people who already use these energy sources and demonstrates real-life applications for those who would like to.

ReNew also covers sustainable transportation and housing issues, the conservation of resources, recycling and broader environmental issues. *ReNew* is available from newsagencies, by subscription and as part of ATA membership. ATA membership costs $55 per year, and offers a range of other benefits.

Publisher: ATA
Editor: Donna Luckman
Technical editor: Lance Turner
Advertising: Olivia Neville-Smith
Publications manager: Kulja Coulston

Editorial and production assistance:

Special thanks to Kerry Archer, Jason Bond, Lisa Mariah and Anthony Abell.

Contacts and contributions

Send letters and contributions to:

ReNew
PO Box 2001 Lygon St Nth, Brunswick East
VIC 3057 AUSTRALIA
ph:(03)9388 9311, fax:(03)9388 9322
Email: ata@ata.org.au
Web site: www.ata.org.au
Street: ATA Solar Workshop
CERES Environment Park 8 Lee Street
East Brunswick VIC 3057

Contributions are welcome, guidelines available on the web: www.ata.org.au or on request.

Advertising in ReNew

Advertising is available for products and services relevant to our audience. We reserve the right to refuse and cancel advertising at our discretion. Advertising enquiries: olivia@ata.org.au ph:(03) 9380 3406 fax:(03) 9388 9322

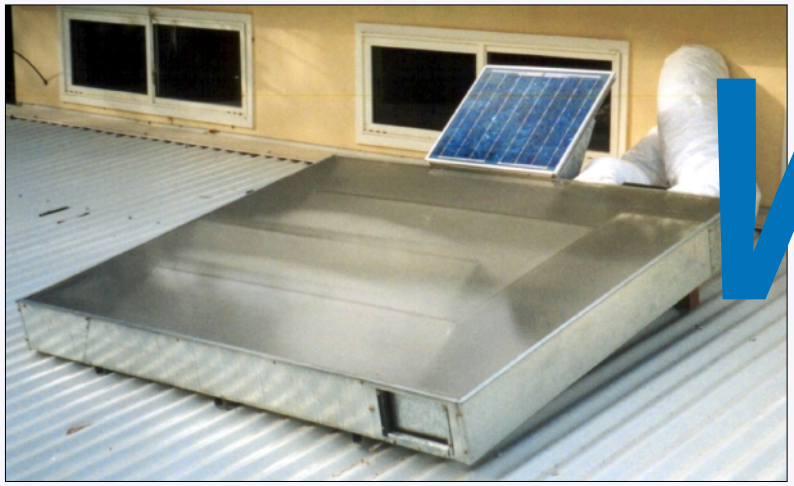
Next advertising booking and editorial deadlines:
29 September 2003, copy due 10 October 2003.

Printed by PMP Australia. Produced by Caidex Print Management. Distributed in Australia and New Zealand by Gordon and Gotch.

$7.15 Recommended Retail Price
Registered for posting by Aust Post: No VBG 4172

ISSN 1327-1938

Reg. No.: A0017411T ABN: 57 533 056 318



WIN!

One of two SunLizard solar air heaters

in the ReNew/Alternative Fuels and Energy subscriber competition

Total prize value: $1980 each

Features of the Sun Lizard Solar Air Heater.

- No running costs
- No maintenance
- Heats and cools
- Reduces energy bill for heating and cooling between 30% and 60%
- DIY installation
- No greenhouse gas emissions
- No burning fossil fuels for electricity
- Heats a 10 x 10 metre area

Take out an ATA membership, become a supporter, subscribe to *ReNew*, or renew your current membership or subscription, before 30 October 2003 and you could win one of two Alternative Fuels and Energy Sun Lizard solar air heaters valued at $1980 each including GST. See the conditions below, and get your membership or subscription in today!

Conditions and how to enter

(1) The competition is open to anyone who subscribes to *ReNew* or joins the Alternative Technology Association (ATA) during the competition period, including existing subscribers and ATA members who renew their subscription/membership during the competition period, and to *ATA Supporters*.

(2) The prize is not redeemable for cash.

(3) Paid ATA staff, members of the ATA executive committee and members of their immediate families are ineligible to enter.

(4) The competition runs from 26 April 2003 to 30 October 2003. Subscriptions/memberships must be paid by 5pm on Friday 30 October 2003 to be eligible.

(5) The competition is open to individuals only. Corporate entities, collectives and organisations are ineligible.

(6) To subscribe or join the ATA, use the subscription form in this issue (or a copy of it), visit our webshop, or call the ATA on (03) 9388 9311 to pay by credit card.

(7) The competition is only open to Australian and New Zealand entries. New Zealand winners must pay the cost of freight from Melbourne, Australia to their destination in New Zealand. The prize does not include installation of the unit—but AFE will assist with information to make it as simple as possible.

The *ReNew*/Alternative Fuels and Energy subscriber competition is proudly sponsored by Alternative Fuels and Energy, ph:(03) 9737 1566, email: afe@alternativefuels.com.au, www.alternativefuels.com.au

Greenhouse gases are increasing in richer countries

A United Nations (UN) report released in June 2003 has found greenhouse gas emissions from industrialised countries are increasing. In the 10 years between 2000 and 2010, emissions could increase by 17 per cent, despite measures in place to limit them.

'These findings clearly demonstrate that stronger and more creative policies will be needed for accelerating the spread of climate-friendly technologies and persuading businesses, local governments and citizens to cut their greenhouse gas emissions' according to Executive Secretary of the UN Climate Change Convention, Joke Waller-Hunter.

The UN projections, based on data provided by governments from 2000-2001, can assist in the planning of future climate change strategies. Interestingly, most of the reporting governments stated how important the 1997 Kyoto Protocol is in shaping their domestic policies, with its targets being a first step towards long-term and continued emission reductions.

Australia's government is seemingly not in agreement. Prime Minister John Howard told radio station 3AW and a meeting of the Minerals Council of Australia in June that Australia will still not sign the Kyoto agreement because it is not in Australia's national interest.

The government maintains that, although not formally bound to Kyoto, they are still committed to the Kyoto target of an eight per cent increase in emissions by 2012. Critics say that this target is unattainable under current government policy.

UN Report available on www.unfccc.int

WMO warns of increase in extreme weather

The World Meteorological Organization (WMO) has added their weight to the growing evidence of the effects of climate change, stating that recent scientific assessments indicate that as global temperatures continue to warm due to climate change, the number and intensity of extremeweather events might increase.

Extreme weather events such as higher and lower temperature averages and high amounts of rainfall have gradually been increasing over the past 100 years. This is consistent with the predictions of global warming which tell us that, as the atmosphere warms, the climate becomes much more unstable. Over the past century the global average surface has increased around 0.6° C.

'New record extreme events occur

every year somewhere in the globe, but in recent years the number of such extremes have been increasing,' the WMO warned.

Western Europe wilts under extreme heat wave

No need to tell the WMO predictions to the people of Western Europe who withered under a record breaking heat wave this northern summer. The United Kingdom has recorded it hottest day since records began as the temperature reached 38.1°C. Portugal declared a national state of emergency as it battles devastating forest fires.

The French Government put in place an emergency hospital plan to help deal with the growing medical crisis. It is thought that up to 3000 people, mostly elderly, died due to the extreme heat conditions. In the Netherlands, authorities decided to allow seawater to flow into the country's extensive waterways and canals system to compensate for the low water level attributed to the drought.

Mandatory five-star homes for Victoria

From July 2005 all new homes built in Victoria will have to meet a five-star standard for energy efficiency and water conservation. All new homes will have to have AAA taps and fittings and a pressure reduction valve and either a water tank or a solar hot water system.

It is estimated that these measures would halve the energy usage of new homes and reduce water consumption by up to a quarter. This amounts to about 60,000 litres of water a year saved by the average household and a substantial reduction in greenhouse gas emissions and use of fossil fuels.

Currently, the average Victorian house has a two-star rating. Through good design that considers house orientation, double glazing and insulation, you can achieve a higher rating and increase the comfort of your home. It is estimated that the additional capital cost for new houses will range from $1000 to $3000.

Environment groups welcomed the introduction of the new measures. 'This is a great outcome for all Victorians. Homeowners will have lower energy and water bills for the life of the house, it will create jobs in the building industry as well as help to protect the environment,' says Rachel Ollivier, ATA's (Alternative Technology Association) Executive Director.

Victoria is the first state to introduce a compulsory, sustainable housing rating system. It is hoped that other states and territories will follow their lead.

Massive expansion of UK offshore wind power

The UK government has greatly increased the amount of energy to be produced by wind power with the granting of thousands of licenses for wind turbines to be established off the coastlines of northern Wales and southeast England. Once established, wind power would account for 5% of total UK power needs and produce 10 times more power than the existing level of installed wind power.Trade and Industry Secretary Patricia Hewitt told the BBC 'We have got the best wind resources in the whole of Europe and it is crazy that we are lagging behind countries like Germany, Spain and Denmark, when we have the great expertise in offshore developments that we built up with North Sea oil.' The creation of the offshore wind would help the government achieving its target of 10% of energy from renewable sources by 2010, and would provide the potential to create up to 20,000 jobs in manufacturing and construction.

www.bbc.co.uk

Photo credit: Elsam A/S

Australians willing to pay more for clean energy

A Newspoll commissioned by Greenpeace shows that an overwhelming 83% of Australians would be willing to pay $3.50 more on their monthly energy bills if it meant that 10% of Australia's electricity would come from new renewable sources by 2010. 'This clear response is the strongest indication yet that Australians are willing to pay more for clean, renewable energy. Coming so soon after the decidedly underwhelming response to Peter Costello's tax cuts, the poll gives the Prime Minister a mandate for strong action on climate change and renewable energy.' Says Catherine Fitzpatrick, Greenpeace climate specialist.

Greenpeace Australia media release 11 June 2003.

SA council trial of biodiesel garbage truck

The City of Onkaparinga in South Australia has just completed a successful trial of converting a waste collection vehicle to biodiesel.

'It is a win-win situation on so many levels, from operational efficiency, worker safety, public health and of course the environmental benefits of using a sustainable fuel source.' Explains Bill O'Reagan, Waste and Recycling Manager.

The rubber seals in the truck's engine fuel system were changed to synthetic material to accommodate biodiesel. During the 10 week trial the operator found that marginally more biodiesel was used than conventional diesel, however it was slightly more effective in the lower gears which are used during garbage collection. 'The trial has exceeded all our expectations in reliability and performance and we are very keen to extend the use of biodiesel to other vehicles,' says Mr O'Reagan.

This initiative is scheduled to commence in 12 month's time to coincide with the establishment of a biodiesel blending plant.

Sustainable energy projects award winners

Many projects that help reduce greenhouse gases and the impact of climate change were winners of 2003 Australian Banksia Environmental Awards. The Sustainable Energy Development Authority (SEDA) in New South Wales won the government leading by example award for its Solar In Schools initiative. Forty-three schools received their own solar power system, and through a fun and hands-on way, learnt about renewable energy, energy efficiency and global warming.

Orbital Engine Corporation's innovative direct fuel injection technology that allows two-stoke motorcycles to reduce noxious emissions by 80% and fuel consumption by 40% took out the sustainable product design category.

The 60L building, described in *ReNew Issue 83*, was the winner of the leadership in sustainable building award. The award for environmental leadership in communication went to *Your Home*. The Australian Greenhouse Office's, *Your Home* project encourages and supports the development of sustainable housing, with an easy-to-read consumer magazine and technical fact sheets and manuals, all of which are also available on the *Your Home* website.
www.yourhome.gov.au

Laundromat operators need to clean up act

Ian Gilholme, president of the Laundromats Association of Australia, warns operators to clean up their act and provide front loading washing machines that save water, energy and soap. He told the ABC: 'Laundromats have been around since, I suppose, the 60s and 70s. Unfortunately they're still in the 60s and 70s technology.' Maybe they can follow the lead of a laundromat in Illinois, USA, that has gone one step further and installed a solar hot water system. The system produces more energy than any other solar system in the state and can provide up to 5400 litres of 48° water or more a day to its 145 washing machines.

Sustainable cities inquiry

Australian Environment Minister, Dr David Kemp announced in August the establishment of an inquiry to develop a blueprint on how our cities will look in the future. The Sustainable Cities 2025 Inquiry will look at the impact of urban sprawl and future development patterns of cities and how to reduce the environmental, social and economic impacts. Submissions close 31 October 2003. For further information www.aph.gov.au/house/committee/environ

Photo credit: Pacific Hydro

The Challicum Hills Wind Farm in operation near Ararat in Victoria.

Electricity flowing from Australia's biggest wind farm

Pacific Hydro's 52.5 megawatt Challicum Hills Wind Farm near Ararat in Victoria has started generating electricity. The 35 generators have been progressively brought on line since July, and at the time of writing, the farm is operating at 90% capacity. The wind farm is expected to be fully operational in the next few months.

Under a 15 year power purchase agreement, the electricity has been sold to Origin Energy. At full operation the wind farm will produce enough electricity to supply the needs of around 25,000 households.

Groundwater out of sight, out of mind

The world's 'natural underground reservoirs' are under increasing threat according to a UN Environment Programme (UNEP) report launched on World Environment Day 2003. The report hopes to raise the profile of groundwater resources, where most of the world's freshwater is found.

According to Klaus Toepfer, UNEP's Executive Director, 'Some two billion people and as much as 40% of agriculture is at least partly reliant on these hidden stores.'

Water table levels and pollution are listed as some of the major threats to groundwater. The report also makes numerous suggestions as to how groundwater can be conserved and sustainably managed, including increasing public awareness of 'hard facts' in developing countries and implementing groundwater monitoring and early warning projects.

Queensland land clearing laws stalled

A joint Federal-State proposal to reduce tree clearing in Queensland has received mixed reviews from conservation and farm groups.

An outcome of extensive negotiations between the Queensland and Federal governments, the proposal included a $150 million assistance package for farmers. Premier Peter Beattie believes the proposal would further protect the state from environmental problems, such as salinity and species extinction.

Farm lobby group Agforce has rejected the proposal to the disappointment of environmental groups, labelling it as 'unworkable'. Agforce has also expressed concern over the lack of consultation with landholders during government negotiations.

The proposal announced in May has still not been finalised, as haggling over the compensation package continues. The final package is hoped to be finalised before Christmas.

A state moratorium on land clearing permits will remain in place until a decision is reached.

Australian and New Zealand collaboration on climate change

The cooperation between the Australian and New Zealand Governments on tackling climate change has been strengthened with the announcement of a formal partnership. While the details of the partnership are to be further developed it will include ongoing scientific research into climate change, co-

operation on energy efficiency, and engaging with businesses on technology development.

'Australia and New Zealand are vulnerable to the effects of climate change, and we are also aware of the particular risks from climate change for our neighbours in the Pacific,' says Dr Kemp, Australian Environment Minister.

New Zealand ratified the Kyoto Protocol in December 2002, while the Australian Government has publicly stated it is not in the national interest to ratify.

Continued increases in renewable energy needs government support

Sales of solar photovoltaic (PV) systems grew by 27% in 2002, according to figures released by the Australian Business Council for Sustainable Energy (BCSE). 'The growth in sales for solar PV systems in Australia is consistent with what is happening around the world' said Ric Brazzale, BCSE Executive Director. In 2002, Australia's production of solar PV panels doubled. Total industry sales amounted to $190 million in 2002, of which $100 million represented exports. 'The solar PV power market is one of the fastest growing energy markets worldwide, and has been for the last five years, with compound annual growth of around 35%,' said Mr Brazzale.

The wind industry has also been expanding in Australia, with the number of wind projects in construction over the past six months doubling from 106MW to 227MW. There has also been an increase in the number of wind projects gaining approval, from less than 300MW in October 2002 to almost 400MW in June 2003.

However, the renewable industry maintains that this growth would not continue unless the Australian Government commits to the 10% Mandatory Renewable Energy Target. 'Increasing new renewable energy generation to 10% by 2010 means investment of nearly $10 billion and more than 9500 new jobs, a good portion being in economically hard-hit rural areas,' said Australian Wind Energy Association (AusWEA) President, Ian Lloyd-Besson. 'But if the MRET target is not raised to world levels, these jobs and investment dollars will be jeopardised.'

Largest power failure in North American history

Around 20 million Americans and Canadians were thrown into chaos on 14 August when they were hit with the largest power failure on record. Authorities are still investigating the cause of the failure but it is believed that the breakdown started in upstate New York or neighbouring Canada when a power surge triggered a shut down of power. Within seconds it affected power supplies from the Canadian province of Ontario in the north to New Jersey in the south.

Questions are being asked how the failure could spread so quickly to such a large area and why procedures put in place after the last major blackout in 1965 did not isolate the failure to a smaller area. The power failure occurred on the afternoon of a hot and muggy day when air conditioning can account for up to 30% of power use. As the power was being restored to areas residents were encouraged to minimise their energy use to help alleviate the stress on the vulnerable system.

Rural Wind Power Info Pack

The Sustainable Energy Development Authority in NSW has released a free information pack to highlight the benefits of wind power to land owners. To grab your copy contact SEDA on ph:(02) 9249 6100 or www.seda.nsw.gov.au

Uncertainties on biodiesel excise

Three months after the federal budget, when the government announced that a fuel excise tax of $0.38 cents per litre would be placed on biodiesel, uncertainties still exist on how it is going to be applied.

Under the current Federal Government's plans, the excise tax will apply to all biodiesel, whether it is produced for commercial purposes or personal use. That means biodiesel made by individuals for their own vehicles will attract the excise tax. To date, there has been no formal statement issued by the Australian Tax Office about how this scheme will be administrated for 'backyard' producers.

According to Kulja Coulston, ATA's Policy Manager, an added complication inherent in the current excise proposal is the biodiesel excise subsidy arrangement. 'It appears that manufacturers of the biodiesel will need to pay the excise tax upfront, and then claim back the excise as a subsidy. Not only may this present a cashflow issue for some producers, but the subsidy will likely be linked to the biodiesel fuel standard which has not yet been released.'

'We are continuing our efforts to clarify the situation because the current excise proposal looks like it will be an economic and administrative burden on backyard producers.'

Congratulations to the winners of our *ReNew* Readers Survey competition. Elizabeth Shearman, Frederick Heatherington, Lisa Lee Black, Nicholas Sorraghan and Todd Fraser all won themselves a Freeplay radio.

Thank you to all our readers who contributed, your feedback helps us to make *ReNew* even better.

Bushfire safety

In the last issue of ReNew, the front cover photo and story of the 'Bush fire safe home' built by Judy and John Dunlop is undoubtedly a safe bush retreat. Readers may wonder how bush fire safety and energy issues relate, but in fact they are quite related. So many homes are lost in advancing wild fires because the occupants flee in their cars with the only real defence against losing their entire home and possessions being the household insurance policy.

Houses which are rebuilt and refitted as a result of being razed in a wildfire, have an automatic embedded energy content which doubles, and being an owner builder myself, I can vouch for the huge amount of energy and effort in house construction. So much so that I am determined not to be a victim of such losses. Much of my knowledge of fire safely issues have been gained from reading *The Complete Bushfire Saftey Book* by Joan Webster, Random House Publications. I strongly advise forest dwelling people to obtain their own copy.

My concerns regarding this feature article are that it is somewhat misleading. It gives the impression that, in order to be completely safe in a bushland setting, then an absolutely fire proof shelter, such as this one, would be required. If only for the absolute protection of human lives, this may be so, but please consider the alternatives.

As a result of CSIRO studies after the Ash Wednesday fires in 1983, and CFA's most recent policy, it is preferable that able bodied people stay within their bushland homes to 'actively defend' it whilst the wildfire front passes. Previous bushfire statistics have shown that the presence of two or more capable adults, with limited fire protection equipment (mops and buckets) have an incredibly high chance of saving their home from being totally lost. Keep in mind that in the worst case scenario that the attempt to save the house failed, then this does not mean that the occupants are doomed along with all their possessions. Houses which are lost as a result of wildfires typically do so well after the external fire front has passed. lt is this vital information which has lead to fire authorities suggesting that, although a refuge is the safest place, being inside your home and actively defending it is the most practical thing to do. A certain amount of fire preparedness around the house exterior is of course essential.

The recent fires in north-east Victoria have been hailed the worst since 1939, and yet there was only one human death (not house fire related) and moderate infrastructure losses. This suggests that homeowners are taking notice of their most protective fire defence options.

The other aspect of building fire refuges is that for the huge cost and effort of building an earth covered style refuge, if that time and money were spent on making the house and surrounds as fire safe as possible, then home owners would feel even more secure about staying inside the home to protect it. ln my own case, I have dozens of vegetation wetting sprinklers, and shutters to cover all critical windows and despite having our own very fire proof cellar, it is not in our fire plan to use it.

John Hermans, Clifton Creek VIC

Biomass ok

Rob Hills' letter in your July/September 2003 issue complained that Western Power's plantation mallee project did not 'do much to sustain the environment'. Maybe I'm naive and gullible but I really like the sound of that project and think it deserves support. According to what I've read about it and to the promotional material online (www.westernpower.com.au/html/about_us/environment/renewable_energy/renewable_bioenergy.html) the coppicing of mallee that has been planted on degraded, salinated farmland can produce lower groundwater levels through the tree transpiration, carbon sequestration in the roots, oil and biomass-sourced electricity. Unless I'm missing some dark side to the project, I'll continue to wish it well and hope that it will be supported.

Richard Corkish, Lidcombe NSW

More on biomass

Having read the letter by Mr Hills in issue 84, I too was concerned about Western Power's Renewable Energy growth initiatives so I did a bit of research into the matter.

The primary reason that mallee plantations have been grown in Western Australia is to reduce the effects of salinity that land clearing and broadacre agriculture have caused. In order to make large scale plantings (large enough to reduce the water table) economical, farmers have had to find some way of producing an income from the trees to cover the cost of planting, and replace the earnings that would have been gained from the planted land by grazing or cereal cropping. The solution was to use the trees to produce eucalyptus oil, activated carbon and renewable energy.

The mallee plantations will be harvested by a method called coppicing where branches/trees are harvested but the root continues to grow and produce new foliage. Use of mallee trees for energy is carbon neutral as carbon absorbed in the harvested timber is released when combusted/gasified and thus has the same effect on carbon dioxide emissions as wind generation, hydroelectricity or any other renewable energy source. The growing roots also provide a carbon sink which removes some of the excess carbon diox-

ide in the atmosphere. There is no embodied energy in the trees, unlike photovoltaic cells and wind turbines, and recycling of materials at the end of their life has little impact on the environment. Unlike most renewable energy schemes, the plantations will restore vegetation and environment.

Interestingly, Australia is a net importer of eucalyptus oil which is becoming known as a more environmentally friendly replacement for trichloroethane, which is a banned ozone depleting degreasing solvent. Activated carbon is also imported and is used predominantly in water filtration.

As well as reducing soil salinity and water table levels the plantations may improve productivity in existing farming activities by reducing wind speed over cleared land, thus reducing the likelihood of desertification and evaporation from water sources and providing natural shelter for livestock.

The opportunity to grow mallee plantations for energy, oil and activated carbon provides farmers with an economic and environmentally sustainable rural industry which is far more promising than many other existing farming operations.

I do hope that Mr Hills does not stop purchasing 'Natural Power' as it is one of only a few ways that consumers can encourage the growth of renewable energy in Australia. It is a shame that Western Power did not provide 'Natural Power' users with a bit more background.

Emma Spinks,
emmaspinks@btopenworld.com

Double glazing feedback

Having just read the article on DIY double glazing in issue 84 of *ReNew* I was a little concerned about the specification of 3mm glass for the retrofit panel, especially considering that the previous paragraph had referred to 4mm glass as the standard for commercially made units. There is very little 3mm glass used in windows nowadays, and I would suggest that anybody considering this worthwhile retrofit should consult the relevant Australian Standard, AS1288-1988, or their local building surveyor or at least get the advice of a glazier when purchasing the glass.

Russell Pearse,
Ararat

Clean LPG?

In *ReNew* issue 84, page 46, the baby electric Tango car is listed as being 1386kg. This is heavier than my son's XF Falcon, which does 45mpg equivalent on LPG. If the governments of the world were serious about air pollution, they would encourage LPG use. No pollution from exhausts!

In every oil reservoir there is an average of 30 times the gas than recoverable petroleum. Usually, it is just wasted into the atmosphere, oil is what they are after. Underground oil reservoirs contain gas which is ready to use, but the oil is often uneconomic to refine at this stage.

Governments could drop GST on LPG equipment and LPG in service stations. I don't think so! But, if they did, it would be a win/win situation for the planet and the motoring populaton. So, why don't they?

Bor Ybsens, Woolgoolga NSW

LPG is not greenhouse neutral, but in fact produces plenty of greenhouse gases, just like all petroleum products. It has lower emissions in some areas compared to petrol, but its energy content is less than that of petrol, so you use slightly more LPG to go the same distance.

Around 60% of the world's supply of LPG comes from the separation of natural gas products (the gas found in oil reservoirs), but the remaining 40% comes as a byproduct of refining crude oil into petrol and other fuels. If all vehicles were to switch to LPG, it is doubtfull there would be enough of that fuel available without radically changing that ratio.

While the Tango is a heavy vehicle for it's size, a great deal of that weight comes from its lead-acid batteries. Were these to be swapped for nickel-metal-hydride, lithium or a similar higher energy density battery, then weight could be dropped considerably. A fuel cell system would improve matters even more so.

The Tango, like many alternative fuel vehi-

Continued on page 84

First solar concentrator power station for central Australia

Kate Hairsine reports on the establishment of a 220kW solar power system to service Aboriginal communities of the Anangu Pitjantjatjara Lands

The first solar power station to supply an indigenous community is nearly up and running. Consisting of 10 photovoltaic (PV) concentrator dishes with a combined output of 220kW, the grid-feed solar system will provide around 20% of the power to a cluster of remote communities in the far northwest of South Australia.

Located in red desert country at the foot of the Musgrove Ranges, the neighbouring communities of Pukatja (Ernabella), Umuwa, Watinuma and Yunyarinyi are home to about 550 Pitjantjatjara, Yankunytjatjara and Ngaanyatjarra people. Their electricity is currently supplied by four small grid-connected generators, which consume roughly 600,000 litres of diesel a year. If everything runs to plan, the solar power station should reduce diesel use by around 120,000 litres, displacing more than 330 tonnes of carbon dioxide per year.

Photo: Solar Systems

Remote Area Commercialisation Program

The solar project was initiated by the Pitjantjatjara Council, who received $1 million in funding from the Australian Greenhouse Office's (AGO) Remote Area Commercialisation Program (RACP). Aboriginal and Torres Strait Islander Commission (ATSIC) and the South Australian state government have contributed a further million each.

The purpose of the five year, $56 million RACP is to support projects which lead to the commercialisation of new renewable energy technologies. David Bajjali, the then Electrical Technical Officer for the Pitjantjatjara Council Projects Division, initially applied to RACP for funding for a large-scale grid installation using flat plate PV technology.

When this submission was knocked back because the technology was already in commercial use, Bajjali turned his attention to an innovative solar concentrator, developed by the Melbourne company Solar Systems, as featured in *ReNew 75*. One submission and several rewrites later, the solar power station based on Solar Systems' CS500 unit got the go ahead.

Wilson Foster, the chairman of the Pitjantjatjara Council, is proud of the solar power project for several reasons. The solar power station was initiated by Anangu people for Anangu people, and will be owned by an Anangu controlled organisation. It uses an Australian idea and Australian technology. It is good for the environment, and helps the Federal Government reach its greenhouse targets.

Even though Pukutja is the biggest community on the mini-grid, it was decided to build the solar power station just outside Umuwa, as this is the service centre for the Anangu Pitjantjatjara Lands.

Construction and set up

Construction of the solar power station began in 2001, although not without a

Photo: Solar Systems

few mishaps. Two people had to be medivaced to Alice Springs on the same day after they were bitten by King Browns (they're fine now, but might never sleep easily in swags again). And of course, Murphy's law says that the day you have the trenches open, it will rain six inches in 24 hours even though you are in one of the most arid regions of Australia.

The dishes have twin axis tracking systems to follow the sun throughout the day in order to maximise the output.

Solar System's Technical Director, John Lasich, is reluctant to reveal details of the tracking system, as it has a patent pending. In fact, there are eight patents pending, and three received for technology used with the CS500 system.

Each 14.5m high paraboloid dish has a surface area of 130m^2 and is fitted with 112 mirrors made of a laminate of glass, steel and plastic. The mirrors, which have been precisely aligned with a laser robot built specifically for the job, reflect the solar rays into the receiver, concentrating the sun 500 times.

Innovative receiver

The receiver is made up of back-contact silicon PV cells. According to Lasich, the dish is the only one in commercial production which concentrates into a PV rather than a thermal receiver. Lasich believes that Solar Systems are the world leaders in this technology.

'Other people have tried concentrating to PV at very low power, but they gave up because it was difficult. We were the first to get into kilowatt stage, and then into hundreds of kilowatts. This is because we were very focused on solving the issues. We had to extract the very high power density of heat necessary to cool the cells to below 50 degrees, whilst operating at 500 suns.

'We also provided an even flux distribution over the 1536 cells (in the receiver) in order to allow large series strings of solar cells to deliver power efficiently at 270 volts DC. Then we had to develop technology to track the sun and manage the whole system in a holistic manner.'

The PV receiver currently operates at an efficiency of 24%. Lasich expects that in the future, it will be possible to increase efficiency by around 50% for about 10 to 15% of the capital cost. 'We are currently testing a unit which has 33% efficiency. At the concentrator conference in Alice Springs in November 2003, a couple of guys will present a cell that has 36.5% efficiency. If you want to look into the future, the predictions are that a cell efficiency of circa 40% is achievable in the next couple of years.'

Future upgrades

For David Bajjali, the possibility of low-cost system upgrades was one of the selling points of the CS500 unit.

'Instead of getting bucket loads of high-efficiency cells, you put all the money into infrastructure and then upgrade as technology becomes more efficient. Even between signing the contract (with Solar Systems) and delivery, there has been a 2 to 2 ½ kW improvement per dish. Within five to 10 years, you should be able to greatly increase current efficiency simply by up-

grading the receiver as they become more efficient.'

Cooling system

The dishes have matched inverters which produce 20kW of standard three phase, 415 volt AC power at the output terminals. The inverters and the receiver cells are air-cooled, with the heat being extracted by fans. According to Lasich, although pond cooling is more efficient than air cooling, one of the conditions of the AGO funding was to develop a system that was suitable for arid areas.

'Even in mid-summer in central Australia the average combined day and night temperature is about 25 degrees, so the cooling water taken from a small pond might be 27 degrees at the hottest. Whereas if you are using air-cooling, you could end up with a 45 degree day, and then you also have to subtract the energy required to run the fans.

There are a number of inefficiencies (with air cooling), but the AGO is trying to be responsible with water out there. The objective was to show that (air cooling) would work, not to show that it was the most efficient way … but the price you pay is something like a drop of 10% in efficiency,' explained Lasich.

In future installations, Lasich would like to use existing water treatment ponds or closed pools as heat dumps where possible.

Grid connection

The inverter output from the solar power system is connected via a 33kV transformer to the grid, into which about 750kW of power is also delivered from the diesel generators.

The diesel generators read the output from the solar power station as a reduction in load and reduce their output accordingly, thereby saving fuel and cutting greenhouse gas emissions.

Maintenance

Aside from the cleaning of the dishes which will take place every three to four months, the system is designed to be unstaffed, and will be remotely monitored. Solar Systems has a 12-month maintenance contract for the Umuwa solar power station, after which the system will be managed by the project owners, the Anangu Pitjantjatjara Council. However, the council will have to get a licensed energy provider to operate the power station once it is up and running.

Many projects on indigenous communities falter because there are funds available for capital projects, but very little funding for upkeep and training of workers. In the case of the solar power station at Umuwa, however, several factors might contribute to the ongoing success of the project.

Firstly, Solar Systems have recently received three contracts for similar remote solar power stations in the Northern Territory, and is in negotiations for several more. As its first commercial undertaking, it seems in the company's best interests to ensure that the Umuwa solar power station continues to run smoothly even after their formal involvement in the project ends.

Secondly, the South Australian government and ATSIC have invested significant funds in the solar power project, and are about to spend an additional $11.3 million constructing a central diesel powerhouse to integrate with the solar power station at Umuwa. When completed, it is planned to distribute electricity from the central powerhouse to other communities.

It is more probable that such a large and publicly declared investment will be looked after. Indeed, as John Rowett, a Senior Project Officer with Department of Aboriginal Affairs and Reconciliation who is managing the Umuwa project said, 'We want Umuwa to be a showpiece of what can be done for other clusters of communities in other states.'

Hopefully then, the coalescence of commercial and political interests at Umuwa will ensure this and other similar project's continued success. ✲

Energy efficient mortgages

With new housing prices going through the roof, building a five-star energy efficient home will not only save you money in the long term, but reduce your mortgage as well. Hilary Harper looks at the green home loans currently on the market

Many homeowners would be shocked to learn how much greenhouse gas their homes produce. In Queensland's tropical climate, for example, the average house in 1999 produced 7.75 tonnes of carbon dioxide annually, mainly from cooling and hot water appliances. In a typical building's 100-year life, that's a staggering 775 tonnes of CO_2, not counting the embodied energy contributed by the building process (which includes transport, manufacturing, extracting natural resources, and administration), which is potentially 40% of the house's operational energy over that period.

A five-star rated energy-efficient house would recoup at least 3.6 tonnes of CO_2 a year, saving about $330 on power bills, easily paying for its fit-out over the century, and increasing its resale value. However, there is a distinct lack of experience and information in the housing market to inform people of these longer-term savings. A 2002 Australian Greenhouse Office report found that the idea of saving money alone doesn't change people's energy use, partly because it's hard to calculate and tends to be 'invisible'.

Mortgages, however, very visibly affect household budgets, and 'green home loans' now offer reduced interest rates for energy-efficient homes. This is a move the ATA (Alternative Technology Association) welcomes. 'The more products entering the market rewarding energy efficient customers, the more change in attitude we'll see in the public; it doesn't matter how idealistic you are, you're always constrained by your finances,' said Kulja Coulston, ATA's Policy Manager. The housing market is very competitive now, with August ABS figures suggesting first home buyers are being squeezed out. However, while energy efficient mortgages (EEMs) have been available for some time in the US, they've been slow to take off in Australia, but there are now a few options on the market.

Products on offer

Bendigo Bank

The Bendigo Bank offers a Green Home Loan, on the heels of a Green Personal Loan, with lower rates for customers investing in energy-efficient products, and their Ethical Investment Deposit Account, which invests in socially and environmentally responsible projects and gives a commission to Oxfam Community Aid Abroad. Mathew Churchill from the Products Division says the Green Home Loan flowed naturally on from this philosophy.

'The bank puts a lot of pride into being socially aware and socially conscious…and giving a fairly major discount on our standard rate made a clear statement that we're prepared to do the right thing.' In most states, owners need a five-star Nationwide Housing Energy Rating Scheme (NatHERS) rating to qualify for the loan. For Queensland and Northern Territory climates—where NatHERS is an inappropriate rating tool— the bank and the Environment Protection Authority (EPA) developed special criteria, including convective ventilation, pale exterior walls, and pergolas for shading. At 0.5% off the standard variable residential rate, they estimate savings of around $10,000 on a 27-year, $100,000 loan—a very conservative figure. But the bank benefits too: 'It's brought in more business outside the loan itself, because people have liked what we're doing.' And the Bendigo's mortgage portfolio growth took its profit up 21% this year, rocketing the share price to a record high.

