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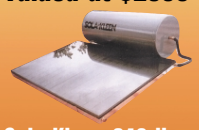

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(see page 5 for details)

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Relax in a solar heated spa

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FLOODED							
7G	6	190	210	26.9	260	181	276
9G	6	215	239	28.8	260	181	276
8C6V	6	330	366	44.2	298	178	365
8L16	6	370	420	51.2	298	178	419
8KFS	12	135	150	35.8	346	171	292
9C12	12	228	253	57.5	394	178	362
GELTECH							
8G27	12	86.4	98	28.9	324	171	251
8G31OT	12	97.6	108	32.0	329	171	240
8G4D	12	183	210	58.9	527	216	254
8G8D	12	225	265	72.9	527	279	254
8GGC2	6	180	198	31	260	181	276

* NOMINAL

FOR GELTECH ALL RATINGS ARE AFTER 15 CYCLES AND CONFORM TO B.C.I. SPECIFICATIONS.

IMPORTANT CHARGING INSTRUCTIONS: WARRANTY VOID IF OPENED OR IMPROPERLY CHARGED. Constant under or overcharging will damage any battery and shorten its life! Use a good constant potential, voltage-regulated charger. **For 12-volt, batteries, charge to at least 13.8 volts but no more than 14.1 volts at 68°F (20°C). For 6-volt batteries, charge to at least 6.9 volts but no more than 7.05 volts at 68°F (20°C).** Do not charge in a sealed container.

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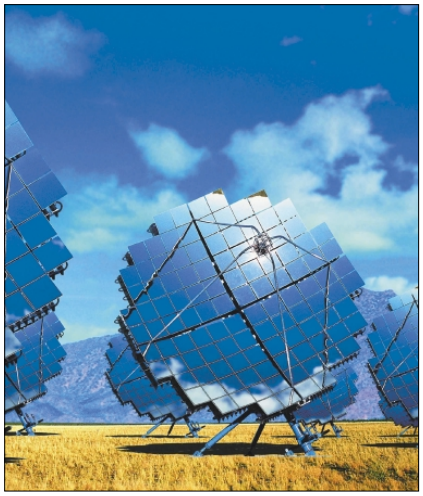

Sneak preview! This computer-generated image of a 1MW solar power generator, near Broken Hill NSW, will soon become reality. Story page 9.

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Energy efficient appliances. Take a look at a new range of fridges that use half the power of the average fridge. Products page 72.

A solar-powered scarecrow is a simple, yet novel way to experiment with solar power. Page 80.

About ReNew

Formerly titled *Soft Technology*, *ReNew* is published by the (Australian) 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 $44 per year, and offers a range of other benefits.

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editorial

Are we witnesses to a culture change?

The majority of Australians have a connection to the mains electricity supply, yet most of us have very few dealings with our electricity supplier. Usually our bills for consumption just arrive in the mail and we pay what is owed at the nearest post office. There is little contact, if any, with the electricity retailer—and no way of knowing from exactly where the electricity is sourced—except that it is available at the flick of a switch.

This era of complacent purchasing is nearing an end for many in the Australian community wishing to use their money to buy 'clean' electricity which is not polluting, or for those who are choosing to generate their own electricity and feed it into the grid.

Grid-interactive solar systems and Green Power (which enables customers to choose 'green' energy as opposed to that sourced from coal-fired power stations) are both relatively new customer 'profiles' as far as energy retailers are concerned, and power companies are now having to devise policies and products to deal with the increasing number of conscientious electricity consumers. Just as they are scrambling to concoct contracts to suit contestable customers (see our report on page 42).

Never before have we, the consumer, been able to find out from which generators our electricity retailers are sourcing our electricity, and now this information is available on websites, government departments and over the phone from electricity companies (well, at least for the renewable energy component of our power).

The change in culture has come from the growing public awareness of the seriousness of human-induced climate change, and also from government policy which now mandates that retailers and large buyers of electricity source an extra two per cent of their power from renewable sources, know as the Mandatory Renewable Energy Target. Under the MRET and Green Power, companies must disclose the amount and source of renewable energy they are purchasing.

This is quite an empowering step in the average customer/supplier relationship, especially as deregulation of the energy industry is upon us and retailers are scrambling to increase their market share. The time has never been better to think about what kind of electricity customer you would like to be.

This issue of *ReNew* is designed to be somewhat of a reference for readers wishing to investigate cleaner electricity options. We have done our best to provide as much information as possible to help you make up your mind and know what to prepare for. Our Green Power buyer's guide (page 46) outlines what products are available from what company and the way the program is structured. Our feature on negotiating a network connection for grid-interactive solar systems is a must-read for those thinking about installing a system on your residence (page 38).

I hope you enjoy this issue, it has certainly been a great challenge for me—especially after coming back from a one-month cycling tour in Western Australia!

Kulja Coulston

PS. In the last issue I mentioned that we may need to raise our subscription price. Please note: it has now increased to $24 per annum.

WIN!

A Sola-Kleen/Smalls Solar 240 litre all copper solar hot water system

in the ReNew/Solar-Kleen/Smalls Solar subscriber competition

Total prize value: $2500*

The Sola-Kleen/Smalls Solar range of solar water heaters are made with all-copper tanks and collector tubes, making them extremely durable and suitable for all water types.

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Sola-Kleen/Smalls Solar has been manufacturing solar water heating units since 1957, and there are many Sola-Kleen/Smalls Solar water heaters still in use today that are over 30 years old!

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- Tank dimensions: 575mm diameter x 1500mm long

***Take out a *ReNew* subscription or ATA membership before 27 July 2001, and you could win a Sola-Kleen/Smalls Solar all-copper solar hot water system valued at $2500 including GST. See the conditions below, and get your subscription or membership 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.

(2) The prize is not redeemable for cash.

(3) The winner will need to pay the cost of installation.

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

(5) The competition runs from 1 March 2001 to 27 July 2001. Subscriptions/ memberships must be paid by 5pm on Friday 27 July 2001 to be eligible.

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

(7) *ReNew* subscriptions cost $24 per year. ATA membership costs $45 per year ($33 concession). Overseas subscriptions cost AUD$29 in NZ and PNG, AUD$36 elsewhere. Two-year subscriptions and memberships are also eligible.

(8) To subscribe or join the ATA, use the subscription form on page 58 of this magazine (or a copy of it), or call the ATA on (03) 9388 9311 to pay by credit card.

(9) The competition is open to *ReNew* readers in any country. Sola-Kleen will pay 50% of freight costs inside Australia. Winners outside Australia will be responsible for any additional freight charges.

To help us speed the processing of postal entries, PLEASE print your name and address on the back of the envelope

The *ReNew*/Sola-Kleen/Smalls Solar subscriber competition is proudly sponsored by Sola-Kleen/Smalls Solar. For more information Sola-Kleen/Smalls Solar can be contacted on ph:(08)9271 5725 fax:(08)5271 3136, email: sola@sola-kleen.com.au, web site: www.sola-kleen.com.au

Portland to be hub of wind industry?

If four additional Pacific Hydro wind power sites are approved for construction, the Victorian coastal town of Portland could find itself at the centre of Victoria's wind industry.

Already the construction of the 18MW Codrington farm between Portland and Warnambool is beginning, and proposals are being pursued for wind farm developments at Cape Bridgewater, Cape Nelson and Cape Sir William Grant. There is also the prospect of developing an assembly and manufacturing plant in the town of Portland, which could lower capital costs of wind farm developments in Australia.

Andrew Richards of Pacific Hydro said that if the demand for turbines reached at least 50 turbines per year, an Australian-based wind turbine manufacturing industry could lower costs by 10 to 15 per cent.

He said Portland was ideally placed to serve as the central hub of manufacturing activity, with its deep-sea port and location in an area where more than 500 megawatts of wind generation potential had been identified on the Victoria and South Australian coasts, as well as inland in these regions.

Progressive policy

In its response to the Victorian Government's *Greenhouse Strategy Discussion Paper*, the ATA has proposed a Greenhouse Levy and a Sustainable Technology Development Program.

The Greenhouse Levy is proposed as a key to addressing market distortions in energy pricing, providing signals to markets for greenhouse emission reduction and investment in renewable energy, and providing a pool of funding to ensure that Victoria is able to resource and implement an effective greenhouse response. It would apply to electricity, gas, petrol and diesel, based on the relevant greenhouse factor associated with the particular energy.

The Sustainable Technology Development Program is proposed to recognise the pivotal role technology plays, and the need to fast-track sustainable technologies. A successful model for such a program exists in the Netherlands: The Dutch National Inter-Ministerial Programme for Sustainable Technology Development (STD). The Dutch have estimated that in order to achieve sustainability there needs to be improvements to current technology in the range by a factor of 10 to 50 (that is, between 90 and 98 per cent less environmentally intrusive).

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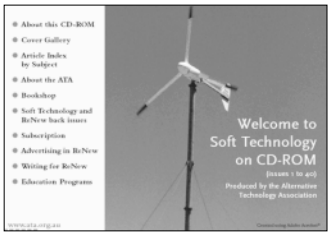

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Renewable Energy Regulator

The Office of the Renewable Energy Regulator (ORER) is currently being established by the Australian Greenhouse Office, with the appointment of a regulator to be made by 1 April 2001 to coincide with the enforcement of the new Renewable Energy (Electricity) Act.

ORER will eventually become a separate authority responsible for supporting the regulator and overseeing the implementation of the Act and the Renewable Energy (Electricity) Regulations 2001.

Contacts: orer@greenhouse.gov.au, GPO Box 621, Canberra ACT 2601, ph: (02)6274 1416.

Harnessing the power of the ocean

It's estimated that a one metre high wave contains around 3kW of power per metre (length) of wave front, and a three-metre wave contains around 49kW of power per metre. So when you consider that waves can be many miles long, the amount of energy they deliver to our coasts is immense. If only this energy could be harvested!

Ocean Power Technologies is developing the innovative 'Smart Buoy' technologies to do just that. Deployment and testing will be done by PowerCor.

The intention of this test is 'to demonstrate the commercial and technical viability of using the energy of the ocean for off-grid and grid-connected applications'. The SmartBuoy (rated at 20kW output in a 2-metre swell) is expected to be installed in early 2001, less than a three kilometres offshore near Portland, Victoria. The buoy is as large as a small caravan and is deployed off a barge pulled by a cabin cruiser.

Water surges in and out of the buoy and is used to move a piston, driving a hydraulic system that powers generators inside a sealed compartment at the top of the buoy. Electrical power is carried from the buoy by undersea cable to the shore facility that converts the electricity for use.

The concept of using buoys makes for easy growth and scaling; for example a 1MW power system would consist of 50 buoys arranged in a grid all connected back to a common shore facility.

Fuel consumption labels

All new cars sold in Australia must now carry a fuel consumption label on the windscreen. The label will display the vehicle's city-cycle fuel consumption in litres per 100km.

The aim of the label is to encourage the purchase of fuel-efficient (and therefore less polluting) vehicles by making consumers more aware of the potential environmental and financial costs of fossil fuel consumption.

For more information or to obtain a *Fuel Consumption Guide* contact: ph: 1300 130 606 or www.greenhouse.gov.au/transport/fuelguide

David Abba dies

The Sustainable Energy Industry Association CEO David Abba's sudden death on 14 December 2000 was a sad and terrible loss for the renewable energy industry. For the 12 months that he was CEO, Mr Abba played an important role in guiding the newly-formed SEIA into a professional organisation that is well-regarded within the renewable energy industry. He leaves behind his wife and two young children. Sylvia Tulloch will serve as SEIA's acting CEO until a suitable replacement is decided on.

Solar research

A Solar Research and Development Project Network which will carry out applied research that will have direct application to the renewable energy industry has gained the support of the Department of State and Regional Development.

The network involving Victoria University, Allied Solar and energy retailer TXU, received three separate grants from the department to enter the development stages. A $15,000 grant was given for the preparation of a business plan, $12,000 for a feasibility study and $10,000 for strategic research.

Victorian SHW rebate amendments

The Victorian Solar Hot Water program has been extended to provide rebates of up to $1500 on accredited solar water heaters and to apply to existing off-peak electric systems where more panels have been added. The rebate has also extended to include the installation of new solar water heaters on non-residential buildings, such as farms, government facilities and community group buildings. For more information contact the Sustainable Energy Authority of Victoria on 1300 363 744 or www.seav.gov.au/solarhotwater

SolarOnline

E-commerce has come to the solar industry in Australia! You can now purchase a range of silicon PV based solar products on the internet using your credit card.

SolarOnline is the newest Sustainable Technologies Australia initiative which will allow retail customers to buy over the net. Wholesale customers can use it in their manufacturing operations or for resale. The site is available at: www.sta.com.au/solaronline

STA is also establishing a production facility in Queanbeyan NSW to manufacture the Titania Solar Wall Panel. The $11 million development program attracted a $1 million grant from the Australian Greenhouse Office. The panels are expected to be available by July 2001.

Clean energy becoming investment winner

The renewable energy industry has been promising to emerge as one of the 'hottest' new sectors on the stock market—and it seems that the ripples of success are beginning show.

The passing of the controversial Renewable Energy (Electricity) Act by parliament in the wee hours of 8 December 2000 apparently sparked an overnight increase in renewable energy investment on the stock exchange. Coupled with growing public interest in ethical investments, stemming from heightened awareness of human-induced climate change, it appears that the fledgling industry is being assessed with interest by speculators.

Investments in industry generated a revenue of $8 billion in 1999/2000 and this is expected to rise, especially as more Australian renewable energy companies, such as Perth-based Solar Energy Systems (whose $5 million Initial Public Offering on 15 December 2000 closed on schedule and was oversubscribed) decide to list on the Australian Stock Exchange.

Making solar hot water sexy: In front of TV crews at the launch of Victoria's Sunset Heights solar precinct near Sunbury, Olympic Gold Medallist Kerri Pottharst tells John Thwaites, Victoria's Deputy Premier, the benefits of a shower using hot water heated by the sun.

The Act, which mandates that retailers and large buyers of electricity source an extra two per cent of their power from 'renewable' sources by 2010, was introduced to increase the amount of electricity being sourced from renewable sources to 9500 gigawatt-hours per year by 2010.

Most investment is expected to be in the landfill and biomass sectors of the industry which is expected to comprise more than 50 per cent of new renewable generation.

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Bendigo Bank offers a flexible at call account offering a range of interest options that allow you to support projects which are socially and environmentally beneficial. The fund has been developed as a result of an alliance between Bendigo Bank and The Ethical Investment Trust (a Community Aid Abroad initiative).

For more information about the Ethical Investment Fund, contact your nearest branch, telephone 1300 366 666 or visit www.bendigobank.com.au

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The Everlasting Daisy Bracteantha viscosa is available through the Victorian Indigenous Nursery Co-operative, a project funded by The Ethical Investment Trust. Photographer: Frances Cincotta. Subject to terms and conditions. Government Fees and Charges may apply. Bendigo Bank Limited ABN 11 068 049 178

A megawatt of solar—in Oz!

This computer rendered image of the planned 1 megawatt power generation facility at Broken Hill provides a sense of scale of these enormous dishes.

To date the largest solar power generating array in Australia has been the 400 kilowatt photovoltaic system at Singleton in NSW. However, a joint venture between Solar Systems Pty Ltd and Australian Inland Energy and Water has upped the stakes with the planning of a one megawatt grid-connected solar array due to commence construction near Broken Hill NSW later this year.

These two companies already have experience with solar concentrator photovoltaic systems. They worked together resurrecting the White Cliffs 14-dish solar array, a 42kW generator near Broken Hill. This experience led them in the direction of a larger system, and this new installation is the result.

The array will consist of 42 parabolic dishes that track the sun, each dish focusing the sun's rays onto a water-cooled photovoltaic array of greater than 20 per cent efficiency at its focal point. Each dish is designed to have an output of 24kW DC at 260 volts, which is then fed into the mains grid via a three-phase inverter.

The SS20 tracking dishes are designed and made in Australia by Solar Systems P/L. Each dish is an autonomous unit and operates independantly of all the others, allowing maintenance to be performed on individual dishes without having to shut down the whole array.

Environmental savings

The project, covering 10 hectares, is expected to save the equivalent of 1908 tonnes of CO_2 in its first year of operation, with around 71,000 tonnes saved over its expected 30-year operating life. Operation efficiency of the system should improve over time as new technologies are developed. A research centre to be established at the site will make best use of the experience gained with this project.

The total cost of the project is expected to be around $6.6 million, and will be funded in part by a $1 million grant from the Australian Greenhouse Office and a $250,000 grant from the Sustainable Energy Development Authority.

Further information

Solar Systems, the designers of this project, can be contacted on: ph:(03) 9819 9544.

When finished, the plant will be jointly managed with Australian Inland Energy and Water, ph:(08) 8082 5800, www.aienergy.com.au

Power use formula

To expand a little on comments made by Dennis Stanley in the article 'Renewables for Renters' in *ReNew* issue 73, page 26, instantaneous power consumption (in kilowatts or watts) can also be determined using a standard rotating disc electricity meter and the following formula:

P = (3600 x N) / (T x R x D)

Where:
P = real power in kW (multiply this by 1000 to get the answer in watts)
N = the number of divisions counted
T = time (in seconds) for the disc to rotate through the N divisions
R = the number of revolutions per kilowatt-hour (rev/kWH) of the meter being used. This is normally printed on the meter. Two common values I've seen are 133.3 and 266.6
D = The total number of divisions for one revolution of the disc. Often this will be 100.

Example: The meter takes two minutes and 15 seconds (135 seconds) to rotate through 50 divisions using a meter with a rev/kWH value of 133.3 and a total number of divisions per revolution of 100.

Therefore, P = (3600 x 50)/(135 x 133.3 x 100) = 0.1 kW or 100 Watts.

When doing your tests, it's best to switch off all known appliances then do a check for power consumption. This will test for any unknown or phantom loads. Corrections can then be made to future calculations.

Meters normally have some method of marking major and minor divisions. This may be longer or thicker lines every five or 10 divisions, and/or numbers. The markings on the meters I've seen seem strange—one meter I have seen has longer lines to indicate fifth and tenth divisions, but not always. Another meter starts numbering every tenth division 10, 20, 30, 40, 50 but then starts counting back down again after that.

To help counteract errors when measuring smaller loads it's best to take the sample over a reasonable length of time. For example, two minutes for a load of around 100 watts. The smaller the load measured, the longer the sample period should be.

When measuring larger loads, it may be more appropriate to count entire revolutions of the disc rather than fractions of a revolution. In this case, the D parameter of the above formula could be omitted and the N parameter changed to be the number of complete revolutions.

Oh, and remember to turn the fridge/freezer back on when you're finished measuring!

Robert Kemp,
robkemp@tpg.com.au

More thoughts on the Asko problem

I have just been reading the current issue of *ReNew* and I see that the problem of not being able to run the Asko washing machine from a sinewave inverter remains unsolved. Although my experience with household appliances is limited (I am an Electrical Fitter Mechanic with a heavy industry background), fault finding is what I do for a living.

Some questions to consider when looking for the problem are:

Are the control electrics working?
Is the motor stalling, and if so, when?
Have any circuit breakers tripped?

The fact that the Asko works fine from the grid in areas with poor power waveform would tend to suggest that it's not the quality of the sinewave that's causing the problem. This would leave the inverter's capacity and voltage as possible culprits.

Some inverters have what is known as soft-start function. That is, if they experience a surge load (as will happen when a motor starts) they lower the output voltage in order to try to lower surge current to within the capacity of the inverter's power transistors. This is mainly intended for appliances with transformers (which also cause surge loading when you turn them on).

However, induction motors (as commonly used in many appliances) have a mediocre start-up torque and if subject to soft starting with anything other than a light load (a washing drum full of clothes and water is definitely not light) they can easily stall and may even burn out if not fitted with overload protection. Some motor controllers are designed to drop out if the line voltage drops below a certain level (brown out protection).

With many top loaders, the motor drives the bowl via a hydraulic coupling which allows the motor to run up to speed before connecting the load. The Asko, on the other hand, may use a direct belt drive.

Like I said before, at this point I can only speculate, but I hope this can be of some help. Finally, I must raise the subject of working on electrical appliances and wiring. Several letters have been printed in *Silicon Chip* magazine regarding the legalities of who can work on what. The Electrical Workers Board has also chipped in on the subject stating that unless the circuits being worked on operate at voltages of less than 35 volts AC or 115 volts DC, only those who possess at the very least some form of electrical ticket, if not an electrical trade, are allowed to carry out such work.

I personally would not encourage anyone without appropriate training and certification to work on 240 volt wiring or appliances. If you must do your own work, then have it checked over by a qualified electrician before you even think of powering it up. Many a backyard wiring or repair job has re-

sulted in people being killed or injured from electric shock and in some cases shonky wiring has resulted in houses being set alight. It matters little whether you draw power from the grid or produce your own with an inverter. Always remember that electricity can, will and has killed those who do not treat it with the respect it deserves.

David Grattidge, Townsville Qld

David, have a read of the next letter for the answer to the Asko problem. You were on the right track as far as inverter capacity was concerned.

Regarding 240 volt wiring, this has been a bone of contention for many years and will continue to be so, I suspect. While it is true that you must be qualified to work on 240 volt systems, there are many unqualified people out there with considerable expertise in electrical wiring—indeed, some of them have a far greater understanding of electricity and its dangers than many electricians. I have seen qualified sparkies working on live wiring many times, and have had to fix a number of shonky wiring jobs done by 'qualified' personnel. I have even come across electricians that don't know the most fundamental electrical principle—Ohm's law—quite a worry, really.

That is not to say that all, or even the majority of electricians are this bad, but I have to say that I have come across it so many times that I have to wonder.

Lance Turner

We have an answer!

We are writing in reply to your enquiry about problems with the Asko 10505 washing machine.

We made lots of enquiries and comparisons when buying a low-energy use washing machine to use on our solar system. Most manufacturers said that warranties would be null and void if used on anything but grid power. Asko were an exception.

At the time, we had just bought a Selectronic SA21 sinewave inverter. According to the Asko 10505 compliance plate, the SA21 would quite adequately run the washing machine. So we bought the machine and took it home. It would not work. We took it back to the shop, explained that it wouldn't work and had found a loose screw when unpacking the machine. The shopkeeper arranged for us to take it to the local authorised Asko repairman. He looked it over, fiddled a bit, plugged it in. It worked. We took it home and plugged it in. It wouldn't work. We took it to a neighbour and tried it on their 5kVA generator. It wouldn't work.

We rang Selectronic to ask for advice. They were extremely helpful, suggesting various things for us to try. It wouldn't work. We took the machine back to the repairman. It worked. He set it up to test the surge current. Although the stated wattage is reasonably low, the actual surge power is extremely high—momentarily over 5000 watts.

The Selectronic people suggested that their SA31 sinewave inverter would have enough surge power to start the machine, and sent one to us to try it out. We set it up. The machine worked. Selectronic made arrangements for us to return the SA21 to Solar Charge (where we had bought it) and pay the extra cost.

We have now been using the Asko washing machine on our solar system with the Selectronic inverter since August 1996. The only time we have any trouble is when someone is using the computer. The machine struggles a little, but it does work. Despite this instantaneously high surge power requirement, the unit is very energy and water efficient, and on a normal solar radiation day, doing the washing doesn't deplete our battery reserves. Coupled with our solar hot water, we have a system that washes well and performs as we had hoped. We congratulate Selectronic and Asko for their support and assistance. Our experience with these companies augers well for others in this currently small but important market.

Judith and David Thompson
dinkum@netconnect.com.au

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WATERLESS TOILETS

Not just the power companies

I often find magazines like yours and a few others dumping on electricity companies but silent about gas companies. I often read about steep price increases in electricity down the track. Actually, the price with Great Southern Energy has come down over the past 10 years. The only increase was a full 10 per cent for GST. LP gas on the other hand has gone from $38 a bottle to $84 a bottle. I can think of no other product or service that has increased by that amount, not even council rates or petrol.

I bought a good second-hand stove for $200 and paid $90 for installation, believing I was going to save money. I got a rude shock when I got the first bill. I continued to use it carefully until I got the second bill. I only cook up one square meal a day just for myself. I found that I was going through one litre of gas for each meal. I already had a microwave and a toaster oven. I then went out and bought a small electric frying pan and toast n' grill (a fold down device that cooks both sides at once). I now use just 1kWH to cook a square meal.

I feel sorry for people who have disconnected from mains electricity and bought an LP gas fridge. The cost of a gas bottle is about the same as my quarterly electricity bill.

Elgas sent me a piece of junk mail when I disconnected. It stated 'We are proud of our product LPG. It's clean, it's efficient and better value than electricity.' They also ask: 'How does the price of LPG compare to electricity? LPG at $59 per cylinder is equal to 9.4c per kWH. Standard Victorian domestic electricity tariffs are around 12c per kWH and small business prices around 14c per kWH.'

Actually the price for LP gas at the time was $65 per cylinder. Above the minimum charge—you are doing pretty well to go below the minimum charge of 3.28kWH a day—the price with Great Southern Energy was 9.5c per kWH. It would be interesting to see how they worked out the comparisons. Even dividing 9.4 by 59 and multiplying by 65 you end up with 10.36. But most important of all they forget to say that gas does not transfer heat at anywhere near the efficiency that electricity does.

As the catering industry primarily uses gas and by and large are reluctant to invest in new equipment, it is unlikely that the price of LPG is going to ever come down in price. In business people simply charge whatever price consumers are willing to pay.

You may or may not like McDonalds and KFC, but they are undeniably successful commercial operations. I wonder if they use LPG.

Alexander Cranford,
alexcran@telstra.easymail.com.au

As LPG is a fossil fuel, we would hope that its price won't come down! However, while electric cooking appliances may seem more efficient, in the overall fuel cycle they are not even close. Remember, over two-thirds of the energy contained in the fuel used to generate electricity is lost before it even gets to your house, making all electrical appliances very high greenhouse gas emitters, unless the electricity is being produced from renewable sources.