Maleny Credit Union

Queensland's Maleny Credit Union last year launched the Cool Home Loan, supported by the Queensland Conservation Council and the Federal Government's Cool Communities program (see page 45 of this issue). Its interest rate is 6.45% with no ongoing fees for homes meeting five or more energy-saving criteria, including 600mm plus eaves, tinted windows, ceiling fans, and sealed fireplaces.

The union's Todd English says the loans have proved so popular through word of mouth that they're averaging five per month—impressive for a regional town—and 'converting' customers seeking ordinary home loans, because the cool loan makes better financial sense. It's also lucrative enough for the bank to continue it beyond the Cool Communities funding.

Green Home Loan Company

The Green Home Loan company offers 0.25% off the major banks' rates on houses that are rated four or five stars. Homes with three stars plus three other elements developed with environmental architects, including use of plantation timber, 'green energy', or the more abstract 'living in a subdivision based on sustainable concepts' also qualify. The company's Mike O'Mullane estimates savings of $17,000 to $80,000 on a $300,000 loan. While unsure if the company's criteria included embodied energy, he's pleased they can offer customers a way to help the environment, despite the company's loss in profit from waiving fees. 'Normally going green costs you more money, whereas with this we're hoping people will see that this is a saving for them.' He's also keen to point out that, while funded by the ANZ, the Green Home Loan company offers a level of personal service bigger institutions don't, and can develop ongoing relationships with their customers.

Will the big banks follow?

Lenders assume a high degree of customer sympathy with energy efficiency goals, but also agree that while avoiding the major banks might well be a drawcard, most customers are price-driven. Mike O'Mullane says when Victoria's mandatory five star housing code begins in July 2004, all new homes will automatically qualify for his product, so major banks will effectively be funding green houses anyway—and presumably won't be lowering their rates.

The Commonwealth, National and Westpac/Bank of Melbourne currently do not offer green loans; the Commonwealth knows of borrower demand for environmentally friendly construction, but feels 'it is not in its customers' interests to provide additional assistance based on narrow (energy efficiency) criteria, which may disadvantage other home buyers.'

Future prospects

With all these loans, properties are assessed at valuation, and again if customers refinance, but monitoring for ongoing compliance is hard.

Green loans are theoretically risky for lenders, but savings on running costs in energy efficient homes allow

Product	Company	Home loan rate	Comments
Bendigo Green HomeLoan www.bendigobank.com.au	Bendigo Bank	6.1% variable, pegged at 0.5% off standard variable residential loan rate; maximum 30-year loan, some fees apply, discounts on other bank services.	In all states except QLD and NT, building plans need five-star NatHERS rating by accredited assessor. If NatHERS is redeveloped to allow for higher than five-star ratings, Bendigo Bank will adapt their criteria to raise the bar. In QLD and NT, need to satisfy the five compulsory criteria and nine elective criteria.
The Green Home Loan www.thegreenhomeloan.com.au ph:(03) 9347 3622 free call 1800 801 371	The Green Home Loan (company), c/o Suburban Management Pty Ltd.	0.25% discount on standard variable home loan rates (major banks' rates). Currently Green Home Loan rate is 6.24%. They contribute up to $750 towards legal or valuation fees if the loan is $100,000 or more. Written guarantees that no future fees will be added for the life of the loan. Maximum 30-year loan.	For four or five-star rating from SEAV, or any four of elective criteria.
The Cool Home Loan info@malenycu.com.au ph:(07) 5494 2144	Maleny and District Community Credit Union - MCU	6.45%, no ongoing fees, free redraw facility, no minimum lending amount.	Have to meet at least five selective criteria.

their owners to pay back loans faster. In fact, the AGO confirms energy efficiency financing probably wouldn't exist if everyone involved didn't benefit financially, 'despite the existence of genuine altruism in individuals and firms'. For such schemes to work, they say, the social goal and financial benefits must be felt immediately and personally.

The AGO and the Alternative Technology Association agree that, ideally, government shouldn't count on the finance industry for greenhouse reduction initiatives but should themselves support energy efficient financing. Preferably that which takes into account all the energy consumed over the lifetime of a building, unlike most of the ratings systems currently used by financial institutions that look only at the initial building design.

Renovating sustainably

With ever growing interest in home renovations, Kulja Coulston looks at the advice on offer and some outstanding examples of sustainable retrofits

Australia's consistent support of lifestyle media, such as television programs featuring home and garden renovations, indicates that a large proportion of TV audiences still love to watch what other people are doing with, or perhaps more importantly, what they are spending on their homes.

The most successful addition to mainstream lifestyle programming is Channel Nine's *The Block*. *The Block* has been the highest rating show on Australian TV for a decade, and has recorded estimated viewing audiences of around 2.2 million per episode. Reality-renovations has proven to be big-bucks TV.

The program's phenomenal following could be attributed to many things, but overall, its popularity is unsurprising in an era where growth in the home renovations market is outstripping growth in new home building.

Photo: Dick Clarke

Dick Clarke's home in Elanora, NSW, with the renovated lounge room overlooking the garden and the freshwater storage tank located underneath the verandah.

Australian building industry

In Australia, around 145,000 new homes are built each year, representing two per cent of the seven million existing homes. With so many homes already in place, and many Australians reluctant to pay ever-higher property prices, renovations are becoming more attractive to middle Australia.

The Housing Industry Association's regular *Renovations Monitor* found that there was a boom in home renovations in 2002, with almost 67,300 households undertaking major home modifications collectively worth $4.01 billion. HIA's March 2003 figures show that this trend is continuing, with around $1.08 billion already spent in the first three months of this year—a 23.4% increase on the December 2002 quarter.

For people (like me) who prize good building design, growth in the conventional housing and renovations market is not something to celebrate. Poorly designed homes are the norm rather than the exception in Australia, and the propensity for these homes to have high energy and water use means they are a long term liability for our environment.

Thankfully, there are a few architects and building designers out there who care about a building's environmental performance. Some designers are even developing important expertise in the area of 'sustainable' renovations—where existing homes with poor environmental performance are converted to buildings worthy of a feature in *ReNew!*

Sustainable renovations tour

Two such designers were part of the *Sustainable Houses: Renovating Your Home,* seminar tour which visited Brisbane, Sydney, Melbourne, Adelaide and Perth in May/June 2003. The tour was presented by the Australian Greenhouse Office and ATA (Alternative Technology Association).

Renovating Your Home featured lectures by Dick Clarke of Envirotecture and Andreas Sederof of Sunpower Design, two of Australia's leading environmental designers. Andreas and Dick each presented a case study of a successful 'sustainable' home renovation project

Andreas Sederof of Sunpower Design shows the freshwater and greywater tanks cleverly located under the front verandah and along the side of the house.

Photos: Sunpower Design

they had completed, and explained the audiences their priorities and decision-making processes throughout the project.

While the audience numbers for the tour were but a fraction of the millions attracted by *The Block* and other TV lifestyle programs, I have no doubt that the majority of those who did attend took away something useful for their home renovation project or line of work.

The information presented at *Renovating Your Home* was independent of commercial influences, free from product and advertising bias and primarily focused on environmental outcomes. Audience members were able to ask questions of the speakers and benefit from their thoughtful anecdotes and rules of thumb.

I was fortunate to be on the sustainable renovations tour, representing the ATA, and found that even after the fifth seminar I gleaned something new each time—whether it be the name of a new nontoxic varnish or where to locate a window for effective cross-ventilation.

Renovated Victorian terrace

In his presentation Andreas explained how he transformed his client's single-fronted 1800s Victorian terrace to reflect their values of nontoxic building materials and finishes, and a strong commitment to energy and water conservation. It was up to Andreas and his colleagues to meet this brief, with the added challenge of working with a small block and roof space.

Illustrating the project with slides, Andreas explained to audiences around the country how the home was altered to incorporate passive solar building design, thermal mass, and ceiling and wall insulation. He indicated where recycled timber was used and how other timbers were selected based on sustainable forestry principles.

A full greywater treatment system and rainwater tanks were incorporated in the design and were concealed under the

front verandah. A solar water heater and a grid-connected photovoltaic solar electricity system were squeezed side by side on the tiny roof.

After listening to Andreas talk, it was apparent that making this home renovation more 'sustainable' required a healthy problem-solving approach and commitment. This is especially true in the area of sourcing suitable materials and obtaining the relevant planning approvals. However, he showed that these issues can be worked through.

'We are used to having to try harder to get our projects approved and new practices accepted, [and] it is now much easier than it ever was,' said Andreas. 'Nontoxic materials are becoming more available.'

'The problem with conventional builders is that you have to hand feed them when it comes to specialised systems and materials. It becomes a question of motivation. Some builders are excited by these topics, many are not. It's the job of the specifier—that is, the designer or architect—to get the contacts and provide information in the specifications. It is best not to give the builder a choice, just to insist that the specification are followed.'

Renovation in Elanora, NSW

For those of you who have seen Dick Clarke speak, you will probably recall his unforgettable sense of humour, as well as his strong commitment to reducing waste in the building process and designing homes to suit the climate in which they stand.

For his *Renovating Your Home* presentation, Dick spoke about the renovations to his own home. In particular, he focused on the final renovation stage from which his home office, family living space and rainwater system were born.

Dick's home has a lot of features worth talking about—including a grid-connected solar electricity system which supplies half of the home's energy needs—a large rainwater harvesting system which again, like the Melbourne example, is hidden under the back verandah. He also has included cross-flow ventilation throughout the house to remove the need for artificial cooling systems.

However, much of the audience fascination about this home was the use of *reverse* brick veneer technique in the passive solar design of the renovation. Reverse brick veneer essentially means the incorporation of internal, rendered brick veneer walls. The brick wall which was added to the inside of the

north-facing living space acts as thermal mass. This method enabled the original weather-board exterior of the house to be retained.

It is worth noting that Dick's family home got better, not bigger. The clever renovation he designed significantly improved the use of the space, while reducing his family's energy and water consumption. They are now all enjoying their home much more without its footprint encroaching on their outside living space.

'The most satisfying renovations I have done have been those which do not make the building bigger at all — where we rearrange the spaces within the existing envelope, make some changes to windows and traffic flows and the like, and in that process of turning the house around we turn the inhabitants' lifes around, so they can use less energy to stay comfortable all year,' says Dick.

The kinds of strengths that owners should look for when assessing a home for a sustainable renovation include a combination of an adaptable floor plan to allow a better response to the site and climate and the presence of appropriate building elements and materials for the climate. Of course, this will vary depending on location—high mass would it be appropriate for Victoria, or a big roof overhang in Rockhampton.

Photo: Dick Clarke

The inside of Dick Clarke's renovated lounge room.

'An objective appraisal of a house should be done before any decisions are made about extending what's there. If there are enough strengths present, they can be built on—but otherwise it may be better to wipe the page clean and start again.'

Beware bad advice

There is undoubtedly pressure in the Australian housing market to build bigger homes than is really needed by the occupants—Australia's new suburbs are full of examples of this. Larger homes not only use more materials, but also need more energy to heat, cool and light, more time spent cleaning and more furniture needed to fill the rooms. In addition, a poorly designed home is expensive to run and does not necessarily make for 'happy campers'.

'Design for what you really need, not for what you think "they" will expect you to have,' is another of Dick's simple design criteria. 'Real estate agents are the very worst at perpetuating these myths. We are not all the same [but] chances are if you design something to suit yourself, it will suit many other people as well.' ✲

The long version of both Andreas and Dick's home renovation projects are found in the *Your Home Technical Manual* case studies which are available for free download from the AGO's *Your Home* website: www.greenhouse.gov.au/yourhome/technical

The full Your Home Technical Manual is available for purchase from the ATA webshop at: http://shops.bizarsoftware.com.au/ATAShop

What to do with the doggie-do?

ReNew's new editor Donna Luckman cleans up her own backyard and suggests ways for you to deal with your own dirty business

As a keen gardener I thought I was pretty up to date with organic gardening practices. Living in the inner city of Melbourne, in our household, all vegetable and garden wastes are placed into composting systems or otherwise used as mulch—thus putting nutrients back into the soil and reducing the amount of waste going to land fill. Another source of waste that is often overlooked, and perhaps already lingering in your backyard, is dog poo.

Well, such was the case at our place, until I recently discovered that you can compost your dog's poo. Why had I not heard of this before? A quick search on the internet revealed that this is not a secret at all. Not only are lots of people already doing it, but you can buy off-the-shelf dog poo composting systems for your house, or even your apartment.

Urban waste

Melbourne Water estimates that 90,000 tonnes of dog poo is produced in greater Melbourne every day, some of which is washed into our waterways, and eventually ends up in Port Phillip Bay. Dog poo is high in nitrogen and thought to be one of the reasons for the high levels of e-coli in urban waterways and on beaches.

Dog poo is also an urban litter problem. With large numbers of owners taking their pets for a walk in public spaces there is a high concentration of dog poo in our parks and recreational areas. And let's face it, nobody likes stepping in dog poo whilst kicking the footy around on the weekend!

A common sight: dog owners leave plastic bags full of dog poo next to the rubbish bag dispenser in my local park.

Local council initiatives

Many local governments around Australia have introduced laws that require dog owners to pick up after their dogs when they defecate in public places. These days it is not uncommon to see plastic bag dispensers, provided for the collection of dog poo, in parks that have high dog patronage.

In recent years the message to pick up after your dog has made a large impact and more owners are willing to oblige. However, I know at my local park, by the end of the weekend there is a pile of plastic bags on the ground near the dispenser waiting for someone else to dispose of them.

The problem with this method of disposal, from an environmental perspective, is that plastic bags of poo end up in the rubbish and ultimately as landfill. Some councils have trialed the use of biodegradable plastic bags but they were apparently prone to splitting.

Other ideas that have been discussed by councils include the introduction of dog toilets similar to those used in Europe. The dog toilets are areas set aside in a park for the dog to do its business. However, the toilets need to be cleaned regularly and dogs need to be trained to use them.

Dung beetles are another option, but

the possible environmental impacts of introducing a foreign species is unknown. The beetles also tend to go dormant in winter which would be a drawback in Melbourne and other colder climes.

Other more extravagant ideas include the encouragement of owners to use 'doggie diapers' and the 'doggie dunnie', which can be installed at home.

Cruikshank Park trial

In 1999, the Maribyrnong City Council in Melbourne's inner west trialed a dog poo composting system in Cruikshank Park, Yarraville. The trial was initiated by a local resident who was concerned about the amount of waste going to landfill via the plastic bag system.

He trialed the composting of his own dog's poo over a two-year period and then approached the council with his findings.

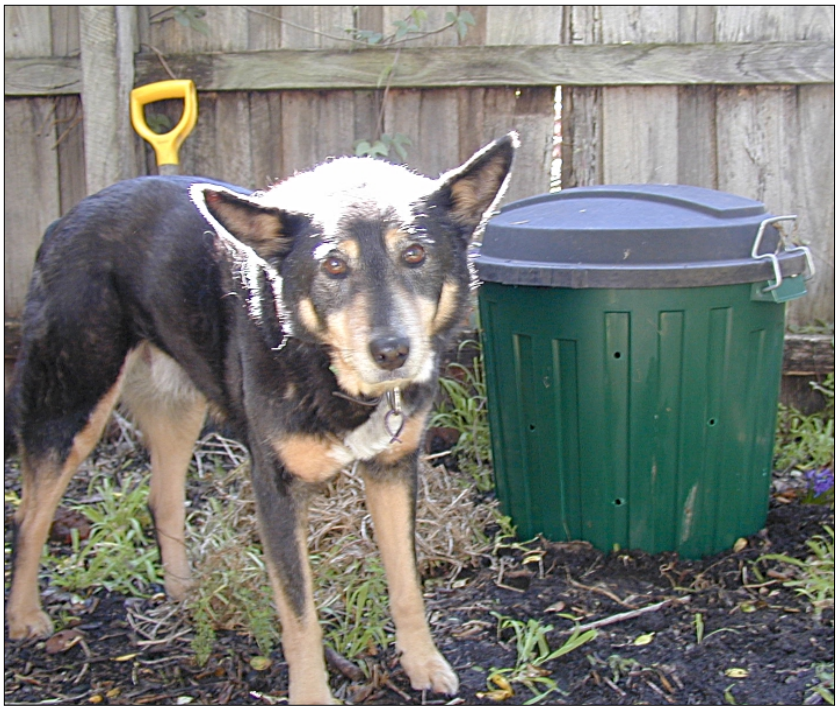
The council set up 10 black compost bins around the park. Dog owners could deposit the poo using a paper bag and cardboard scoop provided by the council. The paper bag and cardboard scoop become part of the composting mixture. Originally, piles of soil and vegetable matter were located next to the bins for the owner to place a scoop in after disposing of the waste. This was to help the decomposing process as well as to reduce the smell. But the council found that the bins were filling up too quickly. So the additional mulch was removed and the bins were then emptied every six weeks, with most of the composting process occurring offsite. Unfortunately, the compost bins finished operation eight months ago, not because the composting system did not work, it was rather successful, but it was not economically viable, as they were constantly vandalised.

How to do it at home

So, let's return to our backyard. Duva is a medium size dog but boy can he leave a lot of poo around. Here is our experimentation with dog poo composting. We did not want to buy an off-the-shelf composting unit, preferring to make do with materials we could find.

We cut off the bottom of an old plastic rubbish bin and drilled holes around the side of the bin to allow for aeration. We dug the bin about 20 centimetres into the ground, to ensure that no curious doggies think the bin is the new food scrap compost and try to get into it. The bin was placed under a tree, so it receives shade in summer but is able to get some sunlight in winter.

Due to the high nitrogen content of dog poo we needed to add some carbon fixers such as grass clippings, straw, mulch or even strips of wet newspa-



A very impressed Duva poses for the camera next to the dog poo compost. Only seconds before, the photographer stepped backwards onto some dog poo.

pers. We have a pile located nearby to make sure some is added, but not too much. No food scraps from our kitchen go into the compost as there is a separate bin for those. It is a wholesome dog poo diet for these worms.

We bought some worms from the CERES nursery to place in our new compost. At the nursery Alex told me something very important. **Do not place any dog poo in your compost 48 hours after worming your dog.** Otherwise you may have a massacre on your hands.

You also need to keep an eye on the composition of your worm farm to ensure that it does not dry out (just add some water) or not too sludgy (add some mulch, dry grass clippings et cetera).

So now, not only is it safe to walk out to our clothes line without any accidents, but Duva is helping to contribute to the health of our garden. ✲

More wind measuring options

In the last issue of *ReNew* we looked at a couple of low-cost options for measuring windspeeds. Here we present more options that may be ideal for anyone wanting to install wind turbines on their properties

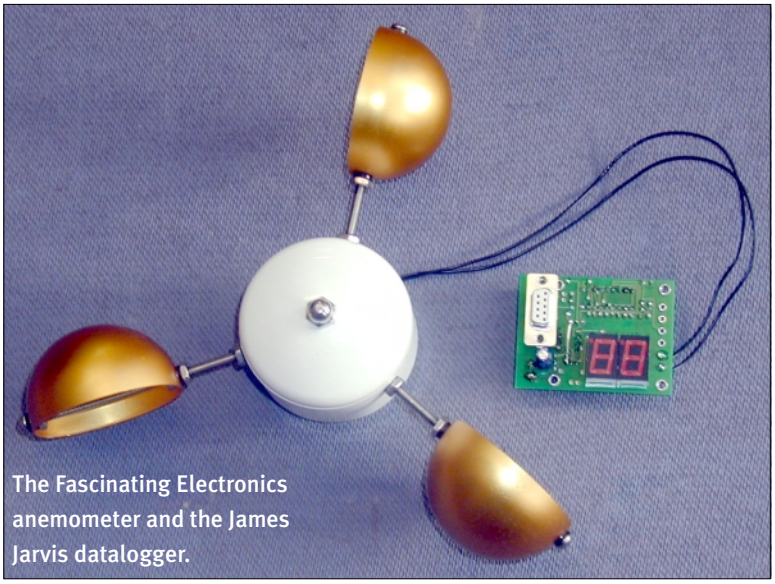
In the last issue we looked at the 1-wire weather station manufactured by AAG, as well as the Davis weather stations sold here by EcoWatch. Since then, many readers have told us about other options for low cost wind monitoring.

Dick Smith Electronics was, until recently, selling a pre-built weather station, the WM918. It is manufactured by Oregon Scientific in the US (www.oregonscientific.com). While their website lists many retailers in Australia, we don't know of any outlet in Australia selling this item, although we haven't called them all to find out one way or another. If anyone knows where to get this or a similar item, please let us know!

Another option is the range of weather sensors from Fascinating Electronics, also in the US, (www.fascinatingelectronics.com). This company makes weather sensor kits including anemometers, wind vane, rain gauge, temperature and humidity sensors. The kits are easy to assemble and the results are robust and simple-to-use sensors.

While you can buy just one or two of these sensors, there is a complete weather station kit available that includes an anemometer and wind vane with 'T' mount, rain gauge, five temperature sensors, two humidity sensors, cables for all instruments, signal conditioning and barometer board, experimenter computer interface, power supply and case, Windows software and serial cable. All this is just US$499.90, plus shipping, of course.

But what if you just want to measure wind speed without having a PC to do the datalogging? Well, just buy the anmometer kit and connect it to the excellent little datalogger kit from James Jarvis. Details of this kit can be found at: http://aprsworld.com/windspeed/



The Fascinating Electronics anemometer and the James Jarvis datalogger.

The kit is also available pre-built, and this is how we recommend you buy it, as the board uses very thin tracks and tiny solder pads and requires good soldering skills. This kit also comes with basic software that allows you to set the mode of the logger and download the stored data, which is saved as a text file, ready to import into a spreadsheet. The kit can run from three 'AA' cells for around 9 months, or from any supply from 7 to 28 volts—ideal for solar power!

All in all, a very simple and effective device for recording windspeed. However, it doesn't record direction, but provided you have a wind vane that you can look at from time to time to confirm the site isn't turbulent, direction shouldn't really matter for wind turbine siting.

The final option is an Australian designed kit from Realtime Control in Victoria. This kit is a datalogging anemometer that measures both wind speed and direction by using an asymetrical anemometer—one of the three cups has a 'wind brake' on it so that the rotor speed varies during each revolution. This oscillation in the sensor's output is measured by the microprocessor and decoded into wind direction. The average speed of the sensor provides the speed measurement.

This novel approach eliminates the need for a separate direction sensor. Be warned, though, the construction of this kit is a lot more involved than the Fascinating Electronics kit and will need a greater skill level. Details can be found at: www.alphalink.com.au/~derekw

The ATA is now stocking the 1-wire weather stations, the Fascinating Electronics anemometer and the pre-built version of the datalogger from James Jarvis. For more information, go to www.ata.org.au and click on the link to our webshop, or call (03)9388 9311.

Super Summer Solar Sizzlers!

PHOTO-VOLTAIC PANELS

These incredible, triple junction, amorphous panels are taking the market by storm, and for good reasons ! **Over 20% more actual battery charging amps** than crystalline panels under realistic, high temperature Australian conditions ! Shadow tolerant, **unbreakable construction**, (no glass) very low embodied energy and weight. **20 year performance warranty.**

	Amps @ 14V and 50°C	Inc GST
Uni-Solar US-64	4.5A	$ 599
Uni-Solar US-42	3.0A	$ 425
Uni-Solar US-32	2.25A	$ 339
Uni-Solar US-21	1.5A	$ 249
Uni-Solar US-11	0.7A	$ 199
Uni-Solar US-5	0.33A	$ 99

WIND DRIVEN GENERATORS

The first wattage rating is at 20 knots, (realistic) the second figure is peak (rare). Wind power obeys the "cube" law. Double the wind speed = 8 times the power and vise versa. If your average wind speeds are below 8 knots forget it!

Ampair 100	12/24v	60 / 100 watts	$1450
LVM 612/624	12/24v	120 / 360 watts	$2350
Soma 1000	24/48v	1000 / 1200 watts	$4171
Bergey XL.1	**24/48v**	**1000 / 1200 watts**	**$4995**

PLASMATRONIC REGULATORS

Brilliant Aussie built units, with the edge on performance and value. A digital display presents all essential solar system parameters, volts, amps in / out, amp-hrs in / out. With the optional shunt and PLS, the inverter load amps and daily amp-hrs used can be displayed. Inbuilt 30 day data logger.

PL-20	12/24/48 volt 20 amp smart controller	$ 299
PL-40	12/24/48 volt 40 amp smart controller	$ 399
PL-60	12/24/48 volt 60 amp smart controller	$ 599

REGULATOR ACCESSORIES

PLI	Serial interface for PC/modem	$ 119
PLS 2	Shunt adaptor (AD converter) for PL regs	$ 149
SH200	Shunt, 200 amp, 50mV	$ 79

TRUE SINE WAVE INVERTERS

Your country needs you....to support it's electronics industry, and with superb **true sine wave** inverters at these prices why on earth wouldn't you ? Come on...get on the phone and do it !! Your blues will be gone without a Trace !

		Inc GST
Latronic LS-412	12v 400 / 1500 watt	$ 690
Selectronic SE-12 / 12	12v 600 / 1500 watt	$ 1084
Latronic 47-BKZ-12	12v 700 / 2800 watt	$ 1135
Selectronic WM1200-12	12v 1200 / 3600 watt	$ 1668
S.E.A SEAP-12-1K3	12v 1300 / 3900 watt	$ 1942
Latronic 412-BKZ-12	12v 1300 / 4000 watt	$ 1805
Latronic 518-BKZ-12	12v 1800 / 5500 watt	$ 2205
Latronic 48-BKZ-24	24v 800 / 3200 watt	$ 1175
Selectronic WM1000-24	24v 1000 / 3000 watt	$ 1459
Selectronic WM1500-24	24v 1500 / 4500 watt	$ 1851
S.E.A SEAP-24-2K2	24v 2200 / 6000 watt	$ 2571
Selectronic SE-32	24v 2400 / 7000 watt	$ 2899
Latronic 525-BKZ-24	24v 2500 / 7500 watt	$ 2442
Latronic 530-BKZ-24	24v 3000 / 9000 watt	$ 2714
S.E.A SEAP-24-3K0	24v 3000 / 9000 watt	$ 3222
Latronic 535-BKZ-48	48v 3500 / 10500 watt	$ 2805
Selectronic SE-42	48v 3600 / 10000 watt	$ 3354
S.E.A SEAP-48-3K8	48v 3800 / 10500 watt	$ 3434
P.S.A. RAP-5-48	48v 5000 / 10000 watt	$ 8498
Latronic 915-GI-72	72v 1500va Grid feed	$ 2714

ENERGY STORAGE BATTERIES

We've supplied these premium grade home power system batteries for 18 years. They're rated at 4000 cycles, ie, an average life span of 10+ years in a correctly designed plant. 5 yr honest warranty from the world's leading battery company. EXIDE ENERGYSTORE have become the industry standard in the past twenty years for reliability, performance and price.

All sizes available. Free freight to major centres.

EXIDE 24RP830T	24v 21840 watt-hours	$ 2579
EXIDE 24RP910T	24v 24000 watt-hours	$ 3198
EXIDE 24RP1080T	24v 28320 watt-hours	$ 3860
EXIDE 24RP1330T	24v 34800 watt-hours	$ 4389
EXIDE 24RP1600T	24v 38,400 watt-hours	$ 4999

Solar Technology Designers Catalogue 2003

Now entering it's 14th year, this compelling 150 page master design manual / catalogue is endorsed by thousands of enthusiasts as their renewable energy bible ! This edition is substantially revised, and written in a clear and innovative style for your renewable enlightenment, by leading solar engineer and pioneer Christopher J Darker. cdarker@unisun.com.au

Estimating your energy requirements; *Power system design; *Solar radiation maps; Solar (PV) panels; * Wind generators; Batteries; Regulators; *Inverters; *Chargers; Energy efficient appliances; Water pumping; Water heating; *Passive solar buildings; *Heat Pumps;

This manual is for consumers, dealers, installers, electricians, educators, administrators, journalists, politicians. From beginners to experts this is undoubtably the first and perhaps the only book to read before designing, purchasing or assembling a renewable energy system. **View table of contents and sample pages at www.unisun.com.au**

1983 AD • UNIVERSALITY OF THE SUN (UNI-SUN) • 2003 AD

1/13 Scanlon St, (Box 2009) Solar City, Esperance, WA 6450, Ph: 08 9071 1513, fx: 08 9071 3591, mob: 0418 934 607 www.unisun.com.au email: cdarker@unisun.com.au

Move over blitz, rescue and the block, meet this task force

An innovative scheme being trialed in Victoria is achieving both social and environmental outcomes. Andy Aitken of the Broadmeadows Energy Task Force team tells all

The task force's mission is to provide energy audits and energy saving retrofits to low income households. Once completed this will help householders save money on their energy bills and increase the comfort level of their Broadmeadows homes.

The Energy Task Force are converting homes like this one in Melbourne's north west, to be more comfortable and energy efficient.

Task force team

Our team consists of six people who have been unemployed for an extended period, plus our two trusty supervisors Brett and Matt. The project is a win-win situation for all involved. Not only are homes being made more energy efficient, the residents are becoming more aware of the environmental benefits of the installations. It has also been great for the task force team. Being unemployed for much of the last 12 months we have each gained training and are back in the workforce.

Carmel, Nina, Stuart, Paul, David and myself, the task force team members, have a diverse blend of experience and talents. Knowledge was freely shared, without hesitation. We feel that our efforts are not only making a difference but are appreciated by the generous, concerned and sometimes eccentric characters of the Broadmeadows community.

Task force training

Before we started assessments, we had a two-week training period. Infoxchange Australia provided instruction on Occupational Health and Safety (OHS) issues, which was understandably very detailed. We also looked at job skills and personal effectiveness; for example, how to develop new skills as well as recognising and nurturing existing skills to gain employment in a variety of fields. John Green from Sustain Now, delivered training in ecological and sustainable design. We covered concepts such as site orientation, solar access, insulation, draughts and other ideas that readers of this magazine

Broadmeadows Energy Task Force

The Broadmeadows Energy Task Force (ETF) was initiated by the Sustainable Energy Authority Victoria in conjunction with Neighbourhood Renewal, and was funded under the Victorian Greenhouse Strategy as a pilot project to improve the energy efficiency of Victorian homes. The ETF is concentrating on households on the Mews Estate and in the Jacana region of Broadmeadows. The ATA (Alternative Technology Association) is managing the project in conjunction with two other organisations—HomeGround Services, a community based organisation working in the fields of homelessness and housing, and Infoxchange Australia which focuses on community development using IT. The Sustainable Energy Authority Victoria is working with other organisations in two more pilot regions, Bendigo and Geelong. Stage 1 of the ETF finished in late August 2003. ATA has lodged an application to conduct stage two of the project.

would have at least one finger on the pulse of. He also told us we were all MAD, Making A Difference.

Our training does not stop there. Every second Monday throughout the 12- week program we have formal training sessions from Infoxchange Australia. We are also continually learning from our experience on the job and from Matt and Brett, our affable supervisors. They create a great team environment and encourage improvisation from the task force team.

On with the job

Our welcome into the Broadmeadows community was made warm by HomeGround Services. Tracy Hyatt, the recruitment officer and a Mews Estate local, and the rest of the HomeGround team, door knocked the area and recruited homes to be assessed.

HomeGround gave us access to the Mews Community House to use as a base while working in the region.

They also gained consent from the residents for their energy bills to be monitored by the Sustainable Energy Authority Victoria for the two years before and after the project. This is to assess the effectiveness of the program and quantify benefits.

House assessments

During the assessment we asked the residents about their habits as far as energy and water consumption are concerned, focusing on their main living areas. Issues include lighting, draughts, bathroom water consumption and insulation.

We inspected the homes for draughts around the doors, window sashes and through the exhaust and static vents in the ceiling. We discovered one of the main sources of draughts was from the gaps between the ceiling cornices and walls. The ceiling and roof space are also inspected to identify the condition of any existing insulation and to gauge how much more was needed. Shower roses were also checked. We estimated the commonly fitted shower rose allowed a flow of 25 litres a minute, much more than the nine litres a minute of the AAA shower roses we have fitted. Hot water systems were also examined for any exposed pipe that may need to be insulated. The whole assessment took about 45 minutes to conduct.

Retrofit

Once the assessment was complete we arranged a convenient appointment for the retrofit with the householder.

We used lightweight self adhesive

The task force in action, from left to right: Carmel sealing a draughty doorway, Stuart placing a pelmet above the window and then placing a rubber strip on the bottom of the door, while Nina makes sure the new compact fluorescent light is working.

The task force team with their distinctive bottle green uniforms and matching green van have become a familiar sight to the residents of the Melbourne region of Broadmeadows. The author Andy is the one about to receive some sealant in his eye from Matt one of the trustworthy supervisors.

weather stripping products to seal any draughty windows and doors. The bottoms of the external doors were more often than not fitted with draught stoppers. Internal doors were also fitted with strips along the bottom (rubber strips if the floor is level or brush if otherwise) to help the householders zone their main heating areas effectively. Any gaps in the construction joints were filled with an acrylic sealant.

A device called a 'Draft Stoppa' (refer to the products section in *Renew 84*) was fitted where possible over any exhaust fans. This is basically a one-way valve with two butterfly flaps that open when the exhaust fan is operating, and remain closed when not—quite clever really.

Pelmets, the elongated boxlike fittings that shroud the tops of curtains, were attached at the top of the windows to create better insulation. In a heated room, hot air rises but it doesn't retain heat forever—as it cools down the heat drops. So what happens when this cooling air contacts cold glass like that in a window? It falls faster, increasing air movement and convection currents and transferring more of your precious heat to the outside world. Pelmets significantly retard this process by forming a barrier along with the curtain which slows the convection currents and therefore reduce heat loss. I learnt a great deal in this area of the retrofit.

We are also replacing existing incandescent globes with high-efficiency compact fluorescents. The standard replacement for a 75 watt incandescent is a 14 watt compact fluoro. Compact fluorescents of different wattage were used to accommodate individual householders preference for brighter or dimmer areas around their homes.

Task force reflections

After retrofitting homes my curiosity grew as to how effective the task force's labour actually was. One thing that disappointed me at the start when I told people that I worked on the task force in Broadmeadows was the instant preconceptions and stereotypes they had about the area and the people.

Halfway through the project the task force team held a community barbecue in collaboration with Mews Community House. The day was a sizzling success! No need for introductions, as we had shared a cup of tea or two with the residents in their homes. The kids tired us (well me) out with games of 'tiggy' and a fairly physical game of three on three basketball.

When I went to bed at the end of the day I decided I wanted to continue my involvement working in that area of Melbourne as our work had been constructive and appreciated by the community.

I feel satisfied that our work has been beneficial to the 100 households retrofitted. We estimate that the retrofitted houses will save between 10% to 25% on their heating, electricity and water bills.

I have faith in the fact that the team has made a difference to so many people—with long-term benefits to their home's comfort, their cash flow and increased their interest and knowledge in how small changes affect the distribution of our planet's resources.

How big should my eaves be?

We take a quick look at why your house needs them, how big they should be, and the relationship between eave and window sizes

If you ask the average builder this question nowadays, they will most likely look at you and ask why you even want them, as they add to the cost of a house. Of course, the builder doesn't have to live in the house after it is built, so he usually doesn't care if the place is an oven in summer simply because there is no eave overhang (on the north side of the house, at least) to exclude the hot summer sun.

In contrast, some older homes have quite wide verandahs, and while these may seem like a good thing, they can actually work against you during winter by not allowing an winter sun into your home to provide warmth.

However, if a house is designed correctly, the eaves will be the right width so that they exclude summer sun, but allow in the winter sun. But what width of eave is right for your home? Well, it has to do with the height of your north-facing windows, and their placement in the wall.

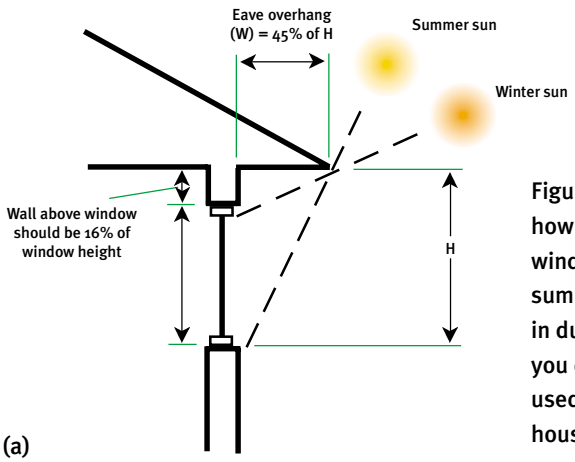
There is actually a simple rule of thumb when designing homes, at least for homes situated in the lower lattitudes, like Sydney and Melbourne. This rule can be seen graphically in Figure 1(a).

The rule states that the width of the eaves (call this W) should be around 45% of the height from the bottom of the window to the ceiling (call this H). Another part of this rules states that the height of the wall above the window should be around 16% of height H. I have to confess that I am not sure what this part of the rule actually does, but the closer you stick to these dimensions the better your eaves will perform.

Now, being able to design eaves of the correct size is fine if you are building a house, but what if you already have a house that has little or nothing in the way of an eave overhang on the north face? There are many options, but one of the simplest is a pergola that uses battens that are mounted with the appropriate width-to-space ratio. This solution can be seen in Figure 1(b), and is something that can be implemented for relatively low cost.

While a lot could be written about this subject, the basic information given here is a good start to help you design you eaves and windows correctly. It is applicable to at least as far north as Sydney, but obviously, as you get closer to the equator the eave width will need to be smaller if you want to make use of winter sun. Indeed, in the far north of Australia, eaves on the south side are needed in summer.

The information in this article was based on chapter 5, Windows, of the SEAV's Energy Smart Housing Manual. This can be downloaded from the SEAV website at: www.seav.vic.gov.au/buildings/housing_manual.html



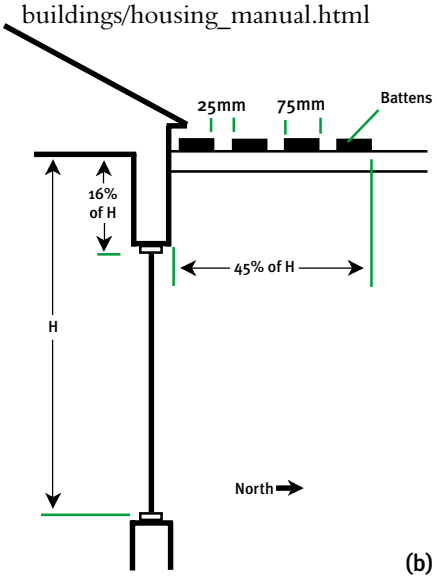


Figure 1. On the left you can see how eave width relates to window height to exclude summer sun while allowing sun in during winter. On the right you can see how battens can be used to add correct shading to a house made without eaves.

From rabbit warren to the Beach House

Cheap housing opportunities are declining in the inner-cities of Australia, but this modern energy efficient rooming house provides warm comfort for disadvantaged tenants in Melbourne's St Kilda area

Derelict warehouses and buildings in the inner city are hot property these days, as they are snapped up by developers and turned into trendy apartments for private sale. So it is refreshing to see new community housing that is built for those who just need a roof over their heads.

Such is the case of the newly renovated 'Beach House' in the Melbourne suburb of St Kilda. The renovated building provides 19 rooming house rooms and seven self-contained bed-sit units with updated kitchens, new dining areas, additional bathroom facilities and improved fire safety services.

The St Kilda Rooming House Issues Group—an organisation who, for about 20 years, have addressed the decline in cheap rooming houses—found the rundown building and, with $2.35 million funding from the Victorian Government's Social Housing Innovations Project, were able to transform one of the last rooming homes in the area. The redevelopment in total cost $3.16 million.

The ATA (Alternative Technology Association) provided the energy efficiency advice, which has made the accommodation more cost effective. The house features solar hot water, solar light wells, a rainwater tank to provide water for flushing toilets, time control showers, hydronic heating and compact fluorescent lights throughout.

As the cost of utilities is factored into the weekly rent of the units, lower running costs mean more affordable housing for those who need it most. The energy efficiency consultation by the ATA saved $6500 on the cost of the solar hot water system alone.

As Cathy Humphrey, Chair of the St Kilda Rooming House Issue Group points out, while the Beach House will not solve the growing gap between those who can and can not afford private housing, it is a sign of hope and a step in the right direction.

'This project won't address the problem for low income, marginalised Australians. These citizens don't dream of having a house and a passport to inter-generational wealth. They hope they won't have to sleep on the beach tomorrow night.'

The hot water solar collectors on the roof of the Beach House.

Left: The new rainwater tank that feeds water to the toilets for flushing.

Above: The communal kitchen in the renovated Beach House.

Room with a view

In the early eighties, five loosely connected friends were spontaneously brought together and built an environmentally sustainable housing community. The result is spectacular

It all started when Roger Buck, an architect who was working on low-cost state housing for the New Zealand government, was asked to assist a friend who was looking to buy some land to build on. The friend had come across a 2.83 hectare site of steep, north facing, undeveloped land at Clifton Hill, overlooking Christchurch. She had written it off as a solitary venture but its potential to Roger was immediately clear.

From there it all happened rather quickly. To make the venture affordable the two gathered resourceful friends to bring on board, a solicitor joined in who took care of legal matters, and a real estate agent. Together they still did not have the funds to buy the land so another friend formed the fifth party and lent money (with no interest) to those who could not afford their part of the shares. 'Sorting this out took about a week. Everything came together very nicely, and we made a cash offer and that was it. Split five ways, the cost for each of us was less than half the going price for an ordinary section at that time, but the land was undeveloped, and had no services to the boundaries,' explains Roger.

Development plans

With the land purchased the group set about drawing up development plans. These were based on three basic concepts held by the group. Firstly, the development of housing and infrastructure needed to suit the existing land forms and climate rather than imposing on the land a conventional subdivision. Secondly, the group wanted to form a community, one that encouraged personal initiative and self help—essential to making it affordable. The disposition of the houses in relation to each other and the surrounding environment would also play a pivotal role in creating a successful community. Thirdly, the group wanted to create housing that was environmentally sensitive, and which enhanced the surrounding environment.

As the site was unserviced, eroded and totally bare, the development plan had to include roads, retaining walls, stormwater management, irrigation, revegetation and walking tracks. Conventionally subdivided, the site could have had twenty-six buildings. However, the group decided to build only five houses. Well separated, the houses were located on the upper part of the block to leave the bulk of the site for open space areas and to take full advantage of the spectacular views overlooking Christchurch, the mountains, and the Pacific Ocean.

Development approvals

The development proposal was submitted to the council with the expectation that they would grasp the proposal as a model for innovative and environmentally sustainable housing development. However, the process proved very frustrating and eighteen months later the project was approved only after an approach to the mayor and the council manager to get things moving.

Never-ending construction

In the late 1980s construction started on the site and the first house was built. Two more houses followed and the last two houses began five and seven years ago respectively.

All stormwater is stored on the site. An underground tank holds up to 180,000 litres, while four dams average 12,000 litres each. A concrete tank holds about 20,000 litres. The total storage potential is around 250,000 litres. The tanks and dams collect rainwater from the houses and other hard surfaces and from properties outside the site where it flows across the boundary. This water is used to irrigate the open space area with thirty overhead sprinklers and also as a backup source for fire preven-

The first house to be built on the Clifton Hill site overlooking Christchurch and the Pacific ocean.

tion. The discharge system allows for the selection of particular water sources, and also for discharge sectors.

The planting of native species in the open space area and around most of the houses is now sufficiently well established to provide a haven for local birdlife such as fantails and bellbirds. Some of the planting includes exotic species such as poplars to give visual continuity with adjoining properties.

The area is starting to manage itself thanks to the irrigation. Noxious weeds such as gorse and broom are suppressed by larger native plants that are becoming self-propagating .

'We think that, for the most part, the open space area will eventually require very little maintenance. The most regular human input will be keeping the walking tracks cleared and maintaining the irrigation system,' explains Roger.

Co-housing development

Decisions on all developments on the site, including the building of new houses and major alterations to existing homes, are subject to consultation with the whole group. To reduce costs, much of the work on the site has also been carried out by members of the group.

A few years ago a decision was made to move away from joint ownership and aim for individual freehold titles, as some of the group felt uncomfortable with this non-traditional arrangement. This introduced very substantial additional costs which could only be recovered by selling three building sites, thereby increasing the number of houses from five to eight.

Lessons learnt

As Roger points out, while a lot has been achieved there have been problems and not everything has gone smoothly. 'The reality is that there has been a succession of events that have presented difficulties. But given the scale of the venture, the span of time, and the fact that we all have had full-time jobs elsewhere, sticking with it has produced the results we hoped would come. I think all of us appreciate that we have something very special, which could never have been achieved any other way.'

Some of the factors that have helped contribute to the success of the project include the mix of relevant skills. An architect, a solicitor who swapped places with a quantity surveyor, a real estate agent and electronics engineer all brought valuable skills which led to a substantial reduction in costs.

Having a relatively small group also made things easier to manage. And maybe a bit of luck and being at the right place at the right time.

'The site itself was a fluke of timing and circumstance and this governed the design and placement of all the houses, but its purchase showed the value of spontaneity and a willingness to take a risk.'

And the major lesson learnt: 'If we can live like this so can anyone'. ✲

The lowest dam on the site that collects runoff from the road and overflow from the other dams. A level-sensing automatic discharge system and water release valve can be operated remotely from the central control.

Ian and Rosemary Bywater's house

Like all the Roger Buck designed houses on the Clifton Hill site, the Bywater's takes full advantage of the steep north facing slopes to create a highly efficient, passive solar house. The external walls are built of polystyrene block with concrete cores while the internal walls are almost entirely made of concrete block. Polystyrene blocks are practical, easy to use, and are a fantastic insulator. All walls were hand plastered with cement-based plaster using a white marble aggregate that had added oxide to provide the colour. These combinations give the walls a soft creamy, finely-textured finish. It also eliminates the need for painting.

The ceilings are exposed concrete which has only needed a paint finish, and ceramic floor tiles have been used throughout. The windows are double glazed with low-E glass, which is more efficient than normal glass, and the frames are unplasticised PVC (uPVC) to reduce energy losses associated with metal frames. The house is excavated deeply into the ground on the south side to minimise exposure to the cold southerly winds. This also substantially reduces the visual bulk of the building.

The house has a solar hot water system and a shower base that recovers heat from the used shower water by warming the incoming cold water that is being fed to the hot water cylinder—the cold water pipe takes the form of a spiral which is welded to the underside of the metal shower base. A WhisperGen Stirling engine running on LPG provides electricity to the house and hot water to the in-floor space heating system, which is a supplementary space heating system for winter.

The three-storey house has three bedrooms, including a guest room which has its own en suite. There is ample living space that takes full advantage of the outstanding view by including two terraces and a balcony. One terrace links the main living area, kitchen and guest room with the garden, another is outside the main bedroom, and the lounge has its own balcony. The terraces are the roofs of rooms below.

The main roof at the highest level is designed to be earth bermed. Soil will be placed on it so that it merges with the adjoining hillside above, so that the house will be buried almost completely into the ground.

Roger and Lena Buck's house

This house (cover photo) was one of the earlier houses built on the Clifton Hill site in the 1980s. This passive solar house is also constructed with concrete, including all exterior and interior walls and the numerous intermediate floors. In this case, however, all the insulation is on the outside, which provides for a larger amount of accessible thermal mass.

The pitched portion of roof is tiled and the solar water heating panels are recessed into this roof. The flat areas are designed to be earth bermed, or to be used as terraces.

The window frames are made of timber, which has similar thermal values to unplasticised PVC, and the windows themselves are double glazed with normal float glass (which was all that was available at the time it was built).

All the living area floors are tiled—which is about half of the total floor area—and this is where most of the solar energy is obtained. Tiles conduct heat into, and out of, the concrete underneath, whereas finishes such as carpet tend to prevent this happening. All the concrete structure is insulated with expanded polystyrene, and the pitched roof—which is timber construction—has more than the normal level of glass fibre insulation.

Both of these houses will be open for inspection as part of Solar House Day on 14 September 2003. Go to www.solarhouseday.com for details.

The solar hot water system provides about 60% of the hot water needs (for a family of four adults), and the deficit is made up by using it in conjunction with a conventional electrically-heated storage cylinder, and by an instantaneous electric heater for one of the showers.

Not only did Roger design the home, he and his wife did a significant proportion of the building work, including making the window frames and all the doors, in order to make it affordable. The house has proved to be the perfect family home. The building materials used have made it quiet and comfortable and the design has a good balance of areas for personal space and communal living.

Roger is in the process of building a trombe wall and a conservatory on the level above. Both will provide increased solar gain. Experience suggests that the house has sufficient thermal mass to use this extra energy without overheating. The trombe wall makes use of an existing stone-clad concrete retaining wall, and is connected in a controlled way—to manage the flow of heat—with the lowest room in the house.

A solar cooker big enough to feed an army—of school kids

'Sunny' Miller shares his experiences constructing a large, mobile solar cooker that will spend this summer travelling to schools around Perth

The original intent of the community solar cooker was to develop an alternative food cooking method for use in remote places. The replacement of wood fires with solar cookers could help reduce the environmental impacts of camping and the occurrence of accidental bushfires. By feeding a large group of people I could also demonstrate the capability of solar cookers. Though I have experience with designing and constructing solar cookers this was my first go at constructing a large transportable cooker.

Rhiannon from Parmelia Primary School loads some food into the giant solar cooker.

How it works

The principle of operation is the same as for a solar hot water system. A window with something black inside absorbs the heat of the sun. However, as there is no water draining the heat away you have a solar system capable of getting much hotter than boiling.

In fact it is not unusual for a simple domestic cardboard box cooker to reach 135°C in half an hour. That will thoroughly cook a quiche, chocolate cake or veggie casserole in about two and a half hours under the summer sun in much of Australia.

Design

The community cooker was designed by myself, based on similar devices used in India and Mexico. I read about the 'Mexican' cooker in Home Power magazine. It was designed by Ed Eaton of Solar Energy International in Colorado, USA. The 'Mexican' cooker was made entirely from wood. The inside of the 'Mexican' cooker had aluminium duct board lining painted black with expanded metal mesh above the duct board to assist the circulation of hot air. It had fixed side reflectors and an adjustable main back reflector. The reflectors were covered with Everbright, a shiny aluminium.

Our community solar cooker has two separate chambers. This allows for one side to remain hot while the other side is opened. Knowing that the wind would move a lightweight cooker with large reflectors I decided to make the case out of plywood for strength and weight. For weather-resistance the plywood case was then covered with colorbond sheet metal. The inside metal absorbers were made of sheet steel and coated with matt black high-temperature powder coating as used on domestic wood heaters. Glossy black reflects some light—matt black absorbs more.

For the inside of the cooker I opted for solid sheet steel. Though it probably takes longer to heat up than the aluminium duct board used in the 'Mexican' cooker, once heated it provides a strong and even heat, and is easier to keep clean.

The main reflector is attached with hinges at the top of the cooker so that it can be opened and closed to the desired angle. I decided to make the side reflectors removable to make them easier to

The community solar cooker is 2.2 meters long by 60cm high at the back wall. The double glazed window sits at an angle of 21 degrees. This is higher than Perth's latitude and is a compromise biased to the high summer sun. I assumed there would not be a lot of use of the cooker during winter. For one thing there is a lot of winter haze around here, and though not very noticeable, haze certainly affects the cooker's performance.

The main reflector is the same size as the window—that is 2x1 metres—so when it is opened up it adds roughly another metre in height. When collapsed and transported the cooker fits neatly on its 7x4 (foot) trailer. Having the cooker trailer—mounted has the advantage that equipment can be stored under the cooker. This space can hold display boards and trestles for shows.

Construction

Cabinet

I undertook the initial cabinet making and was then assisted by Permaculture *work-for-the-soul* participants from Hillside Farm, Gosnells, south of Perth. Holes for rear doors were cut in the outer skin to match with existing holes in the wooden box. Then the inner metal liner, the absorber, was cut and folded, but not so much as to touch the outer metal.Jarrah frames cover the gap between.

It is important that inside and outside metal do not touch; this gap serves as a thermal break to prevent heat 'running' from the warm absorber to the outer case and being lost to the outside.

There is food grade fibreglass insulation between the inside black absorber and the wooden case. This insulation has a face of thin aluminium foil. To keep the foil from peeling when putting the tightfitting absorber in place, we put a sheet of newspaper over the plywood case and the insulation. After the absorber was installed it was simple to just tear away the exposed paper.

Doors

The insulated doors are quite thick. They are filled with wool and covered inside with sisilation (a sandwich of paper and aluminium foil used in building construction). Facing the inside of the cooker are black metal covers.

Glazing

The job of the windows is to allow solar radiation into the cooker. They should be strong, clear, easy to clean and have minimum potential for condensation or air leakage.

We used double-glazing with an insulative still air space between the two sheets of toughened glass. The assem-

bly is silicon sealed and separated from the case by wool weather stripping.

Reflector

The reflectors have a metal tubing frame with galvanized sheets attached. 'Nevamar' mill finished, anodised aluminium sheet was used as the surface for the main reflector, while air conditioning ducting foil was used as the surface for one of the side reflectors and kitchen aluminium foil for the other. The different surfaces will be assessed in regards to reflectivity and corrosion.

The angle of the reflector is adjustable to three different settings. This is done with a square tube prop with one hole at the top which is fastened with nuts and bolts to a hole in the reflector frame. Near the bottom of the prop there are three holes. A bracket at the front of the cooker on either side is where nuts and bolts fix the bottom end of the prop. The user selects the hole that gives the most sunshine into the cooker.

Fan

With the solar community cooker I have opted to place a fan in one chamber and, for comparison, one chamber without. Preliminary experience has indicated that the fan might not be necessary as the heat distribution is very even.

Thermometer

A six dollar oven thermometer has been fixed to one of the walls.

Cover

To protect the cooker during transport we purchased a vinyl 'Tonneau'. The cover was reinforced where it touched the sharp corners of the cooker.

Problems we encountered

Doors

Door latches that easily open, close and effectively seal have yet to been found.

Reflector Props

The props that hold the main reflector at three different angles needed to be strong, collapsable, storable and have minimal moving parts. The final reflector props involves bolts and nuts which are loose and may go astray, so we are still looking for a better solution. Gas struts were added as an extra safety measure to ensure the main reflector would not fall and hurt someone.

Members of the Perth ATA branch check out the community solar cooker.

Reflectors

The mounting brackets for the removable side reflectors ended up being in the way of the added gas struts. A future modification may allow us to reconnect the side reflectors but for now they are not used.

Absorber

Originally we had hoped to have baked enamel as the finish on the absorber, however no one could be found to do it. The powder coating that we used was thin and the correct colour seems not to be very rugged. Removing food scraps off the absorber floor also takes off some of the coating.

What we would do differently

Large-scale trailer-mounted cookers can be much simpler if they are made from just metal. As the cooker is placed on the trailer there is no need to use the wood for additional weight. You could make an effective and cheaper cooker using only metal for the frame.

If solar cookers are to be used for bush camping or remote areas they will need to be less vulnerable to window breakage, both from falling objects and from pots hitting the glass from inside.

In conclusion

All up, the cooker has been in construction about two years and cost about $4000. Much appreciated financial assistance came in the form of an alternative energy grant from the Western Australian Government through the Sustainable Energy Development Office. The project was rather innovative and the brainstorming and assistance of Mr John Bowler, a wonderful solar chef, was a blessing. By the look of the faces of the kids at Parmelia Primary School that I visited recently, proof is in the pudding. Or pizza or biscuits or... ✲

Sunny can be contacted on ph/fax:(08) 9459 3606 or sunnymiller@iinet.net.au

In the next issue of *ReNew*, Sunny will show us how to make a simple cardboard cooker in 1 hour—Ed.

Cool Communities—a year on and even cooler

Queensland Cool Communities Facilitator Kirsten Macey gives us the lowdown on what 'cool' things have been happening across Australia

There is no longer a debate about whether climate change is real; we know that it's happening now. Scientists have said that global warming contributed to the most recent drought in Australia and we can continue to expect more impacts from climate change. There is no longer any uncertainty about how much we should reduce our greenhouse pollution, but how we can achieve it. Cool Communities is one small step to making a big difference to global warming.

The Cool Communities project is designed to provide a more tangible link between energy use in the home and global warming. By working with government, industry and the community to reduce greenhouse pollution, the project is finding ways to cut greenhouse gases, save money and improve our lifestyles at the same time.

A year ago, Cool Communities selected twenty two communities to participate in the first national program to reduce greenhouse pollution in households across Australia. Every state and territory has its own Cool Communities. They range from a workplace in Canberra; to a remote Aboriginal community in the Northern Territory; former timber towns in Western Australia; a catholic parish in Queensland and a football club in Melbourne.

One year on, Cool Communities project has worked with 3000 households, with each house reducing their emissions by an average of nearly one tonne every year. This equates to a reduction of almost 3000 tonnes of greenhouse gases nationally. The environmental significance of this is great and so too are the economic savings of the houses that have participated.

The success of Cool Communities is demonstrated by the involvement of a diverse range of groups nationwide, all of which offer practical activities that householders can do. One of the highlights has been the variety of approaches and the innovations in project design undertaken. Here is what Cool Communities has achieved in your state.

Australian Capital Territory

The ANU Food Cooperative and Sullivan's Creek Catchment Group Cool Communities in Canberra trained over 20 volunteer energy auditors to undertake assessments of householder's home energy use. The ANU Food Cooperative also collaborated with builders, carpenters, plumbers and the newly trained energy auditors to retrofit a 'low-income' rental home to demonstrate energy efficiency in a tangible way. This weekend workshop included installing Winter Windows, curtains and pelmets, draught proofing for windows and doors, ceiling insulation, a water efficient shower head and compact fluorescent lights. As part of this project, a tool kit was developed so that other members of the cooperative can use the tools and equipment required to retrofit their own homes.

Queensland

The Earth Benefits Club is a revolving savings fund set up through the Maleny Credit Union's Cool Communities project. It provides no-interest loans for environmentally beneficial purposes such as solar water heaters, insulation, energy efficient appliances, rainwater tanks or solar photovoltaic panels. This savings club helps to support house-

holders who lack the upfront cash needed to buy environmental products. The Earth Benefits Club is all about people helping people and is especially good for people on low incomes.

Victoria

Victoria has taken an integrated approach to household sustainability to achieve greenhouse gas abatement. The Sustainable Living at Home program, run by the City of Port Phillip and supported by Cool Communities, has successfully focused on building neighbourhood support groups to achieve long-term environmental outcomes in the areas of energy and water saving, waste reduction, travel and purchasing.

The Western Bulldogs Cool Community has likewise achieved comprehensive energy, water and waste audits for all 100 households. This involved the training of 35 household auditors to conduct the household assessments. In addition, householders are provided direct subsides for the purchase of low-cost energy and water saving products, with a 97% uptake of energy efficient lighting and 74% installation of water tanks.

Tasmania

One of the exciting projects coming to fruition is the installation of full ceiling insulation (R3.8 batts) in 20 student rental houses in Hobart, as part of an initiative by the University of Tasmania Cool Communities project. The Tasmanian University Union manages student housing and is committed to increasing the energy efficiency of its buildings. The houses will be cosier in winter with the prevention of up to 50% of the heating loss from homes, saving money on student's heating bills. Private landlords of student houses are also being encouraged to participate through incentives of low cost insulation and a rebate of $200.

Western Australia

The Manjimup Warren Districts Renewable Energy Group Cool Communities project has proven to be a great complement to WDREG's core passion for renewable energy and energy efficiency. The group's excellent technical skills has enabled them to build devices ranging from a low water use shower head tester to a biodigester. But, perhaps their greatest achievement has been their development of a Greenhouse Gas Calculator which is on their website at www.wdreg.org.au

Above: Women from the Leichhardt Cool Communities check out some energy saving products.
Left: The SWaP show in full swing in South Australia.
Far Left: The rubbish disposal system in action at Ikuntji.

Northern Territory

Ikuntji, an Aboriginal community near Alice Springs, worked to develop a more hygienic and less polluting method of waste disposal, which both reduces greenhouse pollution and encourages community spirit, education and role modelling for other such communities.

In Darwin, the Cool Communities project celebrated its anniversary of the project with a 'Magical Mystery' bus trip, (destination Channel Island Power Station) to see where Darwin generates its electricity. An award was handed out to the household that saved the greatest amount of greenhouse gases, which was over four tonnes, equating to $750 saved on their annual energy bill. Other awards were given for innovative behavioural changes undertaken throughout the program and first prize went to a couple who now make love with the lights off!

New South Wales

Leichhardt City Council, an inner city municipality, took on the challenge of attracting time-poor, non-green types to the Cool Communities project. The diversity of groups that attended Cool Communities workshops was a major highlight, with a Spanish seniors group, a Vietnamese women's group, housing collective, school kids, and a community native nursery being amongst the range of groups involved in the project. This project has demonstrated that all types of people are willing to make changes in their homes when they are aware of how they can participate.

South Australia

Electricity prices in South Australia have jumped an average of 25% since last year, and there's been an enormous interest in what Cool Communities has to offer. The travelling SWaP Show (Save Water and Power) was a performance that delivered an energy efficiency message, put on by nine councils and performed by Our Planet Enterprises. South Australian Cool Communities have conducted over 25 public forums and workshops (including some great composting workshops), held 'open house' tours, built partnerships with local businesses and promoted hundreds of AAA rated shower heads and over 1000 compact fluorescent light globes, as well as 150 worm farms!

Cool Communities continues

Cool Communities aims to develop a culture of greenhouse action across Australia. Many of the initiatives developed can be used as models for other Australian communities and households to reduce greenhouse gases. We've still got a long way to go but the signs are good! ✲

Cool Communities will be looking to recruit more communities in the next few months so look out for details. For more information contact the Cool Communities Facilitator in your state or territory. Cool Communities is an initiative of the Australian Greenhouse Office and environment groups across Australia. www.greenhouse.gov.au/coolcommmunities

IF YOU DEPEND ON POWER DEPEND ON

SELECTRONIC

THE PERFECT CHOICE

Stand Alone Sinewave Inverters From 200w to 3600w in 12, 24 or 48 volts DC

SILENT AC POWER ANYWHERE ANYTIME

Phone: 613 9762 4822
Fax: 613 9762 9646
Email: sales@selectronic.com.a

Selectronic Australia PTY.LTD. (Incorporated in Victoria) Bayswater, Victoria, 3153 Australia. Selectronic is a Trade Mark of Selectronic Australia Pty Ltd

For more details visit our website:
www.selectronic.com.au

Incorporating the exclusive Selectronic Thermal Share Technology

This latest technology provides significant reduction of heat stress within power devices and is a major breakthrough in the area of long life and reliability in power inverter design.

ACN 063 863 785

AUSTRALIAN MADE

Quality System
Quality Endorsed Company
ISO 9001 QEC 6419
Standards Australia

tst® thermal share technology

SELECTRONIC AUSTRALIA

Over 50 ways to reduce your energy costs

Start doing it now!

1. Shut your doors when you are heating and cooling so that the energy only goes to the room you are using.
2. Decide what you want from the fridge before you open the door (and close the door straight away too).
3. Use cold water whenever you don't need hot water.
4. Turn off lights whenever you are not in the room.
5. Dress for the weather.
6. Use the sun whenever you can for whatever you can!

Watch your bills

7. Keep track of your energy use and find the cause whenever your bill changes.
8. Motivate your kids—offer to share energy savings with them.

Light your house the smart way

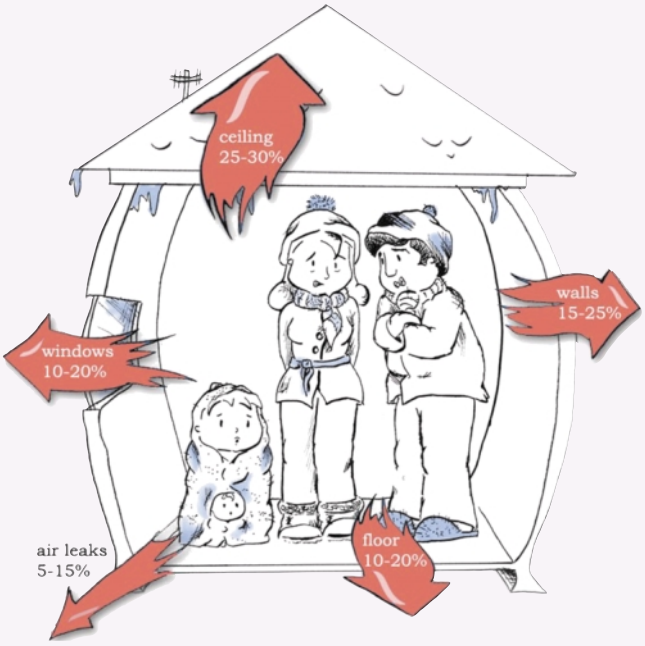
9. Use daylight instead of electricity whenever you can.
10. Fit low energy, compact fluoro light globes.
11. Brighten your rooms with light coloured surfaces and then reduce the wattage of your lights.

Heat, cool and ventilate for comfort

12. Make sure windows are shaded from the summer sun.
13. Use curtains with pelmets to keep heat in during winter.
14. Draft proof your rooms.
15. Insulate your ceiling and walls.
16. Set your thermostat lower in winter and higher in summer—every degree costs an extra 10%!
17. Open windows to make the most of breezes when the temperatures outside are mild.
18. Capture winter sunshine with a dark rug or floors—especially from north facing windows.
19. Keep filters dust free and regularly maintain heaters and coolers so they run efficiently.

Cooking quickly

20. Put lids on pots when cooking.
21. Use the microwave instead of the electric stove if possible.
22. Use the toaster instead of the griller.
23. Only boil the water you need at the time in the kettle—don't fill it right up if you only need one cup!



Power that stands by doing nothing

24. Turn things off at the switch instead of by the remote.
25. Invest in a 'switched' powerboard so it is easy to turn off individual appliances not in use.
26. Turn off the water heater when you go away for holidays.

Hot water—save water and energy!

27. Fix dripping taps, especially hot water ones.
28. Reduce the length of your showers.
29. Fit a AAA rated shower head—if compatible with your water heater.
30. Use pipe lagging to insulate your water heater's pipes.
31. Use AAA flow restrictors and aerators for better water use.
32. Lower the temperature setting on your water heater's thermostat (no lower than 60°C for storage tanks).
33. Bathe with a friend.

When washing and drying...

34. Use a solar dryer—that's right, the clothesline!
35. Wash your clothes in cold water.
36. Front loaders use less water than top loaders.

Get it right when you buy or rent

37. Get the size right first then read the energy stars to choose the most efficient appliances—the more stars the better.
38. Check what an item will cost to run before you choose it.
39. Choose a house that has living areas facing north and makes the most of it's north-facing windows to provide heat in winter but has shade to keep cool in summer.

Fridges—working 24/7

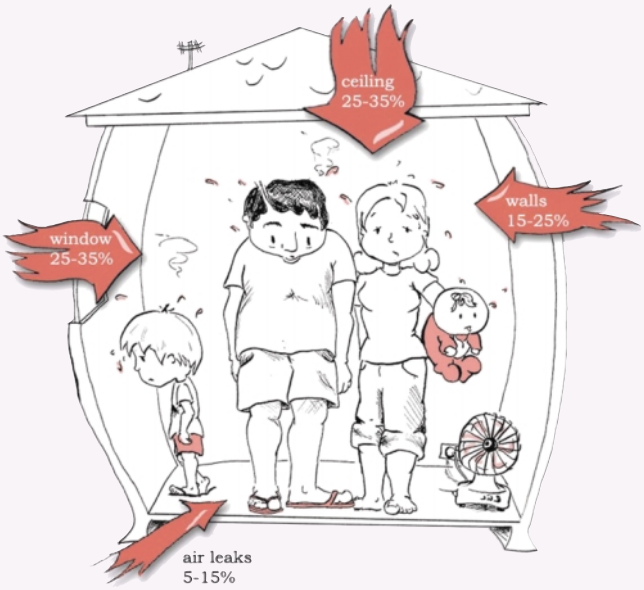
40. Clean the seals and check they are working well.
41. Clean the coils at the back of the fridge.
42. Have good airflow over the coils to take the heat away.
43. Use a thermometer to check the fridge is set at the right temperature—every degree costs an extra 10%!
44. Use the right sized fridge.
45. Turn the second fridge on only when it's needed—$150 a year can buy a lot of beer!

Smart travel options

46. Walk, ride a bike, take the bus or train.
47. Keep your car well tuned so it runs efficiently.
48. Plan and do everything in a single trip instead of many.
49. Travel with a friend instead of on your own.
50. Drive smoothly to save petrol.
51. If you have a choice, take the smaller car.

Swimming pools and other guzzlers

52. Use timers to optimise the running time of pumps.
53. Make sure the spa is well covered and insulated.
54. Clean the filters.
55. Make sure pumps are sized well and maintained.



Thank you to the ANZSES South Australian Branch for the tips.

The wise choice of many alternatives...

Every home with an electric storage hot water system emits around 4.8 tonnes of greenhouse gases every year.

Choosing a high efficiency gas powered hot water system would reduce those emissions by around 73%.

We think that's a decision you would be proud of.

Imagine then if that gas hot water system also...

- needs no power source
- has no pilot light
- only heats the water you use, as you use it
- is extremely energy efficient
- provides up to 16 litres per minute of continuous hot water.

Introducing... the NEW Bosch 16H HydroPower

At the special offer price of:

$699 including GST

PLUS...
for a limited time, Elgas will give you an Easymix Blender and 176 litres of LPG (approx *$240 value) absolutely FREE!