The fact is that, while the financial equation is the most important to many people, and understandably so for low income earners, this is changing out of necessity. We can no longer choose a particular fuel source simply because it is the cheapest. Environmantal considerations must be factored into the equation.

Lance Turner

Another biodiesel success

I want to let you know of my experiments with biodiesel using the formula from the book *From the Fryer to the Fuel Tank*.

I obtain used cottonseed oil from the local roadhouse (I live on a grape farm 200km north of Alice Springs). Possibly due to cottonseed oil being of very good quality, the pH tests consistently indicate that I use 4 grams of caustic soda per litre of oil.

I have used a small Kubota pump for about 50 hours now with no problems. I have not run it under load but don't see why there would be any difference.

I am now looking for a cheap diesel car to run and am building my own 200 litre mixing plant using an old sanding machine and a mixer similar in design to a paint mixer.

I also heard from my brother in Adelaide the other day of someone he spoke to in a pub who runs his car from biodiesel he makes from oil that he get from one of those horrible American-originated fast food outlets.

A request: I recently heard on radio of a solar power company who set up a system at Errabella Community in South Australia which uses glass to capture and reflect sunlight to a small silicon panel, reducing the overall cost to one third of other systems. Do you know who this company is and could you possibly run an article on it?

Anthony Heaslip, Ti Tree NT

The system you mention sounds like the Solahart parabolic trough system we featured in ReNew *issue 70, as well as in issue 74. There are other similar systems installed elsewhere, such as the White Cliffs installation pictured on page 46 of this issue.*

Lance Turner

ReNewed inspiration

I am only halfway through Issue 73 of *ReNew*, the first issue I've bought. However, I feel compelled to let you know how much I've gotten out of it already and the inspiration it has given me to explore greater energy efficiencies and alternatives in suburbia. Although a

member of a bushland preservation group and a keen recycler, I'm yet to take that next step to being what marketers call a True Blue Greenie. However, my subscription payment will be in the mail this week—that's a start.

As a marketer with over 15 years experience, I can see what a wonderful future lies ahead for the renewable and alternative energy sector and I've firmly set my sights on working within the industry, using my commercial skills to assist an environmentally beneficial organisation. I want to be able to look my (now four-month old) daughter in the eye one day and proudly tell her what daddy does in his work, rather than convince her that my promotion of another fast-moving consumer good has made her world a better place.

Dean Comber
cdcomber@powerup.com.au

Road rage

I have just read Bob Fuller's article on reducing car use (*ReNew* issue 74) and in particular his discussion of bike riding as an alternative means of transport. He quotes Ken Gelden as saying that bicyclists never need to join a queue at traffic lights and are able to avoid road rage. I almost choked on reading such crap.

My partner and I are regular commuters on bikes for work and fitness and believe that this sort of attitude is responsible for a lot of the antagonism towards cyclists from motorists. Every time I see a cyclist run a red light or cut between traffic to move to the front of a queue, I think to myself 'there is another nail in a coffin of a cyclist somewhere'. Rightly or not, motorists get annoyed when they see this sort of behaviour and are then more likely to cut the cyclist off, speed past them further up the road or hurl abuse at them as they go past. More often than not this behaviour is directed at the next hapless cyclist they come across.

I obey the road rules and try to be pragmatic when I'm riding in traffic and yet I am still subjected to countless near misses and road rage on every ride I take. I would love to see more cyclists on the road to increase cycling's profile as an alternative to cars, but it requires a high level of skill and fitness to coexist with traffic and not cause problems to other road users. Obviously neither Bob nor Ken ride in the city or if they do they are wood-duck cyclists whose behaviour ends up causing me so many problems on the road.

Michael Lynch
mmlife@magna.com.au

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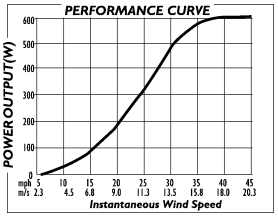

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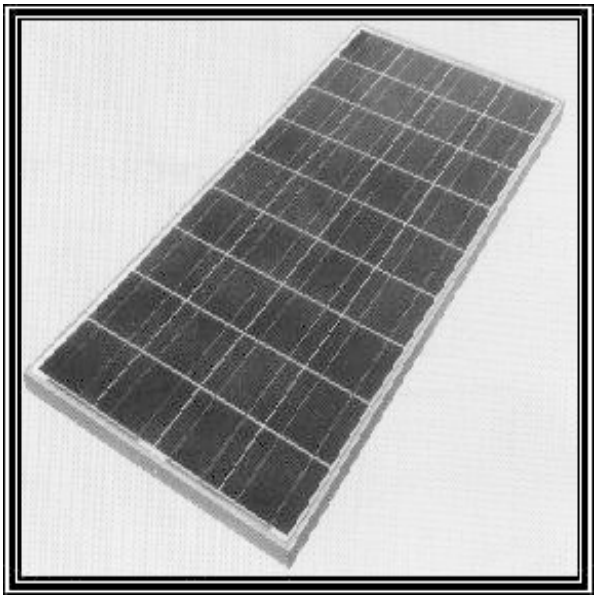

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WHY BUY FROM AN OIL COMPANY?

ReNew inspires new home

Alan and Lesley Wickham write about their smart, green house—composting toilet, energy efficient, solar-powered—which they built from scratch using *ReNew* as a reference

We were already past the age when most people embark on the challenge of building a new home, but in 1999 circumstances inspired us to change our lives. We moved some 500km from the NSW Central Coast to the North Coast, where by chance we picked up our first copy of *ReNew*, issue 67.

We had searched for the ideal house and not found it, but fell in love with a north-facing block of five hectares, mostly forest, with beautiful views of the Dorrigo escarpment. Inspired by the magazine and *The Sustainable House* by Michael Mobbs, we began planning our new house, based on passive solar and environmentally-friendly principles.

The Wickham's house has passive and active solar systems, a composting toilet system, rainwater tank and a pool for pleasure and to act as thermal mass.

Passive solar design

We chose a clerestory style, a design deriving from an old idea where rows of windows on the first storey of a cathedral allowed light into the nave. The north-facing clerestory windows incorporate louvres to allow for light to penetrate into the middle of the house, and for warm air in summer to be exhausted by creating a draft of cooler air at ground level. A well designed eave over the clerestory shades the windows in summer while the low winter sun penetrates well into the house.

Although we were interested in using mudbrick, the soil on site was unsuitable, while importing mudbricks was too expensive. Concrete blocks provided an alternative, on a thicker-than-normal concrete slab for better thermal mass. Thermal mass was also enhanced by siting a 100 kilolitre underground concrete water tank and a 50 kilolitre swimming pool as close to the house as was permitted.

Insulation

However, our choice of building materials brought conflicts between our philosophies and budget. Having explored the range of natural insulation materials, we found that they were more expensive than fibreglass and those which were not substantially more required more expensive installation procedures. We decided to install *biosoluble* glass blanket insulation under the metal roof, chosen primarily for its cost effectiveness but also because the space between the cathedral ceiling and the roof is well sealed, eliminating the problem of fibre contamination inside the house. The same system has been used over the wide verandahs, which cuts out heat radiating downwards from the metal. Heat reflecting glass and acrylic have been used on the western walls and pergola.

The choice of floor covering over the slab can also effect heat transmission. Some passive solar designers suggest either no tiles (patterned slab face) or dark coloured tiles. Because our main concern in this climate is heat reduction we chose a light coloured tile, which provides light reflective qualities and does not absorb summer heat.

To compensate for the loss of the thermal properties of mudbrick, our concrete walls are thickly rendered to a depth of 10mm inside and outside, with ochre added to the outside render to approximate the earth colour of our site. We had carefully considered AAC (aerated concrete) blocks but rejected their use because of their cost and the complexity of their installation requirements. In the bush, expertise of this type is not always readily available.

Light-coloured tiles were chosen for their heat reflective qualities needed in the hot, humid climate of the mid north coast of NSW. The concrete block walls are thickly insulated to prevent heat exchange.

Windows

As the sub-tropical climate here is very hard on exposed timber (and we intend to grow very old in this place) we reduced our annual maintenance by choosing aluminium window and door framing and zincalume flashing over the majority of exposed timber. Main structural timber, along with bench and vanity tops, are recycled timbers from a dismantled wool store in Newcastle. Other timbers used are plantation pine, apart from a handmade front door made by a local craftsman.

Ceiling fans have been positioned for effective airflow (*ReNew* issue 68), aided by substantial gaps between the tops of internal walls and the ceiling. Internal doors have been built of timber, with oversized, adjustable louvres.

Appliances

Electrical appliances were selected with durability and energy consumption in mind and, in the case of the washing machine, dishwasher and spa bath, low-water usage appliances were chosen. Much of the lighting is modern fluorescent, selected for its energy efficiency. In the walls behind the fridge and freezer are top and bottom vents to allow for cooler outside air to carry away the heat generated by the compressor and the coils—another idea from *ReNew*, which demonstrated that this should reduce the energy consumption during the summer. Combined with high ceilings throughout, this effectively prevents heat build-up above the fridge and freezer. Cooking is by LP Gas and electricity.

In this climate, very little heating is needed apart from evenings during midwinter. We decided against using wood fired heating after reading the article and resulting letters in *ReNew* issue 68. Instead, for those rare chilly times we have a portable LP gas heater, which doesn't occupy space in the room during the majority of the year, when it is not needed.

Solar hot water

Popular wisdom around here says that solar hot water systems are not cost-effective because of extended foggy and cloudy periods in this high rainfall area. (We live within sight of Tallowood Point, officially the wettest place in New South Wales.) We were determined to have one, and sought a system which would meet our needs with minimal boosting. The 300 litre Black Chrome XII from Solahart certainly meets our needs, requiring boosting only after around seven to 10 days of continuous cloud, and then it is able to carry through for days again on one off-peak boost. However, during extended hot, sunny periods, the unit overproduces hot water, which initially it 'dumped' at boiling point on the roof, causing considerable problems, such as melted downpipes. We have now solved this problem by leading the dump water across the roof to the underground tank through copper piping. This prevents hot water damage and saves wasting water.

Solar power system

The energy saved in using solar heated water means significant reductions in total energy requirement—which brings us to *ReNew's* most valuable gift to us—our photovoltaic system and the subsi-

dy from the Commonwealth Government. We have twenty 75 watt Solarex solar panels, with space for more when we can afford it, and are considering adding a wind generator in the future.

We are linked to the power grid with a Trace SW3024E inverter, with the means of reducing our energy bills by making the meter run backwards when our arrays are producing surplus electricity. We have four 6 volt, 215 amp-hour Federal 9G batteries. We could have bought more capacity and had the option of running everything from them, but couldn't afford it. As it is, we can run everything except our electric oven and pool filter. Grid supply interruptions are not uncommon in the bush and previously they resulted in such joys as water shutdown, as we depend on electric pumping from our water tank. The loo would flush only once in a blackout! With our battery back-up we don't notice when the grid supply is interrupted — not even a flicker!

This house is one of the first on the North Coast to have incorporated a grid-connected PV system in the house design from the outset. We hope many others will follow. With the addition of 40 square metres of solar pool-heating mats, valuable in mid-summer to cool the pool water by up to four degrees overnight, the entire roof area on our northern side is taken up with energy collectors!

Composting toilet system

Our Dowmus wet-composting waste management system was also a first for the area. The local shire had some initial misgivings, but were willing to try it out. Our system is functioning with 10,000 earthworms (locally supplied) happily chomping away on all our organic household wastes (including kitchen wastes, cardboard and paper) and preparing highly enriched castes for future use on our veggie gardens. The added bonus is the pathogen-free waste water piped for underground dispersal to our newly planted native trees. During this summer's drought, it has helped considerably in establishing our garden.

So thank you *ReNew* for our smart green house and the lifestyle that goes with it. Was it expensive? Expensive is a relative term. We simply used the proceeds of the equity in our former house (which was being engulfed in the urban spread between Sydney and Newcastle) to provide our shelter and lifestyle in a new environment. The cost savings in buying a rural acreage were used to provide all of the energy efficient add-ons. Furthermore, we feel a lot better for having done it.✲

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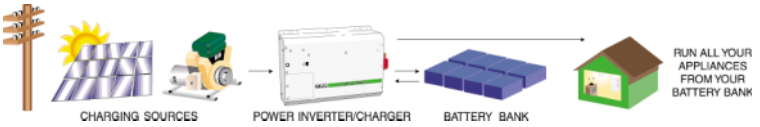


Whatever happened to hydrogen?

We take a quick look at the use of hydrogen to replace carbon as the world's primary fuel source

It is the oldest, simplest and most plentiful element in the universe, it surrounds us, and we are composed of huge numbers of its atoms, yet most people have never thought about the use of hydrogen as a fuel source.

Hydrogen is the simplest element, consisting of one proton and one electron. It is also the lightest, and because of that there is very little atmospheric hydrogen on this planet. However, we are surrounded by vast quantities of it trapped in the form of water (H_2O).

While we can't burn water, no matter what some 'energy from nowhere' proponents might say, we can easily extract the hydrogen from water using electrolysis. By passing an electric current between two electrodes immersed in water, you get hydrogen gas at one electrode and oxygen gas at the other. If the source of electricity used for this process is gathered from a clean source such as wind, water or solar power, then you have an energy storage system that is clean and flexible.

You can also extract hydrogen from hydrocarbon fuels, including fuels we currently use such as petrol, natural gas and methanol. This latter fuel is becoming more widely looked at as an energy source for cars as it can be fed into a device called a methanol reformer that separates the hydrogen from the carbon in the hydrocarbon molecules, liberating hydrogen gas for direct use.

Hydrogen can be used in several ways. It can be burned to provide heat, or it can be reacted in a device called a fuel cell, which combines hydrogen with oxygen from the air to form electricity and heat, with water being the only waste product.

The electricity from fuel cells can be used to power vehicles, homes and businesses, and the waste heat can be used to provide space heating and hot water.

Fuel cell types

There are several main types of fuel cell, including phosphoric acid cells, proton exchange membrane (solid polymer), molten carbonate, solid oxide and alkaline cells.

The phosphoric acid cell has already been commercialised considerably, and there are units in use at hospitals, hotels, power plants and office buildings.

The proton exchange membrane (PEM) cells are generally found in small systems, such as the MicroPower units shown elsewhere in this article. One company, Ballard Power Systems, has put a great deal of time and money into developing these fuel cells for use in transport and other areas, and has numerous cell stacks in use around the world.

Indeed, there now seem to be many companies developing and selling fuel cells commercially, but unfortunately, few are based in Australia.

One fuel cell company that is based in Victoria, Ceramic Fuel Cells Ltd (CFCL), is working to develop solid oxide fuel cells for power generation applications. To date it has no commercially available products, but has produced and tested several fuel cell stacks and is aiming at producing a 40kW fuel cell stack for sale by 2003.

The cell being developed by CFCL is expected to have efficiencies greater than 50 per cent, and will be able to use natural gas directly without the use of a separate reformer.

H-Power Pacific is another company developing fuel cells for the domestic market, but unlike Ceramic Fuel Cells, H-Power already has a PEM fuel-cell based combined heat and power unit

Right: Ballard Power Systems of Canada has been developing fuel cells for use in transport systems for many years, and has done numerous real-world tests in cars, vans and buses, like those at right which were used by the Chicago Transit Authority for two years.

Below: Ballard's Mark 900 fuel cell power module is designed for mass production in the automotive market, and has been used in numerous prototypes, including those made by Ford and Nissan.

available that will be sold in Australia later this year. This unit can supply 4.5kW of continuous electrical power (10kW peak) and over 5kW of heat output for space heating and other uses. The cost of the unit, which can use LP gas or natural gas as its fuel source, is expected be around $35,000, making it very competitive with the average solar power system, though it should be remembered that natural gas and LP gas are not renewable fuels.

The MicroPower units from Warsitz Enterprises come in three models: 3 watt (1.5 volts @ 2 amps), 6 watts (3 volts @ 2 amps) and 9 watts (4.5 volts @ 2 amps). Here you can see the 9 watt cell, as well as a complete kit including hydrogen storage bottle, regulator, PEM (proton exchange membrane) fuel cell and control circuitry. Efficiency of these units is 50 to 60 per cent, and they range in price from US$330 to US$790.

Power of the future?

There has certainly been a lot happening in the fuel cell industry since we last looked at it, especially with the development of PEM cells. There are numerous systems available commercially, and while at present they are not cheap, economies of scale once mass production begins is expected to reduce prices to a fraction of what they are today.

If you want to buy a fuel cell, basic demonstration kits start at less than US$200, though these don't do much except show off the technology. More useful units cost thousands of dollars, but in certain situations may be the ideal choice of power supply.

There are some big players in the fuel cell game. Almost every major car manufacturer has developed a fuel cell vehicle, and some aim to have them in production within the next few years. Xcellsis (formerly DBB Fuel Cell Engines) plans to produce 100,000 fuel cell engines a year starting in 2004, and has teamed up with Shell Oil to develop the hydrogen infrastructure for fuel cell vehicles.

Ultimately, many of us will derive our electricity for home and transport from fuel cells. This technology, combined with clean energy generation such as photovoltaics and wind power, should allow considerable reductions in current greenhouse gas emissions plaguing this planet.

Links

Electrifying Times: Online magazine with heaps of alternative fuel and fuel cell vehicle information: www.electrifyingtimes.com

Fuel Cells 2000: A great fuel cells site which provided a lot of the information for this article. www.fuelcells.org

H-Power Pacific: Will soon be supplying a residential fuel cell power supply system here in Australia. Contact Frank Wheeler, ph:(02) 9887 3116, fax:(02) 9870 7681, email: inquiries@hpowerpacific.com, www.hpowerpacific.com

Hydrogen Now: General web site on hydrogen as an energy source: www.hydrogennow.org

Electro-Chem-Technic. A company in the UK selling educational fuel cells: www.i-way.co.uk/~ectechnic/

Warsitz: Small fuel cell systems for demonstration and low-power use: www.warsitz.com

Ecosoul: Small educational fuel cell kits: www.ecosoul.org

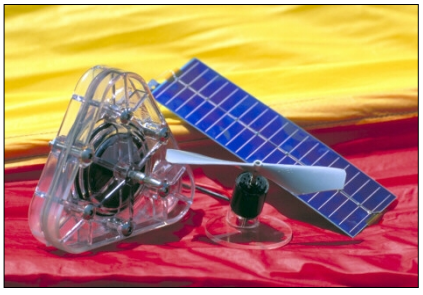
Ceramic Fuel Cells Ltd: Australian developer of solid oxide fuel cells: www.cfcl.com.au

Heliocentris: German company making educational fuel cell kits: www.heliocentris.com

DAIS-Analytic: Manufacture small demonstration sized systems, residential sized power supply systems, PEM membranes and other products: www.analyticpower.com

Energy Partners: Developing 3kw residential grid-connected power supply fueled by natural gas: www.energypartners.org

An example of a fuel cell system used for backup power production. This unit, manufactured by Energy Research Corporation, is a molten carbonate system that can produce up to 250kW on demand and uses natural gas directly without the need for a separate reformer. This company has also installed a 2MW demonstration unit in Santa Clara, California.



This demonstration kit, from Ecosoul (a non-profit education organisation in the US) uses a sealed electrolyser/fuel cell combined with a solar panel to demonstrate how a fuel cell system can be used to store electricity made from a renewable energy source such as solar.

The almost electric vehicle

While they are not purely electric, hybrid vehicles are a huge step in the right direction and are considered by many as the future of personal transport

In the past we have looked at electric vehicles, and also briefly touched on hybrid vehicles (those that use more than one power source to move the vehicle), so we thought it was about time we took another look at the state of play.

On the purely electric vehicle front, there seems to have been very little movement, at least from the major car manufacturers. No new models have been developed or released, and none of the manufacturers are really pushing their electric cars. The main problems seem to be the cost of the vehicles, the disadvantages of carrying around so much extra weight in the form of a battery pack, and the lack of range in most of these vehicles.

With hybrid vehicles, on the other hand, you can have the best of both worlds. You get the high efficiencies and low running costs of an electric vehicle with the range and instant refueling convenience of a conventional petrol vehicle.

Hybrids work by using a combustion motor of some form to provide some of the motive power in conjunction with an electric motor. The electric motor can provide additional power for overtaking and climbing hills, or it may even be used as the sole means of propulsion under certain conditions.

However, this is not always the case as there are different hybrid systems being developed, so we will take a quick look at the only two hybrid vehicles currently available and how they work.

The Insight

Honda decided to go with a less-than-practical two-door design for its hybrid, greatly limiting the possible market. Their vehicle uses a parallel hybrid system—either one or both motors can propel the vehicle directly. The car is predominantly powered by a one-litre petrol motor that can have its power output boosted by a pancake-shaped electric motor attached to the same output shaft. This provides a power boost when it is needed without the need to have a large petrol engine running at low efficiency the rest of the time. The electric motor also acts as a generator during braking or when there is little load on the petrol motor, recharging the nickel-metal-hydride battery pack.

Other features that add to the Insight's amazingly low fuel consumption of 26km/l (74mpg) include an all-aluminium body, low rolling resistance tyres and an engine shut-off system while the car is stationary.

The Insight should be available here in Australia sometime this year, making it the first, and hopefully not the last, hybrid vehicle to reach our shores.

Honda recently announced plans to import the Insight hybrid vehicle in the first half of this year (we haven't seen any yet!).
The Insight is powered by a one-litre lean-burn engine that works in tandem with a brushless DC electric motor. During deceleration, the electric motor becomes a generator to convert kinetic energy (normally wasted as heat in conventional cars) into electricity and store it in a nickel metal hydride battery.
The Insight achieved consumption figures of 3.85 litres per 100km and a highway rating of 3.36 litres per 100km during independent tests conducted by the United States Environmental Protection Authority.
An aluminium body—which is 40 per cent lighter than an equivalent steel body—contributes to the Insight's fuel efficiency. The manual transmission version of the Insight weighs just 820kg.

The Prius

Toyota went for a more practical approach to their hybrid in more ways than one. First, it is a four-door capable of easily seating four adults, so it will appeal to a much larger market than the Insight. Second, its hybrid system does not require the petrol motor to be running whenever the vehicle is in motion—indeed, at speeds below 25km/h, the car is normally propelled by only the electric motor, making it very quiet and clean.

Unlike the Insight, all of the propulsive force comes from the electric motor, which is powered from a 288 volt battery pack and a petrol motor attached to a generator. Because the petrol engine is running with close to a full load, it can be

The Toyota Prius has been a great seller in Japan, Europe and the US. The car is capable of fuel economy in the range of a mere 4.5 litres per 100 kilometres.
The Prius uses a 1.5 litre petrol engine to boost power from a 288 volt battery bank. Electricity is provided to a 33kW permanent magnet motor coupled to a continuously variable transmission.

run at very high efficiencies, thus reducing fuel consumption and greenhouse gas emissions. The Prius is said to have a fuel consumption of half of an equivalent petrol-only vehicle—about 22km/l (63mpg).

Toyota has brought seven of these vehicles into Australia for testing, with a view to selling a hybrid vehicle here in the future if the trial is successful. We have also heard that Australia's largest car leasing and fleet company, LeasePlan, are planning to offer the Prius to their customers in the near future.

What of the future?

There is no doubt that Australia needs to reduce its per capita greenhouse gas emissions, and doubling the fuel efficiency of the nation's car fleet would be a step in the right direction.

However, while combustion engined hybrids are far more efficient than petrol driven vehicles, there remains a lot of room for improvement. The next big advance will be fuel cell vehicles. Fuel cells have the ability to generate electricty far more efficiently than any engine/generator combination, and generally produce only water as a by-product.

Imagine a vehicle as quiet and clean as an electric vehicle, but with unlimited range and the ability to use fuels such as methanol or even pure hydrogen. Such cars are currently being developed and road-tested, and at least one manufacturer—DaimlerChrysler—expects to have production models available by 2004. When we will see them here in Australia is anyone's guess, but at least we can look forward to the time when driving is no longer such an environmental hazard.

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10kW Turbine at Wilson's Promontory, Victoria

Patient safety secure with solar backup system

The Hunter Health Authority uses environmental principles to improve the all-round energy and health performance of its hospitals

Story by Graeme McMullan

Patients can rest assured that the sun will keep shining.

Hospitals can be the most environmentally wasteful institutions in our community—but as the Hunter Health Authority in Newcastle has demonstrated, even small changes to improve the performance and waste disposal regimes of health institutions can make an amazing difference.

The Hunter Area Health Service is committed to continually reducing energy needs and greenhouse gas emissions while continuing to expand the health services provided and improve the quality of care. The passive-solar design of the John Hunter Hospital in Newcastle is a good example of this as it achieves the best of both worlds.

One wing of the hospital requires no air-conditioning system to meet patient comfort needs, and relies on natural ventilation. This has eliminated the all-too-common risk of air-borne diseases breeding in vents and then spreading throughout the wing via air-conditioning ducts. It has also recorded massive energy savings from avoiding running a large air-conditioning system 24 hours a day.

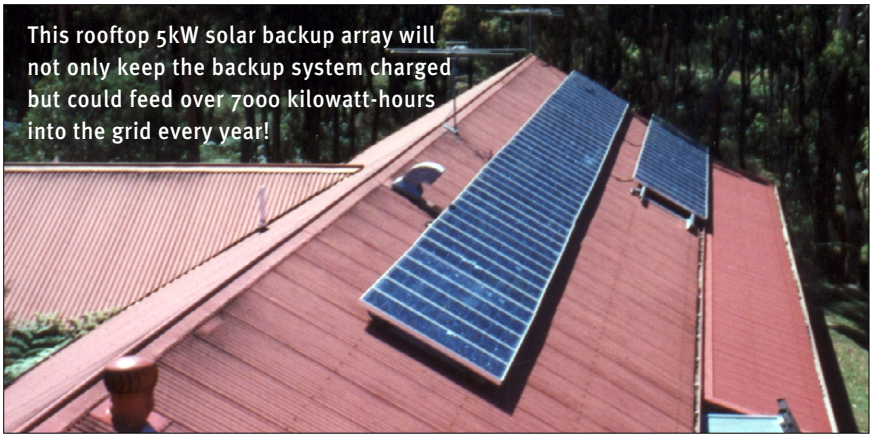
Another impressive initiative of the authority was to introduce a solar-powered emergency backup system at the Wansey Dialysis Centre located in Charlestown, Newcastle.