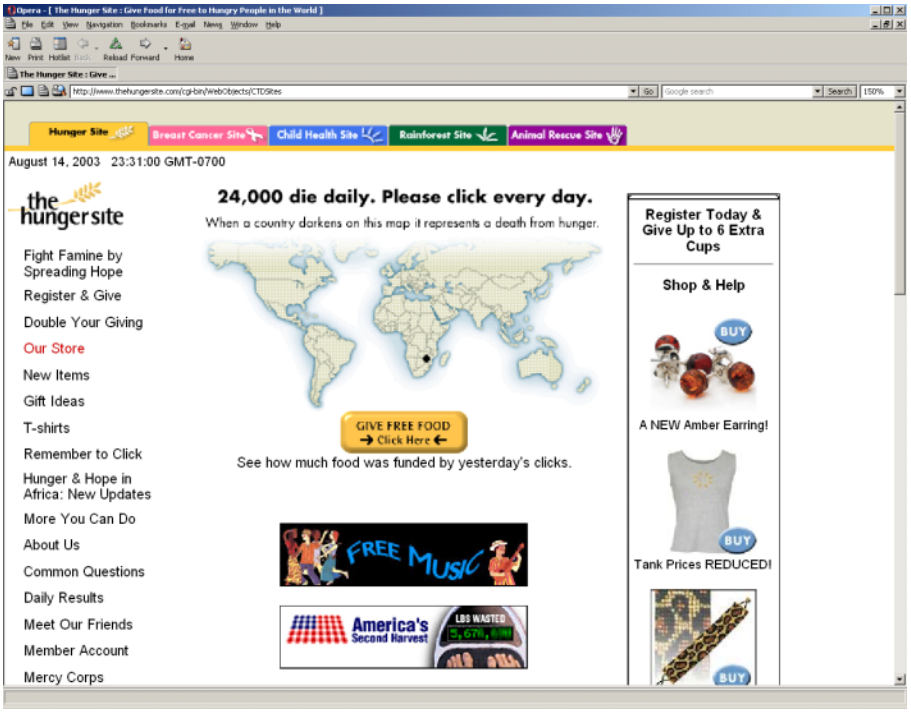
*RRP including GST

ELGAS

Call 131 161 to take advantage of this outstanding offer

www.elgas.com.au

www.thehungersite.com

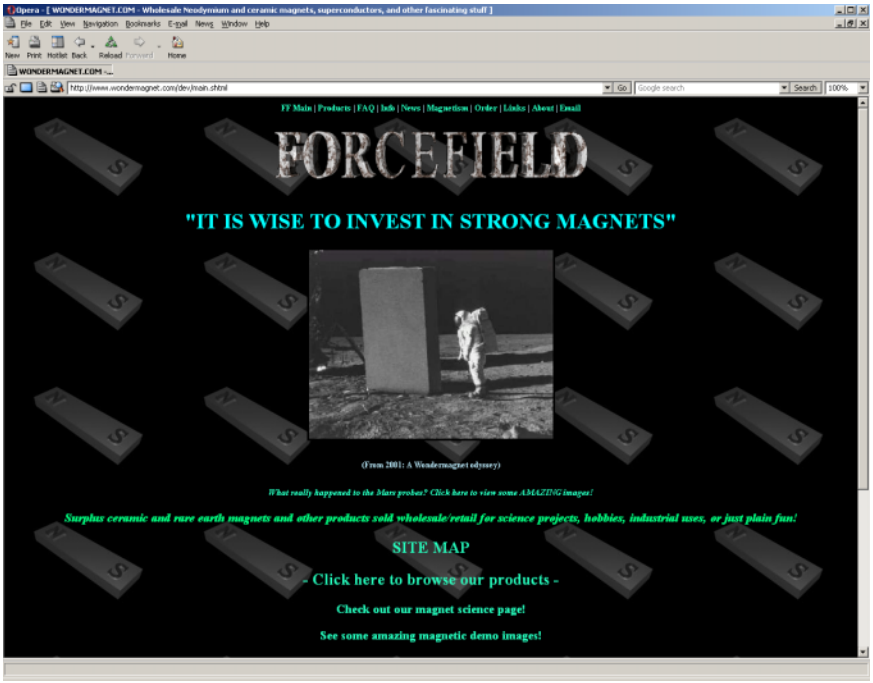


If ever there was a web site (or in this case, a group of sites) that everyone should visit on a regular basis, The Hunger Site (and the associated sites, The Breast Cancer Site, The Child Health Site, The Rainforest Site and The Animal Rescue Site) must be it.

The concept behind these sites is simple. You go to them once each day, click on the appropriate button, and with this simple act you have, through the sponsoring companies of each site, improved the planet in some small way. Whether it be by supplying a cup of food for starving people or animals, saving a small piece of endangered rainforest, or even funding free mamograms for women who otherwise could not afford them, all you need to do is click.

Of course, the sites are covered in links to the products of their sponsors, but as so many of those products are quality items, then the sites are worth browsing for that reason too—there are over 350 internationally available products available, so look for the international shipping available icon when browsing.

There are plenty of links on these sites, including to other sites such as the Take Action Center and the Nature Conservancy site.



www.wondermagnet.com

Ok, go on, admit it, you love magnets, and why not, magnets are one of those really cool mysterious objects that give rise to all sorts of interesting and sometimes a little whacky ideas.

If you are a magnetophile, then wondermagnet.com is the place to find some of the most powerful magnets available. These guys sell surplus magnets, particularly the massively powerful rare-earth types, in all shapes and sizes, from tiny 3mm cubes right up to 25mm spheres and 50mm x 25mm disks—there are heaps of other sizes and types.

But they don't just have magnets—there is also a range of books dealing with both magnets and a number of other topics. There are experiments, and the materials to perform them, like magnetic viewing film, that actually lets you see the magnetic field in real time. There is even a superconductor levitation kit!

So, if you need serious magnets for that next generator project, or just want the strongest fridge magnet you have ever seen, this is the site for you!

Build these LED replacement lamps

The super bright 1 watt Luxeon LEDs and the smaller but equally impressive Superflux range have been amazingly popular, but fitting them into standard light fittings is not a simple task. To help overcome this problem, we have designed several kits that allow you to build a direct replacements for DC lamps found in many homes, especially off-grid dwellings.

There are three kits available. The first kit, the Luxeon LED halogen, lets you make a lamp that is a replacement for a MR16 halogen lamp, which is the common 50mm lamp found in most halogen downlight fittings. This kit allows you to fit three 1 watt Luxeon LEDs of any colour choice, or even multiple colours if you wish. Power consumption of this lamp is less than four watts, and it includes a constant current driver circuit, rectification so that you can use the lamp on AC output transformers, and a 500mA fuse to protect the LEDs. Note: it is not suitable for use with high frequency switchmode halogen transformers that have an AC output, as the rectifier supplied cannot switch fast enough. Switchmode transformers with a DC output are suitable, providing they are capable of running with such a small load compared to the original lamp.

There are two circuit boards in this kit. The smaller of the two contains the rectifier and current limiting circuit. This board attaches to the larger board, which holds the three LEDs.

The second kit, the Superflux LED halogen, is similar to the first, except that instead of three Luxeon LEDs, you use (up to) 18 Superflux LEDs, wired in strings of three LEDs. The standard design is for the full 18 LEDs to be used, but fewer may be used by changing the current drive of the constant current circuit, which is simply a matter of changing one resistor. Because of the lower cost of the Superflux LEDs, you can make LED halogen lamps with this kit for less than the cost of the Luxeon kit. The down side is there are currently no high output white Superflux LEDs available, and Lumileds (the makers of the Luxeon and Superflux ranges) have as yet no plans to manufacture them.

The third kit, the Superflux LED bulb, is aimed at all those people who don't have or don't want to use halogen lamp fittings. It consists of six circuit boards (five LED boards and one base board) that are soldered together to form a cube that can be fitted with any circular lamp base type from 14mm through to 27mm Edison Screw bases. The kit is not provided with a lamp base, you have to get your own, which is usually just a matter of carefully removing the glass part from an old light bulb and using the metal base. There are instructions on doing this later in this article.

Building the kits

The construction method is similar for each kit, and you will need a moderate level of soldering skills to complete them. Use a soldering iron with a maximum power rating of 25 watts (or a temperature controlled soldering iron if you have one). Anything hotter than this may overheat the LEDs and boards.

Luxeon LED halogen

Start with the smaller of the two boards. The first thing is to install the two long pins (nails). These are the pins used to hold the lamp into the halogen socket. Push them from the component (non-copper) side through the two holes in the middle of the board, until their heads are seated against the circuit board. You may need to use a small hammer to get them through the board. Turn the board over and, making sure they are parallel to each other and perpendicular to the board, solder them to the board. You will need to put the heat into the pin first, and once the solder sticks to it, flow it onto the board. They are galvanised nails and should solder easily, but you can clean them with steel wool if you wish.

Now insert the other three PC pins (from the component side) in the two holes marked 'LED–' and the hole under R1 at the very bottom of the board. Push these through the board so that they protrude a millimetre or so out the other side and solder into place.

Now insert the fuse clips, making sure the small tag on each clip is towards the outside. These can be a tight fit, so fit them before the rest of the components. Once soldered into place, fit the fuse.

Next you need to fit the BD139 transistor, Q1, to the small board. This is attached to the copper side of the board, the large copper area helps to act as a heatsink. With the metal face of the transistor facing down, bend the legs downwards so that they will go through the board, and so the hole in the transistor

lines up with the hole in the board. Mount the transistor using the silicone rubber washer, 3mm bolt, nut and tooth washer, with the head of the bolt against the transistor. You will need to trim the excess rubber from the bottom and sides of the rubber washer, as it will cover the pin holes if you don't.

Lastly, you can fit the rest of the components. Install the two resistors, the bridge rectifier and the small transistor, Q2, as close to the board as possible, being careful of the orientation of the last two devices. Solder these in place and trim their leads.

You will have noticed that there are two resistors supplied for Q2. The 2R2 resistor will give a LED current of around 300mA and a running temperature of around 50°C for an ambient temperature of 25°C. If you intend to run the lamp in a higher ambient temperature, then use the 2R7 resistor. This completes the driver board.

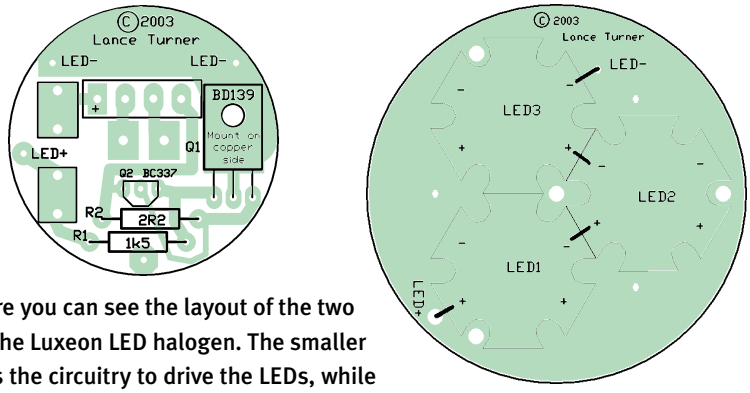


Figure1. Here you can see the layout of the two boards for the Luxeon LED halogen. The smaller board holds the circuitry to drive the LEDs, while the larger board holds the LEDs themselves.

Now take the large board, place it face (LED side) down and place three PC pins (the gold coloured pins) into the three small holes on the board. Make sure that you don't use the hole marked 'LED–' as it is close to one of the pin holes. Push the pins so that they protrude through the LED side of the board (the side with the writing on it) by about 1mm. You can now solder these three pins on both sides of the board, but keep it neat as you don't want solder where the LEDs are mounted.

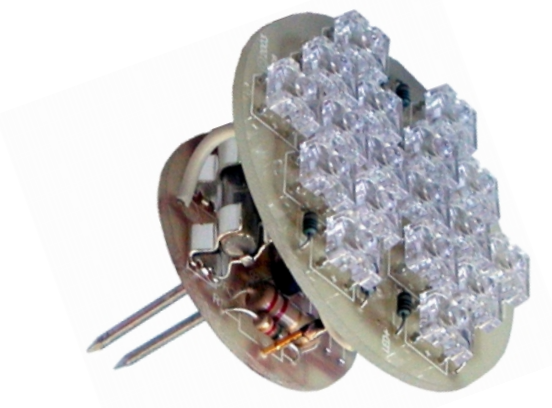
Next, screw the three small screws into the outer three LED mounting holes, making sure you can still slip the edges of the LEDs under their heads. Now place your three LEDs onto the board, orienting them the same way as on the overlay. Place the PC spacer over the long screw, and screw this into the centre hole in the board. Tighten all the screws gently to hold the LEDs firmly

in place. You might want to test fit the screws first before fitting the LEDs, so that there is less risk of slipping with a screwdriver and damaging a LED.

Now you can wire the LEDs together. Make a note of how they are connected in Figure 1. Solder small pieces of wire between the three LEDs to join them in series, and then connect the negative end of the series string to the connection point on the board marked 'LED–'. You can use the offcuts of the resistor leads for this purpose. Connect the length of hookup wire to the positive end of the series string, which should be next to the spare hole in the board. The hookup wire passes through this hole and down to the driver board below. Keep the connections short and neat, and make sure you don't overheat the circuit boards of each LED and damage them.

To finish the lamp, you line up the PC pins of the two boards (remembering that the pins do not make an equilateral triangle, so the boards will only align in one position) and solder the tips of the pins together. Then you cut the hookup wire to length, strip the end and solder it to the driver board at the point marked 'LED+' (next to the fuse).

Testing is simply a matter of connecting the lamp to a 12 volt power source while measuring the current. It should settle at around 300mA or a bit less.



The Superflux LED version of our LED halogen kit. While not yet available in white, the coloured kits are great for architectural highlighting, party lights, safety lighting and many other uses.

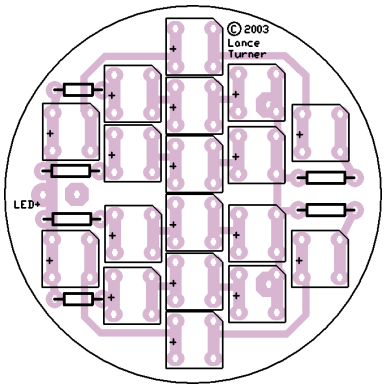


Figure 2. The Superflux LED halogen replacement board. The LEDs are connected in series strings of three, so you can use from three to 18 LEDs, depending on how much light you need. Note that the driver board is the same as for the Luxeon LED kit.

Superflux LED halogen

The Superflux LED version of this kit is similar, except that instead of three 1 watt Luxeon LEDs, it uses up to 18 of the smaller and much lower cost Superflux LEDs. This allows you to build a similar lamp to the first one, but for lower cost (especially the amber or red version, which costs only $36 for all 18 LEDs).

Construction for the smaller board is the same as the small board for the Luxeon version (it is in fact the same board). The only change is if you decide to use less than the full 18 LEDs in the bulb. In this case, you have to recalculate the value of the current sense resistor, R2. As an example, if you wanted to use only nine LEDs (three strings of three LEDs) then you would need half the total current (150mA instead of 300mA) in order to keep the current through each string to 50mA. This would re-

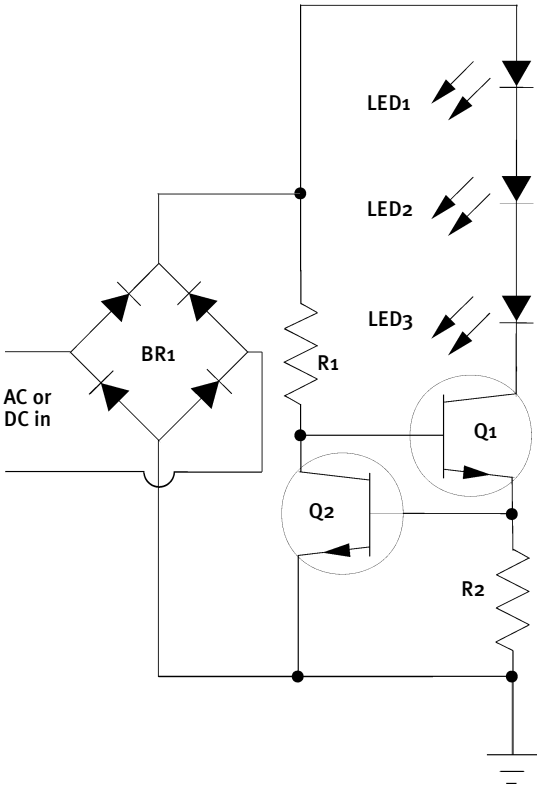
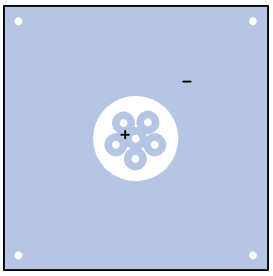


Figure 3. The schematic diagram of the LED halogen kit. Note how simple the circuit is.
Current flows through the LEDs, through transistor Q1 (which is turned on by a small base current via R1) and resistor R2 to ground. When the voltage across R2 reaches 0.65 volts, corresponding to a current through it (and therefore through the LEDs) of 300mA, Q2 starts to turn on, robbing Q1 of base current and thus limiting the current to 300mA. The bridge rectifier, BR1, allows the use of either AC or DC power sources.



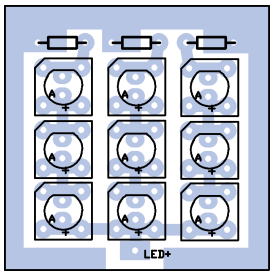


Figure 4. The boards for the Superflux bulb. On the right is the LED board, and on the left is the base board. Note that the LED board can take either Superflux LEDs or standard 5mm LEDs.

quire a current sense resistor double the standard value of 2.2 ohm, so a resistor of 4.7 ohm (the closest readily available value to 4.4 ohm) would be used.

The LED board of this kit is even simpler to build than the Luxeon version. Just insert the PC pins and the six 10 ohm resistors (these are used to balance the current flow through each string) and solder into place, trimming the resistor leads. Then insert all of the LEDs, making sure they are the correct way around, and solder them into place. and the board is finished! It is just a matter of joining the driver board to the LED board as described previously and connecting the hookup wire from the LED+ point on the driver board to the same point on the LED board. The kit is then complete.

Superflux general purpose bulb

This kit is very different to the previous two, and is far more versatile in the number of light fittings it can be used in. The kit consists of six square circuit boards that are soldered together to form a cube. Five of these boards are identical and hold nine Superflux LEDs of your colour choice, while the sixth board completes the cube and holds the lamp base. The board can take any Edison Screw or bayonet base from 14mm to 30mm in diameter, which means you can make a bulb to fit almost any light socket available.

It should be noted here that this bulb, like the other two, is designed to run from 12 volts. In fact, this one has no rectification built in, so it must be run from 12 volts DC. This makes it ideal for caravans and solar lighting systems, but suitable plugpacks are readily available to allow this lamp to run from 240 volts AC if desired (the ATA stocks a suitable high-efficiency switchmode plugpack).

Assembling this lamp is a bit trickier than the other two. You start with the

five LED boards. Fit the resistors and LEDs, and solder them into place. Note that the resistor values will be different for the various colours, as the different coloured LEDs have different voltage drops. The red and amber LEDs use 82 ohm resistors, as they have a voltage drop of around 2.6 volts each, and can handle up to 70mA of current. The green, cyan and blue LEDs all have voltage drops of around 3.5 volts and have a maximum current of 50mA, and so use 47 ohm resistors. We also supply this kit with a mixture of red, green and blue LEDs, which makes a sort of funky pseudo-white light output (great for kids rooms or where perfect colour rendition is not needed) which, with their combination of different voltage drops, require 62 ohm resistors.

Note that this lamp kit can also be fitted with standard 5mm LEDs, but you need to increase the resistor values accordingly. To calculate these, you need to know the voltage drop of each LED, multiply it by three to get the drop of the whole string, subtract it from your supply voltage (13 volts is a good average figure to use for 12 volt systems) and divide that result by the LED current, in amps. So, as an example, for white LEDs with a voltage drop of 3.4 volts at a current of 20mA, you would have: 13-(3.4 x 3)/.02 = 140 ohms.

Getting back to the construction, once you have soldered all the LEDs and resistors into place, connect an 80mm length of hookup wire to the LED+ connection of each board. Next, you need to solder the edges of four of the boards together to form a square tube. Don't go crazy with the solder, keep it neat and just use a small fillet at the corners of the boards. The hookup wires should all be at the same end of the tube. The fifth board solders to the end of the tube where the hookup wires are. Once this is done, you will have a cube with one side missing, and five wires coming out that end.

The next step is to solder a short length of bare tinned copper wire into each corner of the open end of the cube so that they protrude out the open end like the hookup wires do. Now, put this assembly aside to cool a bit. Once it has cooled, you can test each board by connecting a (fused or current limited) 12 volt supply across each board in turn and make sure they light up properly. Connect the positive to the hookup wire, and the negative to anywhere on the copper edges of the board. The edges double as the negative connection of the boards, thus eliminating negative wires—just like the body of a car doubles as the negative wire.

To make the base board, you first have to decide what fitting you want. A common size is the 27mm ES (Edison Screw) base, and these are readily available. Whichever base you choose to go with, you need to find an old bulb (or sacrifice a new one) that has a brass or tin-plated brass base. Some, especially the bayonet type, have aluminium bases that can't be soldered easily, so avoid these.

Caution: When removing the glass from the bulb base, you must wear eye protection as well as gloves to prevent you from injuring yourself. Also make sure that the glass is contained—don't do this on the loungeroom carpet!

To remove the glass, wrap the bulb in layers of newspaper and gently tap the bulb through the paper with a hammer. Once it has shattered, open up the paper and remove the base. You will need to remove any glass still attached with a pair of long-nose pliers. You will also need to remove some of the glue from the inside of the base so that you can pass the connecting wire through to the end pin.

Once you have cleaned your bulb base of glass and cement, use your soldering iron to remove the solder from the end terminal to expose the hole. This can be difficult, and it is sometimes easier just to drill out the hole from the inside using a 1mm or 1.5mm drill bit.

Now that you have your bulb base, you can finish your bulb. Cut a short length (about 50mm will be heaps) of hookup wire and strip a few millimetres of insulation off each end. Solder

Relative efficiencies of lighting options

Incandescent:	2-7%, 10-15 lumens/watt
Halogen:	up to 10%, up to 20 lumens/watt
LED:	up to 25%, up to 55 lumens/watt
Fluoro:	up to 30%, up to 60 lumens/watt

Note: These figures are approximate and are given for comparison only

Advantages of LEDs

- Extremely long life
- Very durable and reliable
- Generally more efficient than incandescent and halogen lamps, especially the coloured LEDs, and so generate less heat for the same amount of light
- Don't require high voltages like fluoros do, so are simpler to drive

Disadvantages of LEDs

- Most colours are not as efficient as fluoros
- Not as simple to drive as incandescents
- More expensive than most other lights at present

The All New *AIR-X*

A breakthrough in small wind turbine

AIR-X:
ROTOR DIAMETER: 46 inches (1.15m)
WEIGHT: 13 lbs (5,85kgs)
MOUNT: 1.5" schedule 40 pipe (1.9" OD, 48 mm)
START-UP WIND SPEED: 7 mph (3.13 m/s)
VOLTAGE: 12 and 24 VDC (36 and 48 VDC available soon)
RATED POWER: 400 watts at 28 mph (12.5m/s)
TURBINE CONTROLLER: Microprocessor-based smart Internal regulator with peak power tracking
BLADES (THREE): Carbon fiber composite
BODY: Cast aluminum (AIR-X Marine is powder coated for corrosion protection)
KILOWATT-HOURS PER MONTH: 38 kWh/mo@12 mph (5.4m/s)
WARRANTY: 3 Year limited warranty
SURVIVAL WIND SPEED: 110 mph (49.2 m/s)
OVER-SPEED PROTECTION: Electronic torque control

Southwest Windpower is pleased to introduce the latest evolution in small wind turbines, the **NEW *AIR-X***. The ***AIR-X*** combines what has made AIR the world's number one selling small wind turbine with new technology previously found only in today's state-of-the-art mega-watt-class wind turbines.

All of these features are primarily found within the body of the turbine. The new microprocessor based speed control results in increased performance, improved battery charging capability and the **elimination** of "flutter" noise from the machine. The controller allows for peak-power tracking of the wind by optimizing the alternators output on all points of the cubic curve and then efficiently delivers the energy to the battery. The turbine's smart controller allows it to actually control blade rotation speed thus **eliminating** the buzzing noise commonly found with the AIR 403 and 303 in high winds. Furthermore, a new series of carbon-reinforced blades with a modified pitch angle further increases power production.

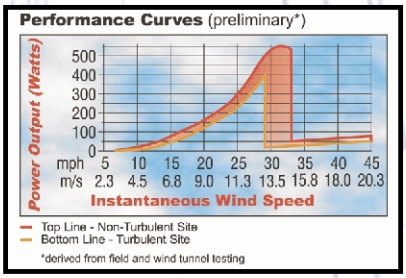
The new electronics are a considerable improvement over the previous AIR-403 controller that consisted of diode-rectification and a simple on/off voltage switch.
To the customer this means:

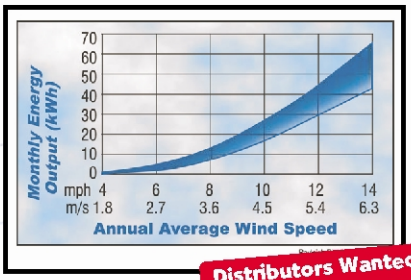
1) Much Lower Noise: Previous AIR wind modules relied on their aero-elastic blade design for protection in high winds, causing loud flutter noise in winds above 35 mph (16 m/s). AIR X's circuit monitors the wind speed and slows the blades as it reaches its rated output **preventing** it from ever going into flutter. The result is a much quieter wind turbine. In high winds, the ***AIR-X*** will continue to produce power at a reduced level until the wind decreases, at which point maximum output will resume. Additionally, when the battery has reached its charged state, the ***AIR-X*** will slow to an almost complete stop. Only when the battery has dropped below its voltage set point will it startup and resume charging.

2) Improved battery charging: Previous AIR designs required 300-400 amp hour battery banks so the trickle charge of the wind turbine could be adequately absorbed. The AIR X's charge controller periodically stops charging, reads the battery voltage, compares it to the voltage setting and if the battery is charged, it completely shuts off all current going to the battery. This function is performed within a few milliseconds. The closer the battery is reaching its full state of charge, the more often the AIR X's circuit repeats this action. This means any size battery from 25 to 25,000 a/h or higher can be charged safely.

3) Lower stress design: ***AIR-X*** limits power on the input side of the electronics by controlling the torque from the blades. The power no longer has to be dissipated by the electronics resulting in lower stress on the circuit, bearings and other materials. Furthermore, stress on wind turbines occurs primarily in high winds. Under these conditions, the electronic stall design reduces the speed to 600 rpm, thereby significantly reducing turbine and tower loading.

The ***AIR-X*** is our most expensive venture to date. Thousands of hours of research and testing have gone into the design. We are confident you will love the improvements the ***AIR-X*** has to offer.





Distributors Wanted In All States

Air Marine Australia 43 St Hellier Street Heidelberg Heights 3081
Phone: (03) 9459-2888 Fax: (03) 9459-4327 Email: airaus@hotkey.net.au Web: www.airaus.com

one end to the centre hole of the base board, and tin the other end to make it easier to pass through the hole in the base.

Now you need to solder the five ends of hookup wire from the LED boards to the five holes in the base board that surround the centre hole. Once this is done, feed the ends of the tinned copper wire sticking up from each corner of the bulb through the four holes in the corners of the base board. Push the base board down, making sure the five hookup wires are completely inside the bulb and not damaged in any way. Once the base board is level with the edges of the other boards, bend each wire over in turn, solder them to the corners of the base board and trim the ends.

To finish the bulb, feed the centre hookup wire through the metal bulb base until it pokes out through the hole in the centre terminal, and solder the wire into place. Trim any excess wire and make sure the end is nicely rounded. Use a file (gently!) if necessary. Now, position the base in the middle of the base board and solder it to the board in three or four places around the base. You bulb should now be complete and ready for testing.

Connect it to your current limited (or fused) power supply and apply 12 volts. The bulb should light up. Note that the bulb will run warm, and the temperature will vary depending on the ambient temperature, the supply voltage and even the type of fitting used. It should be warm, but not hot to the touch.

These kits are available from the ATA, go to www.ata.org.au and click on the webshop link to order them, or call 03 9388 9311.

The general purpose bulb kit lets you make a screw or bayonet based bulb to fit almost any light fitting you wish.

dryfit

Sonnenschein

Reliable for life!

Sonnenschein's dryfit® "Solar" range of batteries has been continuously developed since 1958. From the inventors of the Gel maintenance free battery comes a specially designed battery for all renewable energy applications.
Proven performance, over the last three decades in thousands of sites throughout the harshest regions in Australia and the world back up their reputation as the ultimate Solar battery.

Solar Block: Grid Plate monobloc batteries for heavy-duty applications, with a service life of 8-10 years. Designed for 1200 X 100% extracted capacity (according to IEC 896T2). Sizes: 12V 60Ah to 6V 300Ah

A600 Solar: The world's only Tubular Plate gel battery designed for Solar applications, this is the ultimate in ultra high discharging lead acid batteries. 15+ year service life and up to 1600 X 100% extracted capacity (according to IEC 896T2). Sizes: 2V 240Ah to 2V 3500Ah

Consider these advantages:

* **Absolutely maintenance free: no more topping up acid; no danger to user, children or animals.**
* **Safe: no acid discharges, fumes or spillages.**
* **Simple battery room required: install almost anywhere, even indoors!**
* **High cyclic performance & high C10 discharge rate: smaller battery bank required.**
* **Patented cyclic additive: proven long life, even at high temperatures.**
* **Deep discharge resistant: added safety for remote sites.**
* **High energy acceptance: very efficient and can be easily fast charged.**
* **Manufactured to extremely high quality (ISO9001) for the highest reliability.**
* **Fully recyclable: environmentally friendly.**

Don't settle for second best, buy the best. Get reliable for life.

Contact us for your nearest distributor
Sonnenschein dryfit Solar. Ph: 1300 733 004
www.mhpower.com.au

M&H POWER SYSTEMS
M&H 22146

Battery charger buyers' guide

This guide shows you what to look for in a charger for your renewable energy system and lists the commonly available chargers. By Jason Bond

The energy inputs to a renewable energy power system may at times not provide enough energy for the load attached to it. The solution to this is often a 240 volt AC generator. To integrate with the rest of the system this needs to be matched to the chosen DC voltage. The device used for this is, of course, a battery charger. Some mobile systems in motor homes or yachts for example, charge via the mains as opposed to a generator.

Linear chargers

There are two main types (or topologies) of battery charger available. The simplest is the linear charger, which uses a standard mains frequency transformer to step the AC voltage down. This is then rectified to DC and filtered to reduce the AC ripple still present on the output.

This describes the simplest possible linear charger. In practice it will usually include some form of voltage regulation to ensure a controlled charge. The more sophisticated this is the less supervision needed to ensure the batteries are not overcharged. The typical efficiency of this topology is around 60% to 85%.

The major advantage of the linear unit is simplicity. This translates to reliability with less components to fail, so they tend to be more robust. If they do fail they are much easier to service than a more sophisticated design. In a remote location where you are depending on the system for basic services, this is an important consideration.

Switchmode chargers

The other type of charger is the more modern switchmode, which uses power electronics to convert the AC to DC. First the AC is rectified to a high DC voltage. This is then switched to create high frequency AC, transformed down to the required voltage and rectified again, then filtered and spat out as DC.

Why go to all this trouble just to get DC? Firstly the transformers required for high frequencies can be smaller, lighter and of course cheaper than their low frequency equivalents. A switchmode unit can be highly efficient, many rate around 90%. Another big benefit is ease of regulation. Because the AC is being regenerated within the charger it is a relatively simple matter to tightly regulate the output. This can be extended to allow for multi-stage charging.

Also available are inverter chargers or bi-directional inverters. These use the same power electronics to provide the inverter and charger functions. They generally include sophisticated control regimes, and should be considered if you are planning a RAPS installation. However, for the purposes of this buyers guide they will be considered primarily as an inverter, and hence will not be considered in depth.

The unregulated linear 50Hz charger as discussed earlier has a variable voltage and current rate characteristic when charging lead-acid batteries. As the initial charge begins the current is at a maximum and this reduces linearly as the battery voltage increases. This form of charging is fine for small format cells. However, in a RAPS situation, with a battery bank costing thousands of dollars, it is probably worth investing in a more sophisticated device, unless you are willing to control the charge manually.

A well regulated charger will at least maintain a constant current or voltage charge depending on battery chemistry. Ideally, multi mode charging will be incorporated. This can be two stage—incorporating boost and float modes or three stage—adding a periodic equalise mode to ensure flooded cell batteries maintain their capacity.

Ripple

If the conversion of AC to DC is less than ideal, an AC component can remain on the output of a charger. I'll spare you the excruciating detail, but suffice it to say many boffins agree (and some don't) remnant AC is not the best for

the longevity of your battery. It effectively subjects the battery to mini charge-discharge cycles and extra heat, so can reduce its expected lifespan.

It can be hard to get figures on ripple output levels, however above about 1000Hz the effects are reduced. This means ripple is of less importance in high frequency switchmode units. Conversely if you are considering a linear unit try to get an idea of its ripple level. If a battery charger states that it has a filtered output, this just means measures have been taken to reduce its ripple.

Electromagnetic interference

This is when unwanted distortion is induced on the input AC waveform. This can effect any other piece of electronic equipment connected to the same supply as the charger. It can manifest as hum in radio or TV reception and is often abbreviated to EMI. Closely related to EMI is RFI or radio frequency interference, for those who don't speak fluent acronym. As the name suggests, this is unwanted emission of radio frequencies and can understandably cause havoc especially with AM radio reception. The Australian standard for these concerns is AS1044, and a charger that adheres to this or an equivalent international standard shouldn't cause too much trouble.

Battery charger ratings

Battery chargers are primarily rated at a maximum current for a given output voltage. This rating will be given as a continuous one for a quality charger. It pays to check how the manufacturer obtains this specification. A charger rated at the nominal battery voltage could put out less power than one rated at the actual float value of the battery. This could be due to less stiff regulation, causing the current to fall as the battery voltage rises. Taking a 12 volt system requiring a 10 amp charger, if rated for a nominal battery voltage of 12 volts you get a power output of 12V x 10A = 120W of guaranteed power output. If rated at the 13.8 volts of a fully charged lead acid battery you get 13.8V x 10A = 138W of power. Most chargers will give their rated power into the float voltage but it pays to check.

Charger sizing

There are two things that determine the size of charger you will require—the nominal system voltage and the maximum rate of charge of the batteries. The voltage is fairly obvious, and the charge rate is often taken as 10% or one tenth of the amp-hour (Ah) capacity of your battery at the ten hour charge rate (C10).

For example, if the capacity of your batteries was 800Ah at a charge rate of 100 hours (C100), at the C10 rate the capacity may be only 600Ah. To get the charge current just divide 600Ah by 10 hours to get a charge current of 60 amps. If there are no chargers available for your chosen system voltage at the exact current rating, go for the nearest available one rated below the calculation to avoid damaging the battery.

Types of batteries

The three main types of batteries in common usage for RAPS systems today are the nickel-cadmium (or nickel-iron), the flooded cell lead acid battery and the sealed lead acid (SLA), which can be either gel cell or absorbed glass mat (AGM) types.

Nicads are rugged, tolerant and have a high performance, they are not damaged by complete discharge and can even be stored short circuited. Accurate charging voltages are of great importance for Nicads.

The sealed lead acid battery is also rugged and being sealed can't spill acid electrolyte. The flip side of this is if they are overcharged they can be easily damaged, so a charger for these beasties needs to have a tightly controlled voltage output. Whilst not as pricey as a nicad, SLAs are also not cheap.

The most prevalent battery chemistry in a RAPS environment is the flooded lead acid. These will be deep cycle types, as opposed to an automotive starting battery. To ensure a long lifespan the batteries must be looked after.

There are three possible charging conditions of a flooded lead acid battery:

Boost: the initial high current charge to do most of the actual charging.

Text continued on page 62

Manufacturer	Model	Topology	Input (Volts AC)	Output V (Volts DC)	Output I (Amps)	Dimensions (L x W x Hmm)	Weight (Kg)	Comments	Price (RRP)
Beehive	BH-2-1208*	2 stage switchmode	180-264 47-63 Hz	12	8	120x205x55	1.1	*Models can be used as a DC-DC converter with DC input voltages of 150-350V. 100-200mV of ripple.	POA
	BH-2-1214				14	168x205x55	1.6		
	BH-2-2404*			24	4	120x205x55	1.1		
	BH-2-2407				7	168x205x55	1.6		
	BH-3S/3D-1225	3 stage switchmode		12	25	285x238x70	3		
	BH-3S/3D-1245				45	325x230x102	5.1		
	BH-3S/3D-2415			24	15	285x238x70	3		
	BH-3S/3D-2425				25	325x230x102	5.1		
Durst	1208	2 stage switchmode	90-260	12	8	125x127x57	1	Suitable for a wide range of lead batteries. High efficiency (90%)	$285
	1214		180-260		14	178x127x57	1.5		$383
	1225		200-260		25	290x240x80	2.9		$616
	1245		200-260		45	320x250x115	3.4		$904
	2407		180-260	24	7	178x127x57	1.5		$438
	2415		200-260		15	290x240x80	2.9		$669
	2425		200-260		25	320x250x115	3.4		$900
Bainbridge Technologies	BTHI12151C	3 stage switchmode	230 or 115 50/60Hz	12	15	295x222x77	1.7	3 output models avaliable. Remote monitor panel avaliable as option.	$592.90
	BTHI12251C				25				$756.80
	BTHI12401CUni				40				$1373.90
	BTHI12601CUni				60				$1969
	BTHI24151C			24	15	295x222x77	1.7		$806.30
	BTHI24301CUni				30				$1749
	BTHI24501CD		230		50				$1969
	BTHI48751C		230/115	48	7.5				$1001
Excelsior Power	BAT12/12F	Switchmode	230	12	12				$349
	BAT25/12F			12	25				$499
	BAT25/24F			24	25				$649
	BAT50/12F			12	50				$649
KCS	PS120-24	Switchmode	240V	27.6	4.3			Australian designed and made.	$285
	PS120-12			13.8	8.7				$285
	PS240-24			27.6	8.7				$355
	PS240-12			13.8	17.4				$355
	PS300-48			55.2	5.4				$577
	PS300-24			27.6	10.8				$577
	PS300-12			13.8	21				$577
Master Volt	Mass 12/60	3 stage switchmode	180-260 50/60Hz	12	60		5	Optional intelligent remote to integrate with Mastervolt inverters.	$2464
	Mass 12/80			12	80		5		$2992
	Mass 24/50			24	50		5		$2497
	Mass 24/75			24	75		7.7		$3817
	Mass 24/100			24	100		7.7		$4895
RGS Technology	BC 24/20	Switchmode	220-250	12-16 or 24-32	0-40 (@32Vdc)	500x350x160	17	Generator auto start.	$1850

Manufacturer	Model	Topology	Input (Volts AC)	Output V (Volts DC)	Output I (Amps)	Dimensions (L x W x Hmm)	Weight (Kg)	Comments	Price (RRP)
Stanbury Scarf & Lord	AT6/25/2SAR	Linear	240*	12	25	645x345x390		*Tranformer primary has taps to allow for different input voltages. Circuit protection by HRC fuses. Automatic equalise function.	$1120
	1AT6/40/2SAR				40				$1206
	AT6/60/2SAR				60				$1258
	AT6/80/2SAR				80				$1456
	AT12/25/2SAR			24	25				$1180
	AT12/40/2SAR				40				$1337
	AT12/60/2SAR				60				$1552
	AT12/80/2SAR				80				$1670
	AT24/40/2SAR			48	40				$1685
	AT24/50/2SAR				50				$1795
	12/40/2SW	Switchmode	Nominal 240 capable of correcting mains variations.	24	40			DV/DT state of charge measuring for accurate charging.	$1510
	12/80/2SW				80				$1848
	18/60/2SW			36	60				$1685
	24/50/2SW			48	50				$1795
Statpower	Truecharge 10i	2 stage switchmode	200-250 50/60 Hz	Boost 13.8-14.8 Float 13.1-14.2 Equalise 15.5	10	190x170x70	1.6	Also sold as Xantrex products.	$494
	Truecharge 20i	3 stage switchmode			20	390x165x70	2.5		$806
	Truecharge 40i				40		3.4		$1067
Studer Innotec	MBC 12-25/3	2stage switchmode	230/115 ±15% 47-63Hz	Boost 14.5 Float13.8	25	200x270x120	2.2	3 outputs, avaliable with 1 or 2 outs. *for lead antimony batteries.	$817
	MBC 12-40/3				40	230x290x130	3.6		$1509
	MBC12-60/3				60	280x360x135	4.6		$1805
	MBC24-20/3			Boost 28.8* Float 27.4*	20	230x290x120	3.6		$1361
	MBC24-30/3				30	280x360x135	4.6		$1672
	MBC24-50/3				50	280x360x135	4.6		$1961
Woods	D1230	Dialomatic Manual. Linear design using phase controlled triacs for regulation	220-250VAC 50-60Hz	12	30	270x300x270	11	Will charge batteries from a single 2V cell to rated voltage. Best suited to flooded cell lead acid.	$804.10
	D1260			12	60		17		$1284.80
	D2415			24	15		11		$729.30
	D2430			24	30		17		$1203.40
	D2460			24	60		21		$2239.60
	D4815			48	15		17		$1278.20
	D4830			48	30		21		$2239.60
	1230B	BETAcharge II Linear	220-240VAC 50-60 Hz	12	30	270x270x270		Suitable for a wide range of batteries.	$810.70
	1260B			12	60				$1565.30
	2415B			24	15				$810.70
	2430B			24	30				$1430
	1230F	Filltered BETAcharge II Linear		12	30	270x440x270		Output ripple 150-300mV deppending on model.	$1254
	1260F			12	60				$2737.90
	2415F			24	15				$1240.80
	2430F			24	30				$2040.50
YK	YK1212	2 stage switchmode	240 ±10% input power 280W	Boost 14.5V Float 13.8	12	230x205x82	2.1	Designed for lead acid batteries including AGM and Gel types.	$250
	YK0824			Boost 29.4 Float 27.6	8				$250

[Book review]

Green House Plans

Editor Alan T Gray
RRP: $19.95, ISBN: 0 9586397 52,
80 pages, Earth Garden Books 2002.
Available from Earth Garden Books:
www.earthgarden.com.au

How much information can you glean from 80 pages of plans, photos and at times, blatantly self promoting text? Quite a lot, if you are in a position to initiate the construction of a free standing house in south eastern Australia, and have some knowledge of ecologically sustainable practise.

Green House Plans is a slightly perplexing publication—it is neither an authoritative design text in the way that say, the *Your Home Technical Manual* is, nor is it a collective sales brochure for the designers displayed, although this is mostly what it is. Its production values are modest, with black and white photos and clear floor plans, but as a means of keeping the counter price below $20, that is commendable. It is, of course, printed on plantation paper.

It contains examples of the work of 20 leading designers, spread from southern Queensland to South Australia, with coastal, highland and a couple of inland examples shown. While it may seem skewed not to include more examples from the arid zone or the tropics, it is reasonable, considering that 80% of Australia's population lives in the greater coastal strip.

What is most perplexing about this booklet is the supporting text. It varies between light and easily read technical descriptions, to something resembling a fairly bald marketing exercise. Whether this reflects overly loose contributor guidelines, or just the different approaches of the various designers, is unclear. The result is inconsistencies and varying amounts of factual information being given.

This is mildly frustrating, as the book contains some extremely interesting buildings, and some of the designers are amongst the best we have. As a building designer, I can interpret most of what I see in the plans and photos, but without more information a lay person may make wrong assumptions, which could easily lead to bad results. The reader will often need to seek more information from the designers showcased, but maybe that's the whole point of the book.

Reviewed by Dick Clarke

Continued from page 59

Float: a trickle charge designed to finish off the charge and keep the battery topped up.

Finally, some chargers allow for an **equalise charge**. This is a controlled overcharge to ensure the cells in the battery are all at an equal state of charge, and to prevent the battery stratifying.

Battery safety

Lead-acid batteries give off a potentially explosive combination of hydrogen and oxygen gases when charging. Combine this with the possibility of sparking from the terminals, and the necessity of a correct installation to the relevant standards is obvious. The Australian Standard AS3011 Part 1 and/or Part 2—*Electrical installations: Secondary batteries in buildings* is a good place to start. There are also other risks associated with any battery bank, including chemical risks of battery acid and the toxicity of the battery's materials, and the ever present electrical risk of possible high short circuit currents.

Conclusion

Not surprisingly, the choice of a battery charger depends largely on the size and type of battery it is destined to charge. The expected frequency of use is also an important factor—if it is to be used infrequently, a user may be willing to monitor and manually set the charge.

The table on page 60 to 61 compares some of the available battery chargers on the market. It focuses on units either specifically designed for renewable applications or chargers that are suitable due to automatic charging capability.

Contacts

Bee Technical, ph: 1300 888 320, beetechnical.com.au

Bainbridge Technologies, ph:(07) 3821 3333, fax:(07)3821 3977, www.baintech.com.au

Excelsior Power, 3/4 Apsley Place, Seaford VIC 3199, ph:(03) 8796 3260, www.inverter.com.au

K & C Stork, PO Box 177, Bacchus Marsh VIC 3340, ph:(03) 5368 7370, mob:0418 548 499, www.kcsolar.com.au

Mastervolt Australia, 30 Beach St, Kippa-Ring QLD 4021, ph:(07) 3283 7800, fax:(07) 3283 7811, www.mastervolt.com

M+H Power Systems (YK products) ph:1300 733 004, mhpower.com.au

Outback Marine (Studer), 3/5 Erton Drive, Labrador QLD 4215, ph:(07) 5563 9088, outbackmarine.com.au, www.studer-inno.com

RGS Technology, 27 Lyttleton St, Castlemaine VIC 3450, ph:(03) 5470 5890, fax:(03) 5470 5892

Stanbury Scarf & Lord Pty Ltd, PO Box 361, Baulkham Hills NSW 2153, ph:(02) 9674 2700, fax:(02) 9624 1093

Woods Battery Chargers, PO Box 118, Thornton NSW 2322, ph:(02) 4966 2811, fax:(02) 4966 2911, woodsbatterychargers.com

Backyard bees—bee sweetly sustainable

Phillip Calais gives us the buzz about beekeeping in your backyard

What has beekeeping got do with *ReNew* I hear you say. Well the way I see it, *ReNew* is the premier Australian magazine about sustainable living. While the dominant topic may be renewable energy, it is certainly not the only one, and sustainable water use, transport, building, permaculture and so on are also important topics. In other words, *ReNew* is about peoples needs for energy, water, food and shelter in a sustainable, or renewable, manner. And part of the food need is sugar—or honey. Hence an article about backyard beekeeping.

Now don't get me wrong, sugar is great stuff—I use white, brown, raw and every other type. And the sugar industry is a valuable contributor to our economy. But like other forms of monoculture there are problems—insecticides, herbicides, fertilisers and cane toads to mention a few. Then there is pollution resulting from not only the growing of the crop, but also from preharvest burns, waste residue and so on. But it is good to see that slowly these issues are being addressed—for example by using bagasse (fibrous cane waste) as fuel to generate electricity and heat.

And bees? Well, not only do they provide me with a natural sugar product collected from my neighbours' gardens, but they also pollinate the plants resulting in increased crops of fruit and veggies from my garden and my neighbours' gardens.

I can have my honey on toast in the morning (or anytime) or use it as a sweetener in cooking and drinks, to make mead (honey wine) and honey vinegar. Honey, as well as bees wax candles, make great presents for friends and family. You can also get pollen and Royal Jelly, but I don't bother. And my honey is 100% natural—not boiled or treated like shop-bought honey or chemically bleached like some white sugar is. (If you buy white sugar, buy from the leading Aussie manufacturers as they don't use bleach.)

But having bees is also a two-edged sword—or rather sting—and there are issues that must be dealt with.

Types of bees

Something that many people aren't aware of is that there are many different types or 'races' of bees, each with their own characteristics and temperaments. Australia has many types of native bees. As well as being stingless, their honey is often of superb quality. Unfortunately, Australian native bee hives are not useful for beekeepers. They produce only a few litres of honey a year while a hive of imported bees may produce over 100 litres a year.

Caucasian bees are well suited to backyarders as they are relatively docile. Italian bees are a bit more aggressive and stronger. They produce more honey and are able to better defend themselves against 'robber bees', ants and other pests, so are preferred by professional beekeepers. Right at the other end of the scale are African-Brazilian hybrid 'killer' bees which are dangerously aggressive and fortunately,

not found in Australia. Feral bees living in tree hollows and Telstra junction boxes are very common and range from very docile to utterly mad. Unfortunately, there is only one way to really find out. But generally speaking, the darker the bee, the madder they are and the more honey they produce.

In a hive there are three different types of bees—the queen, the workers and the drones. The queen is perhaps the most important. Commercial beekeepers may pay thousands of dollars for a good queen. She is the big one that lays the eggs. A good queen will not only be very prolific, but also of a strong breed. There is usually only one mature queen in a hive and the queens are 'bred up' by the workers who 'convert' a few ordinary larvae to queens by feeding them 'Royal Jelly'—a high protein, vitamin and mineral rich goo. If the queen dies, is ill, old or not very productive, the workers instinctively rear some new queens to take her place.

The workers are small, sterile females that make the honey, clean the hive, and above all, defend the queen and the hive against intruders (including you). Interestingly, workers do occasionally lay eggs, but as they are not fertilised, only develop into males.

The males or 'drones' are bigger than the workers but smaller than the queen and develop from unfertilised eggs from the queen (and occasionally from workers). Their job is to show off, drink lots of honey, and try and chat up the virgin queens. When the virgin queen is ready to mate she goes off on her 'maiden' flight with a thousand or so blokes after her. Only one gets lucky although he drops dead after his 30 seconds of glory. The queen then returns to the hive from her big flight out and starts laying. The unlucky blokes go back to the hive, where they hang around like old farts in a pub telling jokes, until winter time when they are kicked out into the cold and told not to come back. *Ce la vie!*

Obtaining bees

Around springtime, the hives multiply by swarming. What occurs is the workers breed up a number of queen cells. When a new queen emerges from her cell, she will sometimes hunt out unhatched queens and kill them. (Commercial beekeepers remove the queen larvae and put them in plastic 'cages' to prevent this.) She then boots the old queen out of the hive, who takes along some of the workers. This 'swarm' will hang in a tree protecting the queen while some workers go off searching

for a suitable hollow log, hole, or your neighbour's letterbox in which to form a new hive. At swarming, the bees are generally very docile as they have drunk as much honey as possible before leaving the hive and have a 'duty' to cling to the queen, rather than to try and sting you to death.

It's a good idea to have your protective gear and an empty 'brood-box' ready so if you see a swarm, all you have to do is (somehow) knock them off the branch into the box where hopefully they will stay. If you manage to get the queen in the box, the workers will follow.

In an emergency, you can just use a cardboard box, preferably with a few frames (refer to equipment needed) already inside. If you do this, make sure they are transferred into a proper brood box within a day or two, otherwise it may be difficult to move them out later.

If you are on the lookout for a swarm, your local council may be also worth a try. Often people phone them up complaining there is a swarm in their backyard. But make sure to tell them that you are only after a free-hanging swarm within reach of the ground and not a hive of mad, black bees in a crack 30 metres up a chimney.

You can also buy queens and workers from some beekeepers and apiarist supply shops, but make sure that the bees are certified disease-free.

Moving bees

Sooner or later, you may need to move your bees. This can be a bit of a drama, but need not be so.

At night time, the bees all go into the hive, so all you have to do is seal up the entrance with something and away you go! I use a piece of foam to stuff in the gap and 'gaffa' tape to keep it in place. I've even carried hives around on the front passenger seat of my car like this. You just need to make sure you drive carefully and that the entrance is well sealed and the brood-box and 'supers' are attached to each other. Having 50,000 mad bees attacking you on the freeway at 100km/h wouldn't be very nice...

Another bit of advice, if you fumble it and they start coming out, run. Seriously, if you don't do it quickly and neatly, they will come out and go 'bee-serk', so its best to leave them and try another night.

Finally, when moving bees, you need to either move them by no more than a few metres or at least a few kilometres. Anything in-between will cause problems as the bees will fly back to the old location.

Equipment needed

There are really three types of gear that you need: protective equipment, hive equipment and extraction equipment.

Protective Gear

The two main bits of protective gear are the veil and smoker. The veil is made from strong netting such as fly-wire and usually hangs from a wide-brimmed bee-proof hat. You need to be able to tie the netting around your shoulders so the bees don't get in. The other essential item is a bee-smoker which puffs out smoke and sedates the bees. At least in theory. You stuff dry leaves in it—pine needles work well—and light it up. Gentle puffs of smoke calms the bees and allows you to open the hive and remove the frames. Too much (or not enough) just makes them angry.

Other gear that I wear includes a white lab coat, as bees tend to ignore white, and plastic (not leather) gloves. I also cover all gaps at my wrists and ankles with clean, well washed and rinsed socks with the toes cut off. You can also buy proper 'bee-suits' from apiarist suppliers.

What you wear really depends on your reaction to bee stings. One of my friends just wears shorts as all he does is swear a bit when stung. I blow up like a balloon, so I wear a bit more and am currently looking through catalogues of surplus Kevlar flak-jackets.

Hive equipment

The modern hive was developed by a guy by the name of Langstroth about 150 years ago in the United States. He observed that the queen is much bigger than the workers and it is possible to 'exclude' the queen and her eggs from one box, which only becomes filled with honey.

The Langstroth hive is made up of six major parts: the base, the brood-box, a 'queen-excluder' and one or more 'supers' in which the frames sit, plus the ventilated lid on top of it all. The base is, well, obviously the base bit and is usually plywood or sheet metal.

The wooden brood box is where the queen and her entourage live and is fitted with eight to 10 'frames'. The queen lays her eggs here, and the workers feed the larvae and enter and exit the hive from this box. On top of this is a wire mesh through which the workers—but not the queen—can pass into the top 'super' box, which is also filled with frames. This means that the queen can't get into the top super box to lay eggs, so it becomes filled only with honey. Prior to Langstroth's hives, both the 'brood' (bee larvae) and honey were all mixed in together necessitating straining thousands of drowned bees and larvae out of the honey. Messy, cruel and not very productive.

The frames are rectangular wooden or plastic devices that hold the comb. The standard types have steel wire running across them and normally when new frames are put in a hive, a thin layer of 'foundation' wax is also put in. The foundation provides a straight and reg-

ular base on which the bees build up their honeycomb. You can also get plastic frames with plastic foundation but the first time you use them, you need to rub a bit of sterilised (boiled) honey on them to attract the bees or they may not build up honeycomb on the frames.

A good location for the hive is under a tree which allows in the winter sun but shades the hive in summer. (Like a human house, they need good solar passive landscaping).

Extraction equipment

Finally, you need extraction gear. I use a large plastic tray in which I put the full frames, a sharp knife, an electric fry pan full of boiling water and a honey centrifuge for spinning the honey out of the comb.

While it is possible to get the honey out by simply letting it drain out, this takes a long time and you will need a second set of frames to put in the hives. You can also gently heat the comb and melt the wax so that it separates. But the best way to extract the honey is to use a heated knife to cut the 'capping' or wax seal off the honeycomb and put the frames in a centrifuge and spin the honey out. Commercially-made centrifuges that hold two, three or four frames are available but are expensive. My friend Jonathon made his using a 200 litre stainless steel solar hot water tank, plus some odds and ends.

If you get second-hand gear, make sure it is sterilised by fumigation or heating it to around 180°C. Store your gear in well sealed containers to keep out the wax moths, ants and feral bees with diseases.

One last thing that I keep on hand is a packet of antihistamines. 'Telfast' is good. A bottle of red wine also helps (at the end of the day).

Getting out the honey

How do you know when to empty the hive? Well, a professional beekeeper will simply open up the hives and have a look. But then, they want to maximise the honey (and money) and not only do they keep a very close watch on what is happening, but also move their hundreds of hives around following the flowers. But for most backyarders, it's enough just to open up the hive two or three times a year—say mid-spring, early summer and late summer and take out what is there. I typically get 50 litres a year per hive. In the warmer areas, it may also be possible to get honey in winter. One thing you shouldn't do is empty the hive before or during winter, as the bees won't be able to fill it up again, and you'll have 50,000 starving bees.

Now comes the fun bit. Choose a 'nice' day. Nice days equals nice bees. Nasty days equal nasty bees. Usually, anyway. The best time is about 10am or so on a warm and sunny day, when all the bees are out gathering nectar. If it gets too hot, they will be in the hive trying to fan it cool, and if its too cold and windy, they will be in the hive keeping warm.

After getting everything ready and donning protective gear and lighting up the smoker, you'll need a big screwdriver or tool to pry off the lid, as the bees make propolis, a dark 'glue', to seal up the gaps. As you do so, gently puff in a bit of smoke to sedate the bees. Then carefully pry out the frames and gently shake or brush the bees off with a soft and clean brush before putting the frames in a clean container. If you want to put in new frames, now is the time.

It's important to remember that bees, like other animals, seem to be able to sense fear, so stay calm and cool. Don't make quick, jerky movements and be reasonably quiet. Bees also don't like strong smells, so don't eat garlic sausages and cover yourself with deodorant beforehand. Also, no honey and banana sandwiches—they'll smell that and go for you too. And try not to squash too many bees— it makes the others go mad.

Even so, there will probably be a few bees that get a bit agro. You can easily tell, as they make a different buzzing sound and will follow you around doing kamikaze dive-bombing raids.

Item	Approximate Cost
Bee hive: 1 brood box + 1 super, queen excluder, base, lid etc	$100
Frames x 20	$50
Smoker	$50
Veil and other protective clothing	$100
Centrifuge	$50 - $200
Other stuff – knife, brush, etc	$50
Total Cost	$400 - $500

Now with the frames out, take them away, well away, and after checking there are no bees on you, remove the veil et cetera and start extracting the honey. Using the hot knife (heated by dipping in the boiling water), carefully slice off the 'cappings' or wax covers that the bees use to seal the honeycomb. Bung them in the centrifuge, and, gently at first, spin them for about 30 seconds. Then take them out and turn them around and spin again. As the frames get lighter, you can spin faster. It's a good idea however, to have a few spares in case any break. Obviously, if you want the wax, you will also need to put new frames back in the hive.

Once finished, put your gear back on, relight the smoker and put the frames back in.

Generally speaking, from a 10 frame super, you should get 12 to 15 litres of honey and from an eight frame, 9 to 12 litres.

The only processing I do is gently warm the honey in the sun (under a glass cover to keep the bees out!) or in a bath of warm water. Then I pour it through a sieve to remove bits of wax and straight into jars. If I have collected any wax, I put the bits in a big pot of boiling water. The wax melts and all the gunge ends up in the water. After it has cooled, there is nice clean wax on top.

If you want 'comb' honey, either just cut chunks out or use a special 'comb' super and frames which are only about 100 mm high.

Problems

There are many problems, ranging from ants that raid the hive to angry neighbours that shout abuse at you. For a comprehensive list and solutions, you need to read a book about beekeeping. Generally speaking, minor infestations of pests can be treated but major ones may result in the loss of the hive. As with most things, prevention is better than any cure and the best prevention is to make sure your bees are strong and healthy and that the hive entrance is not so big that the bees can't defend it.

Ants will sometimes invade a hive, steal honey and kill the bees. Before placing a hive, have a good look to make sure that there are no ants around. Placing the hive on stilts in a pan of water also helps.

Robber bees are bees from another hive that enter your hive and steal honey. I've never had any problems, but I've heard that others have.

Wax moths lay their eggs in a hive. The caterpillars then eat wax, honey, baby bees, the frames—everything. Look for small, white caterpillars, the holes they leave and silk threads running around.

Foul Brood are a couple of related bacterial diseases and are transmitted by infected bees and equipment. Depending on where you live, the remedy may range from feeding the bees Terramycin antibiotics, to dousing the hive with petrol and lighting a match.

Humidity/heat/cold can all cause problems. Excessive humidity not only promotes fermentation of the honey, but also accelerates disease. Excessive heat can soften the wax and cause the honey to drip and also stresses the bees. As all that flying around is thirsty business, you also need to have plenty of water nearby. A bucket with a piece of hessian cloth hanging out works well. The bees can land on it and have a lick without drowning. Good ventilation also helps with humidity and heat problems. Cold isn't usually much of a problem in Australia, particularly if the bees have plenty of honey stored up.

Neighbours are the people that live next door. If they are allergic to bees, well, it's your tough luck—get chooks instead. While you may be able to hide the hive under a bush, you can't hide the fact that occasionally you wander about looking like a spaceman/women blowing large quantities of smoke and swearing loudly. The best thing to do is let them know, make sure they have no problems and supply them with plenty of honey.

Legal aspects

Yes, there are legal aspects. Just like death, taxes and bee stings. You'll need to check with your local authority (usually the Agricultural Department) as bees may be classed as livestock and a licence may be required. They may also want honey samples from time to time to inspect for diseases. You also need to check with the local council as some councils may ban beekeeping while others may impose a limit of one or two hives in a backyard. Finally, there may also be issues with selling or even giving away honey. You need to correctly label the jar with contents or ingredients (such as 'pure unprocessed organic honeybee honey'), producer (your name and address), and also do silly things like warn people that are hyperallergic to honey not to eat honey. Check with your state or the national health department or relevant authority.

In conclusion

Like all pets or livestock, there is work involved. Unless you are willing to spend a week a year looking after your bees, don't bother. Just buy the honey instead from a reputable beekeeper. However, if you do have the time—and really a day every few months isn't a lot—then you will find that having a bee hive is a very interesting and rewarding activity. ✲

More information

This article has been a very brief introduction to beekeeping. If you are interested in keeping bees, you really need to research the matter more fully. Try your local library, state Agricultural Department, websites or your local amateur beekeeping association.

The national picture

ReNew's regular policy columnist Alan Pears outlines the state of play of energy and climate change policy in Australia

Since my last column, funding for the Australian Greenhouse Office programs has been extended for a year. Apparently the Australian Government will make a major policy statement on energy and climate change late this year that will chart the path forward. This will presumably drive the allocation of resources and institutional frameworks for the next few years.

It's difficult to keep up with the processes that are developing inputs to this new policy statement. We have the ongoing digestion of the Parer Energy Market Review, the Mandatory Renewable Energy Target (MRET) Review, the National Framework for Energy Efficiency (a working group reporting to the Council of Australian Governments), a Taskforce in the Department of Prime Minister and Cabinet, and a Ministerial Oversight Committee on Energy chaired by the Prime Minister. Then there are all the state level processes...

The danger in all this is that, as the heavyweights move in, there will be strong pressures to define renewable energy and energy efficiency as fringe issues, with the focus being placed on issues such as LNG exports, 'clean coal', geosequestration (storage of carbon dioxide in geological structures), energy market reform, encouraging oil exploration, and so on.

We are already seeing strong attacks on MRET, led by the Parer Energy Market Review, which claimed that MRET is an unnecessarily expensive way of reducing greenhouse gas emissions. And it distorts the market! Strange how, for some people, lots of other market distortions can be tolerated, including many that work against renewables and energy efficiency. But distortions that support sustainable energy are not to be contemplated!

MRET needs to be expanded

It seems to me that the case for an expanded MRET is pretty obvious. By 2050, the Australian economy will triple in size while under Business As Usual, energy consumption (and greenhouse gas emissions) will roughly double. At the same time, under conservative climate change scenarios, we will have to reduce emissions to less than half of today's level. That means we need to cut our energy-related greenhouse gas emissions per unit of economic output by around 5/6 of today's level—but we have been improving at less than 1% per year, which would deliver only about a third reduction.

Even energy efficiency enthusiasts like me don't expect energy efficiency to pick up all this improvement (although it could achieve a lot of it if effective strategies were applied). So we clearly need some very low greenhouse impact energy sources. MRET cost is equivalent to less than $20 per tonne of CO_2 avoided, which seems pretty good value in comparison with economic modellers' claims of $50 per tonne and other long term proposals such as 'zero emission coal' and nuclear. Developing our renewable energy industry creates a net increase in jobs while building an industry that replaces imports and captures export dollars. And the community want it.

Let's hope the MRET Review Panel focus their attention on expanding the target and making MRET work better, rather than killing off one of the few positive measures we have.

Solar and gas

I recently reported on the Australian Gas Association's misguided lobbying to cut the rebates for solar hot water in favour of rebates for gas units. The Australia New Zealand Solar Energy Society (ANZSES) has published a powerful response to the AGA, pointing out some major errors in their analysis—worthwhile reading at www.anzses.org.

One of the big bloopers was the assumption that all owners of electric hot water systems use standard electricity tariffs when the majority use cheap off-peak tariffs: correcting this error dramatically reduces the financial benefits of the gas option.

Greenhouse rating scheme wins challenge

At a recent seminar in Sydney, a case study of the application of the Australian Building Greenhouse Rating Scheme (ABGRS)—a SEDA scheme for rating of office buildings—to the

Melbourne Central skyscraper was presented. ABGR rated the building at only two-stars. But in-house experts and two energy auditors claimed it was much better. Detailed analysis showed that ABGR was right—the experts had not noticed some problems that showed up as unusually high energy use outside working hours. ABGR is the only building rating scheme in Australia that relies on information from energy bills.

The importance of looking at actual performance rather than computer simulations or compliance with specific requirements such as insulation has been highlighted by this result.

We need to apply this approach much more widely. For example, much as building houses to a five-star energy rating is a good thing, poor installation of insulation and draughtproofing, inappropriate heating and cooling systems, and a myriad of other factors can mean the house will not be energy-efficient. Benchmarking actual energy bills would help identify problems and create pressure to fix them.

Also, architectural award schemes must be changed so that no building can receive an award (of any kind) until it has been occupied for a year, and has shown that its occupants are comfortable and its energy use meets expectations. We need some accountability.

House ratings progress slowly across states

In January this year, the Building Code of Australia was amended to include energy efficiency requirements for new houses. However, it is necessary for each state to adopt the code before they have any formal status. So far, the amendments have been adopted in the Northern Territory, South Australia and Tasmania. Western Australia should have followed by the time you read this. There is strong lobbying in Queensland to water down what are already fairly modest requirements, while New South Wales is still working out its approach. The anti-house energy rating forces in NSW are apparently working hard to exclude energy rating as an option, a very short-sighted approach.

Meanwhile, Victoria has announced it will introduce a five-star energy requirement with a phase-in from mid 2004. The five-star initiative was announced in mid 2002 in the Victorian Greenhouse Strategy. In a precedent setting strategy, new houses will have to achieve five-stars, or four-stars with a solar hot water system or rainwater tank, from mid 2004. From mid 2005, they will have to meet a five-star requirement *and* install either a rainwater tank or solar hot water system.

At a recent workshop organised by RMIT's Centre for Design, the effectiveness of the star rating scheme was brought home to me. A manufacturer of timber windows was pointing out that, relative to aluminium window frames, his product offered a half to one- star rating benefit. And a manufacturer of add-on air-seals for exhaust fans told builders his product would gain them half a star. We now have a simple language for energy efficient building products!

Energy efficiency and renewable energy

I continue to be amazed at the lack of community recognition of the need to combine renewable energy with energy efficiency. Maybe we need an education campaign. For example, how fast would a normal, inefficient car like a Falcon or Commodore move with the solar panel of a Darwin-Adelaide solar car on its roof—or would it move at all? We could rename the solar race as the solar-efficient car race! Remote area power supply (RAPS) system owners and renewable energy enthusiasts already know that energy efficiency makes renewables more affordable and effective, so lets make sure others learn this important lesson too. ✳

Win **Selection of built electronic kits valued at over $100**

These are built versions of various electronic kits, as featured in our kit review article in issue 83 of ReNew. We can't guarantee which kits you will get, but they are sure to be useful, and all you have to do is tell us about your projects.

The kits will be given to the author of the best build-your-own style article. You don't have to be a tech-head, just have a project, simple or complex, electrical or mechanical, that has appeal to do-it-yourselfers and involves renewable energy or appropriate technology in some form. Entries must describe completed working projects.

Just send your ideas to: *ReNew*, PO Box 2001 Lygon St North, East Brunswick VIC 3057, email: ata@ata.org.au. Competition closes Friday 10 October 2003.

Build your own two transistor real power meter

Want to know how much power your appliances are using at any one time? This meter, designed by Dennis Stanley, will tell you

Energy efficiency savings are the key to success with a renewable energy system and in terms of greenhouse savings through energy conservation, everyone can make a difference.

A few years ago we conducted an energy audit of our own house as part of the process of installing a renewable energy system. The results were startling. Two appliances in particular had a large standby load, using almost a quarter of our electricity bill. They wasted enough power to run a small fridge and the appliances weren't even being used. The process of tracking these phantom loads down using our spinning disk meter at the front of the house required persistence There just had to be an easier way to do it.

This is where a hand held in line power meter comes in handy. A friend of mine recently asked me to design one after a survey of commercially available meters revealed they were all microprocessor based with heaps of features. It seemed like a lot of money to spend and they were quite technical to use.

The energy meter allows you to measure the instantaneous power use of any appliance. While it doesn't tell you total energy used, for many appliances this is easily calculated.

The immediate temptation was to grab a small microcontroler and start adding features. I decided first to look through some old books to see how the problem has been solved in the past. The resulting design is based on an old power meter designed for American power.

The meter described here allows you to measure how much power an appliance is using. Power being a measure of the rate of energy consumption.The measurement scale I have utilised reads out directly in units per hour and units per day. So you know exactly how a given device will appear on you electricity bill. It measures the real component of power—that is, it corrects for power factor and voltage fluctuations. It also shows the direction of power flow so could easily be configured as an import/export power meter. The disadvantage of this meter is that it only gives you an instant reading, so it is hard to tell how much electricity a cycling appliance like a refrigerator uses.