Wansey Dialysis Centre

During the Hunter Health Authority's Y2K risk analysis process in 1999 the Wansey Centre emergency power requirements were scrutinised. The Capital Works and Physical Resources Department, particularly through the progressive thinking of Stuart Leeman and John Stanton and the considerable support of Professor Al Gilles, considered this an opportunity to introduce a backup power system based on renewable energy sources.

In December 1999 Solar Technology Australia embarked on a mission to establish an emergency power system for the centre.

This was no ordinary system. Whereas traditional emergency power supplies are useful only when there is an interruption to the normal supply, the system installed at the Wansey Centre is a grid-connected solar/battery installation. Thus, apart from providing an uninterruptible power supply (UPS), the system also produces electricity from five kilowatts of solar panels. The energy produced directly reduces the cen-



This rooftop 5kW solar backup array will not only keep the backup system charged but could feed over 7000 kilowatt-hours into the grid every year!

tre's energy bill with any excess feeding back into the grid—a first for an Australia medical installation.

Centre function

The Wansey Dialysis Centre has been established to provide haemodialysis services for kidney patients within the boundaries of the Hunter Health Authority. It provides in-house dialysing facilities for patients and training and support for home-based dialysing.

For people with renal failure, haemodialysis is required for them to survive, and is performed four to six hours a day, three days a week, every week of the year.

Haemodialysis is the process by which large machines pump the patient's blood through an artificial kidney to remove waste products and excess fluids from the blood that would otherwise cause patients to poison themselves. Renal failure means that the body is unable to perform this function itself.

At the Wansey Dialysis Centre hundreds of dialysis visits are recorded each week. There are two dialysis units servicing three shifts each day (morning, afternoon and evening) where patients arrive for their treatment.

Some patients can be hooked up to machines for 10 to 12 hours a day, three days a week. It is essential that the system is foolproof as any power failure that shut down machines and caused patients to be moved or their session to be disrupted would be extraordinarily stressful.

The Wansey Centre has revolutionised the delivery of haemodialysis services in the Hunter Region and has won several awards for design, service and business. It is recognised Australia-wide as a model for dialysis care and

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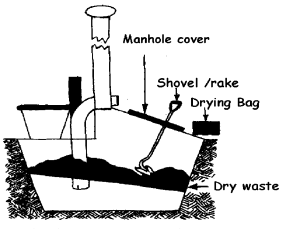

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System specification and major components

Peak continuous capacity	30 kilowatts
Power Solutions Australia inverter	415 volt three-phase
Battery bank	900 amp-hours (120 x Battery Energy 2EG450 A/H)
Backup time at estimated emergency load	four hours
Solar panels	5040 peak watts, 63 x BP Solarex polycrystallineSX80
Emergency supply cut in time	20ms
Estimated annual power produced	7682 kilowatt-hours
Greenhouse gas emission savings	Seven tonnes per annum
Design, installation, project management	Solar Technology Australia

eco-friendly design, featuring the 5kW grid connected photovoltaic system, a water recycling program that has saved approximately six million litres of water to date, and energy-efficient buildings designed in harmony with the environment.

Water savings

The haemodialysis process uses a reverse osmosis system which utilises purified water. In the past this water was discarded into the sewer after use, but now it is piped to the extensive gardens where it is the only water source required to maintain the plants and trees. This system reuses thousands of litres of pure water every day.

Power requirements

The electrical power for normal operations at the Wansey Centre is provided from the Energy Australia network. This connection is used to run all requirements of the centre including dialysis machines, water filtering pumping systems, general power, lighting, air-conditioning, communications and hot water.

Solar Technology Australia engineer Graeme McMullan determined the Wansey Centre's emergency power requirements and considered all of the options needed for providing an emergency power backup system.

His analysis revealed that any emergency power system needed to be capable of supplying, at a minimum, one three-phase 3.7kW pump, a single phase 3.12kW pump, twenty-six 2.025kW dialysis machines, lighting for both dialysis care units, the PABX system and provide backup power for at least four hours.

In the event of a power disruption, any emergency supply must also be capable of providing power to emergency circuits without disrupting operation of dialysis machines or water pumps. To achieve this the system needed to be an uninterruptable power supply. This would prevent the dialysis machines from shutting down and entering in to self-test mode which is a highly undesirable circumstance for patients and clinical staff.

Key issues

Three of the key issues that were considered when evaluating emergency power options for the centre was the capacity of the system to operate the emergency load, the disruption that may be caused during transfer to emergency power supply and the system's overall reliability.

Additional issues that were considered included the initial capital cost of the system, security against Y2K power interruption, the ongoing maintenance expense, the life of major components, the provision of support, system fault alarms, adequately trained staff to operate and maintain the system, its environmental friendliness and the capacity for future expansion.

Staff check the inverter every day at a specified time and monitor the battery charge and health of all of the major components on a regular basis.

The solar feature

The system proposed for the Wansey Centre emergency power system was a UPS that could also, as an option, accept input from renewable energy sources such as photovoltaic arrays and wind turbines. It is important to note that the system is not dependent on the renewable sources and can operate adequately without them.

The inverter-based emergency power system provides standby electricity to the selected power circuits in the centre. The three-phase, 30kW inverter is constantly running and connected to the emergency power circuits and therefore immediately takes over the load in the event of a power disruption.

Typical operation

When operating without the solar array the system performs as a normal UPS. The electricity grid charges the battery bank and maintains the cells at full charge.

The inverter monitors the mains and in the event of a power disruption immediately (within 20ms) begins supplying power from the batteries.

When normal power is restored the inverter acts as a battery charger and uses the electricity from the grid to recharge the batteries. In general, complete recharging of the batteries will occur in approximately twice the duration of the outage.

Operation using renewables

When PV panels are connected to the system the inverter converts the power

This 900 amp-hour battery bank can run the entire centre for four hours.

they produce into mains-quality electricity when the sun is shining. This energy is used to charge the batteries, supply power to the emergency loads, supply power to the rest of the centre and, dependent on the energy being generated, export power to the grid. The solar system also increases the backup capacity of the system.

This feature is not available with alternate UPS systems.

Expansion options

An important consideration in selecting an emergency power supply is the capacity to expand the system in the event of an upgrading of the facility.

The solar/grid/battery system may be upgraded by adding more inverters, solar panels and/or batteries.

Solar panels can be added to the system in units of 720 watts. At peak generating capacity this represents approximately a six per cent increase in system runtime or an additional 15 minutes of power.

The future

At the time of writing, design and costing is being undertaken to add an additional 5kW of PV and a 20kW wind turbine to the system.

The Hunter Health Authority will continue to support and investigate environmental strategies at all of the institutions it manages. Already it supports staff at the Maitland hospital which have initiated energy-saving measures throughout the hospital and composting systems in the kitchen to reduce the energy consumption and amount of waste produced. ✲

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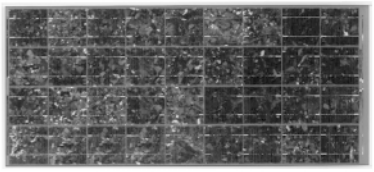

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Watt	Size	Volt	Amp	Cat no.	Price
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60W	502 x 1105mm	16.8	3.56	ZM-9066	$659
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Cat. ST-3020 $29.95

Solar Panel 10 Watt 12V

1 Watt	6V	Cat. ZM-9020	was $30.95	$25.95
2 Watt	12V	Cat. ZM-9024	was $56.95	$39.95
4 Watt	12V	Cat. ZM-9026	was $98.95	$69.95
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Greenhouse-friendly hostel

YHA Australia is helping its guests lessen their impact on the planet by introducing cost-effective energy-saving technology at its hostels

Travelling can be one of the most liberating and exciting ways to spend time and money, but can also become an efficient way to increase your use of the world's precious resources.

Air travel, eating out, staying in guest accommodation, plus the incentive to purchase products in convenient disposable packaging, all add up on the greenhouse scale, even for the most sensitive of globe trotters.

New 'eco' locations

We featured YHA's Halls Gap Ecohostel in a previous issue of *ReNew* (issue 71) and are pleased to see further evidence of the organisation's continued environmental outlook.

Two hostels where energy-saving strategies have been implemented are the YHA Queensbury Hill and Chapman Gardens properties in North Melbourne. Solar water heaters and water flow restriction devices have been installed and are expected to effectively halve the annual gas consumption and reduce by one third the water use on each premises.

Storage tanks were crane-lifted to their final home on the rooftop of the Queensbury Hill hostel in North Melbourne.

This rooftop position will save approximately 34 tonnes of greenhouse gas emissions each year!

Queensbury Hill

This hostel has a capacity of 350 people and runs at 95 to 100 per cent capacity for four months of the year over summer. In other months capacity runs at 65 to 70 per cent.

Eight 440 litre Solahart Black Chrome XII solar hot water units were fitted on the roof of the hostel in December 2000, adjacent to the rooftop barbecue area. The units are a great feature of the rooftop.

The solar water heaters act as preheaters—as high-demand requires the water to be used before it has reached the desired 55 to 60 degrees Celsius. Water then flows from the storage tanks through 12 instantaneous gas water heaters to ensure hot water is available 24 hours a day. This hot water supply successfully accommodates 350 showers in a two-hour period in the morning—and sometimes up to 500 showers each day. Water that is only slightly preheated still saves significantly on energy inputs from non-renewable sources.

The water demand at this site was curbed two years previous by fitting flow-restriction devices in the existing plumbing. Jem Flo discs supplied by Total Water Management Solutions were fitted by YHA maintenance staff to reduce flows from 20 litres per minute to 12 litres per minute. Basin flow was reduced from nine to five litres per minute.

The discs were placed in the tapwear to both hydraulically balance the flow for temperature and pressure fluctuations, as well as set the maximum flow rate to achieve the desired comfort and conservation result. This is a simple and effective method, and applicable in any plumbing system.

Hostel guests have been more than supportive of YHA's composting regime, which has reduced by 25 per cent the weekly volume of waste going to landfill.

'No one noticed the difference in water supply in the showers or basins, and guests are still more than pleased with the quality of the facilities,' said YHA Victoria's operations manager Ross McDougall. 'Our guests are generally very supportive of our environmental policies, but still, no one would enjoy a low-grade shower. We have struck a balance between our environmental policies and guest comfort,' he said.

'At the end of the day we are a business and all of our environmental initiatives need to be self-funding. In this instance the water and gas savings are enormous. Any savings generated are directed back into further environmental initiatives.'

Chapman Gardens

With a maximum capacity of 120 people, this hostel needed only three 440 litre Solahart solar water heaters. It was not fitted with reduced flow devices as it is a more modern hostel and has a majority of water-saver shower roses.

As well as its energy-saving strategies, this hostel has implemented a composting system to reduce its curb-to-waste volume by 25 per cent. Organic waste is separated by guests into bins and collected from the guest kitchen by staff and emptied into the 12 worm farms.

Before instituting the worm farms, the hostel was generating 12 wheelie bins of rubbish per week. This has now been reduced to nine bins per week.

'The castings from the worm farms are used to feed the herb and vegetable gardens,' said Penny Maddock, hostel co-manager. 'We are a Waste Wise organisation and will continue to fulfil our commitments under this program. We have erected signs to inform our guests about the benefits of composting and hope that some will take the ideas back home with them,' she said.

Greenhouse savings

By taking the time to research the benefits of using solar water heaters to preheat its hot water, YHA could be saving up to 34 tonnes of greenhouse gas emissions per annum at these two properties.

As each solar hot water unit is fully cycled each day even on days with low solar input, there will always be a degree of solar gain to offset some of the gas required to heat the water to the optimum temperature.

As peak demand matches the time of greatest solar availability, Mr McDougall believes most hospitality businesses would financially benefit from installing solar water heaters, let alone the environmental savings.

The investment of about $3500 for the Jem Flo system was recouped in six months, and it is expected that the $70,000 cost of the solar water heaters will be recovered in less than five years.

Funding

The composting system was bought with the assistance of a $1000 grant from EcoRecycle in Victoria.

The solar water heaters were installed under the Sustainable Energy Authority of Victoria's Solar Hot Water Rebate Program which provides a rebate on new solar water heaters. The 440 litre units attracted a rebate of $1500 each, which saved YHA $16,500 overall. ✲

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Relax—it's solar heated!

John Meakins

Solar heating a spa, while it may appear straightforward, is a concept the spa and swimming pool industry has yet to embrace. I discovered this after making many enquiries with spa retailers on whether they had a solar option, or if they knew of any existing solar installations. On all counts they drew a complete blank.

When I asked them whether there was a solar option for a spa I received replies such as: 'Why? It'll only cost you a dollar a day in electricity'; 'No one does it'; 'You can't get the temperature high enough with solar'; and 'If you want to save money why not use gas?'

When I suggested that the base of an in-ground spa should be insulated in some way I was told: 'It isn't necessary'; 'It can't be done'; and 'The spa must rest on a firm base and therefore the base must be bedded into quarry dust or sand'. To have water of temperature 37 degrees Celsius separated only by the spa skin from ground, which is 17 degrees Celsius, did not make sense to me at all. After all, we insulate our ceilings when the temperature difference is much less and consider it worth it.

John can relax in his spa, knowing that the energy used to heat it is free from the sun.

Somewhat disheartened by this negative attitude I then proceeded to build my own system using a standard acrylic spa shell. The spa people quite happily sold me one and gave good service.

Insulation

I found some aerated concrete blocks thrown out from a building site and placed these in the spa excavation to form a layer. The blocks were then covered with broken cement sheeting, then plastic sheeting, and finally the sand upon which the spa rests. With the insulated (and firm) base, 75mm foam cover (supplied), and fiberglass insulation around the walls, the spa temperature drops by only one or two degrees overnight. An industry standard installation will drop eight or ten degrees overnight using the same cover.

Two of the solar collectors were home made, while the third was an old Solahart unit saved from the scrapyard.

Collectors

I started by building two glazed polypipe flat-plate collectors but abandoned the poly due to constant leaks. I rebuilt the collectors using recycled copper. These produced plenty of heat to supplement the recycled tankless gas heater I had installed.

Getting the solar heated water into the spa was a headache. Using a small circulating pump proved unsuccessful, as the temperature was either too high or too low, and excess heat could not be carried over for use the next day. The pump died after a short time and a new, more durable, pump was too expensive.

I decided to install a separate 200 litre tank for the solar panels to heat by thermo siphon action (no controls needed). Hot water was then siphoned daily to the spa—a time consuming and hazardous procedure. I needed another solution. I

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contemplated complicated plumbing and controls, but in the end the fix was simple—water under pressure from the spa pump is piped via a one-way valve into the bottom of the tank. Hot water then overflows through a pipe at the top of the tank back into the spa. To regulate the heat flow, a household timer is set to turn on the spa pump for five-minute periods once every two hours during the day. When less heat is required, the timer is reprogrammed to run less frequently. During very hot weather a gate valve to the one-way valve is closed all day and opened manually before use. The water of temperature up to 70 degrees then heats the spa to a comfortable temperature in seconds.

The spa, which has a capacity of 1100 litres, is 100 per cent solar heated from mid September through to mid May. During winter a maximum of 20 minutes of gas heating is required, as the solar heating reaches only about 30 degrees Celsius. The solar heating season was somewhat shorter before I acquired a used Solahart panel from a scrapyard for $30. I used this to supplement the two panels I had constructed myself. Now during summer the biggest problem is excess heat.

I propose to install a 12 volt irrigation valve in front of the one-way valve which will be regulated to open only when the temperature in the spa is below the optimum 37 degrees Celsius. This should stop any overheating and make the whole process automatic, at little cost and with minimum complexity.

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Street lighting—pollution and power waste

Martin Lewicki from the Astronomical Society of South Australia explains why street lights waste so much power and what can be done to fix them

The consumption of electricity for public lighting in Adelaide is out pacing population growth at phenomenal rates. While the population has grown about seven per cent in the period from 1988 to 1997, the power consumption for public outdoor lighting has increased by nearly 50 per cent (Data sources: ABS, ETSA annual reports). This is largely due to Electricity Trust of South Australia (ETSA) supplying inefficient street light fixtures, in particular favouring high-pressure sodium (HPS) lamps for arterial roads.

Even worse, ETSA is opting for the 'new' energy-wasting mercury-vapour lamps for residential street lights that are paid for by local councils! These mercury lights use almost three times more energy (110 watts including ballast) than the fluorescent tubes (40 watts) they replaced. And by the end of their operating life, mercury lights are putting out only half the light they did when new, but are still drawing the same power!

These unshielded mercury lamps create a glary light that impairs night vision. Much of their light radiates uselessly sideways and upward because they have no proper cut-off shielding to reflect their light toward the ground where it is really needed.

There are better alternatives, such as low-pressure sodium lamps (LPS) or the current HPS lamps in properly shielded fixtures, which can give adequate and safe light for a fraction of the energy cost. Properly shielded streetlight fixtures of any type can also be fitted with lower wattage globes because the side-light and up-light that would have been wasted is instead reflected down to the ground.

Improperly shielded light fixtures create unnecessary glare and often shine onto neighbouring properties creating a nuisance. This glare can be especially hazardous to motorists in wet weather. Glare also creates a trashy looking night-time environment and causes eye fatigue from the sharp contrasts between the illuminated areas and shadows.

Wasted light is the major contributor to skyglow, which diminishes visibility of the stars—a natural heritage that should be preserved. Skyglow in parts of Adelaide is so bad that the Southern Cross has diminished to look like a lop-sided coat-hanger. From outside the city the wasted light forms an obvious halo hanging over the city. It is unnecessary, expensive and a blight on the natural environment.

It should be noted here that while this article discusses the problems in Adelaide, the majority of street lights in most cities and towns have the same faults.

Why so much light?

There has been a train of thought that says that well-lit places are less likely to be involved in crime. While cranking up light levels does give the perception of safety, numerous researchers have found no evidence that increasing lighting levels reduces the crime rate. Indeed, most crime is committed in daylight.

'Security lights' at car yards and warehouses very often spray light unnecessarily out and upwards into the sky. This wasted light misses the target of illumination, creating glare and light trespass without improving security. A large proportion of advertising lighting that is aimed upward also misses its target.

This ugly street light is typical of lights found in the older parts of Melbourne. We tried to find an example of a well designed light and found very few.

Why do we allow light pollution to continue unabated? It is mainly due to a lack of awareness and appreciation of the problem and an unexamined notion that more light everywhere must be better, in the same manner that 'bigger is better'. We discovered the fallacy of this ideology when we became aware of the more well known types of pollution such as air, water and food. Light pollution is another dimension of the same problem that can be remedied for less than the cost of the wasted light itself.

What does it cost us?

International lighting engineering 'best practice' states that a streetlight can effectively illuminate the ground out to a

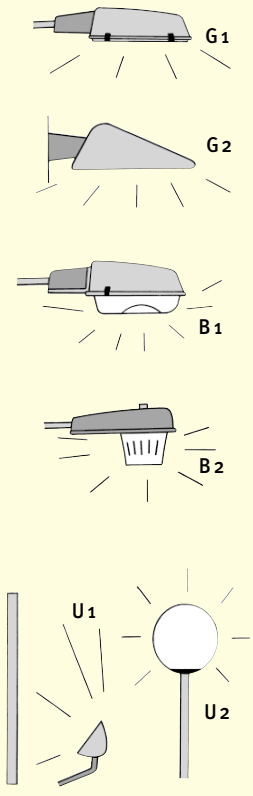
radius of about three times the light's height (above the ground). Any light beyond this distance is effectively being wasted as side-light and therefore causing glare and skyglow. Any light emitted upwards is being wasted completely.

However, there are very few lighting manufacturers willing to release measurements of the lighting intensity patterns of their products, and virtually no-one, it seems, has considered measuring how much light is emitted upwards.

In 1997, nearly $5 million worth of the electricity used for public lighting in South Australia was wasted. Since then the problem has become worse. ETSA was paid $18.9 million for electricity for public lighting in 1997. We were assured that the new streetlights complied with relevant Australian Standards—which, it should be noted, allowed up to 25 per cent of the total light output to be emitted upwards! Even if we are generous and assume that 25 per cent is the total of both side-light and up-light, this wasted light translates to $4.7 million dollars, or about 2000 megawatt-hours of electricity, collectively paid for by the general public.

There is another cost of light pollution. Almost all of the power generated for South Australia comes from fossil fuels. About 36 per cent of the electricity is imported from interstate, 32 per cent from burning Leigh Creek brown coal (dirty by world standards) and 32 per cent from natural gas. In 1997 these sources collectively pumped 9 million tonnes of carbon dioxide into the atmosphere. The contribution of light pollution to these emissions in 1997 was 76,000 tonnes of carbon dioxide. It is ironic that the outcome of this pollution was even more pollution.

ETSA extols us to practice household energy conservation by turning off unwanted lights and to buy energy efficient appliances. Meanwhile, it continues to install inefficient and environmentally unfriendly street lighting. At the same time, the government continues promoting the construction of extra utilities such as the Pelican Point power station to accommodate 'growing energy needs'.



The good

Fully-shielded fixtures direct light below the horizontal toward the ground. G1 is one of the standard 'cobra head' fixtures fitted with a flat lens that prevents light from scattering sideways and upward, avoiding glare and improving the quality of lighting. Fitted with an LPS or HPS (sodium-yellow) lamp they are efficient and make a good choice for many kinds of outdoor lighting, especially roadways. G2 is the preferred light fixture for areas such as car yards and parking lots. Often fitted with less efficient mercury or metal-halide (white) lamps, the design however avoids glare and light trespass without compromising security.

The bad

These fixtures are fitted with a bowl or cone-shaped lens that emits a substantial portion of their light uselessly sideways and upward creating glare, light trespass and sky glow. These fixtures are currently the standard on South Australia's arterial and many residential roads. B1 is the same kind of fixture as G1, however its bowl-shaped lens scatters some of the light inefficiently. It can easily be refitted with a flat lens as in G1. The 'new' mercury vapour lamps (B2) are a very bad choice. They are now being installed in residential streets throughout Adelaide and are especially glary, inefficient and costly to run (they have been outlawed in other countries). A far better choice would be a G1 fitted with a sodium lamp.

The ugly

Intended to highlight advertising or 'enhance' architecture, these lighting fixtures indiscriminately spray light everywhere. Billboard and business lighting, or lighting that is supposed to illuminate significant architecture as in U1, are often placed so that a substantial portion of the light completely misses its target and adds to the waste light and sky glow. Billboards should be illuminated from overhead light fixtures and buildings should be illuminated by carefully designed and aimed spotlights. Both should be subject to curfews in late hours. Globe lights like those in U2 may look good in the daytime, but are very wasteful at night because most of their light goes sideways and up into the sky! They should never be used for street lighting. Alternative efficient designs are available where aesthetic lighting is required.

Gold stars!

However, there are some good examples around the city of Adelaide of the kind of street lighting we should be installing. The airport stretch of Tapleys Hill Road is a good one. These standard HPS 'cobra-head' light fixtures are fitted with flat lenses, transforming them into cut-off shielded fixtures creating a glare-free roadway that improves night vision and safety for both pilots and drivers. The Torrensville section of Burbridge Road is another good example, and there are others to be found.

Speaking out against it

Wasted light costs you, the rate payer. It costs the environment. If your council is unaware you may be able to alert them to the cost savings of good lighting practices. You can start at home by choosing energy efficient light globes. Use only shielded 'barbecue' flood lights and porch lights or complain to (and educate) the council if a glary light is planted over your property. Some residents on The Esplanade have resorted to painting out part of the lenses of unshielded sodium and mercury lamps out of frustration because the light infringes on their properties, creating an unaesthetic garish environment and disturbing sleep.

Most people are unaware of light pollution because it is silent; they cannot smell it or taste it in their food. But its uncontrolled growth desensitises us to the environment and allows us to be lulled into a false sense of security. Its unquestioned escalation contributes to the general world-wide pollution problem by unnecessarily pouring more carbon dioxide and other toxins into the biosphere.

In addition, encroaching light pollution has deteriorated the sky conditions around many of the world's great astronomical observatories. If left unabated, the quality of observations carried

out by these observatories will further diminish along with the value of the observatories themselves.

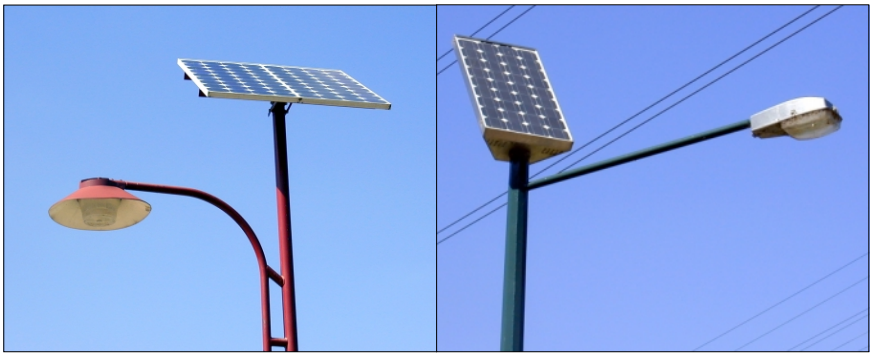
Light pollution also upsets wildlife and fauna. Every year many birds are disoriented by street lights and skybeams and die as a result of collisions with buildings. Light trespass can also cause disruptions to the circadian (day-night) cycle in fauna and humans, resulting in stress and lowered immunity.