Warning!

All components of this circuit may be at mains potential. As with any mains powered circuit, only attempt this project if you are experienced in working with mains voltages. These voltages can easily kill you, so use a safety switch and make sure you are know what you are doing. **If you are at all unsure about working on mains potential circuits, then do not attempt this project!**

When building this project, you will need to make adjustments while the power is on. Always, always use a plastic adjustment tool—never, under any circumstances, use a screwdriver for adjustments!

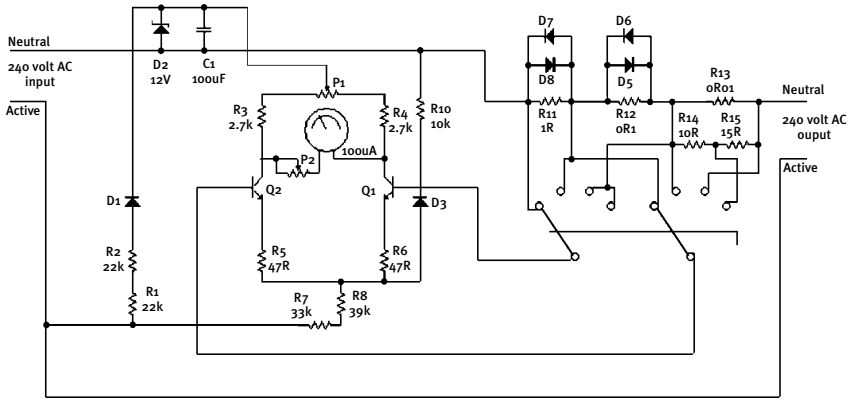


Figure 1. The circuit diagram of the energy meter.

I have chosen a large clear analogue display for ease of use.

How it works

Real power is simply voltage multiplied by current. The complication is that with AC power these values are changing all the time. Simply multiplying the average values together will give you a misleading result. The multiplication has to be done on a millisecond by millisecond basis. While this sounds hard to do, it can be done using quite simple circuits, like the one used here. See Figure 1 for the full circuit diagram of the power meter.

This circuit can be divided into a few sections:

- Power supply
- Current shunts and range selection
- Analogue multiplier

The meter uses a bit of a trick to do its job. With AC power, half the time the active lead is positive with respect to neutral and the other half of the time it is negative. During the positive half of the cycle most of our circuit is inactive while a power supply is generated for the circuit.

Figure 2 shows only the power supply section rearranged for easy understanding. Rs is the combination of R1 and R2, shown as one component for simplicity.

This circuit builds up a power supply to run the analogue multiplier and meter.

Rs, D1, D2 and C1 form a simple 12 volt, 2mA power supply. Rs limits the current, D1 rectifies the AC, while the Zener diode regulates to 12 volts and C1 stores the power for use in the other half cycle.

The other half of the time the active lead is negative with respect to neutral. During this time the rest of the circuit is active and measuring the power passing through the device.

Figure 3 is a simplified diagram of the analogue multiplier during this negative half of the cycle. The following components have been omitted.

- Power supply components already discussed
- Shunt switching and protection R11 to R15 and D5 to D8
- P1 zero adjustment trimpot
- P2 full scale adjustment trimpot
- Protection components D3, R9 and R10

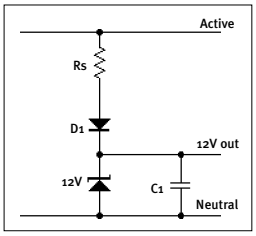


Figure 2: The basics of the power supply.

- emitter resistors R5 and R6, used to desensitise the circuit to component tolerance and temperature drift.

How it works

Q1 and Q2 form what is known as a 'differential pair'. Provided the active lead is greater than 0.6 volts negative of the neutral lead, the transistors are forward biased and a tiny base current can flow through each transistor from neutral to the emitters. This base current is a tiny component of the emitter current—typically 1/500th or so. We will ignore this small current and say that collector current is equal to emitter current.

Two important relationships come out of this arrangement. As the transistors drive emitter current to maintain a 0.6 volt drop with respect to their bases, our common emitter current = Vactive/RCE. We ignore the 0.6 volt drop and, as RCE is constant, then the emitter current is an exact image of the mains voltage.

The second relationship is that Irc1 + Irc2 = Irce.

With no current flowing in the neutral, the bases of both transistors are at the same voltage. The emitters are joined together, so provided both transistors are identical, each will pass a current of half the common emitter current. With each transistor carrying equal current, the value of the current may change up and down with the mains

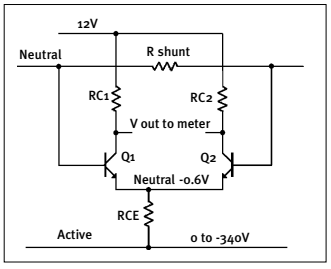


Figure 3. The analogue multiplier.

voltage, but there will be no difference seen across the meter because both sides change identically. A tiny difference in base emitter voltage will upset the balance and cause one transistor to carry more current than the other. This unbalance provides a differing sharing of the available current through each transistor. The shunt resistor provides this small unbalancing voltage which is directly proportional to the neutral current. This is where the multiplication happens, as the output seen by our meter is the *different proportion* of current seen by each leg (which is proportional to current) times the value of that current (which is proportional to the active *voltage*).

Normally, specially matched transistors, packed in the same package so they are at the same temperature, are required for this kind of circuit. They are called super-matched pairs. This is because only a very small base emitter voltage change of 10mV is enough to fully drive our meter display. Without any changes, a temperature difference between the transistors of only five degrees would cause our meter to go full scale with no input. Two precautions solve this in our meter.

The first is to glue the transistors together so they are always at the same temperature.

The second is to add a small amount of separate resistance to each emitter. This is so the major component of voltage difference seen is due to the stable resistors and not the temperature sensitive base emitter voltage. This is called negative feedback and it improves accuracy at the expense of sensitivity. With 50 ohms in each emitter our circuit is a fourth as sensitive, but more resistant to temperature variation. This is the purpose of R5 and R6.

R11, R12, and R13 are the current shunts. R11 is the most sensitive and works in the 0 to 100mA range (10 watt range). R12 works in the 0 to 1A range (100W) and R13 works in the 0 to 10A range (1kW).

D4 to D7 are Schottky diodes. These protect the shunts if too much current is passed by the shunt—the forward voltage of the diode is exceeded and the current flows through the diode instead.

R14 and R15 form a voltage divider to reduce the output voltage of the 1kW shunt for the 2.5KW range.

The rotary switch applies the shunt voltage to the base of Q1 and Q2.

R9 and R10 protect the transistors by ensuring some base current can flow even if the shunts are disconnected during range switching—in normal opera-

tion they are shorted by the shunts and are insignificant.

Diode D3 carries the common emitter current during the positive half of the cycle to protect the transistors from high voltage.

Component selection

The transistors can be any small signal transistor. BC337 types should work fine. Use identical transistors. Glue the transistors together flat face to face using a small amount of epoxy (five minute Araldite or similar).

All resistors should be 1%, ½ watt metal film types with the exception of R1 and R2, which should be 5% 1 watt.

The meter ranges are not individually calibrated so the accuracy of your shunts is important.

For the shunts I used ten 10 ohm, ¼ watt resistors in parallel for the 1 ohm shunt, ten 1 ohm ½ watt resistors in parallel for the 0.1 ohm shunt, and was lucky enough to get my hands on some shunt wire to make up the 10 milliohm shunt. If you can't make this shunt yourself, Farnell Components sell some low ohmic resistors in this range. Or perhaps you could put ten 0.1 ohm, 5 watt resistors in parallel but the resulting shunt would be pretty big physically. As the circuit connections for these low value shunts are included in the measuring resistors, these connections must be as short as possible (see the photo). The Schottky diodes can be connected via longer tracks as they are only protection and do not play a part in current sensing.

The range selection switch is a three-pole, four-position rotary switch. For this project I prefer the black plastic PCB mounted variety as the plastic body and shaft fully isolates the user from the 240 volts inside the box.

The Schottky diodes can be salvaged from a few old computer power supplies. Generally the diodes are in

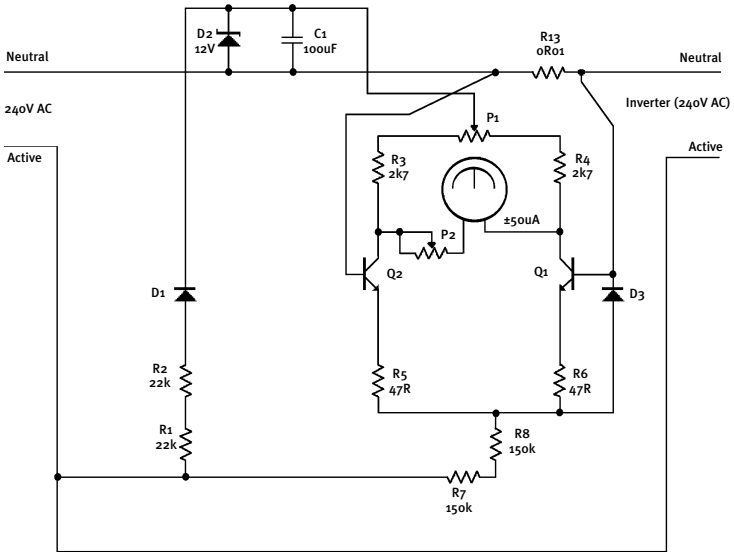
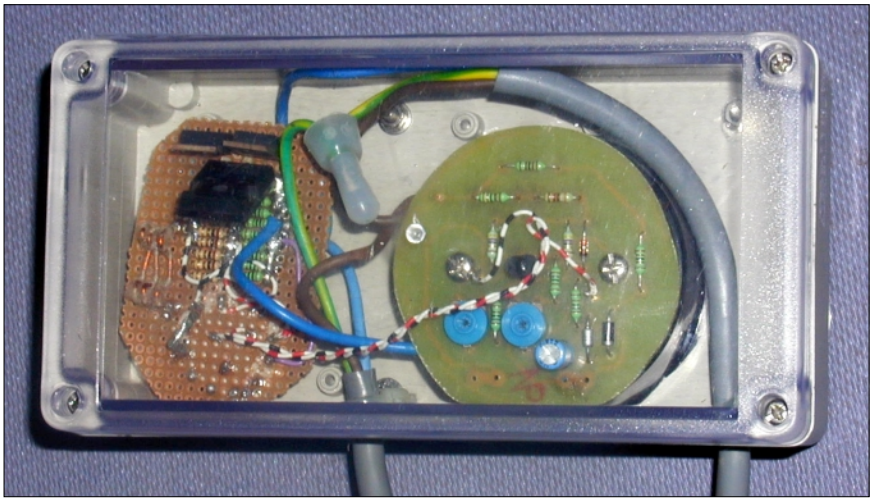


Figure 4. The circuit diagram for the import/export meter version. This lets you see at a glance whether you are drawing power from the grid or sending power to it from your grid-interactive inverter.

TO220 or TO247 packages. A T0220 package is like a three terminal voltage regulator, while a TO247 is a larger package like a power MOSFET. There are usually two diodes in each package, with the cathodes joined together on the center pin. You can recognise them as they will have a picture of the diodes on the package and are generally close to where all the extra-low voltage power supply wires terminate on the board.

With the diode check function on your multimeter, test the forward voltage drop of each diode—it should be about 200mV., the lower the better. I used three devices—one big one (TO247) was used for D8 and D6, while D5 and D7 were the smaller TO220 package. With the TO220 diodes, I connected the anodes together and used them as if they were a single diode to get a suitable current rating. These diodes may be



The workings of the prototype meter. The shunts and protection diodes are mounted on the veroboard on the left, while the meter drive circuit is mounted on the back of the meter itself.

mounted on a heatsink. Without a heatsink, readings of over1000 watts must be taken within thirty seconds. Also remember that the diodes must have a current rating above the biggest appliance you will measure. Use diodes with at least a 10 amp continuous forward current rating.

I assembled the actual amplifier crcuit on a circuit board that I fitted to the back of the meter. The current shunts and diodes were too big to fit on this board and were fitted to a separate piece of veroboard. You can see this in the photo on page 74.

The whole project was mounted inside a sealed plastic box to provde complete insulation for safety. Make sure you fit your meter inside a suitable box—never try and use it without it being properly insulated!

While building the meter, double check the value of all components using a multimeter. In particular, sometimes resistors get sorted incorrectly in the shop.

Parts list

Designation	Type	Value	Qty
R3, R4	Resistor	2.7k	2
R5, R6	Resistor	47 ohm	2
R7	Resistor	33k	1
R8	Resistor	39K	1
R1, R2	Resistor	22k, 1 watt	2
R11	Shunt Resistor	1 ohm, 1watt	1
R12	Shunt Resistor	0.1 ohm, 5 watt	1
R13	Shunt Resistor	0.01 ohm, 2 watt	1
R14	Resistor	10 ohm	1
R15	Resistor	15 ohm	1
R10	Resistor	2.7K	1
C1	Capacitor	100uF, 25V	1
D1, D3	Diode	1N4007	2
D5, D6, D7, D8	Diode	Schottky (see text)	4
D2	Diode	12V, 400mW Zener	1
Q1, Q2	NPN	BC337	2
P1	Trimpot	500 ohm	1
P2	Trimpot	2k	1
SW1	Rotary switch	3-pole, 4-position	1
Panel meter	100uA panel meter	Altronics Q0550	1
Box			1
Mains lead, plug and socket		3 metre extention lead	1

Calibration

Once you have built the meter, you must calibrate it. This is the only time that you should use the meter with the back of the box removed.

Remember, safety first—use only a plastic adjusting tool—never use a metal screwdriver to adjust the circuit. Suitable adjusting tools can be had from your local electronics component store for a few dollars, so pick one up when buying your parts.

Before powering up the meter, adjust the mechanical zero trimmer in the center of the meter so that the meter needle rests directly above zero. Power up the meter with no load connected and adjust P1 for zero indication on the meter (let the transistors reach operating temp for one minute first). With the 0.1 units per hour (100 watt) range selected, connect a new (old bulbs draw less power as they age) 100 watt incandescent lamp. Adjust the full scale pot until 100 watts is displayed on the meter. This is a pretty rough calibration but it may be enough for your purposes. If better accuracy is required, measure the voltage and current through the bulb with your multimeter and calculate the power as voltage times current. This only works with strictly resistive loads like an incandescent lamp. Also, note that you must be very careful when doing this. Don't attempt to measure the current directly, measure the voltage across the 1 ohm shunt and work it out using ohms law. For instance, if the shunt has a voltage of 400mV across it with a 100 watt bulb connected, and the voltage is 235 volts, then the current through the bulb is 0.4/1 = 0/4 amps. Multiply this by 235 and you get 94 watts through the bulb.

Import/export meter

This circuit also has another interesting use—it can be configured as an import/export meter for use with grid-interactive inverters. To do this, you need to use a center zero meter movement. These are difficult to come buy, but a standard movement can be modified to center zero by manipulating the mechanical zero adjust. You have to be really careful not to damage the movement if you do this. In this application you could remove all the shunt switching and switch protection diodes, and just use a shunt of suitable size, which most likely will be a 0.01 ohm.

The ATA is looking at doing this project as a kit in the near future. If you are interested, please let us know.

Energy competition—Is it working? Does anybody care?

Andrea Sharam from Swinburne University discusses the results of recent research on customer attitudes to the privatisation of Victoria's electricity supply and the development of the electricity market

If a private company CEO proposed to their board to spend five billion dollars to place a product on the market without first investigating whether or not there was any demand, the board would justifiably think how quickly (or cheaply) they could get rid of the CEO.

When the CEO in question is the Victorian Government, who plays the role of the board? Voters do not play that role although the metaphor is often used. Voters, as the 'public', nevertheless do sometime have very clear preferences that are not easily reconciled with electoral choices. A case in point in which voters have strong views is 'competition' in essential services.

In January 2002 the competitive electricity market was opened to include Victorian domestic electricity customers. Like the CEO above, the Victorian Government proceeded with 'full retail competition' in electricity without reference to the views of domestic electricity customers, the 'public'. In the process the government also authorised the recovery of billions of dollars of implementation costs from domestic electricity customers for the creation of a market that they did not know whether or not customers would embrace. It is costing each Victorian household somewhere between $60 and $160 per annum for the next five years to pay for the implementation costs.

The market in electricity is promoted as delivering choice to households that would drive price reductions, improve customer service and new products. Consumer sovereign choice, according to liberal economists, is literally the motor of the economy. But what if customers refuse the role of the purely self-interested individual intent on maximizing possible savings? What if they care less about shopping which is required to turn the motor of competition?

Research results

Recent research at Swinburne University was conducted to understand customer attitudes to the new full retail electricity market. The research revealed that Victorian households are deeply pessimistic about the claimed benefits of competition in electricity.

Only 10% of households actually believe that the market will result in them obtaining cheaper electricity prices. Only 20% of households think competition will mean better customer service. The view of Victorians is captured in one unsolicited statement by a respondent:

'[I] believe [the] profit motive will result in me paying more and all companies will be out to screw me out of money, not give it to me.'

Why aren't customers choosing?

For the competitive electricity market

to be successful, it needs to pay for the costs of implementation, deliver benefits to customers and profits to shareholders. It also requires active customers and lots of them. This is stated in the Victorian Essential Service Commission (ESC) 2002 review into the effectiveness of the electricity full retail market. The ESC found that after six months of the market being open, far too few customers were exercising 'choice' to make the market effective. This finding was replicated by the Swinburne research. However, the Swinburne survey sought to understand why this should be the case. The ESC and the Victorian Government rely on the belief that customers will be turned on gradually and participate in ever greater numbers. The fact that regulators and government believe this is the case is a surprise in itself as previous research by the ESC indicated a very significant lack of support for the market.

Customer switching

The Swinburne survey found that only around 13% of households had switched electricity providers after the 10 months of the market being open. About half of these customers had done so because they had moved dwellings and at least half of these were inadvertent entrants into the market as they mostly did not know that by moving house they were moving off their pre-competition tariff arrangement. Many simply did not know they were in the electricity market and were actually on 'market' contracts. This suggests that the government should treat switching rates, the number of consumers actively changing their electricity retailer, with caution.

The largest group of active shoppers who had switched was low-income. The low-income switchers did not believe the market would be good for them but financial necessity motivated them to chase that extra dollar of savings. High and middle income earners have little interest other than those who wanted a green power deal.

Low-income households also tend to be low-volume users. They are price sensitive and reduce consumption in order to reduce expenditure. The survey found that 42% of all households ration their consumption to below what they regarded as essential because electricity was too expensive and/or their income was too low.

'[I] believe [the] profit motive will result in me paying more and all companies will be out to screw me out of money, not give it to me.'

While shopping around is what customers are supposed to do, retailers do not actually want customers switching too often. The cost of acquiring customers is high, so ideally an acquired customer should represent value to the retailer. This at a minimum would be consumers with a high volume of consumption. Therefore it is difficult to see that low-volume, poorer customers would be targeted by retailers and they may find it harder to switch in the future.

Will it work in the future?

The difficulty for government is the possibility of continuing and widespread customer apathy. This would denote market failure and by default leave customers exposed to prices limited only by 'price caps' imposed by government. While customer apathy persists, customers pay far more than they need to. The longer the Victorian Government persists with its belief in the power of markets in essential services, the greater the cost it is imposing on the community and economy.

Government legislation currently envisages full deregulation in 2005. That is, households will be forced to choose a market contract; the safety net tariff will be removed and price oversight cease. This means there will be no obligation on retailers to supply households, prices will be set by the retailer and households will have no choice but to choose. As one observer quipped, it's a policy of 'tough love': if customers get ripped off by the markets, that will teach them for not reinventing themselves in the image of an economically rational man. ✲

[Kid's stuff]

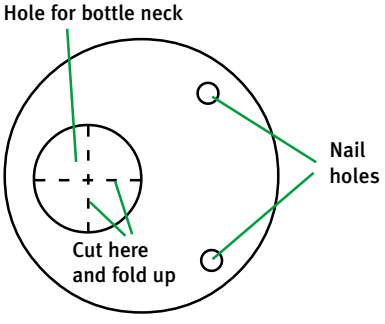
Noel's Treasures from Trash

To make your own Barometer you will need:

- One glass bottle with a long, thin neck
- A glass jar with a screw-top lid
- Some thick cloth tape, like Gaffa tape
- Some food colouring
- Liquid paper correction fluid
- A sharp pointed knife
- A large nail and hammer
- Thick gloves for safety

A barometer is used to measure air pressure. The pressure varies depending on the weather, and any change in pressure gives you an indication of coming weather changes. Low pressure usually indicates unsettled weather and high pressure means fine weather.

Barometers usually come in two types. Aneroid barometers use a springy box of air which flexes in and out with air pressure changes. This moves levers to change the reading of a dial. The other type uses a column of mercury about 76cm high. Changes in air pressure cause the mercury to move up and down the column.



The jar lid as seen from the top. Cut along the dotted lines and bend up the segments to make the hole for the bottle neck.

Our barometer depends on the air in a bottle expanding when there is low pressure or shrinking when there is high pressure.

Making it

Take the lid off the jar and make a couple of nail holes on one side of the top. Now, towards the other edge of the top, mark a circle using the neck of the bottle. Now mark two lines from one side of the circle to the other so that the lines cross at right angles.

You now have to cut along these lines using the sharp knife. This is where you have to be careful, and make sure you have an adult to help you. Wear the thick gloves while doing this, as there are sharp edges that can cut you.

Once you have made these cuts, you need to bend the four triangles created upwards. These act as a support for the bottle, and the bottle neck must be able to pass through the hole into the jar. Now, insert the bottle so that the neck protrudes about 25mm into the jar and use the cloth tape to seal it into place on the lid and to cover the sharp edges.

Now, mix some food colouring into a jug of water, unscrew the bottle and lid from the jar, and fill the jar about ¾ full, and the bottle about ⅛ full. Now, cover the neck of the bottle and quickly turn it upside down and insert it into the jar. Once the mouth of the bottle neck goes below the water in the jar, the water in the bottle will not flow out. Screw the jar lid onto the jar. The water level in the bottle should be about half way up the neck of the bottle. You need to make sure there is a good sized air pocket inside the bottle, as it is this air that expands and contract with changes in the outside air pressure, so the more air in the bottle, the better, providing there is enough water in the neck of the bottle.

A jar, a bottle and some coloured water is all you need to measure the pressure of the Earth's atmosphere. A bottle with a thinner, longer neck would be better than the one used here.

Now using the liquid paper, mark a thick line along the neck of the bottle, so that it starts about 20mm below the water line and ends 20mm above it. Once this is dry you can mark the water level each time the air pressure changes and the water moves. When the air pressure drops, the air in the bottle expands, and the water level in the bottle neck drops. When the air pressure rises, the opposite happens.

Compare your barometers levels with the readings from the weather forecast each night.

Support ATA's work to create a more equitable and energy efficient Australia.

Join ATA as a *Supporter*

Your donations are needed now to support ATA make its voice heard in government, industry and public forums. ATA relies on the financial support of individuals to remain independent, frank and brave in our advocacy. In some forums ATA is the only community voice. Join the growing list of ATA *Supporters* who make our advocacy and policy work possible, by making a tax-deductible donation to ATA each month.

Some of ATA's policy and advocacy efforts

ATA's work linking **energy efficiency with social equity** is an ongoing campaign which aims to cut the energy bills of our lowest income households, in recognition that this helps the environment, improves comfort and can reduce financial stress. ATA's consultancy for the St Kilda Rooming House Issues Groups led to energy saving features being incorporated into a new rooming house. The energy efficient measures are expected to lower the cost of heating, electricity and water bills for tenants by at least 25%. Because the cost of utilities is factored into the weekly rental, lower running costs mean more affordable housing for those who need it most.

Sustainable buildings are the exception rather than the rule in Australia, and ATA is actively pushing for stronger energy efficiency standards to improve comfort and reduce the greenhouse gas emissions associated with housing. In July and August 2003, ATA contributed to inquiries on housing and energy supplies conducted by the State Governments of Victoria, New South Wales and Queensland. ATA called for stronger building standards and more effective energy efficiency programs. See ATA's website for the full submissions.

ATA is actively fighting the introduction of a **biodiesel excise tax**. Since the fuel excise tax on biodiesel was announced in the May 2003 federal budget, ATA staff and members have been lobbying the Federal Government to have it removed. Contact the ATA if you would like to get involved with this campaign.

Donations phone drive

Thank you to all of those who contributed to ATA's donations campaign in June/July 2003. Your individual contributions have already allowed ATA to more than double the amount of policy work it undertakes.

Sign up on page 83

Practical info? Be a Member

ATA is independent, community-based and known for practical, quality information on renewable energy, water conservation, alternative fuels and energy efficiency. For just $55 a year, members receive:

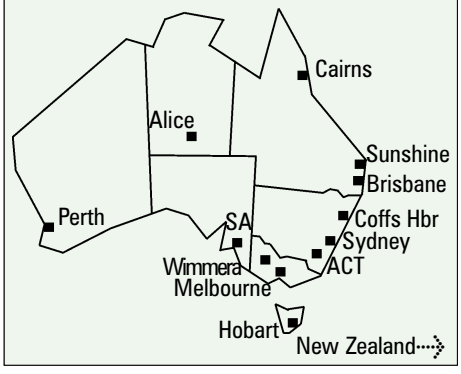
- *ReNew* magazine each quarter
- Advice by email or phone
- *The Sun* newsletter and email bulletins with events and info
- Discounted entry to seminars and open houses
- Discounts on products (below)
- Chance to network with other members at your local branch.

Discounts for members

• A & J Hatcher Solar Power up to 10%, • Advanced Energy Systems 10% • AirMarine Australia 10% • Alternative Fuels: 10% • Australian Corres Schools 5% • Bargain Batteries 10% • Birkenhead Batteries and Solar 10% • BP Architects 5% • B/W Solar 10% • CERES nursery 5-10% • Cycletrek Bunbury WA 5%-10% • Earth Basics 10% • Eco Solar Electrical 10% • EcoSouth $250 off power systems • Enviroflo 10% • Environment Equipment 10% • Everglaze Windows 5% • Federal Batteries 10% • Going Solar 10% • InSolar 1 0% • K & C Stork Solar 10% • Natural Paint 10% • Pearcedale Conservation Park 10% • Playne & Simple Plumbing 10% • Sandford Electronics & Solar 10% • Sharpe & Jephcott 10% • Sola-Kleen 10% • Solar Charge 10% • Solar Energy Australia 10% • Solazone 5%-10% • Solco 5% • Sun Plus Solar: 10% off Sun Plus solar hot water conversion kits. • Sustainable Impact 5% • Talisman Design 5% • The Solar Bloke 10% • 5% to 10% at The Rain Catchers. Melbourne Metro only • 10% off plus a free sample & delivery for Trinature products • Winter Windows 9%

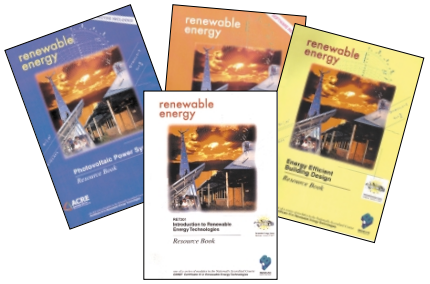
NB: the ATA website has full details of member discounts outlets.

ATA branches



ATA shop by mail

Books, booklets and CD ROMs



Renewable energy and energy efficiency in detail

Brisbane Institute of TAFE has published a range of renewable technology resource books.

Introduction to Renewable Energy Technologies	$73.70	Item code: IRET
Solar Water Heating Systems Resource Book	$92.00	Item code: SWHSRB
Photovoltaic Power Systems Resource Book	$92.00	Item code: PVPSRB
Energy Efficient Building Design Resource Book	$73.70	Item code: EEBD

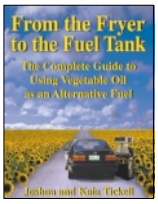
Vegetable oil for fuel

From the Fryer to the Fuel Tank

Author: Joshua Tickell

Price: $34.95, Paperback, 160pp

A great book that shows the reader how to make a clean-burning renewable fuel from waste vegetable oil. Includes detailed instructions on making and using the fuel in a standard diesel vehicle. *Item code: FFTFT*

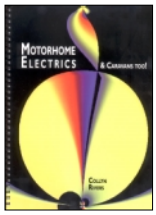


Motorhome Electrics & Caravans too!

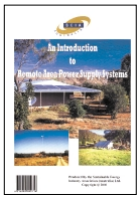
Author: Collyn Rivers

Price $42.50, A4 ringbound paperback, 102pp

Written with the mobile home owner in mind, this book covers all aspects of setting up and using a power system in a motorhome or caravan. *Item code: MHCT*



For remote properties



Remote Area Power Supply Systems: An Introduction

Price: $33.00

New edition! Enables the average person to gain a good grasp of what RAPS systems are all about. Covers individual system components, correct sizing, safe installation and maintenance. *Item code: RAPSS*

Windpower Workshop

Author: Hugh Piggott

Price $30.80, Paperback, 160pp

The ultimate resource for anyone who has ever wanted to build their own wind turbine. Provides practical advice on how to design and build a machine up to five metres in diameter. *Item code: WPW*

Make yours the ideal home

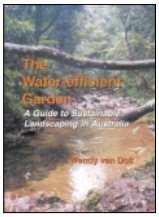
The Water-efficient Garden

Author: Wendy van Dok

Price: $25, As reviewed in *ReNew* issue 81

Practical and detailed information on planning and design of a water-efficient garden, including use of greywater on the garden.

Item code: WEG

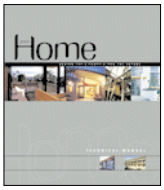


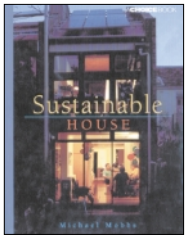
Your Home Technical Manual

Price: $49.50. NB: $11 postage on this item

Gives you the information you need to design and build a more comfortable home that is less expensive to run while being more environmentally friendly.

Contains over 60 fact sheets on sustainable solutions for designing and building your home. *Item code: YHTM*





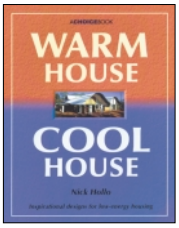
Sustainable House

Author: Michael Mobbs

Price: $38.50, Paperback, 188pp

The sustainable house in Sydney provides all of its own power and waste water recycling on-site. Contains many great ideas on how to make your house less of a burden on the planet.

Item code: SHB



Warm House, Cool House

Author: Nick Hollo

Price: $33.00, Paperback, 172pp

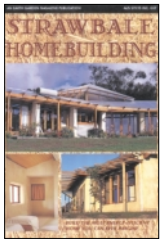
An easy-to-read introduction to the principles of energy-efficient housing design. Covers a broad range of topics and contains an abundance of drawings, plans and photographs. *Item code: WHCH*

Strawbale Homebuilding

Price: $19.95, Paperback, 156 pp.

This book details practical strawbale building practices you can use to build anything from a small cabin in the bush to a mansion in the city. A great book that details many homes that have been built around Australia.

Item Code: SBH

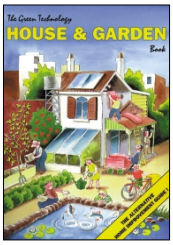


The Green Technology House and Garden Book

Price: $11.00, Paperback

A comprehensive guide to improving your home's energy efficiency. Includes do-it-yourself projects, real life experiences and a comprehensive listing of suppliers.

Item code: GTH&G



Remember to keep checking ATA's online webshop for new products including books, electronic kits, lighting and other exciting things!

Solar hot water

ATA Booklets series: Solar Hot Water

Price $7.90 each (inc postage)

Solar hot water is possibly the best way to get started with renewable energy. This booklet outlines all of the different available system types and which one will best suit your needs.

Solar electricity

ATA Booklets series: Solar Electricity

Price $7.90 each (inc postage)

Covers all the basics you need to know when designing a solar power system.

Renewables on CD ROM

SoftROM

Price: $33.00

Out of stock

Our CD ROM of the first 40 *Soft Technology* back issues is a great searchable resource. Just $3 plus $4 postage inside Australia.

Item code: SOFTROM

ReNewROM

Price: $65 ($55 for ATA members) plus $4 postage

Our long-awaited second CD ROM of the issues 41 to 70 of *Soft Technology* and *ReNew* back issues, many of which are no longer available. This disk is fully searchable with 30 complete magazine issues in PDF format, so it can be used on PCs, Macs and Linux boxes. *Item code: RENEWROM*

Be a fashion guru!

ATA T-shirts

Price: $15.00 plus $5 postage

Sizes: S, M, L, XL

Show your support for the ATA with one of these great Aussie-made T-shirts. *Item code: TSHIRT*

Note: You must state size when ordering!

Save water this summer

Greywater Diverter

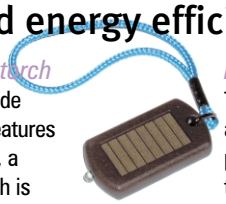
Price: $33.00 plus $8 postage

Don't send that water down the drain, use it to water your garden! Fits standard 50mm pipes, or other sizes with appropriate adaptors.

Item code: DIVERTER

Kits, LEDs and energy efficient lighting

Freelight keyring solar torch



This is a quality Swiss-made white LED keyring torch features an amorphous solar panel, a rechargeable battery which is good for 10,000 charge/discharge cycles, a waterproof rubberised case, battery overcharge protection, multiple dimming levels, 10 minute auto off, weighs less than 20 grams and has a case containing 50% renewably-sourced plastic (made from plants). Measures 55mm x 28mm x 8mm. Price: $32 ($29.90 for ATA members). *Item code: FREELIGHT*

Nightstar kinetic torch

This amazing torch uses no batteries and no incandescent globes, yet will provide light when you want it with total reliability. The Nightstar uses a high power rare-earth magnet passing through a wire coil to provide the electricity to charge a super capacitor that drives the white LED lamp. Around 30 to 60 seconds of gentle shaking gives 5 minutes of full light and a steadily reducing level for another 15 minutes.

Price: $75 ($68 for ATA members).

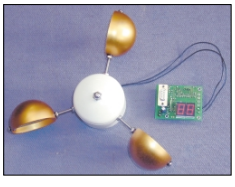
Blaster 3D torch

This is a machined anodised aluminium torch that uses 3 D-cell batteries to drive a 1 watt Luxeon star. Never be stuck with a blown bulb again! The Blaster is waterproof and almost unbreakable. What's more, a set of alkaline batteries should give at least 24 hours of usable light. This torch should last a lifetime! Price: $120.

Weather monitoring kits

The 1-wire weather station connects to a PC to measure wind speed, wind direction and temperature. Use it to monitor the weather, or log a possible site for wind turbine suitability. Price: $200

The anemometer and pre-built datalogger kit from Fascinating Electronics/James Jarvis lets you measure wind speed and log the data without a PC. Download the data only when you need to—the datalogger stores up to 32k samples, and also displays windspeed on an LED display. Anemometer requires assembly but datalogger is pre-assembled and ready to log. Note: does not record wind direction. Price: $240



12 volt, 1 amp switchmode plugpack

This plugpack is ideal for running our LED halogen bulbs or LED halogen replacement kit. Use it to replace the inefficient transformer supplied with most halogen fittings, or wherever you need an efficient 12 volt plugpack. Price: $30

Item code: SMPLUGPACK

Mini-maximiser kit

Price: $35 ($30 for ATA members)

Our popular mini-maximiser kit will handle pumps up to 6 amps. The kit allows you to build the unit for use on either 12 or 24 volts.