There is also a cultural dimension to the light pollution problem. Like diminishing forests, species and natural landscapes, the diminishing stars are also a sign of a disappearing heritage of the night sky from which our ancestors drew inspiration for the arts and sciences. A large proportion of urban dwellers (especially children) have never seen the Milky Way because it has been blotted out by unnecessary sky glow.

We have learned to preserve green areas such as parks and reserves within our cities so that we do not always have to go to the country if we want to be among the trees. We can do the same with our skies at night. While we might not expect an urban night sky to return entirely to its pre-urban state, we can still implement improvements in lighting policies that will create a better night-time environment, bring back the natural wonder of the night sky and help save the environment. It is being done elsewhere, why not here?

The obvious solution

We don't need more lights, we need more effective lights. We need high efficiency lamps housed in shielded fixtures that put light where it is needed. We should not be seeing the glare of a naked lamp until we are within its cone of illumination. LPS and HPS lamps are the most efficient and are the best choice for residential street lighting when fitted within shielded fixtures. Most arterial roads in Adelaide have HPS lamps inside 'cobra



Two examples of solar street lights: The light on the left has a conical reflector to direct light downwards, while the dome-lensed light on the right sends light in all directions.

head' fixtures on high posts but unfortunately they are fitted with bowl-shaped lenses that scatter light sideways and up. These lights can be refitted with flat lenses that will improve downward illumination and reduce glare.

Light pollution control is now being exercised in many communities around the world and in many parts of Australia. International organisations have been spawned to promote education and changes in government, council and utility lighting practices. The Illuminating Engineers in North America (IESNA) and the equivalent organisations in the UK and Europe have instituted standards and design considerations for outdoor lighting of all kinds. The US Environmental Protection Agency's Green Lighting Guide addresses the light pollution problem head on. By contrast, the Australian Environmental Protection Agency has disavowed any responsibility!

Australia now has some of the best public lighting standards in the world, but they are not mandatory in South Australia, even for new structures or developments.

Nevertheless, in response to the growing concern regarding light pollution, Standards Australia has drafted a Control of Obtrusive Effects of Outdoor Lighting Standard (AS4842) and has amended the AS1158 street lighting standards.

These new standards are essentially ignored by the relevant South Australian authorities so the problem of light pollution will continue to grow unless we, collectively, as citizens and voters, make the control of light pollution a significant public concern. What's your local council's policy on this issue? For more detailed information (including success stories) and information sheets visit the International Dark Sky Association web site at www.darksky.org

Sources and links

• ETSA 1998 Annual Report (1.35MB pdf file). No longer available from the ETSA website but available at: www.trilobytes.com.au/astronomy/pollution/etsa9798ar.pdf

• Department of Mines and Energy: www.mines.sa.gov.au

• International Dark Sky Association: www.darksky.org

• 'Lights' mailing list hosted by the Australian National University. Email: lights@anu.edu.au

• Sydney Outdoor Lighting Improvement Society (SOLIS): sites.netscape.net/solislp/, email: solislp@netscape.net

• Astronomical Society of Victoria light pollution notes: www.gsat.net.au/astrovic/lpoll.htm

• US Environmental Protection Agency's Green Lighting Guide of 1995 *Lighting Fundamentals:* www.isat.jmu.edu/common/coursedocs/isat413/read/fundamentals.html

• Lightsearch. What kind of lighting is available and current world standards: www.lightsearch.com/index.html

• Information and contact details for all South Australian local councils is available from www.sacentral.sa.gov.au/government/local_gov/

This article is available on the web at: www.trilobytes.com.au/astronomy/pollution/lpadel.htm. Martin Lewicki can be emailed at: mlewicki@dove.net.au

Reducing schoolyard rubbish is big business—and fun too!

Almost half the schools in News South Wales and the ACT have signed up to SCRAP, an organisation that helps schools save money while saving on waste. Mim Buchhorn explains why the program is such a winner

Some of us may recall the old besser brick incinerator block down the back of the playground that wafted the fumes from burning chip packets on a Friday afternoon. One of my own distinct kindergarten memories is the look on the face of the nun as she delivered a solid smack across my legs for a temporarily forgotten banana peel, left (for the time being) abandoned in the weather shed by my little suitcase. Those were the days— when gladwrap was cool and greaseproof paper (even rainbow coloured) was not.

Ask any teacher today and you'll find that the 'pickup your litter' mantra continues—even more so, given the explosion of disposable plastic packaging and the advertising budgets spent to entice children to demand the 'coolest' products. For any number of reasons, kids still 'turf' untouched fruit and homemade sandwiches and it seems, less regularly put them into the bin. Some kids even arrive at school with a plastic bag full of cola and snacks.

The pressure is on for schools to plug the gaps left where social policies, programs and community efforts may be lacking: from drug education and nutrition to stormwater pollution, energy saving and waste reduction. Getting hands-on systems in place that give receptive and eager minds the opportunity to practice what they sense is appropriate, is fundamental to making environmentally friendly behavioural changes stick.

SCRAP has established green waste programs with over 50 schools and institutions. When combined with paper recycling a typical school can cut its waste by at least 60 per cent.

Making this leap of faith from talking about saving the environment to actually doing something is perhaps the biggest challenge. SCRAP (School Communities Recycling All Paper) started over a decade ago, with the aim of providing on-the-ground support for school teachers, students, other staff and their communities to change their practices and reduce waste. SCRAP began in 1991 when three teachers got together to persuade the recycling companies that collections from schools could be viable, even lucrative. The emphasis was then, as it is now, to make practical, locally-relevant and lasting changes that link with classroom activities.

From humble beginnings at

Holsworthy High School in south western Sydney the paper recycling program grew from the original eight schools to reach over 1400 by the end of 2000—almost half the schools in NSW and the ACT. In addition, the Queensland Department of Education adopted the program in 1996 and over 300 schools in that state now participate. The recycling program has succeeded with the assistance of industry. A decade-long partnership with VISY Recycling has ensured the collection service to SCRAP members, and a return on the paper collected has allowed SCRAP to develop and refine its programs.

An integrated approach

In the past decade, SCRAP has witnessed the change in thinking and practice—from recycling and litter reduction to a 'zero waste' approach—reflecting the fact that environmental problems are born of consumption—waste is just a symptom. SCRAP now offers waste reduction programs that work on a number of fronts: composting and wormfarming for green organics; paper, packaging and toner cartridge recycling; energy reduction; tree planting and environmentally friendly purchasing of office supplies and the school canteen.

The beauty of offering a range of programs is that costs in one area—such as purchasing recycled content paper—can be offset by savings in another—reduced waste removal costs. The SCRAP Program Manual offers the raft of programs to members who can choose which ones they wish to undertake. Many programs are free or available at nominal cost and environmentally-friendly purchasing is made easy with the Green Buys discount of 15 per cent for all members.

Everyone gets involved with the SCRAP programs, not just the kids.

The involvement of the whole school is encouraged—from students to gardeners to parents.

Paper recycling

SCRAP has signed up over half the schools in NSW to paper recycling. Over one third of a typical school's waste is paper, and good environmen-

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The kids learn how to reduce waste by recycling, and have fun while they learn.

tal gains can be made. Recycling saves money on waste removal costs too—a priority for every school! The NSW Government Contract has also brought many government agencies and non-profit bodies under the SCRAP umbrella. Currently over 30,000 tonnes of paper has been recycled through SCRAP.

Toner cartridge recycling

Members receive a rebate for cartridges collected when buying remanufactured cartridges. This saves money, conserves resources, and reduces the toxic and heavy metal load to landfill from discarded cartridges.

Green waste reduction

Schools get 'hands on' by composting food scraps and garden clippings to make healthy mulch for their gardens. Lessons go outdoors and the school experiences first hand how practising environmental responsibility can create more pleasant playgrounds. SCRAP has established green waste programs with over 50 schools and institutions. When combined with paper recycling a typical school can cut their waste by at least 60 per cent.

Solid waste auditing

Students practice maths and science by measuring their school's garbage and by discussing 'waste' as a regional environmental and social issue. They then identify where potential waste savings can be made.

Green Buys purchasing

SCRAP has identified a range of environmentally-friendly products and made them available for purchase. Creating demand for recycled content products makes sense—it is the 'upstream' side to waste prevention. As an added incentive to 'close the loop' and 'buy recycled', Green Buys discounts of 15 per cent are offered to all members. These products are available from SCRAP throughout NSW.

Co-mingled recycling

This is the only program designed specifically for schools that want to recycle their containers and packaging, and is on offer in Southern Sydney only. Donmar Recycling collects food and drink containers from the playground free of charge.

Greenhouse Action Program

Inherited recently from the Hawkesbury Nepean Catchment Management Trust, the GAP seeks to involve schools in tree planting on community and school land to offset the CO_2 impact of their own energy use. The educational benefit is for students to understand the nature of the greenhouse effect and how to counteract it with simple, positive environmental action ranging from planting to turning off lights.

Shifting emphasis from waste to sustainability

Working with the understanding that environmental problems don't fall into neat compartments, SCRAP has devised a holistic approach that offers schools and other organisations a range of environmentally friendly options to choose from—from grounds improvement to fixing leaky taps. The Sustainable Schools Program is a unique partnership between SCRAP and other environmental educators from community-based businesses including Reverse Garbage, The Bower, Oz GREEN and Greenhouse Action.

All of these groups work actively in waste reduction, stormwater management, biodiversity and water and energy conservation.

The program is funded by the Southern Sydney Waste Board and provides hands-on guidance for schools to improve their own environmental sustainability.

During the 'EcoSnapshot day' the project partners worked with students to identify and measure the school's environmental and economic problems and come up with ideas and solutions.

At one high school students calculated the cost of leaky taps, and now the school knows that it's cheaper to hire a plumber to repair the leak instead of wasting water.

Counting lights and estimating the number of hours they are left on is part of the walk-through assessment in the energy (Greenhouse Action) section. These results are compared to the actual energy bills and students can then devise strategies for reducing that consumption. Over half the energy used in most schools is used to light rooms—but is anyone in there?

Most students do not know the meaning of the term 'biodiversity', but after the grounds audit they return to class with a practical understanding, simply by observing and discussing their findings about living things in their own school grounds.

Future vision

SCRAP's future vision is to continue its work in holistic environmental education that is practically based. The focus of this vision is embodied in the new Environmental Education Centre which SCRAP is constructing during 2001. Using a block of land at Holsworthy High School provided by the Department of Education and Training, SCRAP will establish its centre along ecologically-sustainable lines. The plan, briefly, is to recycle a disused army barracks from nearby Ingleburn. The building will be renovated to suit administrative needs but with a self-sustaining philosophy underpinning it. With reused timber donated by the NSW Waste Boards, a new deck will be added. The Bower Reuse Centre will donate

The beauty of offering a range of programs is that costs in one area—such as purchasing recycled content paper—can be offset by savings in another—reduced waste removal costs.

sinks, doors and other fittings. Water will come from a rainwater tank made of recycled plastic donated by Reln. The greywater system will meet the Australian Standard and the greywater will be handled on site rather than going to the sewer. Similarly, the toilet will be a composting system (Rota Loo) also avoiding the sewage system. The centre's electricity will be generated by the sun using a solar array purchased under the Commonwealth Government's PV Rebate Program. The grounds will be planted using permaculture techniques and will model the best in waste avoidance and minimisation. While the centre will cater for SCRAP's administrative needs initially, it is hoped to develop a model which will make it a great place for people to come and learn about what it is to be sustainable in our lifestyle practices, from the ground up.

As a non-profit body with tax deductible status, SCRAP is interested in hearing from any readers interested in its programs as well as those with experience, expertise, equipment and/or materials which could assist in establishing its centre. Please contact SCRAP on telephone: (02)9825 1062, fax: (02)9825 6972 or email eescrap@ozemail.com.au

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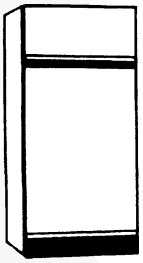

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Awake, grid-connect dreamers

Want to connect your solar system to the grid? Read this to prepare yourself for those *other* details. By Andrew Taylor

City-based readers may well be considering installing a grid-connected solar system to offset electricity consumption and 'do something' about fossil fuel overkill.

Domestic grid-interactive (GI) systems, which allow you to both import from and export to the electricity grid, have been widely installed in Australia and internationally. But technology aside, the process for actually getting connected isn't always as straight forward as some may expect.

For the pioneering owners of GI systems you could say 'the devil was in the detail' when negotiating this relatively new form of customer/supplier relationship with their electricity retailer.

Even with the continuing service improvements helped along by enthusiastic people within power companies, those who choose the grid-connect pathway should definitely conserve a little personal energy supply for dealing with some of the unglamorous details that will be encountered.

Civil disobedience

In the USA some GI system owners found the non-technical aspects of grid connecting so disagreeable that it drove them to skip the official paths altogether, and just 'push the sell button' on their inverters. These 'solar guerrillas' (a somewhat tongue-in-cheek name used by *Home Power* magazine) are satisfied to just reduce their power bill and feel good about making clean energy available on the grid. Of course they can't expect to net export to the grid and receive a cheque in the mail without the utility noticing.

At the end of last year, Australia's own Wendy and Ray Miller and Dave Keenan also 'pushed the sell button' without the official permission of their utility, but in contrast, they did so as a deliberate and public political act with full notification of the utility involved.

They had had enough, after months of attempted engagement with their Queensland utility trying to achieve what they considered a sensible and straightforward arrangement (see their letter published in *ReNew* issue 74). These GI system owners where so disappointed with their lack of progress negotiating an appropriate contract that they decided to defy the law and deliberately provoke a response—immediately announcing their move to a supportive floor at the ANZSES conference in Brisbane last December. Their efforts were finally rewarded with a vastly improved (though not entirely satisfactory) connection agreement, and legal connection of the Miller's system.

Despite the imperfections, figures from the Sustainable Energy Authority of Victoria indicate that almost 500 GI systems were accredited in Australia last year under the Commonwealth's PV rebate program alone. Indeed, in Victoria nearly 50 per cent of accredited domestic PV installations were grid connected.

So, there are a growing number of happy grid-connected homes out there and some utilities are not only more familiar with dealing with GI systems, but are actively trying to remove some of the impediments to connection.

Utility requirements

Even if you already own a well-designed domestic PV system, your utility won't allow you to supply into their network unless specific requirements are met. And, no surprises, every electricity utility in Australia asks for something different in terms of arranging a network connection.

You will need to investigate what the requirements are for your individual situation, but luckily these considerations fall under a small number of general topics, so we can at least prepare you for what to look out for.

Meeting the standards

All electrical equipment you install must not pose any safety threat. The concern foremost in the minds of electricity utilities is that no danger exists for line service staff. From their point of view, any independent generator connected to the grid has the potential to maintain a voltage in lines that would otherwise be dead during a blackout or line works.

Modern GI inverters have a number of levels of protection against such a possibility, and all good ones are certified to meet the national guidelines to that effect. For your system to be eligible for a government rebate, the inverter must comply with the guidelines. System wiring must comply with the relevant guidelines and standards, in particular, appropriate and clearly-labelled isolating switches.

The utilities are also concerned that the quality of power supplied is within acceptable boundaries (voltage and frequency range, for example).

The Sustainable Energy Industry Association's (SEIA) accreditation, also required under government rebate programs, is all that may be required to satisfy the utility.

Special meters?

Depending on the company and the size of the system, the installation of a special meter may be required to deal

with the bi-directional flow of power.

The possibilities include the following:

• A **normal meter** running both directions. This has been the source of a number of problems, as some meters are not designed to go both ways. Some may even have a mechanism preventing 'backwards' flow, while others may sneakily add up exported flow as if it was imported—thus increasing the bill, not reducing it! Most rotating-disk meters should function equally well with power flowing in both directions.

• A new **'net' meter** running both directions. This is a single meter made to run backwards and subsequently provide a single figure for a household's net import/export.

• '**Bi-directional meters**' using dual meters that record the amount imported and exported. It seems that many utilities are tending towards this setup. One reason being that conflicts over billing (such as a customer accusing the utility of not crediting them enough supply) can be resolved with greater ease. Some owners have expressed concern over the potential these meters offer for different tariffs being applied for electricity supply/consumption. The utility typically will retain ownership of the meters but you may well have to pay the installation fee, up to a few hundred dollars. Again it depends on the utility involved.

• Some retailers are happy to just **'deem' the output**, that is, make a yearly estimation based on the system size and location, with respect to the solar radiation zones in Australia.

Billing—arrrg!

Obtaining a suitable billing arrangement is sure to be an important factor in going ahead with a GI system. It is definitely worth putting some effort into making sure things are set up satisfactorily and proceeding as you expect.

The way you are billed may depend on the size of your system and the rate paid may vary with the amount you export. For net billing arrangements, the period of billing may be significant—a yearly billing may be more beneficial for PV owners to account for seasonal variations.

Be aware of different tariff regimes and how they may overlap with your billing agreement. For example, if you are importing Green Power you probably won't be getting paid that same premium for exporting your own clean energy to the grid (although it is rumoured that one retailer is now paying the equivalent rate for home-grown Green Power). Many utilities offer a variety of special tariffs (like 'off peak') that will all have specific requirements.

When the Renewable Energy (Electricity) Act becomes effective from 1 April 2001, owners of GI systems will become eligible to earn Renewables Certificates—the form of tender being used by the government to measure the amount of renewable energy being generated. These certificates may have some value down the track (see our Green Power buyer's guide, page 46 for more information about the ACT and certificates).

Also, find out how GST will apply to your billing. But don't worry, you won't need to obtain an ABN, especially for a residential GI system.

Insurance

Whereas most utilities simply encourage GI system owners to cover themselves with public liability insurance, at least one NSW electricity retailer currently requires that owners also have a policy that specifically mentions the interests of the company. While achievable, this adds the step of convincing insurance company staff to make such an atypical amendment, and the subsequent phone calls to head offices.

Paperwork

Aside from providing the required accreditation documentation, the electricity retailer may have a little of its own paperwork which needs to be completed before you get connected. As with everything else, it depends on the utility involved, but in general it seems there are two main types of document you may come across. (Note: some state legislation requires anybody intending connecting in parallel with the grid to seek the prior permission of the utility involved.)

• A **Formal Application** for connection: many utilities don't require such an application, if they do, it most likely won't require an application fee and shouldn't take more than a few days to process.

• A **Connection Agreement**: many utilities don't have these at all, or require one only for systems over a certain size (for example greater than 3kW). If it is required, expect this to be up to 10 pages long. In general it will be intended to assure the company that your system has been tested properly and is safe, that you understand how to use your system and that you won't modify it without telling them. It may also cover the billing arrangement you agree to.

Enthusiasm within

The good thing to remember when evaluating a GI system for your own situation is that there definitely are people within the utilities who are enthusiastic and approachable about making your sustainability dream come true.

There are still a few uncertainties to be overcome, but the energy retailers are progressing along the learning curve and staff at the general call centres will probably even know who to connect you to (if they can't answer your questions themselves) when you start your investigations.

Further resources

• ARGON email group. To sign up contact: ARGON-subscribe@egroups.com

• Alternative Technology Association provides free technical advice to its members, runs solar electricity adult education courses, and publishes information booklets on grid-connected solar electricity systems (see page 59).

• Utility call centres (see table, page 49)

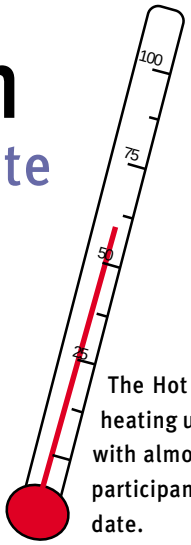
• Sustainable Energy Development Authority New South Wales ph:(02)9249 6100, www.seda.nsw.gov.au has a list of relevant contacts within power companies and a summary of their policies. As does Sustainable Energy Authority of Victoria ph:1300 363 744, www.seav.vic.gov

Free showers from the sun

Hot 100 update

Alternative Technology Association's Hot 100 program is still running. As part of the program a five per cent discount is available for ATA members from Solco. Active Solar Systems will give a 10 per cent discount, as will Solahart on selected models.

If you would like to participate in the Hot 100, contact the ATA, PO Box 2001, Lygon St North, Brunswick East VIC 3057, ph:(03)9388 9311, fax:(03)9388 9322, email: ata@ata.org.au



The Hot 100 is heating up, with almost 60 participants to date.

Four new Hot 100 participants tell us about their systems...

We have recently built a house in the Maitland area and have installed a Quantum heat pump hot water system. The reason we chose the heat pump type is that in our subdivision it was not acceptable to have normal solar panels facing the road, which on our property is north. We believe they don't look very attractive.

With the Quantum system they can be put on any side of the house and can be colour matched to suit the roof. We were also after a split system so that there was not too much weight on the roof, as this would have cost more to strengthen and would have been too expensive. The panels fitted to our roof weigh less than 80kg.

The system works in any temperature down to minus 15 degrees. It is obviously not as efficient at this temperature but still beats direct solar as an overall system. Recently we had zero degrees in the morning and the water was still 60 degrees. The pump is really quiet. All round a really great system.

GlennLawson, Ashtonfield NSW

During November 1999 we (Jaap, Leanne and Emma den Hartog) had a new Edwards 305LX Solar HWS installed on our house to replace our 12-year-old gas hot water system. The stainless steel tank was an attraction, as was the price compared with other

Discounts are available to ATA members from these participating companies

Solahart
10% off
126 Pilbara St
Welshpool WA 6106
ph:(08)9458 6211
www.solahart.com.au

ACTIVE SOLAR SYSTEMS
10% off
Showroom at
45 Industrial Drive
Braeside VIC 3195
ph:03 9587 1934

SOLCO
5% off
PO Box 461
Cannington WA 6987
ph:(08)9356 2844
www.solco.com.au

makes on the market. It also has an anti-freeze system, which is definitely needed in Canberra.

The solar hot water system is mounted at about 25 degrees elevation, facing true north and located about the centre of the house, which is close to the kitchen. The previous system was at the western end, which caused some problems in getting hot water to the ensuite at the eastern end. Installed at the same time was an adjustable tempering valve under the kitchen sink, which controls the hot water temperature for the whole house. We were keen to install the tempering valve to prevent scalding as the water can get pretty hot particularly in summer. The system is also connected to off-peak electricity which gave us a rebate of $150 and cheaper electricity when we need it.

The initial energy bills for gas and electricity for the first three months were interesting in that the gas bill went down about $50 to $60 and the electricity bill went up about 50 cents. For the fun of things I am monitoring and graphing energy consumption and costs to compare with previous years.

Jaap den Hartog, Evatt ACT

This year it's been down below minus five degrees celcius and there have been several sprinklings of snow at 'Kirribirri', an 80 hectare bush block north of Goulburn, NSW. The block is not connected to mains supplies so imagine our joy when in July, after months of waiting, an Edward's solar water heater finally made it from its boxes to the roof. A Metal Dynamics Gourmet Cooker is linked to the hot water system for boosting while simultaneously supplying space heating and heat for cooking. After camping in the shed and then in the shell of the house without any heating, its great to now have lots of hot water just waiting for use without having to do another thing. In the future we're looking forward to lots of electricity from the sun too.

Robyn Fry and Sarah Miller,
Leichhardt NSW

A number of years ago we decided that as soon as our gas hotwater service died we would invest in a solar system. We did loads of homework. We compared the features of each model and selected the unit that would be right for not only our immediate needs, but one that would add resale value to our house, as well as perform well while we had visitors—the Solahart Black Chrome XII, with its 12 year warranty.

Old Faithful gave up in June this year so we called Solahart and they agreed to install the unit within a week. They also immediately sent out their representative with a small electric hot water service to tide us over for the next few days.

Our unit was installed right on schedule and we can recommend the professional manner in which it was done. The electrician then connected the off-peak electric booster.

We added a dual digital thermometer with two thermocouples on the side of the tank. This gives us some relative readings which enable us to calculate the amount of hot water in the tank.

During this winter we have been able to occasionally bypass the booster as we have had sufficient hot water for our needs. This is our contribution to environmentally friendly energy use.

Robyn and Colin Horsley,
Patterson Lakes VIC

Negotiating deregulation

Full retail contestability is now upon us, and you may soon be able to shop around and choose your own energy retailer. Erika Maksem describes the steps required to negotiate a new supply contract

Competitive pricing, greater efficiency, more flexibility and a choice of service levels—these are just some of the windfalls being promised to businesses and larger households with the expansion of retail contestability in the electricity market on 1 January 2001.

In issue 72 of *ReNew* we explained contestability and looked at the implications of deregulation, its background and how it is structured. We will now expand on this by investigating the things we all should know when we become contestable.

Contestability

Whether or not you are eligible to choose your electricity retailer (known as contestability) is determined by your annual electricity consumption measured in megawatt-hours (MWH).

Contestability began in Victoria in 1994, and has since occurred in stages beginning with the largest consumers in New South Wales, the Australian Capital Territory, Queensland, South Australia and Western Australia. All electricity customers in NSW, Victoria, the ACT and SA using more than 160MWH per annum, as well as Queensland customers using more than 200MWH per annum, are already contestable.

In NSW, two or more sites using more than 100MWH per annum, with an individual customer's annual expenditure on electricity reaching $100,000, and sites aggregated under one contract, are also contestable.

On 1 January 2001, the move into full retail contestability (FRC) continued as small-to-medium businesses and larger households in New South Wales, the ACT and Victoria became contestable. By 2003, FRC is scheduled to be in place when all electricity customers in NSW, the ACT, Victoria, Queensland, SA and WA become contestable. As Table 1 shows, the deregulation of the gas market will continue with NSW, the ACT and SA in July 2001. (Note that due to long transmission distances, the Northern Territory will not be contestable, nor will Tasmania due to the lack of an electricity interconnection with Victoria.)

Service options

When you become a contestable customer you have three options:

1. Negotiate a contract with your existing retailer.
2. Negotiate a contract with another retailer.
3. Continue to be supplied by your existing retailer under a 'deemed' contract on published prices and terms. (Note: An added option for larger customers that are willing to manage their usage and exposure is to purchase electricity wholesale.)

If you do not enter into a new contract with your existing supplier or another supplier, you will be 'deemed' to have a contract with your existing supplier. Retailers are required to publish details of deemed contracts containing minimum terms and conditions. However, if you wish to enter into a new contract, you will be able to choose from a range of product and service packages from retailers. You can accept a published offer or negotiate an alternative package to suit your needs. This is called a market contract.

While you may be eager to sign up with another retailer promising a better deal, Victorian retailer TXU (formerly Eastern Energy) advises not to rush into making a decision about your retailer for three reasons. First, there are some regulatory issues that still need to be decided which will affect the structure of charges that you'll eventually pay. So until these are finalised costs quoted may be inaccurate. Second, energy companies are still in the process of developing the various offers

and products so it may be worth seeing all that is on offer before making a decision. Last, even if customers choose not to do anything before the commencement of competition, they will continue to be supplied by their current provider and stay on regulated prices.

Negotiating a market contract

If, after investigating what all the different retailers have to offer, you decide to negotiate a contract with a different retailer or renegotiate your contract with your current retailer, Victorian retailer PowerCor recommends you take the following 10 steps to ensure you get the best deal possible.

Step 1: Develop an energy strategy to provide a foundation for your future energy decisions.

Step 2: Collect information on your historical usage of electricity as retailers will need a record of at least the past 12 months of your electricity usage to calculate your annual consumption in MWH. If you cannot locate your records, contact your current retailer for your historical records as you are entitled to receive your last two years' billing information free of charge. It is also useful to know your 'load profile' or how your consumption varies during the day and throughout the year, as it will help you and your retailer better predict your future consumption and manage the purchase of electricity.

Step 3: Make sure you know which part of your energy bill is competitive by determining the network charges from your host distributor.

Step 4: Develop and use a specific 'Request for Tender' (RFT) as an open discussion of your needs and limitations as this will allow retailers to offer creative options customised for you.

Step 5: Insist that all tendering retailers reply in a standard format so that you can make an 'apples to apples' comparison.

Step 6: Evaluate the tender, making sure that all retailers have costed equal amounts of energy in their quotes; that energy is properly spread across 'peak', 'off-peak' and 'shoulder' time frames, or the time frames as specified in your tender; that all costs other than network costs are included in the retail offer and other documents, before compiling your shortlist of retailers.

Step 7: Negotiate further with your shortlisted retailers.

Step 8: Determine your initial choice of preferred retailer and have them submit the particulars of their support structure in servicing your account, looking for retailers that are committed to long-term partnerships.

Step 9: Enter into a contractual arrangement.

Step 10: Develop an energy efficiency plan with your retailer.

All electricity customers have the same basic terms and conditions in their contract with their existing retailer, known as a 'standard contract'. If, after shopping around, you choose to change suppliers, you need to negotiate a new contract known as a 'market contract' that may have different terms and conditions than the ones you are used to. Your retailer must tell you how a market contract differs from a standard contract. If you sign a contract with a new retailer, they will notify your current supplier that you're swapping.

Aggregating

When people come together in the energy market to secure themselves better deals on their electricity and services, this is known as aggregation. When you become contestable, you can aggregate in a number of ways including adding

Electricity and gas contestability timetable*

Electricity

NSW	1 January 2001	100 MWh pa
NSW	1 July 2001	> 40 MWh pa
NSW	1 January 2002	Remainder
ACT	1 January 2001	> 100 MWh pa
ACT	1 July 2001	> 40 MWh pa
ACT	1 January 2002	Remainder
VIC	1 January 2001	> 40 MWh pa
VIC	1 January 2002	Remainder
QLD	1 January 2002	Remainder (< 200 MWh pa)
SA	1 January 2003	Remainder (< 160 MWh pa)
WA	1 January 2002	Remainder (< 1 MWh pa)

Gas

NSW	1 July 2001	Remainder (< 1 TJ pa)
ACT	1 July 2001	Remainder (< 1 TJ pa)
VIC	1 September 2001	Remainder (<10 TJ pa)
QLD	1 December 2000	> 100 TJ pa
QLD	1 September 2001	Remainder
SA	1 July 2001	Remainder (< 10 TJ pa)
WA	1 January 2002	1 TJ pa
AWA	1 July 2002	Remainder

TJ = terajoules (One million megajoules (MJ))

* Last updated 23 November 2000. These dates are based on current industry understanding and are subject to change.

Source: Great Southern Energy

Table 1

together your contestable electricity supply points, physically configuring your electricity supply points so that combined, they consume a certain threshold of electricity, or by combining with other customers that have supply points consuming a certain threshold of electricity. Talk to your retailer to find out more.

Metering

To change your retailer from 1 January 2001, you will need to install an interval meter with a communication link to record your electricity consumption on a half-hourly basis, as this is how often the wholesale electricity pool price fluctuates. The meters enable retailers to purchase electricity from the wholesale market and will also help you monitor your consumption patterns and manage your usage.

The cost of installing, maintaining and remotely reading an interval meter costs $800 to $1000 per annum, so if you are not changing retailer but would like a new meter, carefully weigh up the benefits of having one installed. Fortunately for small households, once FRC competition becomes available, customers using less than 160MWH each year will not need an interval meter to change supplier.

Each interval meter has a number called a National Metering Identifier (NMI) which retailers use to identify the premises being supplied and to transfer your electricity account as you change retailers. If you change premises, you will be issued another NMI. When you change retailer, they may pass the full cost of the metering onto you or may absorb some or all of the cost in the network tariff they offer you.

Fortunately, as the cost of metering is set by competition, lower cost metering including using your existing basic meter should be available by the end of 2001. A metering provider will install your meter and communication link and a metering data agent will read the meter, both of which will be chosen by your retailer. If you do not change retailer and have a meter installed, it will be the retailer's responsibility to organise installation, maintenance and reading.

At the end of your retail contract, your new retailer may take over your meter from you old retailer, but it will most likely be replaced and your old meter returned to your old retailer for re-use.

Pricing

Government has the reserve power to regulate retail prices and is presently keeping them under review. If retailers want to change the price for deemed or standard contracts, they have to give you two months notice. However, if you enter a market contract, the price offered is not required to be published and may be varied in line with your contract. Before you sign a market contract, make sure you are aware of, and understand, any additional charges that you may incur and, if it is a fixed-term contract, make sure you ask your retailer about any penalty fees.

With regards to the cost of buying electricity, Victorian retailer North Power points out that it is unclear whether competition will reduce prices. For example, electricity currently costs about 12 cents per kWH, about eight cents of which comprises nationally and locally regulated transmission charges, and the other three cents for the electricity itself. No matter which retailer you choose, the transmission charge will remain regulated by your State Government. However, North Power predicts that in a competitive market there will be other incentives for customers to sign up with a particular energy company.

Dual fuel arrangements

The competitive gas market commenced in NSW in 1997 and in Victoria on 1 October 1999. FRC in the Victorian gas market, which is currently set for 1 September 2001, is expected to be pushed back to align with FRC in the Victorian electricity market which will probably not be completed until 1 January 2002. Victorian retailer CitiPower has been successfully selling gas in NSW since December 1999 when contestability was introduced to large business customers there. Dual fuel arrangements offer competitive pricing as well as the ease of having just one point of contact for all your energy needs. Contact you retailer to find out more.

Sources

- Office of the Regulator-General, Victoria, 40-160MWH Customers—*Choice of Electricity Retailer*, November 2000
- Office of the Regulator-General, Victoria Ph: 1300 134 575, www.reggen.vic.gov.au
- Your electricity retailer (see our contacts table on page 49).

SOLAR POWER PRICE CRASH

CANON / UNI-SOLAR PANELS

At last ! the breakthrough in performance and price you have all been waiting for. Uni-Solar's triple junction, thin film P.V power panels represent the state of the art in photovoltaic power. These incredible, glass free units have some unique attributes, that leave glass framed crystalline solar cells in the shade ! A positive temperature response, shadow tolarence, unbreakable construction, very low embodied energy and weight, and lowest consumer cost.

The remarkable Uni-Solar triple layer panel is receptive to a wider spectrum of solar rays, (blue, green and red) and can produce 23% more actual battery charging amps than similarly rated mono or poly crystalline type solar panels, under realistic, high temperature Australian conditions. Formed as one, onto a thin steel foil sheet in an advanced roll to roll process. A solar electric World from dream to real ! Energy revolution underway ; Get on board or rue the day !

www.unisun.com.au or **www.uni-solar.com**

			Inc GST
Canon / Uni-Solar	US-64	Framed	$ 575
Canon / Uni-Solar	US-42	Framed	$ 399
Canon / Uni-Solar	US-32	Framed	$ 319
Canon / Uni-Solar	US-21	Framed	$ 249
Canon / Uni-Solar	US-11	Framed	$ 183
Canon / Uni-Solar	US-5	Framed	$ 109
Canon / Uni-Solar	USF-32	Flexible mat	$ 499
Canon / Uni-Solar	USF-11	Flexible mat	$ 229
Canon / Uni-Solar	USF-05	Flexible mat	$ 135

PLASMATRONIC REGULATORS

These brilliant Aussie made solar charge regulators have the edge on performance and value. The PL series feature a digital display of essential solar system parameters, volts, amps in, amps out, amp-hours in and amp-hours out. With the optional PLS and shunt adaptor, the inverter load amps and daily amp-hours consumed can also be displayed. The PL series are multi voltage units and suitable for all battery types via three pre set programmes, and a fourth program which allows the user to fully customise regulator setpoints.

		Inc GST
PR 1210	12 volt 10 amp basic regulator	$ 72
PR 2410	24 volt 10 amp basic regulator	$ 72
PL-20	12/24/48 volt 20 amp smart controller	$ 241
PL-40	12/24/48 volt 40 amp smart controller	$ 330
PL-60	12/24/48 volt 60 amp smart controller	$ 550

Regulator accessories

PLM	Remote control for PL models.	$TBA
PLI	Serial interface for PC / Modem	$ 99
PLS	Shunt adaptor (AD converter) for PL regs	$ 99
SH-100	Shunt, 100 Amp, 75mv	$ 50
SH-200	Shunt, 200 Amp, 50mv.	$ 99
PCTP	Temperature sensor. Bolt on M8 lug	$ 50

TRUE SINE WAVE INVERTERS

To convert solar or wind generated power into a more useable form, a true sine wave inverter is essential. Try to avoid modified sine wave, quasi sine wave or pseudo sine wave units, or most appliances will deliver degraded performance. True sine wave units as produced by these leading Australian manufacturers will ensure the best value and performance from your renewable energy system.

		Inc GST
S.E.A SEAP-12-150	12v 150 / 400 watt	$ 373
S.E.A SEAP-12-450	12v 450 / 1200 watt	$ 895
Selectronic SE-12 / 12	12v 600 / 1500 watt	$ 1144
Latronic 47-BKZ-12	12v 700 / 2400 watt	$ 1209
S.E.A SEAP-12-800	12v 800 / 2400 watt	$ 1522
S.E.A SEAP-12-1K3	12v 1300 / 3900 watt	$ 2067
Latronic 412-BKZ-12	12v 1300 / 3800 watt	$ 1899
Latronic 518-BKZ-12	12v 1800 / 5000 watt	$ 2331
S.E.A SEAP-12-2K0	12v 2000 / 5000 watt	$ 2957
S.E.A SEAP-24-250	24v 250 / 725 watt	$ 470
S.E.A SEAP-24-500	24v 500 / 1400 watt	$ 895
Selectronic SE-12/24	24v 700 / 2000 watt	$ 1144
Latronic 48-BKZ-24	24v 800 / 2800 watt	$ 1242
Latronic 415-BKZ-24	24v 1600 / 5000 watt	$ 2100
Selectronic SE-22	12/24v 1600 / 5000 watt	$ 2309
Selectronic SE-32	24v 2400 / 7000 watt	$ 2969
Latronic 525-BKZ-24	24v 2500 / 7500 watt	$ 2573
Latronic 530-BKZ-24	24v 3000 / 9000 watt	$ 2861
S.E.A SEAP-24-3K0	24v 3000 / 9000 watt	$ 3453
Latronic 530-BKZ-48	48v 3000 / 9000 watt	$ 2861
Selectronic SE-42	48v 3600 / 10000 watt	$ 3637
S.E.A SEAP-48-3K8	48v 3800 / 10500 watt	$ 3531

EXIDE ENERGYSTORE BATTERIES

We have been supplying these premium, deep cycle, home power system batteries for 18 years, and we know they can easily last 10 to 13 years in a correctly designed system. Rated at 4000 cycles, individual 2 volt cells are made into battery packs of various configurations, depending on voltage and capacity. These are long life, low maintenence power storage batteries, that have become a standard over the past 20 years due to reliability, performance and price.

			Inc GST
EXIDE 12RP340	12v	4080 watt-hours	$ 898
EXIDE 12RP570	12v	6840 watt-hours	$ 1090
EXIDE 12RP830	12v	9960 watt-hours	$ 1558
EXIDE 12RP1350	12v	16200 watt-hours	$ 2283
EXIDE 24RP340	24v	8160 watt-hours	$ 1796
EXIDE 24RP670	24v	16080 watt-hours	$ 2378
EXIDE 24RP910	24v	21840 watt-hours	$ 3133
EXIDE 24RP1080	24v	25920 watt-hours	$ 3540
EXIDE 24RP1350	24v	32400 watt-hours	$ 4567
EXIDE 48RP670	48v	32160 watt-hours	$ 4756
EXIDE 48RP830	48v	39840 watt-hours	$ 5430
EXIDE 48RP1080	48v	51840 watt-hours	$ 7346
EXIDE 48RP1350	48v	62800 watt-hours	$ 9134

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Since 1985! Your discount mail order solar power station. Serving ReNew readers with integrity and compassion. For truly excellent service and advice contact accredited solar engineer **Christopher Darker on 04 1893 4607, or email cdarker@unisun.com.au**

Green Power buyer's guide

Most Australians can directly support renewable energy by choosing to buy Green Power. We look at what's available, where it's generated and how you can buy clean electricity from your retailer. By Kulja Coulston

White Cliffs Solar Power Station generates power for Australian Inland Energy's Green Energy customers

Photo: Australian Inland Energy and Water

In just four years Green Power has developed from a tenuous product on offer to only a few electricity customers in New South Wales, to being one which is available from almost every electricity retailer in the country.

Green Power is consumer-driven—the more households that choose to pay a little bit more for 'green' electricity than for that sourced from dirty coal-fired power stations, the more renewable energy the electricity retailer will purchase.

Due to the increase in product demand, all NSW, Victorian, Queensland, Western Australian, South Australian and ACT electricity retailers have introduced accredited Green Power products in their franchise areas. The Northern Territory will have a product on offer in the next 12 months.

Now that more than 96 per cent of electricity consumers in Australia have the opportunity to choose environmentally-sound electricity from their retailer, we thought it was a good time to see what was on offer.

History

The Sustainable Energy Development Authority (SEDA) in NSW introduced the Green Power program in April 1997 as a way to promote the installation of new renewable electricity generation.

The program is now available nationally and is administered by the National Green Power Accreditation Steering Group (NGPASG) which was established in May 2000. The NGPASG is a collaboration of participating energy agencies in NSW, Victoria, Queensland, South Australia and the ACT. SEDA is the appointed project manager.

Why you pay more

As companies strive for larger market shares in the deregulated National Energy Market (NEM), Green Power provides a market incentive for investment in renewable energy. The customer pays more to cover the higher cost of environmentally-responsible energy generation which may not otherwise be purchased.

Electricity from coal-fired power stations costs about three or four cents per kilowatt hour (kWH) to produce (this does not include network and billing costs), wind power costs between 7.5 and 10 cents per kWH and solar can be up to 40 cents per kWH. Without customer and government-driven demand for cleaner energy production there would be little incentive for companies to invest in it.

Success so far

One of the main impetus behind Green Power is the development of new renewable energy generators. To date there have been 70 new generators accredited since the introduction of the program. This will continue, as retailers are required to source 70 per cent of Green Power from projects commissioned since 1997. Last financial year the requirement was 60 per cent from new projects.

How do I know it's really 'green' energy?

Winning the confidence of the public is the greatest challenge for the Green Power program. A public rightfully skeptical of the environmental credentials of large power companies is difficult to convince of the legitimacy of Green Power.

The National Green Power Accreditation Program (NGPAP) is rigorous in its protection of the integrity and quality of Green Power.

All products sold with the Green Pow-

er tick of approval are accredited under the NGPAP and individually assessed to verify that they comply with high environmental standards. Generators using native forest products, major flooding hydro or municipal waste incineration are not able to be accredited for Green Power because many customers would not support their inclusion.

Sources which are able to be approved include biomass from landfill, sewage plants and sugar mills (bagasse), and wind, solar and hydro plants. The guidelines are available from www.greenpower.com.au or from your participating state energy agency.

Wood wastes

One of the issues which has challenged the Green Power program over the past 12 months is the issue of sustainable biomass. Due to customer concerns about woodchips from native and old-growth forests, the Green Power program administrators approve only sustainable forestry plantation product for use in electricity production.

Generators proposing to use wood wastes as a source of Green Power must prove that the waste is not sourced from 'plantations that clear, or have cleared after 1990, existing old growth or native forests', among other management requirements. The complete *Definitions of Renewable Energy and Wood Sources* document is available from the Green Power website. There are currently no accredited Green Power generators using wood waste as a fuel. If you are concerned about the source of the Green Power product offered by your retailer, don't just assume the worst, find out more from your state energy office or retailer.

Do not confuse Green Power with the Act

It is now mandatory that retailers and large buyers of electricity source an additional two per cent electricity from renewable sources. The Renewable Energy (Electricity) Act (also known as the Mandatory Renewable Energy Target), was passed by parliament on 8 December 2000 and becomes effective from 1 April 2001.

Green Power administrators and the majority of electricity retailers supported the decision to keep Green Power separate from the Act. As a result, it remains a way for customers to continue to pay more for 'green' electricity sourced *in addition to* their retailer's mandatory requirements.

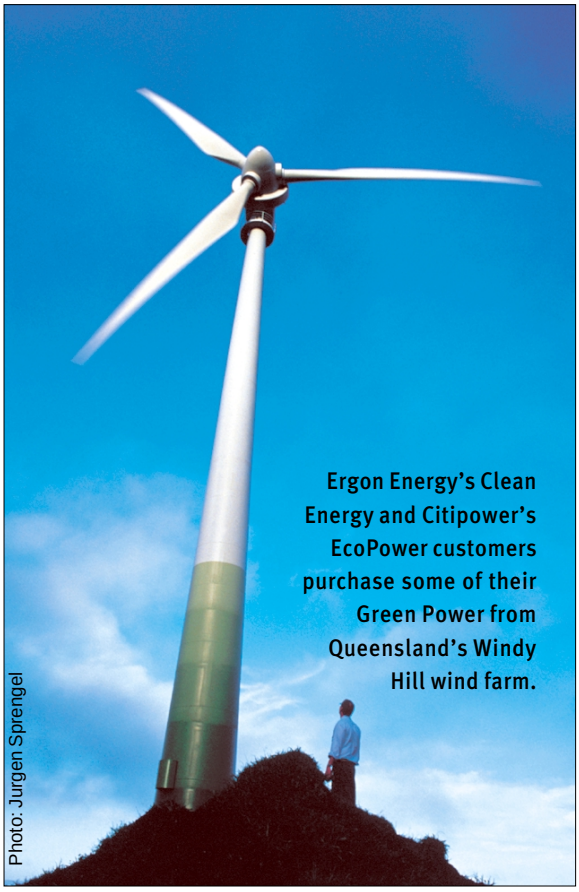

Photo: Jurgen Sprengel

Ergon Energy's Clean Energy and Citipower's EcoPower customers purchase some of their Green Power from Queensland's Windy Hill wind farm.

This legislation is designed to stimulate more investment in the renewable energy industry and provide an additional 9500 gigawatt hours of renewable generation by 2010. Unfortunately the Act leaves open the opportunity for a 'least cost' approach to meeting the renewable energy requirements.

The definition of what constitutes 'renewable' energy biomass under the Act classes electricity generated from burning woodchips from native forests as 'renewable' energy, which therefore allows it to form part of a retailer's mandatory requirement.

Administering Green Power

As there are now two types of renewable energy being sourced by retailers, it is important to differentiate between them. Renewable energy is measured in Renewable Certificates which are issued to retailers when any approved renewable energy is purchased.

Electricity retailers then submit the certificates earned under the Act to the new Office of the Renewable Energy Regulator to prove they have met their obligations. Green Power certificates are submitted to SEDA and ceremonially destroyed. This system will ensure there is no opportunity for 'double-dipping' and claiming Green Power credits as part of mandatory requirements.

How much Green Power is being generated?

Most electricity retailers are purchasing more Green Power than they are able to on-sell to customers, with almost 700,000 megawatt hours (MWH) of renewable energy purchased by retailers last year. There are currently 62,000 Green Power customers purchasing over 300,000 MWH from retailers. If this power was sourced from coal-fired power stations it would pro-

duce about 300,000 tonnes of greenhouse gas emissions. (1MWH coal-fired electricity ≈ 1 tonne of greenhouse gas emissions.)

The uptake of Green Power is still quite low, but growing. Worldwide there are Green Power products available in Europe, the United Kingdom and United States. As the effects of serious climate change become impossible to ignore and the renewable energy industry strengthens, no doubt demand for Green Power will continue to grow.

Photo: Roger Lamb

Moreland Council's 7kW solar pergola provides shade at the entrance of its main offices in Coburg VIC, and generates electricity for Citipower's EcoPower customers.

Signing up

Customers are required to take the initiative to sign up to Green Power—and it's not always easy. Some companies do not promote their Green Power product, and as a result customer service staff can be unfamiliar with it. If you find help is hard to come by don't just give up. Instead, ask to speak with the environmental manager—they all have one.

Every retailer's product has a different name, payment structure (although it is usually a premium paid on top of what would otherwise be charged for electricity), source, procedure and conditions.

We found it was generally better to conduct any investigation over the internet as the information was almost always more comprehensive than what we could find out over the phone, and most companies provided an electronic sign-up form which could be easily submitted.

Reading the table

We have tried to include as much information as possible to help you to make an informed decision about your retailer's Green Power product.

Sector: Due to deregulation, the National Energy Market has been divided into sectors: contestable, commercial and domestic. In some cases different products are available to each sector.

Product options: Customers choose what percentage of their electricity consumption is sourced from renewable energy. This can also be in the form of a price cap.

Energy mix: the percentage breakdown of energy sourced from different generator types.

Electricity from new generators: Refers to the percentage of Green Power sourced from 'new' generators (those commissioned since 1 January 1997). For the year 1999/2000 all retailers were required to source 60 per cent from new generators, this rose to 70 per cent in 2001.

Source: More information about the source of electricity is available on the Green Power website.

Premium: Prices are supplied as a premium price in cents per kilowatt hour, unless otherwise stated in the notes. For example, if you are already paying 14 cents per kWH for electricity and the Green Power premium is 3 cents you will pay 17 cents per kWH for Green Power. **NB: We were unable to ensure all prices include GST.**

Important contacts

Green Power website

www.greenpower.com.au or contact the project manager.

Project Manager

New South Wales

Sustainable Energy Development Authority, PO Box N442, Grosvenor Place 1220 ph:(02)9249 6100, fax:(02)9299 1519, www.seda.nsw.gov.au

NB: A handy number for NSW electricity customers is 136 206 which directly connects you to your local retailer.