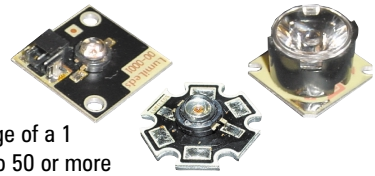
Item code: MINIMAX

LED halogen replacement globes

We now have pre-built globes that are designed to fit standard halogen downlight fittings. There are two types—5mm LED lamps and 1 watt Luxeon star lamps. The 5mm LED lamps come in 12 and 24 LED wide angle versions (100° dispersion angle) to provide general illumination, in white, red, green, blue and yellow. $42 for the 24 LED lamps, $25 for the white, blue and green 12 LED units and $15 for the red and yellow 12 LED units. **Note:** These are polarised globes that require DC and should not be plugged into a halogen socket that is powered from an AC output transformer. We recommend you use our new 12 volt switchmode plugpack.

The Luxeon LED version is a museum-quality white model with a narrow spot beam. It can run from AC or DC, from 6 to 12 volts, and can be plugged straight into a standard halogen lamp fitting without modification. $50 each.

1 watt and 5 watt Luxeon LEDs



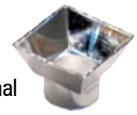
We now have stocks of these impressive LEDs. Each 1 watt Luxeon LED is equivalent to a dozen or more high-brightness 5mm LEDs in light output. With over twice the current draw and twice the voltage of a 1 watt LED, each single 5 watt LED is equivalent to up to 50 or more high-brightness 5mm LEDs in light output. Available in blue, green, cyan and white (**Note: the 5 watt white LED has a rated life of 1000 hours**). For more information, prices and to order, go to the ATA's website at www.ata.org.au or call the ATA on (03)9388 9311. **Coming soon: 3 watt LEDs and 1 watt warm white LEDs!**

Luxeon optical collimators and reflector

New 25mm optic with holder. This optic solves the problem of how to attach the optics to the LEDs! $12 each.

Also available: 30mm super optic. The best optic available for Luxeon LEDs. Tightly collimates the beam from a 1 watt or 5 watt LED with greater efficiency than the Luxeon optic. $18.50 each.

Luxeon standard 20mm optic is the same as in the LEDs with optics, just without the black plastic holder. Fit this to a 5 watt LED for a great torch or directional floodlight. $5.90 each.

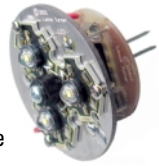


The reflector is not designed for the Luxeon LEDs, but fits nicely over them to give a semi-directional output. $0.50 each.

20 amp speed controller kit

This controller allows you to vary the speed of 12 or 24 volt DC motors from 0 to 100%. It is also ideal for controlling loads such as incandescent/halogen lamps and heating elements. It is ideal for use on small electric vehicle projects, such as electrically assisted bikes and go-carts. While it is rated at 20 amps, this is very conservative, as we have tested it to over 30 amps without problems.
Price: $40 ($35 for ATA members)
Item code: SPEEDCON

LED halogen conversion kit

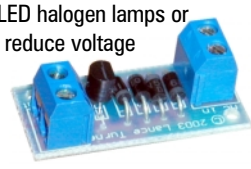


This kit uses three of the 1 watt Luxeon Star LEDs, and includes a rectifier and constant current circuit to drive the LEDs at the correct current. Note that the light output won't be equivalent to a 50 watt halogen lamp, but then, the kit only uses 4 watts! Also note that you may need to replace your halogen transformers, as they often need a minimum load of 20 watts. $22.00 each without LEDs, or $77 including three white Luxeon Stars.
Item code: LEDHALKIT.
We now have a Superflux LED version of this kit which takes up to 18 Superflux LEDs of your choice.
Also available is our new general-purpose bulb kit. This kit takes up to 45 Superflux LEDs to build a 12 volt DC light bulb that can be made to fit any standard screw or bayonet socket of your choice. See our webshop for details of these kits.

Constant current circuit kit

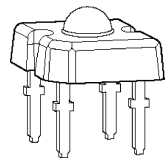
This short form kit allows you to build a simple constant current circuit for driving LEDs from almost any DC voltage. It is available in three sizes, 20mA, 300mA (for the 1 watt Luxeon LEDs) and 650mA (for the 5 watt Luxeon LEDs). These kits could also be used to charge nicad and NMH batteries at a fixed current. Please specify which current rating you need when ordering.
RRP: $8 plus $4 postage inside Australia
Item code: CCBOARDxxx where xxx is the current rating in mA (020, 300 or 650).

Simple 1 amp rectifier kit



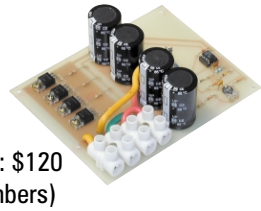
This very simple kit allows you to build a rectifier for use with our polarised LED halogen lamps or for polarity protection of electronic equipment. Uses four Schottky diodes to reduce voltage drop and includes a 1 amp fuse. $5 plus postage. *Item code: RECKIT*

Superflux LEDs



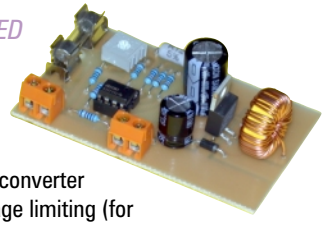
The Superflux LEDs are about the best value for money available in LEDs today. Each 8mm square Superflux LED has the equivalent light output of several of the best 5mm LEDs, for the same or less cost as a single 5mm device! Available in red, green, cyan, blue and amber.
Price: Red and amber: $2 each
Green, blue and cyan: $3 each
Item code: SUPERFLUX-XXXXX where XXXXX is the colour.

Maxi-maximiser kit



Price: 12 amp: $70 ($65 for ATA members), 20 amp: $120 ($110 for ATA members)
A larger version of the mini-maximiser which is available in 12 and 20 amp versions. The kit allows you to build the unit for use on either 12 or 24 volts. You must specify current rating when ordering.
Item code: MAXIMAX

Switchmode LED driver kit



This kit allows you to build a simple switch-mode DC to DC converter with either voltage limiting (for powering small DC appliances from up to 30 volts DC) or current limiting (for driving LEDs directly from up to 30 volts DC). The voltage or current is fully adjustable, allowing the one design to be used for a huge number of appliances or LED types, including the 1 watt and 5 watt Luxeon LEDs. Efficiency is typically over 70% on most input voltages. Kit includes circuit board, all components and instructions, and fuses in the following ratings: 50mA, 315mA, 500mA and 800mA. No case is provided. *Item code: SWITCHMODE.*

Expand your *ReNew* collection

All available back issues up to issue *ReNew* 77 $6.50 inc. postage within Australia. *ReNew* issue 78 onwards $7.50 inc. postage. For a listing of what is in each issue, see the ATA's web site at www.ata.org.au.

Issues available are: *Soft Technology* issues 41, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55 and 56. *ReNew* issues 57, 58, 61, 62, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 80, 81, 82, 83 and 84.

ATA order form

Name Year of birth:

Address

State P/C

Phone (BH) (AH)

Fax/Email: (MOB)

Join me up as an ATA Member

Includes *ReNew* magazine four times a year, *The Sun* member newsletter (also quarterly), discounts on a range of products and services, chance to take part in ATA branch activities. **Please note that memberships are Australia only unless specified.**

❒ Individual membership Aust/NZ $55

❒ Concession (proof of entitlement required) ... $40

❒ Household membership Aust/NZ $70

❒ Individual rest of world membership $68

❒ Business/Government $150

❒ *Gift membership/subscription ..... $_____

*** For gift subscriptions or memberships, please provide both the recipient and giver's addresses.**

I only want to subscribe to *ReNew*

❒ Australia $28

❒ NZ & PNG $32

❒ Rest of world $39

This is a ❒ new or ❒ renewal membership/subscription.

Send me books or products

Item or code	Qty	Price $
Postage Postage for books is $8 for the first book plus $2.20 for each additional book. All membership and subscription prices include postage.		$
Please accept my donation Donations are tax deductible. ❒ Send me a tax deductible receipt.		$
Total (NB. All prices in $AUD. Prices subject to change)		$

I want to be an *ATA Supporter*

Becoming an *ATA Supporter* is a tax deductible donation. For member benefits such as discounts and *ReNew*, also join as an ATA member.

EACH MONTH, I would like to donate

Amount: ❒ $20 ❒ $50 ❒ $100 ❒ Other (min $10) $ ____

ATA will send a tax deductible receipt in July each year.

❒ Debit my credit card (enter card number below)

❒ Debit my bank account (ATA will send you a direct debit form for you to complete and return)

Credit Card payment

Card type: ❑ Visa ❑ Mastercard ❑ Bank card

Cardholder's name

Card no. |__ __ __ __|__ __ __ __|__ __ __ __ |__ __ __ __|

Expiry ___/___ Signature

Payment details for m'ship/subscription

Attached is my:

❑ cheque ❑ money order ❑ credit card details

Save paperwork—renew automatically!

❑ Please renew my membership/subscription by automatically charging my credit card each year (enter card details above). You will be charged at the end of this month, once each year, until you cancel the request.

❑ For automatic renewal by Direct Debit of your bank account, please fax or post this form to ATA and we will send you a direct debit request form for you to complete and send back to us.

Send to

ATA, PO Box 2001 Lygon St North, Brunswick East VIC 3057

Note: Please allow up to 21 days for delivery.

85/03

[Letters]

Continued from page 14

cles, is just a stepping stone away from the fossil fuel powered vehicles of today. You would hardly consider a Model T Ford as being advanced, would you? Yet EVs have really had only that level of development by car makers so far. They are still in their infancy.

However, the Tango does has advantages that your XF certainly doesn't. You can park four Tangos in the space required by one XF Falcon. Imagine how much city traffic and parking congestion could be reduced if most cars were Tango sized! Also, the Tango can be charged from wind, hydro, solar or other renewable energy sources, making it a zero emissions vehicle. That is simply not an option with any petrol powered car.

In short, the Tango, like the other cars presented in that article, exist to show the general public that bigger is not always better, and in most cases it is far worse. Breaking this perception is a first step in reducing traffic problems, fuel usage and greenhouse emissions.

Lance Turner

Double glazing safety tip

In the last issue, the article on double glazing looked very interesting. However, I would suggest that anyone trying this on double hung sash windows also note that the counterweights will have to be increased in size to allow for the extra weight of the second pane of glass.

Alex Sourdin,
Kangaroo Valley, NSW

Batteries and hydros

Thanks for another interesting issue. Just a couple of comments on two articles.

Firstly, nicad batteries. These do have some very good properties but then so do lead acid. Nicads have better resistance to high temperature, can be discharged at high currents and can last a long time with electrolyte changes. On the down side they have lower charge efficiencies (1.4 for pocket plate versus 1.15 for lead acid) and higher self discharge. This makes them less suitable for applications where a period of use between charges is necessary. Should the electrolyte become contaminated with carbonate (absorbtion from atmospheric CO_2) and not be changed, the cell can be spoiled. Disposal can be expensive.

Secondly the article on micro-hydro. Jeffe makes some very good points from a customer's perspective. Unfortunately he has a site that needed a custom made, low head turbine and this bumped the price higher than it may be for other sites. I think that a good hydro site would involve around two thirds of of the cost that Jeffe incurred for a pretty good system. Virtually all 'off the shelf' commercially produced micro-hydros are of the impulse turbine type that requires a high(ish) head to operate. If one of these was used the costs would have been significantly lower. These types can use much lower flows of water so the trash problems are lessened and, being piped, the installation involves a lot less work with rock shifting and cement. After-sales support in any stand alone system is important and I am sorry that Jeffe has had a less than satisfactory result in that area. I suppose it comes down to what services are available in the area you are installing in. In my opinion hydro is about the 'greenest' form of renewable power when all factors (embedded energy, cost, power production and service life) are considered.

Bruce Geddes, Advanced Renewable Power Technology, NZ

Another weather station

A couple of years ago I was looking for a block of land in the Adelaide Hills area. The land I eventually found had a small two-room cottage, a shed, tanks, a dam and no power. I wasn't sure about a permanent residence, but I wanted to log the wind strength et cetera. I looked at anemometer designs using ping-pong balls and knitting needles, feeding into a computer joystick input, but decided that it was not going to be a very accurate system.

I started looking at various internet sites and came across the WM-918 Electronic Weather Station as sold by Dick Smith Electronics, which I eventually bought. The unit is a 'stand alone' device running on internal batteries (12 volt) or an external 12 volt source. It comes complete with a rain gauge and a pole mounted wind gauge as well as inside and outside temperature and humidity, time and date. It also has a connector for a serial link to a computer.

No mains power meant using a laptop running on 12 volts with everything powered from a car battery, with solar panels to charge it. To reduce power consumption the program runs and stores data in a RAM disk (so the hard disk does not start up each time data is stored). At the end of each month the accumulated data is archived (in Excel format) to a file which can then be down loaded to a floppy disk for a hard copy.

The software I used is a shareware programme FREEWX by Andy Keir and displays all data produced by the unit. Small graphs are displayed for a 24 hour period and one can be shown enlarged (in this case wind data). Data is written to a file at a selected time interval and can also be written to the internet.

Since the system was installed last November, it has run continuously with only one hiccough, when the battery voltage dropped below the level required by the laptop. Only a few days data was lost—but I had fortunately downloaded the previous month's archive the night before!

J Duffield,
karmatwo@arcom.com.au

We were going to take a closer look at the WM-918 weather station in this issue, but it seems Dick Smith Electronics has discontinued this unit. It was made by Oregon Scientific, who also no longer list that exact model, though they do have a wireless version. If anyone knows where to buy this or a similar model in Austral-

ia, please let us know. We have also found another option for recording just wind speed, see the article elsewhere in this issue.

Lance Turner

Loved the microcars

Many thanks for your article in the 84th issue of *ReNew* on micro cars. It is amazing that when you talk to people about them they think you are talking about kids petrol remote control racers.

I decided to go and have a look at some of the websites of the cars that you profiled. I was amazed at the promptness, and someone at Daimler-Chrysler must have read your article, as on their website, www.smart.com, (go to the Australian page) and there are two 'smart centres' being built, one each in Melbourne and Sydney with a third to follow in Brisbane.

It is just a shame that these cars are going to be over $20k and they don't have that fabulous looking 'roadster' yet.

Maybe *ReNew* and ATA could suggest to the government for a reduction in the GST or something as all sales are going to provide less emissions for our environment. This may attract more people. But why would you, if a Barina or similar is still less than $15k. It is a matter of choice I know, but price does help.

I'll just have to wait and see what happens, maybe the roadster will come with the Brisbane centre! I can only hope.

Mick Andrews,
Bungendore NSW

Puzzled by microcars

I'm puzzled by what Lance Turner means by a 'true micro car'. Both the SAM and the Carver are longer and as wide as the forty year old Mini Minor or the current Daihatsu Move; both four-seaters. Both SAM and Carver are roughly the same mass as the Mini, too, despite the 140kg battery of the SAM possibly being lighter than the remarkably heavy iron motor of the Mini. However small the Tango is, it has the mass of a Ford Falcon and its enormous torque will kill those small tyres—a major resource cost—besides using a lot of energy to propel it.

That the featured cars are 'sporty' is no compliment. 'Sporty' and 'urban' are antithetical in car design. Besides making roads hostile to other users, stupid ('sporty') driving costs a lot of resources, even if you don't prang. 'Sporty' cars tend to push their drivers to speeds at which the car runs 'sweetly', as against running sweetly at whatever speed the road circumstances require.

The Carver and the SAM are both built low, which is highly undesirable in traffic. Not only does it make more difficult placing the vehicle accurately, it places the driver in a relatively antisocial posture that works against civil interaction with other road users.

Replacing 4WDs with small cars might reduce thuggery and danger on the roads, as well as reducing fuel use. It would barely affect congestion, though, because that is primarily a function of driver skill and civility. Except at total gridlock, most roadspace is taken by the space between vehicles and most drivers of small cars want a little extra space around them.

Parking two cars on a single space is not allowed in many car parks. If it comes to numbers, you can park twelve bikes or more on a normal car parking space, or six in the space of a 'micro' car.

Besides, a 70kg person riding a 14kg bike can make a lot more sense than their driving a 700kg 'micro' car, or the 1400kg Tango. Bikes make particular sense on the 40% of journeys that are of less than 5km when a cold-started car motor feeds filth to the catalyzer that is too cold to cope with it. A bike will give you far more personal freedom than any motorcar, relative immunity from parking and congestion problems, and some gentle exercise as well.

It's not enough to look at 'alternative' transport, we need to look at transport alternatives. Would you be better making this trip on foot, on a bike, on public transport, in a taxi or sharing a car with a friend, whether informally or in a car pool? Slightly better cars are, at best, a small part of the answer. They are no answer at all if car usage keeps rising at the present rate.

John Harland, Brunswick VIC

Less exotic options

In the article titled 'Smaller is Better' (*ReNew*, July-September 2003) Lance Turner argues that using a two tonne car to move one person is inefficient. The 'personal transport vehicles' he describes are interesting, but a bit exotic and expensive for people used to ordinary cars. The option overlooked are small, but otherwise conventional cars.

As an example of a small conventional car, I drive a Daihatsu Sirion. This has a 1 litre engine, seats two in comfort (five at a pinch) and saves almost as much petrol as the cars mentioned in Lance's article. More importantly it is cheap and can be serviced by regular mechanics.

And for the really short trips I have a folding bicycle which can fit in the boot of a small car or on public transport (see www.tomw.net.au/2003/bb/brisbane.html).

Tom Worthington,
tom.worthington@tomw.net.au

Write to us!

We welcome letters on any subject, whether it be something you have read in *ReNew*, a problem you have experienced, or a great idea you have had. No matter what it is, if you think readers would find it interesting, drop us a line!
Send letters to: *ReNew*, PO Box 2001 Lygon St North, East Brunswick VIC 3057, email: ata@ata.org.au

Send us your questions

If you have a problem you just can't solve, or want to know the answer to a general question about sustainable technology, drop us a line and we will do our best to answer your query.
Send your questions to:
***ReNew*, PO Box 2001, Lygon St North, East Brunswick VIC 3057**
Ph:(03) 9388 9311
Fax:(03) 9388 9322
Email: lance@ata.org.au
www.ata.org.au

Floor covering options

Would it be possible to get some technical advice from someone about heat insulation of carpets?

We live in a pole house, passive solar design, well insulated, except for maybe the floor. We have carpet tiles sitting on True-deck.

We are contemplating getting new carpet. Will carpet and underfelt make a difference, compared with what we have now?

Also, we are thinking of coir or jute, which is laid on jute and hair underfelt. We prefer non-animal products on environmental grounds. Do you have any data regarding insulation properties of jute or coir in particular compared with synthetic carpets and wool carpets?

Thanks so much for your trouble.

Dave Goldberg,
barbndave@shoalhaven.net.au

Floor coverings typically have an R rating (which defines the resistance to heat transfer) between 0.2 and 0.8 depending on the material and thickness. Carpets tend to give better ratings when combined with the underlay. Carpets with a rubber or foam underlay have another advantage; they form a barrier that stops any draughts getting through any cracks in the flooring.

Of those two underlay types, I would prefer the foam type. I think it is a bit thicker and hence has more air trapped in it. That translates to a higher R value. The same applies with carpet, the thicker the carpet the higher the R value will be. Wool would also be a little better than synthetic.

With regard to more natural materials the same applies; the thicker the better. However as many of these are not used with an underlay they would probably not insulate as well as a thick carpet with underlay. I can understand the attraction of the natural fibres though.

Hope this gives you enough to go on. If you want more detail you could try a carpet manufacturer. If they give you no joy a good architect should have tables listing the U values (which are the heat transmissivity values—the inverse of R values) of various building materials. The R value can be calculated from the U value.

Mick Harris

Laptops on 12 volts

I am not sure if ReNew has had any information on powering Laptop PC's in the past, but I thought you may be able to help. I am considering purchasing a second hand laptop, and I want to run it on 12V DC from my solar setup. Do you know of any particular models of laptops that could manage this OK, and what is the best way to regulate the power input.

Daryl Clark,
dazlon@markerman.com

Running laptops from a 12 volt solar system is a bit tricky. Laptops run from a variety of voltages both under and over 12 volts. Probably the best way to proceed would be to look for a laptop that runs on 19 or 17 volts. Then use a step up transformer/power supply that will deliver the required voltage from 12 volts. Jaycar Electronics has an adaptor specifically designed for laptops that can supply anywhere from 12 to 24 volts. It plugs into a standard car lighter socket and costs around $90. Oatley Electronics has a short form kit (no case, leads et cetera) that will do a similar job for $22.50.

Mick Harris

Daryl, see the Products section of this issue for a nifty 12 volt DC powered desktop PC.

Lance Turner

Making earth bricks

I am looking for information on the CINVA ram, and it has been suggested that you may be able to help. In particular I would like to find plans to build my own, as I am a welder and mechanical engineering student.

Do any of your advertisers supply either the ram or plans? If not, do you know of anyone else that does?

Thanks for your time.

Geoff Hollins,
geoff.hollins@customs.gov.au

We ran an article on a hydraulically powered version of a CINVA ram in one of the early issues of Soft Technology (ReNew). It includes technical construction details as well as operation instructions and some suggestions on how to get your soil mix right.

The magazine it came from is no longer available but we have placed a copy of the article on our website, go to www.ata.org.au and click on the ReNew link and look at the past articles page.

The other place you would get information would be from Owner Builder magazine. Many of their articles deal with earth building and the CINVA ram was a popular method of earth building in the past. I suggest contacting the editors, they may even know which of their back issues have covered it. Their email address is obmag@origin.net.au.

There is a company, Dalrac, that sells a mudbrick press for $695. They look the same as the CINVA ram. Their phone number is ph:(03) 9888 5297.

Finally, have a look on the web, you will find a number of rams. There are also several US companies selling them, though shipping of such a heavy item to Australia would be costly.

Mick Harris

Notes and errata: ReNew 84

In the Products section, the writeup on biodegradeable plastic bags stated that Australians throw away six billion plastic bags per week. This should have read six billion bags per year. The 12,000 per minute figure was correct.

Build your home for a lot less cost

Timbercrete is a relatively new building material that has many advantages over traditional construction systems like brick veneer. For a start, it is generally about half the cost of brick veneer, and having an 'olde worlde' charm, it looks much nicer. What's more, it has good thermal qualities, both thermal mass and insulation. It does not absorb water, is fireproof, is impervious to termites, and can be nailed or sawn like timber, making it ideal for owner-builders.

Timbercrete products are manufactured and distributed by a network of trained and licensed local businesses. This provides the advantages of using local raw materials, creating local jobs, and lowering freight and product costs.

The blocks are made from a mixture of sawdust, cement, sand and binders, with the resulting blocks being far lighter than concrete. According to Timbercrete, they always use existing sources of sawdust, rather than making it just for this purpose.

RRP: $4 each for the 200mm wide external wall blocks, $3 each for the 120mm wide internal wall blocks. Prices include GST. Overall costs are around $95 per square metre of wall area.

For more information, or your local supplier, contact Timbercrete Products, c/- Post Office, Bilpin NSW 2758, ph:(02) 4567 1149, fax:(02) 4567 1150, mob:0427 671 149, email peter@timbercrete.com.au, www.timbercrete.com.au

Solar powered waste water treatment

Aqua Clarus has released a new range of domestic wastewater treatment systems. The 'Simply Solar' range is based on its 'Simply Natural' wastewater treatment system. The range includes the 'Simply Solar SA' (stand alone solar option) and the 'Simply Solar SR' (solar ready option). According to Aqua Clarus, both of the new models have a low power consumption (300 to 350 watt-hours per day for a house of five people), use a completely aerobic process, require only one annual service, use no chlorine and have no de-sludge requirements.

The 'Simply Solar SA' comes ready to go, complete with its own 120 watt solar panel, control panel, 12 volt DC pumps, battery back up system and a 12 volt DC regulator. The 'Simply Solar SR' comes ready to connect to an existing solar powered infrastructure, including a control panel and 12 or 24 volt DC pumps.

The 'Simply Natural' wastewater treatment system is accredited in NSW and Queensland, and accreditation in Victoria is expected in the near future.

For more information, contact Aqua Clarus on 1300 368 158 or visit www.aquaclarus.com

Recycled pool anyone?

William Edwards & Co Pty Ltd, has recently released an outdoor pool table that is made almost entirely of recycled plastic. It comprises a billiard table complete with a dining table/table tennis table top as an add on. The unit is weatherproof, UV protected and graffiti proof. The cover supplied is light enough for children to remove, but strong enough to protect the unit when not in use. The cloth playing surface is also weatherproof, but the company does recommend use of the cover to protect against animal/bird droppings.

The table is available in two sizes—6' x 3', or 7' x 3'6". Recycled plastic content is over 90%. Matching garden benches, also made from recycled plastic, are available for when the table is used for dining.

RRP: $1650 for the smaller unit, $1950 for the larger model.
Available from: William Edwards & Co Pty Ltd, 165 Perry Street, Fairfield VIC 3078, ph:(03) 9481 7888, fax:(03) 9481 7899, email: wedwards@ergo.com.au, www.williamedwards.com.au

DC compact fluoros and LED lamps

There is not an overly large range of DC compact fluoros available in Australia, but the options have improved greatly with the release of the new range of DC CFLs from Energy Today. The range includes 12 and 24 volt bulbs in sizes from 3 to 30 watts, all with standard BC22 bayonet fittings.

Also available is a range of 12 and 24 volt LED lamps, again all with BC22 bases. Power consumption of all the LED lamps is 0.6 watts, and they come in both bulb and reflector lamp formats.

RRPs range from $22 to 33 for the CFLs, and $33 to $38.50 for the LED bulbs.

Available from Energy Today, PO Box 340, Botany NSW 2019, ph:(02) 9700 0960, fax:(02) 9700 0964, email: energytoday@quirks.com.au, www.quirks.com.au

Keep your garden green and save water too!

Surface watering often does not get the water where it is needed—the roots of the plant. To achieve adequate moisture levels in the soil you often have to apply a lot more water than the plant needs, thus wasting water.

The Borby Water Tube allows you to send just the right amount of water, nutrients and air down to the roots. The tubes are inserted into the ground at the appropriate depth when the plant is first planted. Alternatively, for plants already in the ground, there is a Borby driver available that will let you insert a tube up to 400mm into the soil. Once in place, you water the plant by pouring water down the tube, where it slowly feeds the root system of the plant.

The tube is made from recycled polypropylene and has a perforated cap (to keep dirt and stones out of the tube) made from UV stabilised polypropylene.

RRP: $6.30 each including cap

For more information, or your closest supplier, contact: Borby Water Tubes, 18 Healey Road, Dandenong VIC 3175, ph:(03) 9706 6842, fax:(03) 9706 5984, email: sales@borby.com, www.borby.com

Reversible window screens

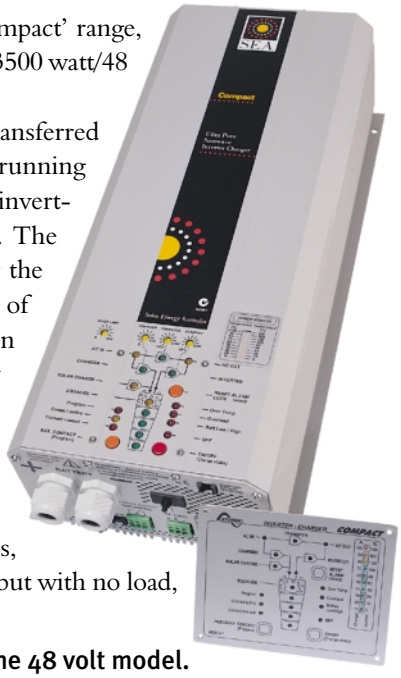
In many cases it is not easy to retrofit existing windows to keep out heat in summer and in during winter. The range of double-sided window insulation screens from ASWI are a simple way to help improve the performance of you home and reduce energy bills in the process.

ASWI screens have a black side (absorptive) and a silver side (reflective) and are fixed to the inside of the window frame. It is not fixed to the glass in any way. ASWI states that in winter, with the black side facing out, 85% of the cold air infiltration from the glass is stopped. The silver side deflects 72% of the heat back into the room. In summer, the insulator screen is reversed. The silver side will then deflect the heat away, stopping over 90% of ultra-violet rays, whilst keeping the cool air in.

While the screens cover the whole glass area of the window, the window can still be seen through because of the tiny perforations in the black and silver layers.

Available from: ASWI, PO Box 167, Coldstream VIC 3770, ph:(03) 9739 0557, fax:(03) 9739 0142, email: aswi@virtual.net.au

Compact inverter chargers



Solar Energy Australia has just released a new range of inverter/chargers. Called the 'Compact' range, they are available in three models: 1300 watt/12 volt/55 amp, 2300 watt/24 volt/55 amp and 3500 watt/48 volt/50 amp.

The inverters work like this: once the generator is started, the load will automatically be transferred from inverter to generator (transfer time is usually less than .02 seconds). Once the load is running from the generator, the inverter will begin to recharge the batteries from the generator. The inverters use a three or four stage charging PWM (pulse width modulation) charging system. The inverters have power factor correction circuitry to minimise the amount of fuel used by the generator. Poorly regulated generators are compensated for by a wide frequency tolerance of 45 to 65Hz. Adjustable power sharing also helps to eliminate phantom switching between generator and inverter. Once the generator is switched off, the load will be automatically switched back to the inverter and battery charging will cease.

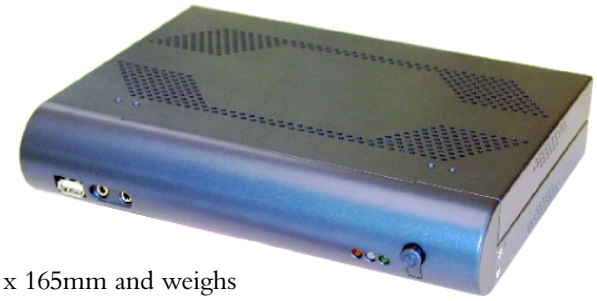
Other features of the inverters include adjustable charge current, auto start, transfer voltage and power sharing. A power meter, charge rate meter and battery state of charge meter are all standard on the units, and can be accessed by an optional remote display.

According to SEA, these units maintain a near perfect sinewave under all types of loads, with very low crossover distortion and excellent dynamic behaviour. When producing AC, but with no load, these units will use 6/9/12 watts respectively.

RRP incl GST: $4522 for the 12 volt unit, $5486 for the 24 volt model and $7367 for the 48 volt model.

For further information contact Solar Energy Australia on ph:(03) 9761 5877, email: sales@solaraustralia.com.au, www.solaraustralia.com.au

Tiny 12 volt computer



We have had many requests over the years for computers that would run from a DC power system, and had, until now, recommended laptops as the best solution. However, Microgram Computers has a tiny PC compatible computer designed specifically to run from 12 volt DC supplies, such as those from renewable energy systems and vehicles.

The computer draws only five watts, measures just 49mm x 220mm x 165mm and weighs around one kilogram. Other features include a fanless design, Eden 533MHz CPU, one 40 pin socket for DOM (disk on module) socket, one 44 pin soket for DOM or 2.5 inch slim HDD (as used in laptop computers), one compact flash card socket, one DOC (disk on chip) socket, PS2 connectors for mouse and keyboard, two USB ports, one LAN port, two serial ports, one parallel port, VGA port (up to 1600 x 1200 resolution), one DIMM (memory) socket which supports up to 512MB of PC 133/100 SDRAM, microphone in and line out sockets. In short, everything most conventional computers have, without the size and energy consumption.

The computer is supplied without an operating system, hard drive or RAM, you will have to buy them separately. Of course, you also need a suitable monitor, but as many LCD screens use an external 12 volt power supply, it should be easy to build yourself a fully DC powered computer. Just remember that the LCD may need regulated DC, not the unregulated power from a battery system, but that shouldn't be hard to provide!

RRP: $749.00 (inc GST). A suitable 20GB hard drive is around $205, with operating systems, memory and LCD screens readily available at any computer store.

Available from: Microgram Computers, PO Box 8202, Tumbi Umbi NSW 2261, ph:(02) 4389 8444, fax:(02) 4389 8388, freefax: 1800 625 777, email: info@mgram.com.au, www.mgram.com.au

LG model WD-8013F 7kg front loading washing machine

RRP: $999 (but regularly sold for $750 to $800). I paid $750 delivered and installed from 'The Good Guys', Northlands, VIC.

When I recently moved house, my new housemate didn't have a washing machine, and as she was supplying most of the furniture and the fridge, I thought I would buy the washer. I thought about getting one of the expensive front loaders, like Asko or Miele, as they are known for their low water and energy use and high reliability, but decided instead to buy a machine I could actually afford. After a bit of shopping around, I decided on the LG WD-8013F Intellowasher. This is a snazzy looking front loader with features like AAAA water rating, four-star energy rating, fuzzy logic control, 7kg wash capacity (gone are the days when front loaders can only take small to medium loads—LG make front loaders up to 10kg), eight wash programs and a spin speed of up to 800rpm. Dimensions of the machine are 600mm wide x 842mm high x 600mm deep, and it weighs around 67kg.

Well, they are the specifications and features, but how well does it work?

Being a low-end model, the washer doesn't have the direct drive system of the more advanced models, but it certainly does an impressive job at washing clothes with very little water. The machine's drum can be loaded with dry washing to the point where it is virtually full, and once wet, the clothes tumble happily and wash properly. In contrast, a heavily packed top loader will usually just sit there with the clothes forming a solid lump that the agitator can't move.

Water usage

I have to say, even though I had owned an Asko front loader in the past, the LG machine used so little water for such a large load, I was quite surprised. When it filled up there was no visible excess water in the drum. The clothes were wet, and were undoubtedly being washed well, but there just seemed to be no excess water. What's more, the time the machine took to fill was very short indeed—less than a minute in fact. Quite often, once the clothes are tumbling, it will add a bit more water to the drum to make up what has been absorbed by the clothes, but this is usually a shot about five seconds long. When the machine pumped out the water at the end of the wash, once again it was clear that there was very little water being used—pumping out the main body of water seemed to take all of 10 seconds. The only time there was any excess water visible was when the machine was doing its final rinse.

All went fine with the wash cycle, however during the spin cycle the machine vibrated out from the wall and started bouncing. I hit the pause button, and realised that the slate floor in the laundry was so uneven and sloping that, once the machine had moved even a few centimetres, it no longer had all four feet firmly on the ground! So, it wasn't the machine's fault, but the dodgy laundry floor.

Well, it took a while, and quite a few washes, but eventually I found the right adjustment of legs on the machine and the right position on the floor where the machine now sits without walking around. Had the floor been flat and level, I expect I would have had no problems in this regard.