Energy Agencies

Australian Capital Territory

ACT Government Urban Services GPO Box 158, Canberra 2601 ph:(02)6207 6250

Victoria

Sustainable Energy Authority Victoria 215 Spring Street Melbourne 3000 ph:1300 363 744, www.seav.vic.gov

Queensland

Department of Mines and Energy GPO Box 194 Brisbane 4001 ph:(07)3237 1435, www.dme.qld.gov.au

South Australia

Office Primary Industries and Resources Level 19 Wakefield House, 30 Wakefield Street Adelaide 5000 ph: (08)8226 5500, www.pir.sa.gov.au

Western Australia

Office of Energy Level 9 / 197 St Georges Terrace Perth 6000 ph: (08)9420 5648 www.energy.wa.gov.au

Retailer	Product name	Sector	Product options	Launched	Total sales (MWH) 1999/2000	Energy mix (%sales) 1999/2000				Percentage sourced from 'new' generators (after 1997)	Source (More than one retailer can source from one generator)	Premium price in cents per kWH	Comments
						Solar	Wind	Hydro	Biomass				
ActewAGL www.actewagl.com.au GPO Box 366 Canberra City ACT 2601 Ph: 1800 447 336 fx: (02)6248 3544	Green Choice	All	50%, 100%	March 1999	10,550	0.1%	_	61.7%	38.2%	66%	**Biomass:** Belconnen landfill ACT, Mugga Lane landfill ACT, Broadwater Sugar NSW, Sarina Sugar QLD, South Johnstone Sugar QLD. **Hydro:** Bendora Stromlo mini hydro ACT, Mount Piper Hydro NSW, Rubicon VIC. **Solar:** Olympic Solar Village NSW.	100% 3.3 50% 1.65 (inc GST)	Residential consumption cap at 22kWH per day. Commercial customers are divided into three groups. Contact for details of premiums and price caps.
AGL Electricity Limited www.agl.com.au Level 2/333 Collins Street Melbourne VIC 3000 Ph: 131 245	AGL Green Energy	All	10%, 25%, 50%, 100%	September 1998	2484	4%	_	_	96%	78.4%	**Biomass:** Tully Sugar Mill QLD, Broadmeadows Landfill VIC **Solar:** Wilpena Pound SA	10% 0.55 25% 1.1 50% 2.2 100% 4.4 (inc GST)	Commercial customers can select between 1% and 100% green energy NB: High % solar due to small demand (MWH)
Advance Energy www.advanceenergy.com.au PO Box 172 Bathurst NSW 2795 Ph: 132 795 Fax: (02)6338 3454	Green Power	All	50%, 100%	June 1997	30,418	0.3%	_	66.3%	33.4%	65.9%	**Biomass:** South Johnstone Sugar QLD, Tully Sugar QLD **Hydro:** NSW: Wellington-Maquarie River,Yass, Gunnedah, Bemboka, Wollondilly, Hume **Solar:** Western Plains Zoo NSW, 5 distributed grid-connect systems NSW **Wind:** Blayney Wind Farm NSW (new)	See comments	No premium prices. Green Power payment calculated as percentages of bill total. 50%: add 8% to total 100%: add 15% to total.
Aurora Energy P/L www.auroraenergy.com.au GPO Box 191 Hobart 2001 Ph:(03)6237 3400 Fax:(03)6237 3125	Not applicable. All of the electricity sold is sourced from hydro sites, all hydro electricity is considered greenhouse neutral.												
Australian Inland Energy and Water www.aie.com.au PO Box 800 Broken Hill NSW 2880 Ph: (08)8082 5800 Fax: (08)8080 2420	Australian Inland Green Energy	All	25%, 50%, 100%	August 2000	N/A see comments	N/A	N/A	_	_	N/A	**Solar:** Whitecliffs PV NSW **Wind:** Blayney Wind Farm NSW	25% 1.75 50% 3.5 100% 7	N/A: Due to the recent introduction of this program no figures are available for the billing period. Contribution-based Solar Future product no longer available.
CitiPower PTY www.citipower.com.au Locked Bag 14031 Melbourne City Mail Centre VIC 8001 Ph: (03)9297 8900 Fax: (03)9297 8905	CitiPower EcoPower	All	50%, 100%	September 1995	5799	1%	28%	39%	31%	60.4	**Biomass:** Broadwater Sugar NSW **Hydro**: Rubicon VIC, Hume NSW, Yass NSW **Solar:** CitiPower Energy Park VIC, Melbourne Central PV, Moreland Council VIC, Sydney Entertainment Centre NSW, 50 other distributed rooftop systems VIC. **Wind:** Breamlea VIC, Windy Hill QLD, CitiPower Energy Park VIC.	4.07 (inc GST)	Commercial customers may negotiate the percentage of EcoPower they purchase
Energex Retail Pty Ltd www.energex.com.au Level 6 200 Adelaide Street Brisbane 7000 Ph: 131 253 Fax: (07)3407 6206	Earth's Choice	All	Only 100%	February 1998	81,527	_	_	17.3%	82.7	60	**Biomass:** QLD: Browns Plains Landfill, Tableland Sugar Mill, Tully, Invicta Sugar, Moreton Sugar, South Johnstone, Luggage Point **Hydro:** Landers Shute QLD, Koombooloomba Hydro QLD **Wind:** Windy Hill QLD (New)	2	Residential consumption cap at 20kWH per day. Commercial customers may purchase 2.5 to 100% of their energy from Earth's Choice
Energy Australia www.energy.com.au GPO Box 4009 Sydney NSW 2001 Ph: 131 525	Pure Energy	All	50%, 100%	August 1996	99,261	0.9	0.7	14.2	84.2	66.2	**Biomass:** Lucas Heights Landfill WMC, Belrose WMC NSW **Hydro:** Glenbawn Dam **Solar:** Foreshore Park NSW, Homebush Business Park NSW, Singleton Solar Farm NSW, Sydney Superdome, Olympic Solar Village, National Innovation Centre, Solarch NSW **Wind:** Kooragang Newcastle NSW, Malabar NSW	See comments	Price is calculated as the full cost per kWH - not as a premium. Prices (inc GST) in cents per kWH: 50% 12.41 100% 14.28 One-year and three-year contracts available.
Ergon Energy Pty Ltd www.ergon.com.au PO Box 107 Albert Street Brisbane Qld 4002 Ph: (07) 3228 8222 Fax: (07)3228 8118	Ergon Clean Energy	All	Only 100%	May 1999	14,050	_	11.2	_	88.8	60	**Biomass:** Bioenergy Green Waste Whytes Gully Gasifier NSW, Proserpine Sugar QLD, Plane Creek Sugar/Distillery, Townsville Sewage Cleveland Bay and Mt St John QLD, (UC) Invicta Sugar **Solar:** Coconut Island QLD **Wind:** Thursday Island QLD, Coconut Island, Windy Hill QLD	2	Commercial customers may purchase 2.5 to 100% of their energy from Earth's Choice
Great Southern Energy www.gsenergy.com.au PO Box 718 Queanbeyan NSW 2620 Ph: 132 356 Fax: (02)6214 9700	Earthsaver	All	see comments	April 1997	10,462	0.6	75.3	24.1	_	75.9	**Solar:** Queanbeyan NSW **Wind:** Crookwell NSW **Hydro:** Wyangala NSW	See comments	No premiums. Consumption is capped at $10, $20, $50 or any other nominated amount per bill.
Integral Energy Australia www.integral.com.au PO Box 6366 Blacktown NSW 2148 Ph: 131 081 Fax: (02)9853 6000	Business Green Power	Contestable	No limit	July 1997	995	5.6	_	94.4	_	99.5	**Hydro:** Kembla Grange Water Filtration NSW **Solar:** 26 Educational Institution sites in NSW, AV Jennings NSW, Edward Street Solar Project QLD, Fitzroy Falls NSW, Integral Head Office and regional office, International Regatta Ctr	See comments	Price neg. with business customers. Expecting to launch a residential consumption-based product in 2001. Contribution-based 'green' energy product available (no longer accredited).
NorthPower www.northpower.com.au PO Box 5118 Port Macquarie NSW 2444 Ph: 132 066	North Power Green	All	50%, 100%	July 2000	9963	_	_	21.5	78.5	78.5	**Biomass:** Broadwater Sugar NSW, Condong Sugar NSW, Harwood Sugar **Hydro:** Copeton Dam NSW, Keepit Dam NSW, Oaky Dam NSW, Chichester Dam NSW **Solar:** Nimbin Sunpower NSW	3.5	Consumption cap of $2.50 per week for 50% and $5 for 100%. Commercial customers may choose a percentage breakdown between 2.5% and 100%.
Power and Water Authority www.pawa.com.au PO Box 1921 Darwin NT 0801 Ph:1800 245 091 Fax:(08)89247755	Not applicable. No Green Power product is currently available. Expected to be introduced in late 2001 or early 2002.												
PowerCor Australia Ltd www.powercor.com.au Locked Bag 14090 Melbourne City Mail Centre VIC 8001 1300 655 696 Fax: (03)9683 4904	Ecosaver	All	25%, 50%, 75%, 100%	April 1997	19,550	_	_	30.2	69.8	66.3	**Biomass:** Plane Creek Sugar/Distillery, South Johnstone Sugar, Malabar Sewage NSW, Corio Landfill VIC, Sunshine Energy Park Landfill, Berrybank Farm, Charles IFL VIC **Hydro:** Yarrawonga Weir VIC **Solar:** Halls Gap YHA **Wind:** Codrington VIC (new)	100% 4.66 75% 3.51 50% 2.34 25% 1.17	Commercial customers may choose any percentage breakdown
Pulse Energy Pty Ltd (was United Energy) www.pulsenet.com.au GPO Box 4728UU Melbourne VIC 3001 Ph:133 000 Fax: (03)9926 5580	Pulse Clean Green Energy	All	Only 100%	May 1999	4998	_	_	_	100	100	**Biomass:** Clayton Landfill VIC, Springvale Landfill VIC	3	Commercial customers may choose any percentage breakdown
TXU Electricity Limited www.txu.com.au Locked Bag 14060 Melbourne City Mail Centre VIC 8001 Ph: 133 466 Fax: (03) 9229 6001	Enviro Energy	Contestable	25%, 50%, 75%, 100%	March 2000	N/A see comments	_	_	N/A	N/A	N/A	**Biomass:** Berwick Landfill **Hydro:** Blue Rock VIC, Thompson River VIC, William Hovell VIC, Glenmaggie VIC	25% 1.35 50% 2.64 75% 3.96 100% 5.28	N/A: Due to the recent introduction of this program no figures are available for the billing period.
Western Power www.westernpower.com.au GPO Box L921 Perth WA 6842 Ph: (08)9326 4911 Fax: (08)9326 4595	Natural Power	All	10%, 25%, 50%, 75%, 100%	January 2000	301	N/A	_	~100	_	N/A see comments	**Hydro:** Wellington Dam WA **Solar:** Kalbarri WA	3	N/A: Due to the recent introduction of this program no figures are available for the billing period

Flawed renewable energy bill finally falls over the line

In the wee hours of the morning on the final day of parliament for 2000, Australia's most important piece of renewable energy legislation was made law. Alan Pears discusses its far-reaching implications

The Renewable Energy (Electricity) Act was finally passed in the early hours of 8 December 2000, one of the last bills passed by Parliament in 2000. Most details of the legislation are in my last column (*ReNew* issue 74). The Government finally negotiated a deal with the Labor opposition instead of the Democrats. The deal excluded indexation of the penalty, allows use of 'wood waste', requires disclosure of the sources of renewable energy, and brings forward the review to two years from the launch. Because of the delay, its starting date has been deferred to 1 April 2001.

Allowing use of 'wood waste' from forests will be a major point of conflict. Already, with export prices of wood chips in the doldrums, operators of coal-fired power stations are offering attractive prices for wood chips to feed into their power stations. There are a few glimmers of hope on this issue. First, if it can be shown to the Environment Minister Senator Robert Hill, that much more 'wood waste' than he expected is being used, he may consider placing limits on the quantities eligible—after all, it is an election year. Also, there is public consultation on the regulations, which will specify the detail regarding compliance (the draft regulations can be downloaded from www.greenhouse.gov.au/markets/2percent_ren/index.html). Last, electricity retailers may feel nervous about buying power from sources that are potentially unacceptable to many Australians as we move towards contestability for households and small business. This would be a really obvious reason to change electricity retailers, and a great focus for demonstrations outside the head offices of offending electricity retailers.

Green Power and the Renewable Energy Bill

There has also been plenty of debate regarding the impact of the renewables legislation on Green Power schemes—where electricity customers voluntarily pay a premium so that their electricity retailer buys electricity from environmentally-preferable renewable sources. On the one hand, Green Power customers are unlikely to be enthusiastic about paying extra for renewable power that a retailer would be legally obliged to supply anyway, so there is a case for keeping them quite separate. But some argue Green Power schemes will die because they will become more expensive and retailers will focus on compliance with their obligations instead of positive marketing of Green Power. Some renewable generators claim they need both the Green Power premium and the renewables premium to make investment in some renewables economically viable—basically they want to 'double dip'.

At present, it looks as though the administrators of Green Power schemes will keep them separate and additional to the mandated renewables. This recognises the reality that Green Power buyers want something extra for their money. But many people are nervous.

As usual, we seem to be concentrating on threats instead of opportunities. To my mind, the benefits for Green Power of the renewables legislation will include:

- A credible accounting system of certificates that can be used to prove that Green Power is additional to mandated requirements—Renewables Certificates for the Green Power can be ceremonially destroyed to prove that they can't be submitted to the government regulator to comply with the renewables target.
- Economies of scale, as Green Power projects can be blended with schemes aimed at compliance with the legislation. Indeed, generators that comply with the Green Power guidelines will be able to sell as much as possible as Green Power, and the rest as renewable power. And they will be able to vary the mix as it suits them.
- Reduced risks associated with investment in Green Power projects. At present, if a Green Power generator can't sell all the Green Power produced as Green Power, it must be sold at standard market prices. Now, any excess power can capture the certificate premium. So an investor in a Green Power project can now rely on a higher price for power produced (subject, of course, to the value the market places on the certificates).
- Increased market sophistication. Not only will electricity retailers and distributors be more interested in identifying renewable opportunities that reduce their supply losses and costs, but there is scope to educate consumers about the range of environmental credentials of different renewables to create real market differentiation.

• If 'waste wood' remains eligible for the mandated target, buying Green Power will be the only way environmentally-concerned electricity consumers can guarantee that they are not supporting the harvesting of native forests.

Greenhouse progress

Despite the lack of agreement at international climate negotiations (COP6) at The Hague in November 2000, the greenhouse steamroller continues to gather momentum. Continuing crazy weather and increasingly strong statements by scientists are feeding increasing concern. The report of the Senate Inquiry into Global Warming was released in late 2000, and it provides a valuable analysis of greenhouse issues. It presents over 100 recommendations for stronger action.

The Commonwealth Government has recently issued a consultation paper entitled *Encouraging Early Greenhouse Abatement Action* (available from www.greenhouse.gov.au) in which it canvasses a range of options for encouraging, or at least not discouraging, early action to reduce emissions. The government is in a bind. It has said it won't introduce either a carbon tax or mandatory emissions trading before international schemes are introduced. So it cannot put a price on carbon, which is the one thing that would reduce uncertainty. At the same time, like most governments, it is not keen to offer financial rewards to those who reduce emissions, because this would cost it money. Meanwhile, some large emitters keep increasing emissions, knowing that this increases pressure on the government to offer generous incentives to desist.

It's a very awkward situation. The difficulties are amplified by the government's apparent reluctance to run a public education campaign and encourage households and small business to reduce emissions. This could impact on sales of large cars (all that we make in Australia, now) and the revenue streams of our struggling electricity industry. Also, an informed public may even become outraged at the behaviour of certain industry groups. Not something you would want in an election year.

At the same time, the government is trying to soften up opposition to greenhouse action by providing information on the subtleties of greenhouse emission trading mechanisms. A report by the Allen Consulting Group for the Australian Greenhouse Office (*Greenhouse Gas Emissions Trading: Allocation of Permits*) makes very interesting reading. For example, it points out that businesses given free emission permits through 'grandfathering' would probably have to pay capital gains tax on their final value, so they would be far from free. The paper explores some fascinating scenarios of how emission permits might be allocated, and the implications for equity, the economy and different industry sectors. A carbon levy set at a low level looks really attractive after reading this paper!

David Abba passes away

David Abba was the CEO of the Sustainable Energy Industry Association from late 1999 until he passed away suddenly on 14 December 2000. In his brief involvement with the sustainable energy industry, David worked tirelessly to build our profile and take us into the mainstream. The experience and networks he brought with him from his work in other industry associations allowed him to achieve a lot. David not only made a difference, but his urbane manner, positive attitude and determination made working with him enjoyable and a valuable learning experience. I, and many within the sustainable energy industry, will miss him. ✲

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Canberra Business Centre Bradfield St, Downer ACT 2602.

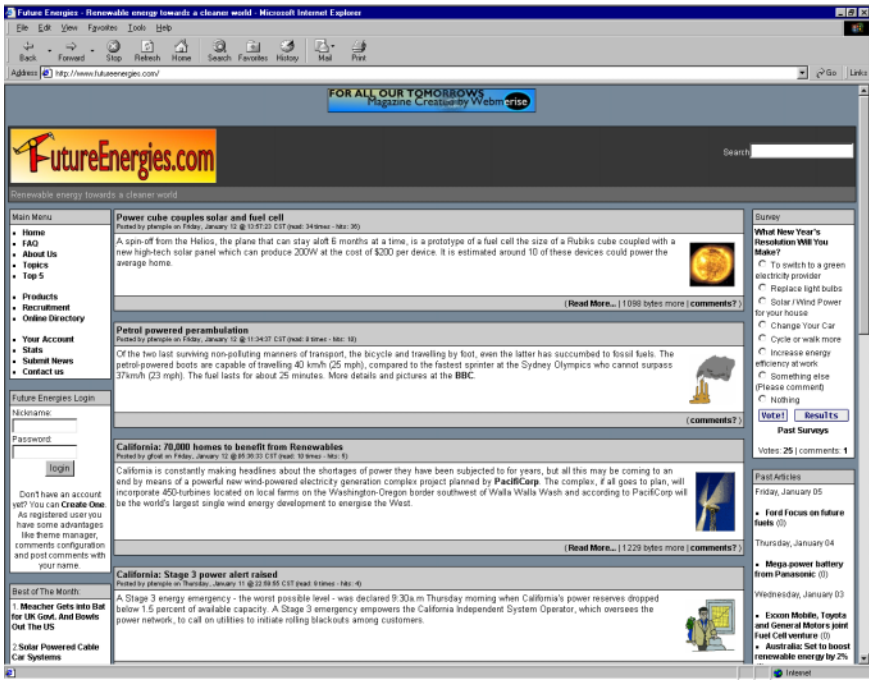
Browser

www.futureenergies.com

FutureEnergies.com was founded as a site aimed at doing something positive for the environment. There are plenty of general online environmental magazines discussing climate change and the woes of pollution, but few discuss what could be done about it, the alternatives available and how we can reduce overall energy consumption.

It is a combination magazine/discussion forum and has daily updated news. Anybody can have a say, although not every article is published. However, all comments are published unless they are libelous or include expletives.

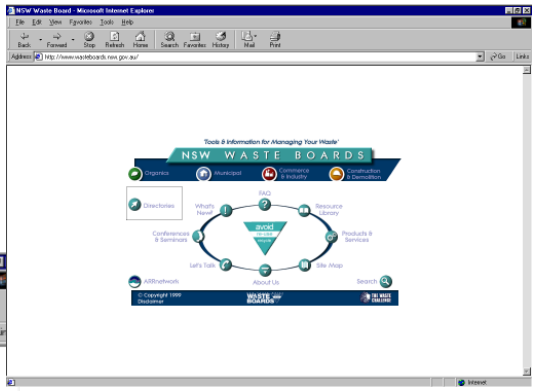
This site is well worth a look, just for some of the interesting and sometimes unusual articles that appear there.

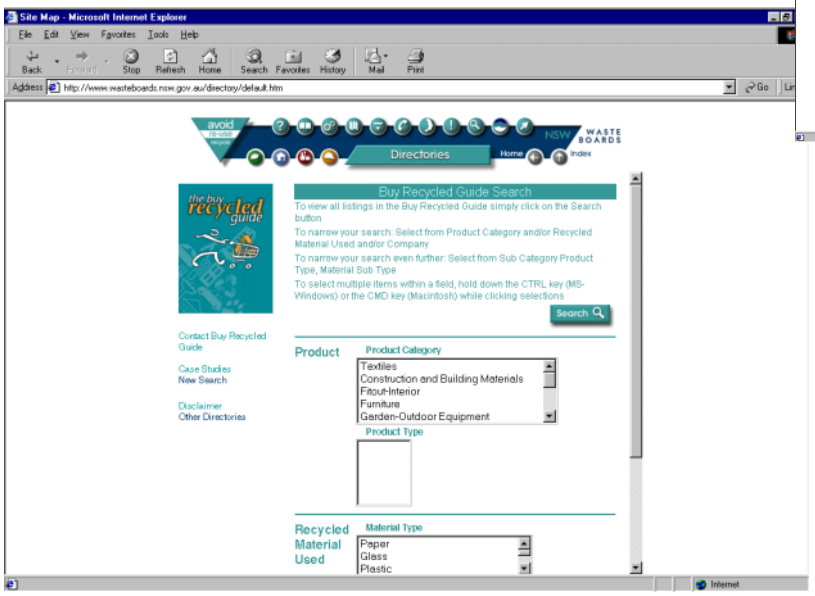


www.wasteboards.nsw.gov.au

The NSW Wasteboards site is billed as a site of 'Tools and information for managing your waste'. We found the most interesting part of this site was the online directory, a database containing the details of dozens of recycled products and the companies that make them.

From paper and cardboard products through to building materials, laser printer cartridges, fabrics, rubber and plastic products, there are many interesting and useful products here that can be used in place of those made from virgin materials.

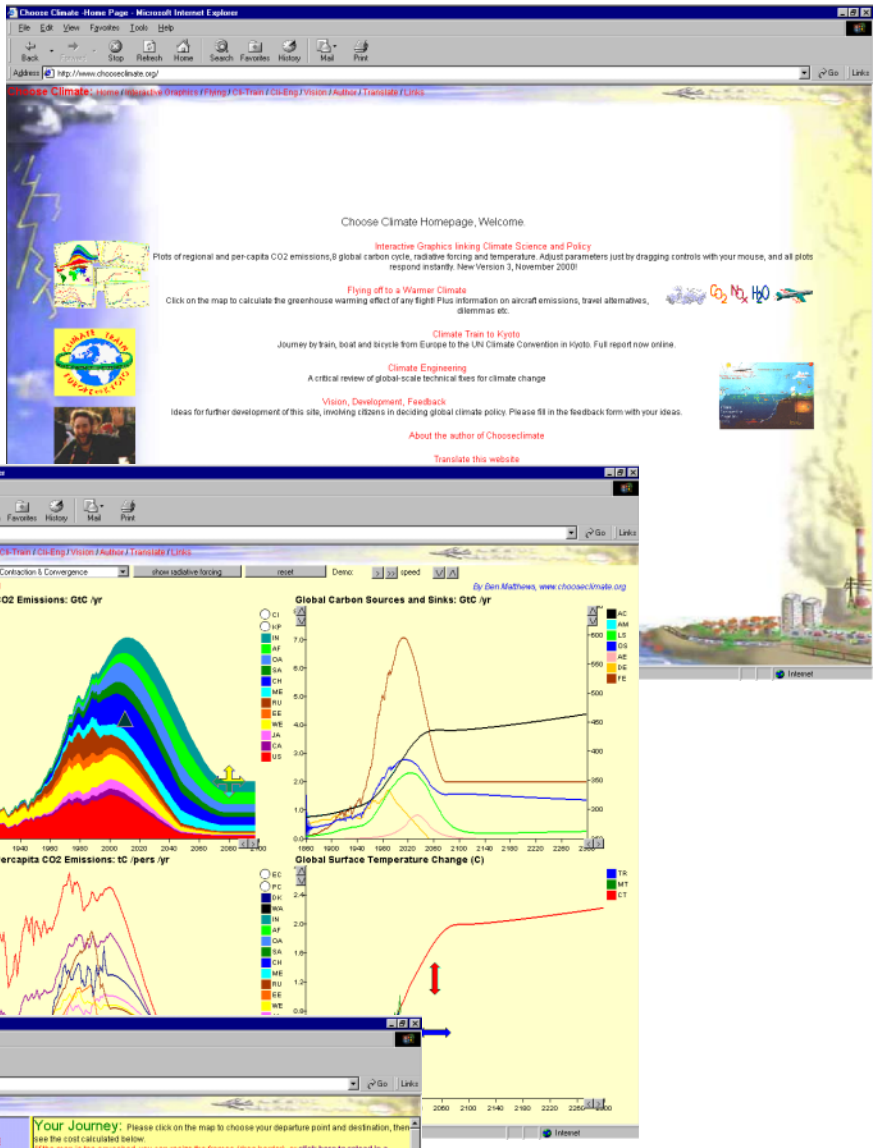




The search function of this site allows you to search on specific products made from specific materials, but sometimes the search engine would give back no results. We found it simpler to select the 'Show all products' option and use our browser's search function to find specific keywords.

www.chooseclimate.org

This is an excellent site if you want to gain an understanding of the potential for climate change over the coming years. By adjusting parameters of the different greenhouse gas emissions scenarios, you can see instantly how the different scenarios will affect the planet in the future, including surface temperature, regional and per-capita CO_2 emissions.

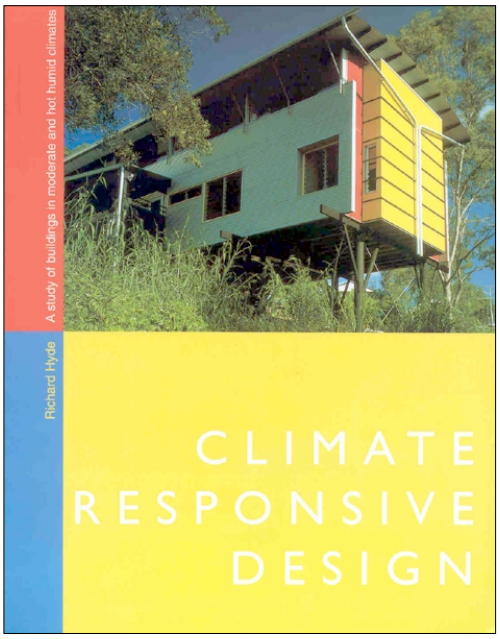


Another section of the site allows you to calculate the environmental damage done by aircraft. You select your start and destination points, the type of ticket and the percentage of occupancy of the plane. The resulting figures for an average trip between continents are staggering—a return flight between Melbourne and London can produce up to 16 tonnes of greenhouse gas equivalent per person!

All in all, while not a large site, it has some great interactive systems, and will make you think twice about your lifestyle.

Climate Responsive Design: A Study of Buildings in Moderate and Hot Humid Climates

Author: Richard Hyde
Publisher E & FN Spon, London, 2000
ISBN 0 419 20970 0
Price $81.30 available from Architext
http://www.raia.com.au/architext/



Over the last three decades much has been written about passive solar design of well-sealed houses in temperate climates, but there is far less information on house design for warmer climates. This book helps to fill that gap.

There has been a lot of debate in more northern climate zones of Australia about the adequacy of the sealed-house model to provide climate responsive designs. Many architects and academics advocate the concept of the free-running or naturally-ventilated house as a more valid approach. In this book Hyde looks at climate responsive strategies other than sealed box passive by presenting built examples. Case studies of houses and commercial buildings are sourced from Australia and South East Asia, but the focus is mainly on reasonably current domestic work of architects in Australia.

Climate Responsive Design deals almost entirely with strategies for moderate (a kind of hybrid tropical/temperate climate like that of Brisbane) and tropical climates. It also touches briefly on designing for the hot arid climate of our red centre. Don't read this book hoping for a one-size-fits-all solution to moderate or tropical design—it's not that simple. It will however provide you with the conceptual tools to design effectively for a specific site.

The book was written for architects and designers who would already have at least some knowledge of climate performance. The text jumps effortlessly from domestic to large urban scale buildings so it is not specifically aimed at people wanting to build a house. Anyone with some scientific understanding and an interest in green design would benefit from reading this book. By gaining an understanding these principles a consumer would be better equipped to then enter into a process of house design or renovation with a designer or builder.

Elemental design

The latter half of the book breaks down climate architecture into the generic elements: roof, external wall, floors and internal walls, verandah and courtyard. In this way it encourages the reader to think about designing for climate with a thermal palette of elements which can be manipulated intelligently to resolve comfort issues in a building.

The book does have its downsides, though, which make it a more difficult read than necessary. It has not been edited properly and the text has many typographical and grammatical errors. One cross-sectional diagram of a floorslab has a label saying 'slap on ground' which I found particularly funny. The text also has no cross-references to link the relevant diagrams and photographs.

I would also argue that given the small format of the book and the relatively high price, the potential buyer would expect some high quality colour photographic content. Instead the photos are a disappointing low resolution black and white.

Seeing past those negatives, though, Hyde looks holistically at building sensibly for climate. The book is not just about thermal performance, but examines other issues such as designing for rainwater, humidity and wind. It also considers appropriate structural framing and construction approaches for hotter climates.

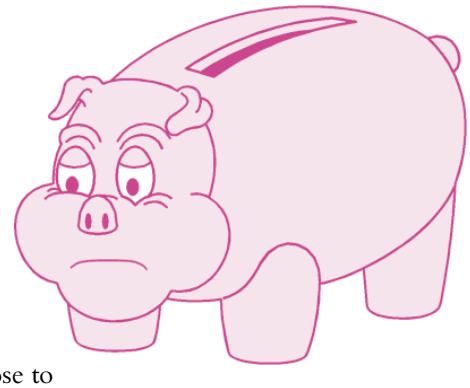
Throughout the book Hyde reiterates the need to think about how buildings work in cross-section. Unfortunately our housing market tends to focus on street elevations and plans. While plans are important, good climatically-responsive architecture comes from well-considered cross-sections.

The highlight for me was the set of temperature-versus-time graphs that described the thermal response of different parts of a real building over a six-day period. This illustrates the thermal response of the different materials under real climate conditions brilliantly.

While there are some problems with it, it is encouraging to see a thorough book focusing on examples of climate-responsive buildings in warmer climates. No matter which climate you are concerned with, the messages about how to design sensibly for local climate with a full thermal palette of architectural elements are relevant.

Michael Shaw

The Big Beg



We are appproaching the end of the financial year, so if you would like to help the Alternative Technology Association with a donation, now is the time to do it.

Being a non-profit organisation, the ATA is often short of funds. Your response to our previous Big Begs has helped us obtain items we badly needed in the past including computer hardware and software and equipment for our renewable energy systems. However, there always seems to be something we need, and our current wishlist includes:

- an upgraded version of our database software
- an energy saving laser printer

Your assistance in obtaining these items would be greatly appreciated. You can choose to either donate money or donate an item itself. Either way, your donation is tax deductible.

Financial contributions can be paid by cheque or money order to the **Renewable Energy Development Trust**, a fund established to make sure that your donations go to helping us help the environment.

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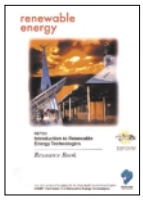

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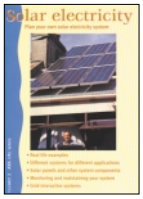

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Author: Hugh Piggott
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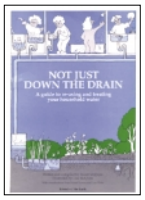

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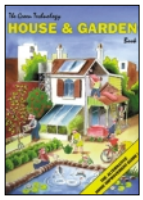

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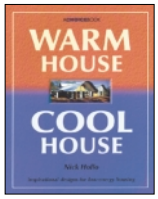

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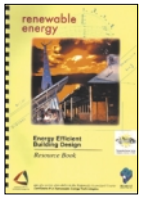

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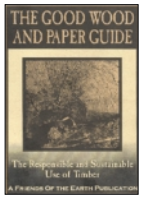

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Anthony Amis (ed) Friends of the Earth, 1999.
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For further details contact the Education Coordinator at
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A home-made water pumping wind turbine

Peter Williams of Roleystone, Western Australia, features his home-built Savonius rotor powered water pump

A few years ago, a friend and I were musing over building our own windmill. Eventually we concentrated on the Savonius rotor turbine.

We decided to build one so we rounded up four empty 44 gallon (200 litre) drums and cut them all in half lengthwise. This gave us eight halves, which to the casual observer must have looked like eight home-made barbeques being constructed.

We needed to make the frame and an advertisement for cheap steel found us picking up some 40mm and 50mm tubing (exhaust pipe material). We constructed a tower using the 50mm pipe for the uprights, with the 40mm pipe used for bracing. The finished tower was a little over six metres in height.

The next stage was to assemble the rotor. The half-drums were welded to a solid 50mm length of steel for the shaft. We attached two sets of four drums for extra power, as can be seen in the photos. We still have space for another set of drums, but believe we do not need it for the moment.

Self-centering bearings were used to locate the finished rotor to the cross bracing on the tower. Flat strap (about 20mm wide) was used to join the drums top and bottom for strength and stability to prevent them twisting in high winds.

I had a lot of fun working out the pulleys. The rotor spins vertically and I had to convert this motion to a horizontal axle to drive the pump. I fixed this by simply twisting one of the belts through 90 degrees and as they were long enough,

this was not a problem. The rotor is connected to the axle via a dog clutch which is operated by a lever. In high winds the windmill still spins but you can disengage the clutch to protect the pump.

The bore pump is a ball-type poly pump. We used a ball joint from an old Ford Falcon attached to a metal disc (off center to give it a cranking motion) to drive the pump. The disc is attached to one end of a shaft which is driven by an 18 inch diameter pulley at the other end. This pulley is driven via a second belt from the dog clutch shaft. This arrangement is mounted on 50 x 100mm RHS (metal tubing). This setup can be seen in the photos.

This machine was a lot of fun. I never tire at watching it work and it is a great conversation piece. It has also become a bit of a landmark in our area and as a result our property is called 'Humdrum Towers'.

Closeup of the pulley and poly pump. The whole arrangement is quite simple and uses off-the-shelf bits.

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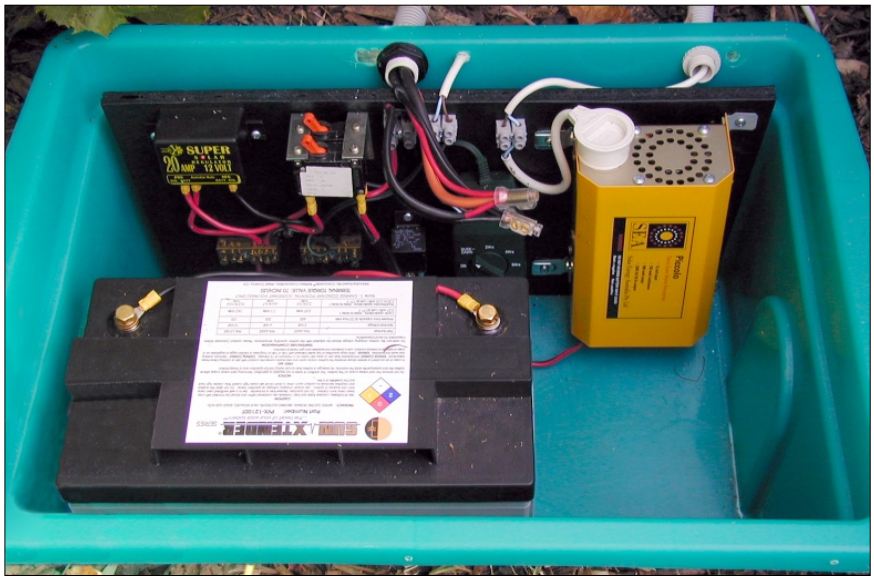
Automatic solar lighting system

Here at the ATA office we have been installing numerous solar power systems. While several of the systems are quite large, and indeed are capable of running our entire office, we thought it would be good to have a smaller, low-cost automatic system that would demonstrate to the public how they can use solar power to provide low-consumption loads like security lighting. We also needed some safety lighting around the office building and adjacent CERES site toilets for use at night during the 'Music Under the Stars' events held at the park over summer.

We decided to implement a system that would be compact, relatively simple and mostly automatic, requiring little maintenance or user intervention. The system must charge the battery by day and automatically turn the lights on at sunset to provide lighting for a predetermined time, even all night long if required. What's more, the components needed to be as cheap as possible yet still be reliable.

This sounds like a tall order, but with a bit of scouting around, we assembled a system that did what we wanted for well under $3,000. In actual fact, we managed to keep the costs well below that with the help of a few friendly renewable energy equipment suppliers.

As the system is being used for demonstration purposes here at the office, some of the equipment was donated. This included the BP Solar panels donated by BP Solar and the Piccolo inverter donated by Solar Energy Australia. The battery was bought from RF Industries at a discounted price (it normally retails for close to $600). This is a top-of-the-line type battery, suitable for use in sealed enclosures. If you are using a vented enclosure with a separate section for the battery, you could use a much cheaper flooded-cell unit, but this would require occasional checking of the electrolyte levels.



Inside the control box you can see the sealed battery at the front with the rest of equipment attached to the board behind it. The sinewave inverter is on the right.

The complete component list can be seen on page 64 and as you can see, some of the components are not specifically designed for use in solar power systems but work fine nonetheless.

This system is capable of running our two security lights all night, with the battery being fully charged again by around 11am the next day during summer. This means that there should be enough energy available in winter to allow the lights to run all night. We do have plans to add some compact fluorescent spotlights to the system to light some dark areas on the other side of the building.

Why 240 volts?

Some of you may be thinking that we could have reduced the cost of the system considerably by omitting the inverter and using 12 volt compact or regular fluoros. We initially took this tack with the system design, but soon came across the problem of finding suitable, good quality 12 volt compact fluoro globes. The best we could find was a 13 watt unit, but we wanted more light than that. What's more, we decided that we would like to be able to use readily available 240 volt bulbs as there is a large range of these available now.

We initially designed the system to use a low cost inverter from Jaycar Electronics. They had a 140 watt modified square wave unit for around $80. However, once the system was installed we discovered that one of the compact fluoros would not fire on this inverter and, indeed, eventually died altogether. This was interesting as the loaded output of the inverter measured 235 volts RMS, well within spec. Obviously, some compact fluoros rely on the peak voltage of the waveform more than others.

We used two different bulbs in our lights, a 20 watt Mirabella and an 18 watt Philips Ecotone. While the Philips unit died, the Mirabella never failed to start, though it did flicker sometimes when cold.

We decided that a sinewave inverter was the way to go, and a quick check of our

sinewave buyer's guide (they are useful, even to us!) showed us the only Australian-made inverter in our required size range was the Piccolo unit from Solar Energy Australia. Lyndsay Hart of SEA kindly offered to donate the inverter and we were away. The replacement Philips light worked well on the sinewave output and the system has worked perfectly for several months now without intervention, apart from the occasional check to make sure the charging system is working.

Assembling the system

We decided to mount all of the components on one piece of recycled plastic board attached to one wall on the inside of the enclosure. I cut a piece of this board as large as would fit inside the box. I then sat down with the components and laid them out as neatly as possible. Once I was happy with the arrangement, I screwed all of them into place.

The lights were simply attached to the workshop by a length of threaded water pipe—simple, robust and inexpensive. We know that the fittings waste some light, but they were the best we could find within budget.

Next came the internal wiring. Even though the maximum current through the cables is 10 amps from the solar panels and about the same for the inverter, I used 4mm^2 cable throughout to reduce power losses.

A few holes were drilled in the box to accommodate the cables and six small holes were drilled through the flange of the lid and the box lip underneath to allow the use of screws to stop the lid being removed by prying fingers.

The board was mounted to the wall of the box with a few screws. We then dug a hole in the garden bed where the box was to reside and fitted the box into place. Once the battery was lowered into position, the box sat in its hole quite firmly.

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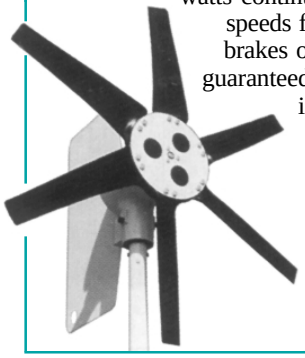

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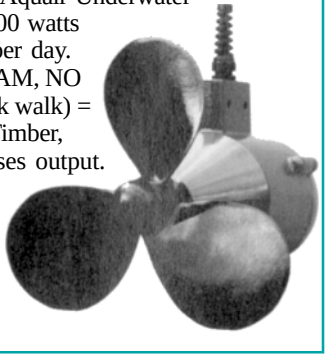

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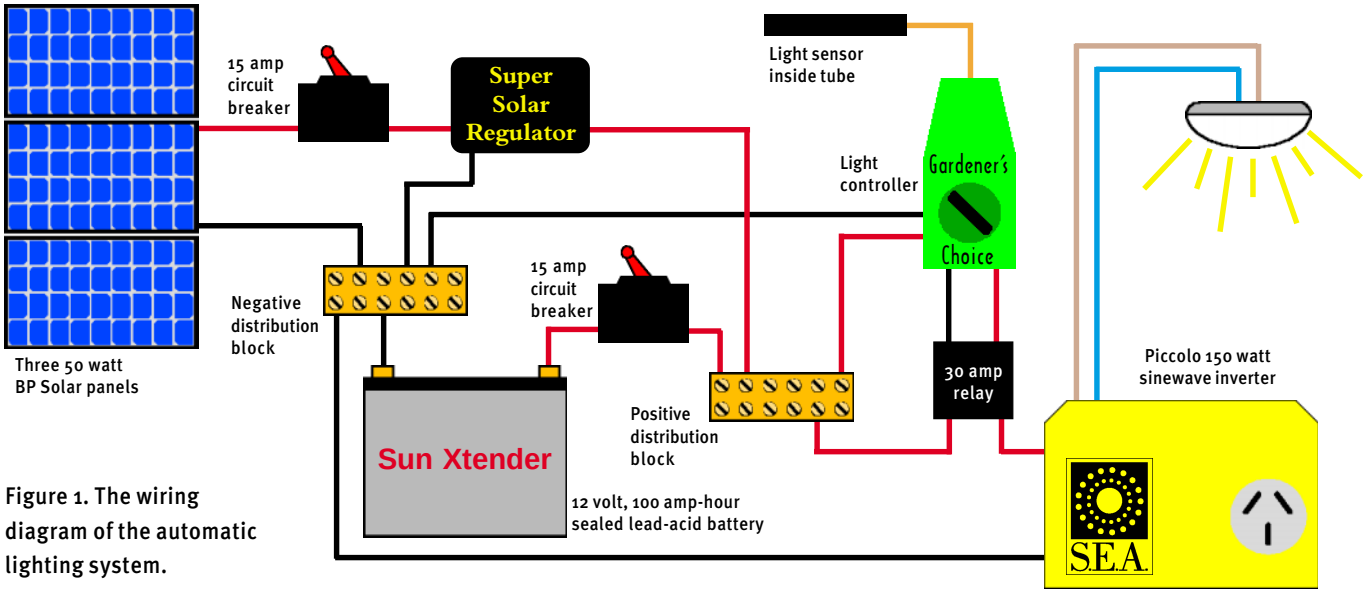

Figure 1. The wiring diagram of the automatic lighting system.

We also coated the lid of the enclosure with Ceratech heat reflective coating to protect the equipment from overheating. Even on a 37°C day the inside of the enclosure sits at around the ambient temperature.

Next we installed the lights and wired them back to the box. They were mounted on short pieces of water pipe, threaded at both ends, which were simply screwed into holes in the building facia. The lights were wired to the inverter using 1mm² mains-rated wire.

Solar array

The solar panels were incorporated into one of the grid-interactive arrays on the front of the Solar Workshop. The three BP Solar 50 watt panels were wired to the control box with 6mm² wire to reduce power losses. While not the most cost-effective solution, we used three 50 watt panels as they were the ideal size to fit in with the already existing array of Canon Econflats. A more effective solution would be to use fewer larger panels.

The system components

Solar panels:	Three 50 watt BP solar	$1500
Battery:	100AH, 12 volt Concorde Sun Xtender AGM sealed lead-acid battery	$ 300
Inverter:	Solar Energy Australia 12 volt, 150 watt Piccolo sinewave	$ 429
Regulator:	12 volt, 20 amp Super Solar Regulator from Maitland Enterprises	$ 70
Lighting controller:	Gardener's Choice garden lighting controller bought from K-Mart	$ 14
Relay:	12 volt, 30 amp automotive relay	$ 6
Circuit breakers:	Two 15 amp lever switch type	$ 30
Extras:	Assorted terminal blocks, connectors, brackets and cable	$ 40
Enclosure:	50 litre storage box bought from K-Mart	$ 17
Lights:	Two sealed bulkhead-style light fittings	$ 70
Bulbs:	Two tri-fold compact fluoro lamps	$ 30
Wiring:	1mm² cable for 240 volt wiring, 6mm² for solar panel wiring	$ 150
Total:		$2656

Reducing costs

By now you may be wondering about how you can reduce the cost of such a system. As mentioned above, you can use fewer larger panels which are generally more cost effective than more smaller ones. You can also use a different battery. In the past we have bought very high quality brand new sealed lead-acid battetries for a few tens of dollars from companies that get surplus stock occasionally. Keep an eye open and you will be surprised what you will find.

Don't use a car battery as these are not suitable and will have a very short life in such an application. You need a true deep cycle battery, of which there are many available now. However, avoid 'truck batteries' as these are of variable ability as far as deep cycling is concerned.

If you have suitable 12 volt lights, you can eliminate the need for the inverter

altogether, thus reducing costs further. However, part of this cost saving will be offset by the need to use a heavy cable for the connections between the control box and the lights.

We did a quick analysis of a system similar to ours, but using a single 120 watt panel, a 130 amp-hour solar grade battery and no inverter, and came up with a total cost of around $1,500 (not including the lights). A system this size should be able to run all night during summer and maybe four to six hours per night during winter (these estimates are for Melbourne) which is all most people will need.

Environmental benefits

So is it economically beneficial to install such a system? Well, that depends. If you are on mains power and can get power to where you need it easily, then the renewable system is not going to win economically. However, if you want lighting a long way from a source of mains power, then costs such as running mains cables in trenches can exceed the cost of a simple renewable energy system.

But financial costs are not the only thing to be considered, nor are they even the most important aspect. Consider an alternative to our solar system like the 'low voltage garden lights' commonly available from hardware and department stores. These are very cheap to buy, but they can actually use considerable amounts of power.

A 120 watt system that runs for eight hours per night will use around 1kWH of power per day. In Victoria, this 350kWH per year equates to around half a tonne of greenhouse gas emission per year—no small figure. This assumes that the lighting transformer is turned off at the wall each morning. Many systems are left running because they are controlled by a simple lighting controller such as the one we bought for our solar system. So the mains-powered system generates even more greenhouse gas emissions by being a phantom load for 16 hours per day.

Even comparing apples with apples, a pair of 20 watt mains-powered compact fluoros running for eight hours per night will produce around 160kg of greenhouse gas per year.

While it is true that the solar equipment itself takes energy to make, so does the installation of power stations and their vast infrastructure, as well as the damage done by mining equipment. And it must be remembered that some renewable energy equipment manufacturers are using renewable energy to make their equipment. All in all, the odds stack up in favour of solar lights. ✻

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[Sustainable technology events]

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ATA workshops 2001

CERES site, Lee St, East Brunswick, VIC

- Greywater: 4 March, 1 April
- Batteries: 25 March
- Solar electricity: 8 April
- Wind power: 15 April
- Solar hot water: 22 April

Fee: $77 for ATA members, $88 for non-members, inc GST. Contact: ATA, ph:(03) 9388 9311, email: ata@ata.org.au

World Environment Day Awards 2001

Presented 5 June, 2001

Awards will be presented in the categories of Local Government, Business Enterprise, Community/Individual, Education/Schools and Media. Nominations close 1 May.
Contact: United Nations Association of Australia (VIC), ph:(03) 9482 3655, fax:(03) 9482 5118, email: unaa.vic@bigpond.com, www.unaavictoria.com.au

EcoGeneration 2001

28-30 March, 2001
Crown Towers, Melbourne VIC

Covers cogeneration, renewables, waste-to-energy and distributed generation.
Contact: Robyn Buccheri or Alison Abrahams, Professional Conference Services, 137 Gardenvale Rd, Gardenvale VIC 3185, ph:(03) 9530 6777, fax:(03) 9530 6526, email: services@profconferences.com

Banksia Awards

Entries close 30 March, 2001

Nominate companies, organisations or individuals you feel have contributed to the environmental cause.
Contact: Banksia Environmental Awards, 61 Gipps St Collingwood VIC 3066, ph:(03) 9419 7188, www.banksiafdn.com

Moriac Harvest Festival

25 March, 2001
Moriac Primary School, VIC

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Contact: Julie Dyson, ph:(03) 5266 1490, fax:(03) 5266 1637.

2001 Water Odyssey

1-5 April, 2001
National Convention Centre, Canberra

The 19th Federal Convention of the Australian Water Association.
Contact: Quitz Event Management, PO Box 632, Willoughby NSW 2068, ph:(02) 9410 1302, fax:(02) 9410 0036, email: dbquitz@bigpond.net.au

SEDA seminars

- Compressed air systems: 24 April
- Motor systems: 7 June
- Hot water systems: 17 July
- Lighting: 28 August
- Heating, ventilation and aircon: 3 October
- Energy management: 27 November

Contact: Renata Bryce, Sustainable Energy Development Authority, ph:(02) 9249 6183.

Sustain 2001

8-10 May, 2001
Amsterdam, The Netherlands

The world sustainable energy exhibition and conference.
Contact: PO Box 77777, NL-1070 MS Amsterdam, ph:+31 20 549 1212, fax:+31 20 549 1843, email: sustain2001@rai.nl, www.sustain2001.com

Community Technology 2001

5-6 July, 2001, Murdoch University, Perth, WA

International conference on governance and sustainable technology in indigenous and developing communities.
Contact: Andrea Lee, Concept Connections, PO Box 235, Mount Hawthorn WA 6915, ph:(08) 9242 2232, fax:(08) 9242 2238, email: andrea@concon.com.au

World Solar Challenge

18-28 November, 2001
Darwin to Adelaide

Planned to arrive in Adelaide in time for the ISES 2001 conference (see below).
Contact: Chris Selwood, ph:(08) 8463 4690, email: wsc@saugov.sa.gov.au, www.wsc.org.au

ISES 2001 Solar World Conference

25 November-2 December, 2001
Adelaide, SA

Includes industrial developments and applications, energy efficiency, research, education, regional development and political issues.
Contact: Hartley Management Group, PO Box 20, Kent Town SA 5071, ph:(08) 8363 4399, fax:(08) 8363 4577, email: ises2001@hartleymgt.com.au

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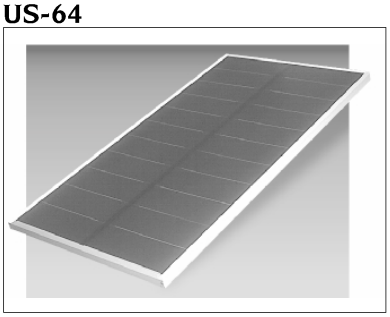

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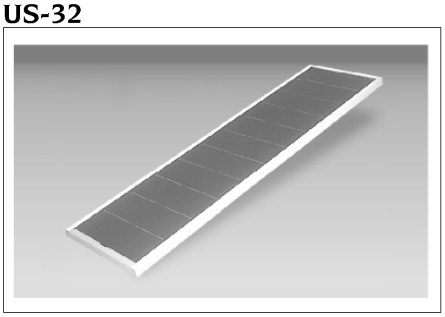

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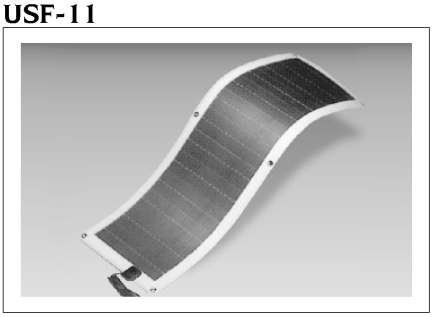

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[Kid's stuff]

Noel's Treasures from Trash

To make your own Solar water heater you will need:

- up to nine aluminium drink cans
- a thermometer
- a large (1.25 litre or more) PET drink bottle
- a smaller PET bottle a bit bigger than the cans
- some pieces of insulation, such as polyester batts and foil insulation
- white, green, brown and black water-based paints
- a newspaper
- ruled or graph paper
- a small funnel
- a paintbrush, sticky tape and some sandpaper

In the next issue we will look at making the solar water heater, but in this issue we will look at some of the design features that work best.

Begin by removing all of the paint from one of the aluminium cans so that it is shiny. It is easier to do this before you open it. Paint one of the other cans white, another one green and another brown. Now paint all of the rest black. Paint each can with two coats to make sure they are fully coated.

Once the paint is dry, take the white, green, brown and three of the black cans, and using the funnel, put 300ml of water in each can. Cut the top off the large bottle and make a small hole in the bottom big enough for the thermometer. Put this bottle over one of the black cans. Cut the bottom off the small bottle and slide this over another of the black cans.

Place all of these cans in a straight line out in the sun. After half an hour, measure the temperature of the water in each can and write these down. Keep taking the temperature of each can every 10 minutes after this until it doesn't change. The can with the highest temperature is the best absorber of heat. The idea behind covering the two of the cans is to see if preventing the wind from cooling the can allows it to work better. The can with the smaller bottle will stop convection (air moving from the heat of the can itself) around the can.

Now put the cans in the shade and see which one loses its heat the fastest and which one the slowest.