So, back to the spin cycle. The machine kept doing its thing, and after about an hour and a half (or maybe a bit longer), it had finished the first load. Taking out the clothes, it was apparent that they were not quite as dry as they would be from a machine with a faster spin speed, but this was to be expected, and they were more than dry enough to hang on racks indoors to dry. It was also clear that, despite the low water usage, the clothes were clean and had no residual soap in them that I could detect, though being a front loader, you only need to use about a desertspoon of powder anyway.

Power consumption

I should mention here that I also had the machine on a power meter while doing a standard load, and the result was impressive. When the machine was set to do a cold load (and in most cases, that is all you need—warm water washing is usually just a waste of energy), total energy consumption for a full cotton cycle (the longest cycle) was just 140 watt-hours! What's more, the peak power consumption recorded by the meter was just 735 watts. This means that the machine should be suitable for use on stand-alone renewable energy systems, although the machine may have had a higher surge rating than this and the meter was just too slow to catch it. I did watch the meter while the machine was

Continued on page 93

Australian standards for PV arrays

Our Standards commentator Ray Prowse discusses the new draft Australian Standard for the Installation of PV arrays

In this edition the new draft Australian Standard for the Installation of PV arrays (DR 03389) is discussed. The draft has recently been released for public comment by Standards Australia.

Why has this standard been developed?

Up until recently PV arrays were always quite small and almost always operated at extra low voltage (below 50 volt AC or 120 volt ripple-free DC). Under ELV conditions voltages and currents were low, and there was little issue with the safety of the system and the personnel undertaking installation and maintenance.

However, with the advent of larger systems under the generous terms of the Australian Greenhouse Office's PVRP and RRPGP rebates, system sizes have increased to the extent that many systems exceed the ELV/LV boundary conditions. Many modules can be connected in series (voltages add) and a maximum power point tracker used to convert the array to battery charging voltage (stand alone systems), or inverter input voltage (grid connected systems). Modules are also larger, with individual cell areas considerably increased, hence the current under normal operating conditions is higher. Note that under these LV conditions, all cabling must be carried out by a licensed electrical worker.

The new standard has been developed to provide guidance to all installers, thus making sure that the system is safe and performs to its design specifications.

Examples of features of the new standard

Figure 1 shows several of the features of this new standard.

Note that there is protection for the array as a whole, as well as the individual strings within it. There is also the possibility of sub-arrays (not drawn in this diagram) and these have similar requirements for protection.

Clause 2.4.1 Discrimination

Overcurrent protection within the PV array shall be graded in such a way that lower level protection trips first in the event of fault currents flowing from higher current sections to lower current sections of the PV array.

This makes sense when the following rating for each protection device is considered.

Rating of each protection device

Strings: If there is information available from the module manufacturer, then that rating should be used. If there is no such information available then the rating should be between 1.3 and 2 times the short circuit current of the module.

The same applies for sub arrays and arrays. Clearly, if the array is made up of parallel sub-arrays, and each sub-array is made up of parallel strings, then the array current will be greater than the

The draft has been released for public comment. All comments should be directed to Geoff Webb at geoff.webb@Standards.com.au.
Note that there is a prescribed form on which to make your comments; Geoff can email that to you.
The draft can be found on Standards Australia's web site. Enter the code DR03389 in the search dialogue box at www.standards.com.au

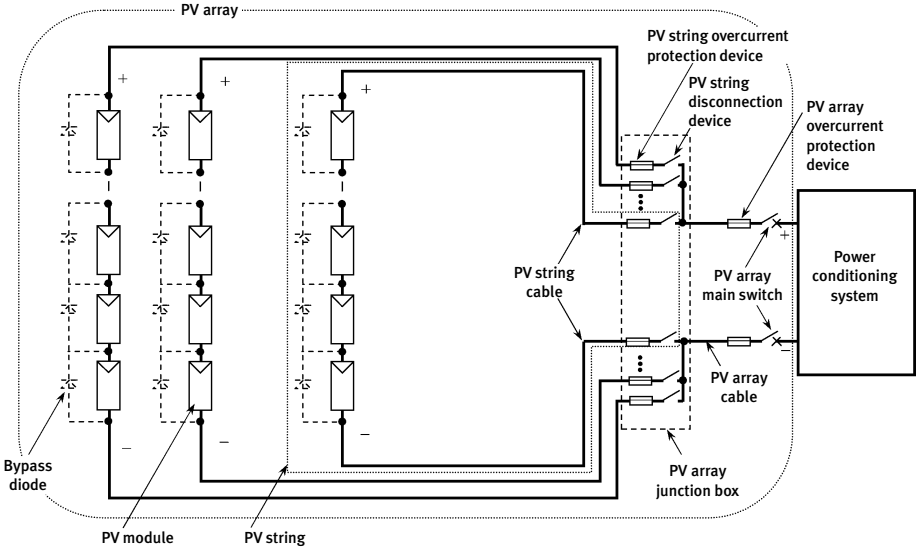


Figure 1. PV array diagram. Note the individual current protection and isolation devices at each end of each string.

sub array current, which will then in turn be larger than the string current.

Where should the protection be placed? The protection is there to prevent reverse current overload, so it should be placed near the load end of the cables. This means that if the array feeds a battery bank, then the protection should be near the battery bank end of the cables. In this case both the cables and components of the array will be protected.

Other features of the standard include (under section headings):

Section 2 Protection Requirements (by-pass diodes, blocking diodes, disconnection means, earth fault protection, emergency switching device, alarms, lightning and overvoltage protection)

Section 3 Wiring Requirements (compliance with wiring standards, system voltage, wiring installation, cable selection, wiring identification)

Section 4 Component Requirements (PV modules, PV array and sub-array junction boxes, switching devices, plugs, sockets and couplers, fuses)

Section 5 Earthing (earthing electrode, equipment earthing, PV system earthing)

Section 6 Marking Requirements (PV array and sub-array junction boxes, disconnection devices, fire emergency information, shutdown procedure)

Section 7 Documentation

Section 8 Commissioning (wiring and installation integrity, open circuit voltage, earth fault protection test, commissioning records)

Appendices

As can be seen from the above, the new standard is very comprehensive and is a step towards improvement in the performance and safety of PV arrays. Clearly there are also costs associated with these extra requirements. Hopefully, consumers, system designers and installers will see the wisdom of the new standards and accept these extra costs as part of a developing industry. Remember, no longer will a shock from a PV array give a nasty fright. With increasing array sizes, that shock may be lethal!

Standards Australia welcomes all comments on draft standards, but please comment on this draft standard now rather than wait until after it has been implemented.

[Product review]

Continued from page 91

running, and even while spinning the actual power use rarely exceeded 250 watts. I haven't had a chance to test the machine on an inverter/battery system yet, so I can't say for sure it would be okay on smaller systems. If anyone out there has experience with one of these machines on inverter systems, please let us know!

I also decided to try the short wash cycle—called the Quick 30. Initially I thought this referred to the time taken to complete a cycle, but it actually refers to the default wash temperature, though it can be set to cold wash with the press of a button. This is something I have noticed on many new machines—the default wash temperature is not cold, but indeed usually 30 to 40 degrees. I wonder how much energy is wasted, and how many people get higher than necessary energy bills, simply because of these default settings. Maybe the manufacturers of washing machines need to seriously think about this and set the factory default wash temps to cold water.

Overall impressions

Well, I haven't had this machine long enough to give a statement on reliability, but on all other counts I am more than happy with it. It washes better than any top loader I have used (but then, front loaders generally do), uses far less water than a top loader, or indeed, less water than any machine I have owned in the past, and uses very little detergent to boot. It easily handles any load you can stuff into the drum and uses very little power per wash. What more could you ask for, especially for such a great price? All-in-all, if it proves to be a reliable machine, I will certainly stick with this brand.

Review by Lance Turner

Classifieds/For Sale

For Sale: Honda Insight Hybrid 2001, auto, 16500Km, world's lowest fuel consumption for a petrol vehicle, immaculate. Offers around 30K. Warranty available. Extremely reluctant seller. ECCO0. *Ph:0403 924 488 (VIC).*

For Sale: Frostbite 24volt fridge/freezer 220lt. Excellent condition. $850. Rutland wind generator 75watts $450 or swap for 75watt solar panel. *Ph:(03) 5726 9465.*

For Sale: Rota-Loo 950 Composting Toilet. As new, unused display, 240v fan, pedestal, turbine vent. Normally $3900, reduced to $3500. *Gavin ph:(02) 6552 9165 Forster NSW.*

Architects/builders

Aron Deuchar-Carpenter: Renovations-alterations-retrofits performed in a sustainable manner to your specifications based on low toxic, low embodied energy or low cost. Reliable, quality workmanship. *ph:(03)5968 2751, 0402 435 372* ♦

BP Architects: Award winning architectural consultancy specialising in green building design; 5-star energy building efficiency, non-toxic building materials, low energy consumption. *Studio 14/149 Fitzroy St, St Kilda 3182, ph:(03)9525 3780 bparchitects@bigpond.com* ♦

Earthbound Design & Construct: Eco-sustainable, Energy-efficient, Naturally healthy designs. Quality construction and owner-builder assistance. ROTA-LOO Composting toilets and Greywater systems. *Gavin Scott Lic No 26508c Pacific Palms NSW ph:(02)6552 9165 gavsearthbound@yahoo.com*

Sunpower Design: Solar efficient and environmentally sustainable house design. Andreas Sederof M.I.E. (Aust) *25 Lanark St East Brunswick 3057, ph:(03)9386 3700 fax:(03)9386 3043 sunpower@ozemail.com.au www.sunpowerdesign.com.au*

Education/Courses

ATA Seminars: Save on Power Bills and Water. Two-hour seminars held CERES and BDC Melbourne. Practical tips to reduce usage and costs. *To book contact BDC, ph:(03)9419 7488, seminars@buildingdisplaycentre.com.au www.buildingdisplaycentre.com.au*

Water Self-Sufficiency Course: With Water Engineer Scott McFarlane. Topics; rainwater tanks, water conservation, greywater reuse, compost toilets. At CERES, Brunswick 10am-5pm, 1st Sunday of the month. *ph:(03)5175 0895, mcfarlanes@netspace.net.au*

Permaculture Online: Free information, Design and Introductory courses on CD or book form. Student and Graduates mailing group online. Serving 22 countries. *Permaculture Visions Cordeaux Rd, Mt Kembla 2526, www.permaculturevisions.com*

Strawbale Workshop: When: 27th and 28th September. 9am – 4pm Where: Balnarring, VIC. Cost: $200. Accommodation available locally. *Ph:(03) 5983 5080.*

Strawbale Building SA: Open Day: Sept 21. Weekend workshop: November. Annemarie Brookman at *The Food Forest, PO Box 859, Gawler SA 5118, ph/fax:(08) 8522 6450 brookman@bigpond.com www.users.bigpond.com/brookman*

Ethical invest/real estate

Australian Ethical Investment: Specialising in environmental and socially responsible investment. Offers public trusts and superannuation. Supports enterprises in sustainable energy and waste management. *CBC Bradfield St, Downer ACT 2602, Freecall: 1800 021 227, www.austethical.com.au*

EcoProperty: Permaculture Lifestyles and Organic Farms For Sale and Wanted. Eco Home Stay. Eco Directory. *PO Box 33, Oyster Bay NSW 2225, ph:(02) 9528 8614. VIC ph:(03) 5348 1546 pk@eco.com.au www.eco.com.au*

Home exterior/interior

Non Toxic Paints: Casein Marble Powder base plus variety of colour pigments, Oils, Lazures, Waxes, Tadelakt and Stuccolustro! *Natural Paint P/L, PO Box 287, Port Macquarie NSW 2444, ph:(02) 6584 5699, fax:(02) 6584 5799 www.naturalpaint.com.au* ♦

Paarhammer windows: Energy Efficient, Double glazed window and door systems. Variety of timbers. Tilt/Turn-Sliding-Bifold-French doors. Custom made to shape/size. *Paarhammer Pty Ltd, Freecall:1800 676 797*

Paint Products: Made from natural and non-toxic ingredients! Wall Paint, Enamel Paint, Varnishes, Oils, Waxes and Thinners. *Bio Products Australia P/L, 25 Aldgate Tce, Bridgewater SA 5155, Ph:1800 809 448, www.bioproducts.com.au*

Ral Homes: Pre-fab Housing delivered Australia and O/S. *Ph:(03) 5352 2352, Ararat VIC, www.ralhomes.com.au*

Winter Windows: Retain winter warmth and keep your cool in summer! The DIY transparent insulation system for windows, skylights, doors. Affordable, effective, invisible. *Easy to install. Energy rated. Ph:(02) 6161 3570, www.winterwindows.com* ♦

Wren Industries P/L: Manufacturer of Concertina FOIL BATTS and RENSHADE radiant barrier aluminium foil insulations for ceilings, roofs, walls, floors, windows, skylights. *139 Herald St, Cheltenham VIC 3192, ph:(03) 9532 5855, tim.renouf@bigpond.com www.concertinafoilbatts.com* ♦

Greywater/composting toilets

A&A Worm Farm Waste Systems: Sewerage, grey water and garbage – one chamber. NATURALLY. No smells. No pump out. We deal with Councils in VIC, NSW, QLD. *Ph:(03) 5979 1887 www.wormfarm.com.au*

Clivus Multrum Australia: The Australian suppliers of EcoLet® and Clivus Multrum™ composting toilets. Use no water or chemicals. See display ad. *Local call for nearest Distributor, ph 1300 13 81 82 or info@clivusmultrum.com.au*

OnZite Wormfarm Systems: The newest design and the latest approvals on an improved Wormfarm System. Will service up to 8 bedroom home. *Call Buzz on 0403 247 654 or ph:(03) 9587 2447, www.compost-toilet.com* ♦

Gough Plastics: The hybrid toilet system. Microflush or waterless toilet systems. *Freecall:1800 308 302, www.hybridtoiletsystem.com*

Playne and Simple Plumbing: Installation and supply of rainwater tanks in plastic, galvanised, colourbond, fibreglass and concrete. Consulting advice available on design of sustainable plumbing environmental systems. *Green Plumber. Mob:0439 398 909* ♦

RE equipm't/components

Batteries

Bargain Batteries: Quality at bargain prices. Gel from $50; 45AH to 7920AH, 2V Gel to 24V Sealed cell. Inverters from 400W to 1300W, self-regulating, all-in-one units. Warranty. *Mob:0402 621 188 (Sunshine Coast).* ♦

BAT REC Battery Recyclers: Good second hand sealed batteries from 7AH to 100AH. All sold with warranty. Ring for price and availability. Transport can be arranged. *Shed 658 Lores Bonney Dr, Archerfield QLD 4108, ph:(07)3277 7588, mob:0409 497 849.*

Federal Solar Batteries: Deep cycle flooded cell & Gel batteries for all solar applications. *Ryde Batteries P/L, 24/51 College St, Gladesville NSW 2111, ph:(02) 9879 5422, fax:(02) 9807 3700, contact@federalbatteries.com.au* ♦

M + H Power Systems: Sonnenschein gel batteries, MSK solar panels, MSW and SINE inverters, Battery Chargers from 1A to 10,000A. Offices in VIC, NSW, QLD, SA, WA and NZ. *Local call: 1300 733 004, www.mhpower.com.au*

Watts Batteries: Specialise in government quality second hand solar batteries (used only in emergencies) All with warranty. Capacity from 130 to 3200AH. Transport can be arranged. *38 Woodfield Blvd, Caringbah NSW, mob:0416 262 752.*

Inverters

Latronics: Designing and manufacturing DC to AC inverters for 20 years. A comprehensive range of Australian made Sinewave power inverters from 400W to 3500W. *ph:1300 550 204, fax:(07) 5491 6792, sales@latronics.com www.latronics.com*

PSA: Sine Wave Inverters providing solutions for all your power needs. RAPS, SGB, SGI. Range from 3kW single phase to 50kW 3 phase. *Power Solutions Australia, ph:(03) 9762 0757, fax:(03) 9762 0715, psasales@powersolution.com.au www.powersolution.com.au*

Selectronic Australia: Still setting the standard with the flexible and innovative Selectronic range of Sine Wave Inverters. All proudly designed and made in Australia. *Ph:(03) 9762 4822, fax:(03) 9762 9646, sales@selectronic.com.au www.selectronic.com.au*

Solar Energy Australia: Manufacturers and distributors of stand alone True Sine Wave DC-AC Power inverters 150W to 3800W, inverter/chargers and grid feed inverters. *Ph:(03) 9761 5877, fax:(03) 9761 7789, sales@solaraustralia.com.au www.solaraustralia.com.au* ♦

Micro-hydro

EcoInnovation: Manufacturer of low cost water turbines using Smart Drive motors. Hydro products designed for your site. Our manual details conversion of Smart Drive motors for hydro systems. *ecoinn@paradise.net.nz. www.homepages.paradise.net.nz/ecoinn*

Platypus Power: Manufacturers of Hydro turbines from 50 watts to 50kW. Site evaluation & equipment selection. Accurate performance curves available. Trade welcome. *PO Box 538, Smithfield 4878, ph:(07) 4055 8057, fax:(07) 4055 8492, plapower@netc.net.au www.platypuspower.com.au*

Water pumping

B/W Solar: ETADRIVE® (brush-less motor 90% efficient) with helical rotor, centrifugal and pool pumps. 5 Star Trakers™, DIY Tracker kits, Inc. drawings for frame. Maximizers with remote control. *Ph/fax:(08) 9341 8790, http://bwsolar.tripod.com* ♦

Eric R Bates P/L: Stock/domestic/small irrigation solar pumping systems. Heads to 120m. From under $1000. Agents Mono, Johnson pumps. *Contact David Bates (PEng Grad IE Aust) ph:(03) 5480 6411, david@ericrbates.com.au www.ericrbates.com.au*

Mono Pumps: Solar water pumping systems. *338-348 Lower Dandenong Rd, Mordialloc VIC 3195, ph:(03) 9580 5211.*

Oasis Windmills: Affordable windpower. Simply installed. Able to pump to 80m (250') head. No expensive rebuilds. Low maintenance. Pumping capabilities up to 18L/min (4 gal/min). *30 Baldock St, Dookie VIC 3646, ph:(03) 5828 6452, mob:0418 340 717.*

Wind

Air Marine Australia: Factory authorized importer and service agent for AirX, AirX Marine and Whisper wind turbines. Manufacturer of battery charging generators and SAM the ELECTRIC CAR. We stock a complete range of solar and renewable energy equipment, including grid interactive wind and solar systems. *Ph:+61 39459 2888, fax:+61 39459 4327 airaus@hotkey.net.au www.airaus.com* ♦

Westwind: Wind Turbines for remote area power supply 3kW, 5.5kW, 10kW or 20kW GP & GF Hill P/L (Manufacturer) *29 Owen Rd, Kelmscott WA 6111, ph:(08) 9399 5265, fax:(08) 9497 1335, venwest@iinet.net.au www.westwind.com.au*

Solar/general

NATIONAL:

Alternative Fuels and Energy: Sun Lizard Solar Air Heater manufacturer. Heat and cool your home using the sun. No running costs. Consulting on Biodiesel, passive solar home design. *ph:(03) 9737 1566, www.alternativefuels.com.au* ♦

Biodiesel Fuel Equipment: Make your own Biodiesel fuel from used cooking oil. Reduces air pollution. Can be used in all diesel engines without modification. Tiamat Global, *Ph/fax: (03) 9583 0751, tiamatglobal@bigpond.com www.alternativefuels.com.au/Biodiesel/biodiesel.htm*

Choice Electric Co: Wholesale Distributor of SHARP Solar Panels, SolarMount PV Framing, SHURflo Solar Bore and Pressure Pumps, Fronius Grid Inverters, Sinewave Inverters. Enersun Solar Batteries. DC Lighting and Electronic Ballasts. *Freecall:1800 074 007, sales@choiceelectric.com.au*

EcoWatch: Australian agent for Davis Instruments, Weather Stations. Wind, Rain, Humidity, Temperature, Barometer, Optional UV, Solar Radiation and PC Link. Evapotranspiration and Soil Moisture option. *Free Catalogue and Price List ph:(03) 9761 7040, fax:(03) 9761 7050, davis@ecowatch.com.au*

Energy Today: BSCE Accredited. Grid RAPS, Solar and Wind. Specialist DC Refrigeration, Lighting and appliances. Selectronics, PSA, and Latronics Inverters. *Quirks Victory Light Co. P/L, Unit 6/17 Green St, Botany NSW 2019, ph:(02) 9700 0960, fax:(02) 9700 0964, energytoday@quirks.com.au www.quirks.com.au*

Excelsior Power: Quality Inverters and Battery Chargers. Inverters. Battery Chargers. Deep Cycle Batteries. Solar Panels. *3/4 Apsley Place, Seaford VIC 3199, ph:(03) 8796 3260, www.inverter.com.au*

Lateral Technology: Est. 1987. Design, manufacture, sales and BCSE accredited installation of Renewable energy systems. Solar, Wind, Hydro and Solar hot water. Manufacturer of SENSTART II Generator remote/autostart device. Authorised BP Solar sales and service. *Ph/fax:(03) 9772 9019, mob:0428 278 707, lateraltechnology@a1.com.au*

Rainbow Power Company: Distributors of Kyocera solar modules, regulators, inverters, DC lighting etc. Contact us for system components, system design and consultation. BCSE accredited. *1 Alternative Way, Nimbin NSW 2480, ph:(02) 6689 1430, fax:(02) 6689 1109, sales@ rpc.com.au*

NEW SOUTH WALES

Sandford Electronics & Solar: TV, video, solar module, deep cycle battery, battery charger, regulator, solar tracker, inverter, meter, wind turbine, micro-hydro, low voltage refrigeration. *Lot 2 Bong Bong Rd, Dapto 2530, mob:0416 050 125.* ♦

QUEENSLAND

Mastervolt: Smart 3-stage Battery Chargers. Rugged Inverter/Chargers. Stand Alone Pure Sine Inverters. Intelligent Battery Monitors and Instrumentation. *30 Beach St, Kippa-Ring QLD 4021, ph:(07) 3283 7800, office@powersolutions.com.au*

VICTORIA

Going Solar: Supply and installation of solar electricity and solar hot water systems. Energy efficiency and green building consultation. Water conservation, greywater sytems & composting toilets. Bio non-toxic paints. *ph:(03) 9348 1000, retail@goingsolar.com.au www.goingsolar.com.au* ♦

Outlook Alternatives: Central heating—hydronic, ducted, wood and gas systems. Solar—hot water, and electricity. Solid fuel—room heaters and cookers. Water pumping and filtering systems. *52 Faithfull St, Wangaratta VIC 3677, ph:(03) 5721 9900, outlookalternate@netc.net.au*

Solar Charge: 30 years serving Victoria. Grid/Remote Solar Power. BP Solar distributor. Home Design advice. See website or visit working display/showroom: *115 Martin St, Brighton VIC 3186, ph:(03) 9596 1974, www.solarcharge.com.au* ♦

RE Installers

NEW SOUTH WALES

Solar Powered Solutions: Full BCSE accreditation. Custom Design, Supply and Installation of Renewable Energy Systems. Solar, Wind and Hydro. *139 Wallace St, Braidwood NSW 2622, ph:(02) 4842 1333, fax:(02) 4842 1322, mob:0429 319 068, Edwards.L@bigpond.com*

QUEENSLAND

Ausolar: Solar and Renewable Energy Systems. Solar - Wind - Hybrid - Grid-Connected Systems. 20 years experience. Accredited RAPS designer and installer. *PO Box 244, Deception Bay Qld 4508, ph:(07) 3888 5051, fax:(07) 3888 2114, info@ausolar.com www.ausolar.com*

Eco Solar Energy: Professional design, supply, installation of RAPS and grid connect systems. BCSE accreditation FDI 576. *10 Longan Rd, Cooloolabin QLD 4561, ph:(07) 5446 8866 fax:(07) 5446 8861, mob:0417 712 751 ecosolar@sun.big.net.au www.ecosolar.com.au* ♦

NENSYS New Energy Systems: Best prices for proven results. Solar and wind energy systems for stand-alone and grid-interactive applications. From equipment supply only to fully installed customized systems. BCSE accreditation FDI 615. *ph:(07) 3812 0565, fax:(07) 3812 1113, nensys@ozemail.com.au* ♦

Solar-Mac P/L: Design, supply and installation of solar home power and solar pumping systems. BCSE accreditation FDI 551. *Contact Peter McPherson, 8 Sundown Dve, Paradise Point QLD 4216, ph/fax:(07) 5529 6611 mob:0407 110 958 solarmac@bigpond.com*

SOUTH AUSTRALIA

EcoSouth: Grid, RAPS, solar hot water, wind, pumps, lighting, Vestfrost. Government rebates. *BCSE Accredited. Call Bonnie for a free info pack ph:(08) 8379 0790 info@ecosouth.com.au www.ecosouth.com.au* ♦

Natural Technology Systems: Station, Rural, Domestic, Grid Connect Solar Power, Solar Diesel for Homesteads, Domestic—Solar—Electric. *120 Prospect Rd, Prospect SA 5082, ph/fax:(08) 8344 7298 www.naturaltechnology.com.au*

Solaris Technology: RAPS and Grid-connect, Solar Hot Water, Water Pumping. Panels, Inverters, Batteries, Lights, Generators and Fridges. BCSE Accreditation, 20 yrs exp. *426 Churchill Rd, Kilburn SA 5084, ph:(08) 8359 1900 fax:(08) 8359 1901, sales@solaris.com.au www.solaris.com.au*

The Solar Shop: Design and installation of Grid connect and RAPS systems. Supply of Solar panels and Wind turbines. *134 Payneham Rd, Stepney 5069, ph:1800 988 877 www.solarshop.com.au*

TASMANIA

Power Plus: Australian products, Largest Range. Accredited Installers of Remote/Grid Connect Systems. Batteries, Efficient Fridges, Pumping / Hot Water. Testing / System Maintenance. *25 Derwent Park Rd, Derwent Park 7009, ph:(03) 6272 4366.*

Solar Tasmania: Tasmania's leading renewable energy specialists. Consultants, designers, suppliers and installers. Professional advice, quotes and information on request. *Call Noel Stutterd at VK Electronics P/L, 5 Corcellis St, Wivenhoe Tas 7320, ph:(03) 6431 7733 fax:(03) 6431 6555, solartas@hotmail.com*

VICTORIA

A B & S Solar Industries P/L: DIY Solar pool heating kits or installed. Solar controllers. Second hand pool panels. Pool covers and rollers. *29 Shafton St, Huntingdale VIC 3166, ph:(03) 9543 7249 fax:(03) 9562 9547, abssolar@abssolar.com.au* ♦

A & J Hatcher Solar Power: RAPS or Grid Connect.Total system Design, Installation, Upgrade or Service. BCSE Accredited. Licenced Electrical Contractor REC 10285. *Ph/fax:(03) 5352 4343, mob:0412 433 975, hatcher@netconnect.com.au* ♦

Agnew Electrics: Design, supply and maintenance of renewable energy systems. Automation of diesel engines. *For your total one-stop service covering VIC, SA and NSW call Robert (Spud) Murphy on mob:0418 934 077, fax:(03) 5358 4250, agnew@netconnect.com.au* ♦

Insolar: Design, supply, install and maintain Solar Hot Water systems. Rainwater Harvesting, Greywater Re-cycling and Solar pre-heated Hydronic Heating. *21-23 Mary St, Nth Melbourne 3051, ph:(03) 9328 4884, stephen@insolar.com.au* ♦

K&C Stork Solar Power Consultants: Design installation and maintenance of Stand-alone and grid-connected systems, solar hot water systems, trade-ins accepted. *Bacchus Marsh VIC 3340, ph:(03) 5368 7370, mob:0418 548 499, www.kcsolar.com.au* ♦

Power Alternatives: Design, supply, installation and maintenance of renewable energy power systems for home and farm. Contact us for a site inspection and evaluation. *PO Box 603, Sale VIC 3850, ph:(03) 5144 1833, mob:0428 609 810, powalt@netspace.net.au*

Sharpe & Jephcott: BCSE accreditation FD1650. New and used equipment (Australia wide). Discount BP solar and Photon panels. Repairs to inverters etc. *5 McLauchlin Ave, Sandringham VIC 3191, ph:(03) 9598 5775, fax:(03) 9502 0113, djsharpe@alphalink.com.au*

Solar Direct: Design and Installation of Solar power and Solar hot water systems. RAPS and Grid-interactive solar systems. Full BCSE accreditation. *9 Quick Street, Pascoe Vale VIC 3044, ph/fax:(03) 9306 8522, mob:0411 269 489 solardirect@optusnet.com.au*

Solar Electricity: City and rural VIC. Fully Accredited Solar Installer FD1694. Design and installation of remote, grid connect and UPS. We do 240V and solar wiring. *Jim 'A' Grade Electrician REC 3349 ph:(03) 9434 2695, mob:0411 093 229 solarelectricity@hotmail.com*

Stephen Cook Solar & Electrical: Design, Installation and Upgrades of RAPS/Grid connect solar and solar hot water systems. REC 9738, BCSE Accreditation FDI668.*70 Madeline St, Glen Iris VIC 3146, ph/fax:(03) 9889 6426 mob:0417 101 451, amscook@bigpond.com*

Sun Wind & Power SWAP: RAPS Design, Sales, Installation and Service. Wind generator manufacture and repairs. BCSE Full membership and accreditation. 10 years experience in reliable service to eastern VIC. *Call Trevor ph:(03) 9444 1777, sunwind@optusnet.com.au*

The Solar Bloke: Remote Area Power Systems Sales, Service and Installation. We supply complete systems for installation. Upgrades of existing systems. BCSE full membership and accreditation. *Rear 27 Lyttleton St, Castlemaine VIC 3450, ph:(03) 5470 5890, AH:(03) 5475 2062* ♦

Wickton Energy: Gas Turbine, Solar, Wind, Hydro. Custom Design Specialist. BCSE Accreditation. Life Time Warranty. 24x7 Support. Statewide Service. *16 Caladenia Circuit, Frankston South 3199, ph:(03) 9775 3491 mob:0408 025 814 wicktonenergy@bigpond.com*

WESTERN AUSTRALIA

Outback Energy Supply: Electrical Contractors EC5698, Renewable specialists, Solar, Wind, Hot Water, Water Pumping, Batteries any application. BCSE FDI627, All areas. *36 Burt St, Boulder WA 6432, ph:(08) 9093 0400, fax:(08) 9093 0411 oesupply@bigpond.net.au*

Transport

NATIONAL:

Recumbent Trikes: Greenspeed: Manufacturer of a wide range of energy efficient and ergonomic recumbent trikes and human powered vehicles (HPVs). *69 Mountain Gate Drv, Ferntree Gully Vic 3156, ph:(03) 9758 5541, www.greenspeed.com.au*

Advertisers' Directory

RAYLITE

(when only the best will do)

Trojan powers Golf cars. RV's. EV's. Utility vehicles. Telescopic booms. Fresh and salt water boats. Floor machines. Renewable energy sources. Aerial lifts. Pallet jacks. Whatever's new. Whatever's next. Whatever needs reliable, dependable heavy service deep cycle batteries and the extra value that's so typically Trojan. Ask for Trojan by name. Or by colour. Our batteries are always easy to find. For the nearest Trojan Distributor call (07) 3299 2600.

MK POWERED

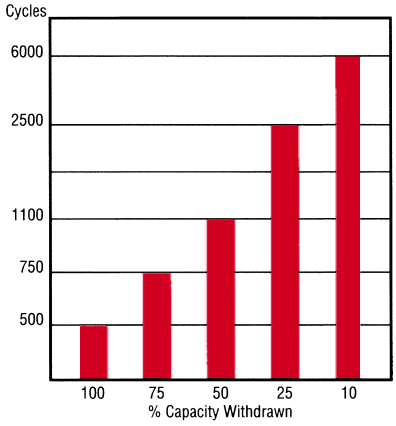
Gel/Sealed Lead Acid Batteries

(Manufactured in USA)

BENEFITS

- Completely maintenance free. Sealed construction eliminates periodic watering, corrosive acid fumes and spills.
- Electrolyte will not stratify, no equalisation charging required. Allows faster recharge.
- Increases durability and deep cycle ability for heavy demand applications.
- Less than 2% per month stand loss means little deterioration during transport and storage.
- Tank formation ensures voltage matching between cells.
- Transports easily and safely by air.
- Quality construction ensures reliable service and support.

Gel Cycling Ability



Number of cycles vs. depth of discharge at+20°C (68°F)
discharge with 20 hour rate

GEL SPECIFICATION

Voltage	12 volts nominal
Plate Alloy	Lead Calcium
Posts	Forged terminals and bushings
Container/Cover	Polypropylene
Charge Voltage	Cycle 2.30 to 2.35; @68°F (20°C) Float 2.25 to 2.30 v.p.c.
Specify Gravity	1.280
Electrolyte	Sulfuric acid thixotropic gel
Vent	Self sealing (2 PSI operation)
Resistance	4.0 milliohms (full charge)
Operating Temperature	Fully charged range: -76°F (-60°C) to 140°F (60°C)

ALCO BATTERY SALES (AUST.) PTY LTD

Sydney 02 4722 2588 **Brisbane 07 3299 2600** **Melbourne 03 9336 4477**

HEAD OFFICE - 3/92-94 Batt St Penrith NSW 2750

Email alcobatt@bigpond.com

TASMAN ENERGY OFFER DISCOUNT SOLAR EQUIPMENT WORLDWIDE

Below is a small list of what we offer. Call with your requirements

Australian Business call for our wholesale pricing

Freecall Australia wide 1800 226626 (Even from a mobile or payphone!)

Solar Panels

Kyocera are arguably the worlds best quality solar modules

Kyocera 120 Watt	$ 990
Kyocera 80 Watt	$ 690
Kyocera 60 Watt	$ 490
Kyocera 40 Watt	$ 390
Unisolar 64 watt	$ 590

Very limited supplies! Be quick for these prices.

Trace Inverter / Chargers

If you use a generator you cannot go past these machines

Trace DR1512	1500W 12V + 70A Charger	$1990
Trace DR1524	1500W 24V + 35A Charger	$1990
Trace DR2424	2400W 24V + 70A Charger	$2590
Trace PS2524	2500W 24V Sine + 65A Charger	$3690
Trace SW3024	3300W 24V Sine + 100A Charger	$6490
Trace SW4548	4500W 48V Sine + 60A Charger	$7990

Air Wind Generators

AirX 400W 12V / 24V Land	$1300
AirX 400W 12V / 24V Marine	$1650

Tasman **Energy**

PO Box 266 Deloraine, Tas 7304
1800 226626 tasen@bigpond.com
www.tasmanenergy.com.au

Latronics Sinewave Inverters

Australian made compact quality inverters

Latronics 412-BKZ-12 Sinewave 1300W 12V Inverter	$	1869
Latronics 518-BKZ-12 Sinewave 1800W 12V Inverter	$	2285
Latronics 530-BKZ-24 Sinewave 3000W 24V Inverter	$	2799
Latronics 535-BKZ-48 Sinewave 3500W 48V Inverter	$	2890

Selectronic Sinewave Inverters

Call for current pricing!

Exide Enerstore Batteries

Australian made tubular plate batteries; call with your requirements