For solar water heaters, the best surface is a special nickel-chrome oxide surface which absorbs heat very well but does not lose it so quickly. However, the paint is expensive and hard to obtain so we haven't used it.

The next part of the experiment is to find out the best way to make the water keep its heat.

Wrap one of the black tins in insulation batt material and then wrap this with the foil insulation. Hold the insulation in place with some sticky tape. Wrap a second tin in a thick wad of newspaper (as thick as the batt material on the first tin) and also cover this with some foil insulation. Leave a third tin uncovered.

Carefully pour 300ml of boiling water into each tin, being careful not to wet the insulation. Record the temperature of each tin every five minutes. From the temperatures you will be able to see which type of insulation is best.

In the next issue we will make our solar water heater. This takes a bit of soldering, so you might want to get some practice at this.

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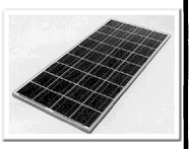
Outback Marine has teamed with Kyocera Solar to supply these high efficiency solar panel arrays. Call us for technical and pricing details. System packages available.



Blue Sea Systems

Originally designed for marine applications, Blue Seas offer a complete range of DC circuit breaker panels, circuit breakers, protection and wiring accessories.

Outback Marine Australia P/L

We specialise in DC-based energy systems for marine, RV and remote land based applications. In addition to our Australian distribution lines, we supply all products required to configure a remote area power system. Outback Marine market to resellers, trade and end-users.

Visit our website or call for a full-line catalogue.

www.outbackmarine.com.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.**

Fluoro interference

I installed a small one-panel solar power system for my neighbour. It has three different fluoro lights, two with inbuilt inverters and one with an aftermarket inverter fitted. They are wired separately to fuses on the power distribution board and the system isn't earthed.

All three fluoros emit RFI (radio frequency interference) which causes snow on the TV and noise on her AM radio. Is there some way of controlling the unwanted RFI?

Peter Schembri, Watagan NSW

This is a problem with many of the cheaper fluoro lights and inverter ballasts. This sort of interference can often be difficult to fix but one thing to try is to earth the system by connecting the battery negative terminal to an appropriate grounding point, usually metal water pipes embedded in the ground or a copper-clad grounding rod driven into the ground. These are available from electrical wholesalers.

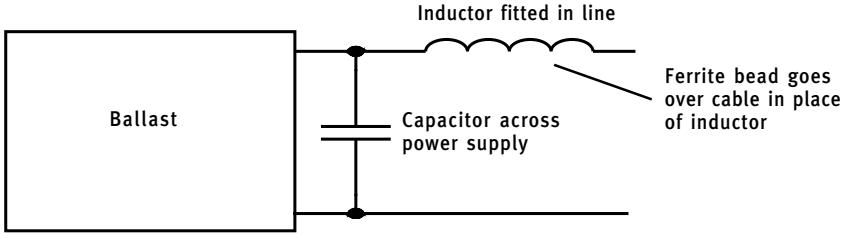
If you are planning to add an inverter to the system later you need to keep in mind that some inverters will fail to autostart if the battery is grounded due to their internal design. Connecting the battery negative to the system earth effectively also connects the battery earth to the inverter neutral as the neutral should be earthed in a properly wired 240 volt system. This bypasses the autostart circuit in some inverters, disabling the autostart feature, and may cause other problems as well.

Another option, and the one I would try first, is to place a 0.1uF polyester capacitor across each of the ballast power supply connections, right at the ballast itself. In addition, an inductive noise suppression choke or coil like those used to suppress interference in car stereos might do the trick. These are wired into the positive supply line of each light, also right at the ballast. These filters can be bought from automotive shops and electronics components suppliers like Jaycar Electronics and Dick Smith Electronics. I have done a simple diagram showing the placement of these components below.

Another simple option are ferrite beads. Normally designed for computer leads, these can simply be slipped over the power cables at the inverter. They are available in both solid or clip-over types, which eliminate the need to undo any wiring, as you just clip the two hinged halves together over the wire. These are also available from companies like Jaycar Electronics and Dick Smith Electronics.

While these suggestions may do the trick, there are no guarantees and some experimentation will be required. The interference may not just be coming from the supply leads, but from the internal wiring of the light between the ballast and the tube. You can't place filter components on these leads as they will interfere with the proper running of the lights.

Lance Turner



Battery alternatives

I just wondered what viable alternatives exist to lead-acid batteries. Lead is very unfriendly to the health and wellbeing of people and the environment.

Also, how much energy and resources go into the production of silicon solar cells, inverters and other renewable energy system equipment considering a life cycle of 25 years? How much of the installation is recyclable?

Gerd Herrmann,
gherrmann@uq.net.au

Lead acid batteries are a concern to anyone who knows the dangers of lead poisoning. However, there are few alternatives available at a realistic price. Nicad batteries are very expensive and cadmium is even more toxic than lead. Nickel-metal-hydride cells have yet to make it to our shores and current world prices for these cells are very high. Nickel-iron cells are a viable option, being relatively non-toxic and long lived, but they have a lower charging efficiency than lead-acid and again are not available in Australia.

The Vanadium redox battery is a viable contender for lead-acid battery banks and is made almost completely from recyclable plastic. It has been under development for some years and there are some demonstration systems running in Japan. The company developing the technology has a web site at: www.pinnaclevrb.com.au. There is no indication on their site of small home-scale battery plants being available yet.

When we will be able to buy a realistically priced replacement for lead-acid batteries is anyone's guess.

We have seen various figures for the energy debt of solar panels. It varies between the type of panel; monocrystalline panels use the most energy in manufacture, with polycrystalline panels second and amorphous panels being the lowest energy consumers (in general).

The worst recent figure I can remember seeing for the repayment time of the energy debt of a monocrystalline panel was around three years. I have seen figures of as little as nine months for amorphous panels, but this seems a bit low.

When you think about it, an 80 watt panel will produce a large amount of power over its lifetime. If we assume the panel is located where it receives an average of five sun-hours per day, then in 20 years it will produce 80 x 5 x 365 x 20 = 2,920,000 watt-hours, or nearly three megawatt-hours of energy. This is enough energy to run a 2400 watt heater continuously for over 50 days, which is a huge amount of electricity. It is hard to conceive that the production of any object weighing a mere eight or 10 kilograms could use anywhere near this much energy. At a retail rate of 12 cents per kilowatt-hour, this much power would be worth $350, or around half the retail cost of an 80 watt solar panel. Simply, you could not sell a panel for their current price if you were using that much energy to make it.

As for how much energy goes into the production of the rest of the system components, we are not aware of any full life-cycle assessments for items such as inverters, batteries and other equipment. Whether the panels in a system produce as much power as is required to manufacture and recycle all that metal, plastic and electronic componentry is unknown, but if anyone has any figures on this we would like to hear from them.

Lance Turner

Direct charging (sort of)

I am considering building a battery charger to store enough power in my caravan to run a small 70 watt black and white TV and an 18 watt fluorescent light on 240 volts for periods of up to four hours every night. I presently have a 4kVA generator which is used to power my meal time electrical appliances and I plan to divert some of this power into a 12 volt, 130AH wet-cell battery for my future nighttime needs.

I would also like to do all my recharging while the generator is being used at meal times to avoid any prolonged noise problems. I therefore require a power system which is relatively quick to recharge.

I read your article 'Build your own battery charger' in *Soft Technology* issue 52 but thought that I might build a charger using an induction motor powered off my generator and driving a car alternator to produce enough power to recharge the battery—about 32.5 amps at 14 volts DC.

My questions to you are:

1. Can car alternators provide 32.5 amps of current continuously over a period of two hours (my calculations for the time required to fully recharge the battery assuming that it is half discharged after four hours of nighttime use), thus avoiding any increases in recharge times?
2. Does the current flow from car alternators depend on their speed?
3. Can deep-cycle wet-cell batteries be continuously recharged with relatively high currents?
4. What size motor would I need?
5. What size inverter would I need considering the TV may create a small power surge on starting?

Some of the answers to my questions may be quite simple but I must admit that I am in no way an electronics wizz (far from it!) Any attempts to have my questions answered by auto electricians have been rather fruitless.

John Balnaves, Marryatville SA

A good car alternator should be able to provide the sort of current you are after. Just use a 55 amp unit, a 35 amp model is cutting it a bit close and would most likely not perform to your needs.

The current flow from the alternator depends on several things including the driving motor's ability to provide the input power to the alternator while maintaining adequate speed. Another factor is, of course, the load itself. Your batteries may not allow that much current to flow into them with an alternator output voltage of just 14 volts. You may have to adjust that voltage up a bit; some alternators have adjustable internal regulators, while others have external regs.

The recommended charge rate by most battery makers is the battery capacity divided by 10. This means a 130 amp-hour battery should be charged at no more than 13 amps. However, this varies from manufacturer to manufacturer, and even from model to model. Most batteries will accept a C/5 charge—26 amps for the above example—without damage.

Now we get to the tricky bit. Running the alternator from your generator via an induction motor is a very inefficient way of doing things. Most gensets don't really like large induction motors hanging off them and the overall efficiency of the setup would be quite low. If we work through the numbers, it could go something like this:

26 amps x 15 volts = 390 watts out of the alternator. Assuming a 50 per cent efficiency for the alternator, this means you need at least 780 watts input to it. This is just over one horsepower so you would need at least a 1.5hp motor, and most likely something larger, as there will be losses in the gearing up. Induction motors run at low speeds, typically 1,400 or 2,800rpm, depending on their design, and a car alternator has to spin much faster than this—possibly 6,000 rpm or more.

The upshot of all this is that the 4kVA generator won't be able to run much else if it is running your setup at full tilt. Most gensets are highly overrated—the rating usually assumes a resistive type load, not the reactive load of an induction motor.

A far more efficient setup would be to run a second belt from the genset motor directly to the alternator which would cut out a lot of energy losses. This may not be possible with your unit as many use a direct drive between the motor and the genset alternator.

Personally, I would look at either a more suitable genset, maybe with a high current DC output, or a good battery charger that is designed to work with gensets such as the RGS unit.

As for your inverter, most inverters have a decent surge capacity so a 100 watt inverter with a 400 watt surge would suffice. Note that the 70 watt rating of the TV is its maximum power rating and that it will usually draw quite a bit less than that while running. You should consider one of the smaller sinewave inverters like the SEA Piccolo—some TVs will suffer audio and video noise on cheaper inverters.

Lance Turner

High efficiency AC fridges

Low power consumption DC fridges have been around for some time, but energy efficient AC models have been very few and far between. The problem has been that they are available in other countries, but no-one has been importing them into Australia.

Renewable Resources Workshop has now started to do so and has a range of 240 volt AC Vestfrost fridges and freezers, all of which have a 5½ or six-star energy rating under the AS/NZ4774.2 standard.

The range includes a 200 litre/96 litre fridge/freezer, a 167 litre/96 litre fridge/freezer, a 330 litre fridge, and 239 and 312 litre chest freezers. These units have power consumption at 25°C of 407, 390, 184, 223 and 260kWH per year respectively, which is less than half the power consumption of the average fridge.

rrp: $2167; $2035; $1815; $1446.50 and $1595 including GST

Distributed by Renewable Resources Workshop, 1 Railway St, Colac VIC 3250, ph:(03) 5231 3593, fax:(03) 5231 1884, email: rrws@bigpond.com

Eliminate your air conditioner

Some time back we looked at a heat reflective coating called Ceratech. While this coating works very well (we have it painted on our office roof), it is imported from the USA.

An Australian version of this coating called Insulcoat is claimed to achieve up to 94 per cent efficiency in reflecting the sun's radiant heat energy which will reduce roof or surface temperatures by 40°C or more, according to the manufacturer.

Insulcoat is a waterborne acrylic based emulsion paint suitable for use on roofs of factories, houses, offices, workshops, trucks and caravans.

Northern Metropolitan Institute of TAFE recently installed Insulcoat on the roof of their buildings and temperatures inside the building have reduced by between seven and eight degrees and, in some cases, by up to 11 degrees.

Manufactured by Insulcoat, 119 Willoughby Rd, Crows Nest NSW 2065, ph:(02) 9956 3824, fax:(02) 9439 2157, email: benchmark@hi-speed.com.au, www.insulcoat.com.au

Smarter glass

There is no doubt that a lot of heat transfers through the windows of the average home, making the interior too hot in summer and too cold in winter. While double glazing can help reduce this problem, you usually need to replace the entire window and frame assembly—an expensive proposition.

ComfortPlus laminated glass from Pilkington is a tinted insulating glass that helps reduce heat, UV radiation and noise transfer through windows. According to the manufacturer, ComfortPlus retains over one-third more heat in winter than standard glass, thus reducing heating costs. It can also reduce noise transmission by up to 24 per cent and, being a laminated glass, it provides a greater level of security than standard plate glass.

The glass is 6.38mm thick and can be fitted to many standard window frames.

Manufactured by Pilkington Australia Ltd, freecall: 1800 810 403, www.pilkington.com.au

Fischertechnik goes solar

Fischertechnik is arguably the most versatile and technically oriented of the construction sets, having been used by many schools and universities to teach the concepts of design and engineering for many years.

While these kits have continued to evolve over the years with additions like computer controls and pneumatics, the range now also includes solar kits.

The Profi Solar kit uses a small crystalline solar module combined with a 10 Farad super capacitor for energy storage and a special low-power consumption motor to allow the construction of many solar models. The kit contains over 300 parts and comes with a 45 page construction booklet describing how to assemble eight models.

There is also a solar set available containing the motor, module and capacitor that allows the huge range of other Fischertechnik kits to be solar powered.

rrp: $218.90 for the Profi Solar kit, $94.60 for the solar motor kit inc GST.

Available from Procon Technology, PO Box 655, Mount Waverley VIC 3149, ph:(03) 9830 6288, fax:(03) 9830 6481, www.procontechnology.com.au

Inflatable solar still

Solar distillation has long been known as a simple and effective way to purify contaminated water, but most solar stills, either commercially or home made, are too large to be truly portable.

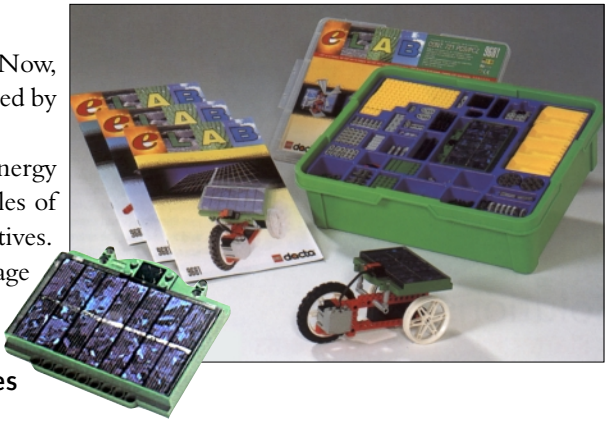
The Aqua Cone from Solar Solutions is an inflatable solar still that simple floats on the water it is to purify. This eliminates the need for refilling and the purified water can be simply siphoned off using either the in-built straw or valve.

The still can produce from 1.5 to 2.5 litres of clean water per day, is manufactured from UV resistant polyurethane, packs down to 530 x 150mm and weighs less than 2kg.

rrp: US$150

Manufactured by Solar Solutions LLC, 7915 Silverton Ave #307, San Diego, CA 92126 USA, ph:+1 619 695 3806, fax +1 619 695 3807, email: info@solarsolns.com, www.solarsolns.com

Solar Lego



Those little plastic blocks have been the focus of many young minds. Now, kids of all ages have the option of making their working models powered by renewable energy.

Aimed at the classroom, the new eLAB Energy and Renewable Energy sets from Lego Dacta give students an insight into the basic principles of energy use, storage and conversion as well as renewable energy alternatives.

Building modules include a solar panel, electrical generator, storage capacitor and lights, as well as the usual blocks, wheels and gears.

rrp: $478.50 for the Energy, Work and Power Starter Kit for eight students and $261.80 for the Renewable Energy Student Set. Prices include GST.

Available from Educational Experience, PO Box 860, Newcastle NSW 2300, freecall: 1800 025 270, fax:(02) 4942 1991, email: teachers@edex.com.au, www.edex.com.au

Low cost regulator

Let's face it—if you just want to set up a few solar lights or any other simple independant power system, you don't want to be paying hundreds of dollars for a regulator with all the bells and whistles when something a lot simpler would do.

Dick Smith Electronics have a 20 amp, 12 volt regulator for around $70 that should do the trick for many simple systems, especially those that use sealed lead-acid batteries.

The regulator uses a relay to switch the charging current, eliminating the heat generated by MOSFETs at high currents. The charging regime is simple—it charges the battery to 14.4 volts and then disconnects the charging source, reconnecting it when the battery voltage falls below 13 volts.

Other features of the regulator include a multi-colour LED to indicate what the regulator is doing, reverse polarity protection and disconnection of the solar panels from the battery at night.

rrp: $69.50

Manufactured by Maitland Enterprises P/L, 496 East Seaham Rd, East Seaham NSW 2324, ph/fax:(02) 4988 6655. Available from all Dick Smith Electronics stores.

Divert that grotty water

The SafeRain water diverter has been around for a few years now. It is designed to divert the initial dirty water runoff from the roof before it gets to your rainwater tank. Once a certain amount of water has been diverted, a valve closes inside the diverter and the rest of the water from the roof flows to your tank. The valve resets automatically once the rain has stopped.

Diverting the dirty water can improve the clarity and taste of the tank water and will reduce tank sedimentation. The valve can be installed in most tank systems and requires no special tools for installation.

rrp: from $120 to $150, depending on the model.

Manufactured by Safe Rain, PO Box 298, Blackburn VIC 3130, ph/fax:(03) 9894 3302, email: saferain@hotmail.com, saferain.hypermart.net

Inverter-connectable regulator

Selectronic Australia has long been known for its high quality inverters and have now added to its range a 60 amp (rated at 40°C) charging regulator.

The regulator works with Selectronic sinewave inverters that have Energy Management Mk II software installed. It is connected to the inverter and the charge parameters can simply be programmed by the inverter's keypad.

The regulator is suitable for either 12 or 24 volt systems and uses the pulse-width modulation method of charge control. The regulator measures 195 x 130 x 50mm, weighs 1kg and comes with a five-year warranty. An optional terminal cover is also available.

$324.50 inc GST. The optional terminal cover is $19.80 inc GST.

Manufactured by Selectronic Australia, ph:(03) 9762 4822, email: sales@selectronic.com.au, www.selectronic.com.au. The regulator is available from Selectronic distributors.

No, it's not part of the Starship Enterprise

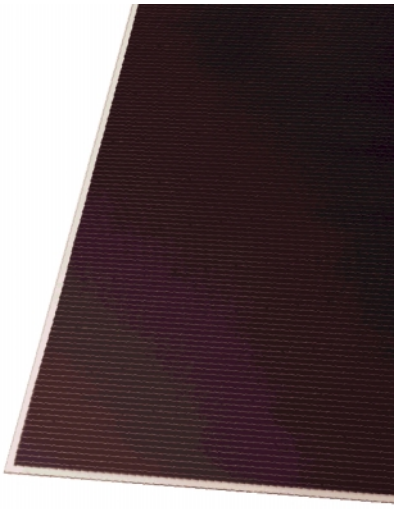
We have looked at pre-packaged RAPS systems in the past, but there has been little in the way of new products until now. Ergon Energy has developed modular RAPS system called the station**power**™ system, which has been designed to incorporate solar and/or wind power to reduce fuel usage and minimise greenhouse emissions.

The system uses a large battery bank in a purpose-built enclosure to store solar and wind generated energy for use at any time of the day or night. A diesel or LPG generator, housed in its own weatherproof canopy, provides backup power when needed. station**power**™ is designed to suit homesteads, outstations and working properties in remote locations.

station**power**™ is made in Queensland for Queensland conditions, is easily upgradable and can incorporate existing RAPS equipment including diesel generators.

rrp: POA

Manufactured by Ergon Energy Pty Ltd, PO Box 107, Brisbane Qld 4002, ph:(07) 3228 8222, fax:(07) 3228 8118, freecall: 1800 456 753, www.ergon.com.au



A solar first

Thin film technology is being used increasingly in solar panel manufacture. Thin-film panels have numerous advantages including good performance under partly-shaded conditions or heat extremes, low embodied energy and low cost (at least in theory).

Most thin-film panels are made from amorphous silicon, but one manufacturer, First Solar in the US, has started manufacturing its FS-50 series 50 watt modules using the material Cadmium Telluride (CdTe). These panels feature solderless interconnection between cells, frameless construction, integral cable with plug interconnections and a 10-year warranty.

The panels are designed to be integrated into the roof of an existing or new building, thus reducing both the cost of the panel and required roofing materials. The panels are designed for 48 volt nominal systems, making them ideal for large battery installations or grid interactive systems. They measure 1200 x 600 x 3mm and weigh 12.25kg.

Manufactured by First Solar, 28101 Cedar Park Boulevard, Perrysburg, OH 43551, USA, ph:+1 419 662 8500, email: fsinfo@firstsolar.com, www.firstsolar.com

AC/DC VCR

There are not many 'consumer goods' available for people with extra-low-voltage power systems, but now you can watch videos without the need for a dedicated inverter just for the VCR.

The Digitor 12/240 volt VCR comes with a 12V DC cigarette lighter lead and an infrared remote control. It features standby mode, rewind and reverse picture search, fast forward and forward picture search and auto repeat.

rrp $283 (incl GST)

Available from all Dick Smith Electronics stores, www.dse.com.au

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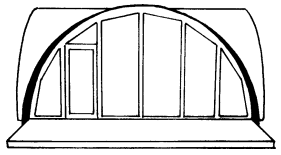

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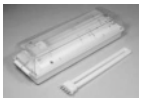

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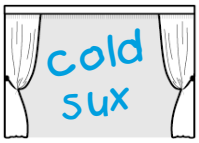

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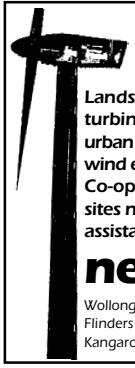

Landscapes jammed with turbines are just as ugly as urban sprawl, and will bring wind energy into disrepute. Co-operatives and mono-sites need additional policy assistance.

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Solar powered garden scarecrow

Rob Scholten

My entry into the *ReNew* build-your-own competition, 'Mr Flappa MK1', was built from readily sourced and recycled parts. He waves his arms up and down to ward off birds or cats whenever the sun shines on him.

Construction

The solar cells, motor, gears and brackets were bought from Dick Smith Electronics, while his body was cut from a floor board. His arms were made using recycled plastic forks, but you could use fly swatters for more effect.

After cutting his body from the floor board, a 60 centimetre length of dowel was screwed to his back for a stake to set him in the ground. Extensions were later added to improve their effectiveness. Holes were drilled at the tips of the handle and a quarter of the way down the length of each fork. The holes at the ends accepted the upper end of the link from the drive motor, while the other holes were for the pivot using screws into the wood body.

Three solar cells were wired in series to power a small DC motor, which turns a worm gear that drives two nylon gears. The larger gear has a hole drilled in it to accept a link to the arms.

The link between the arms and the larger gear was fashioned from a thick paper clip. A hole was drilled into the larger gear about 3mm from the edge, and the lower end of the link was bent and hooked into this hole. The gears rotate around thin screws which were screwed into the body.

In the prototype shown, the motor was secured with Liquid Nails, but later a metal bracket (also available from Dick Smith Electronics) was used for extra strength.

The three solar cells were glued to a piece of PCB (printed circuit board) which was then screwed to a 45 degree angled piece of timber. This was then attached to Mr Flappa's head to look like a hat.

Vaseline was used as a lubricant on the gears and as water protection for the motor.

Mr Flappa doing his job in the garden.

Possible improvements

With more powerful solar cells and a stronger motor, larger arms can be used. You may also wish to consider designing a plastic raincoat for him, to protect against rain or watering! ✲

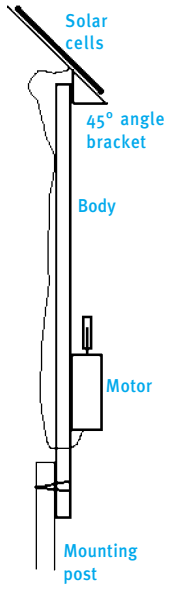
Parts

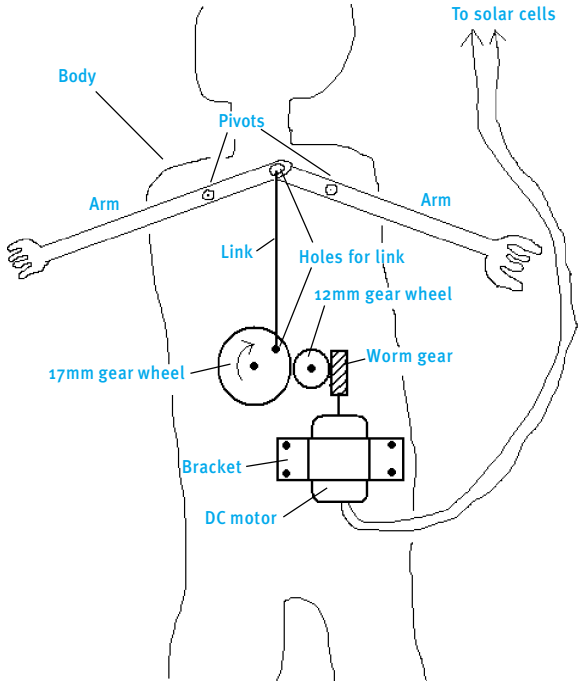
Solar cells: three 1 volt, 250mA, Dick Smith Electronics part# O2013 ($7.63 each)

Motor: 3 to 12 volt, 3600rpm hobby motor, part# P9000 ($1.58)

Gear wheel set, part# P9040 (approx $6.37). Use the worm gear, 12mm and 7mm gears from the pack.

Screws, wire, plastic forks, suitable wood base for the body.





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