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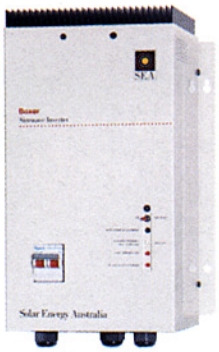

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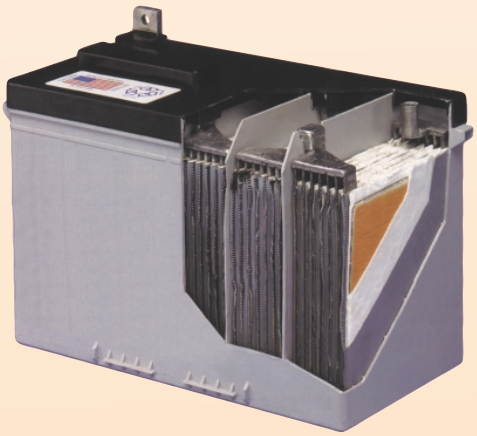

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Contents

Issue 79
Apr–Jun 2002

features

We trek down to beautiful Cape Schanck to visit a passive-solar home with rainwater tanks and a wind and solar system. Page 12.

Left: Visitors enjoy the 'city farm' atmosphere of CERES Environment Park, page 28.

Above: If you're going off-road, make sure your renewable power system is in good order, page 32.

Competition in the electricity market presents challenges for domestic customers. See the ranking of available green energy products on page 40.

Cover story: Fuel efficient diesel cars are the way to go for the aspiring 'biodieseler'. Our article looks at what's available, page 21.

Cover design: Many thanks to Drew Marshall of Radio03.

Build your own solar ceiling ventilator, it will help keep your home cooler in summer. Page 48.

regulars

If you want your food to be low on embodied energy, try this Dream-Pot. Products page 72.

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 $49 per year, and offers a range of other benefits.

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editorial

New growth for clean energy

The renewable energy sector is among some of the most exciting growth industries in the world—and the Australian industry is no exception. While this can be attributed to a number of recent market and legislative incentives, the over-riding impetus for the uptake in these technologies has been the ever more serious threat of climate change.

The Australian government's most significant legislative effort to date has been to stimulate the renewable energy industry through the introduction of the Mandatory Renewable Energy Target (MRET) in April 2001. This target obligates electricity retailers and large users of electricity to proportionally contribute to sourcing 9500 giga-watt hours of new renewable generation by 2010.

At the time of writing the MRET was yet to pass its first real test. On 14 February 2002 all parties that have made a 'relevant acquisition' are liable to surrender certificates to the Office of the Renewable Energy Generator, or face a penalty. The legislation requires that liable parties proportionally surrender 300,000 RECs, representing 300GWh of new renewable generation, or 0.24 per cent of energy purchased. In January 2002 up to 600,000 certificates had already been generated on ORER's web site—more than enough to comply with the first target.

Of the RECs generated so far, 231,000 have come from hydro electric generators, 158,000 from solar hot water, 102,000 from wind energy, 64,000 from landfill gas and 27,000 from sugar cane bagasse. The renewable energy sector is enjoying the boom in demand—next year the target increases to 1.1 million certificates. If industry criticism of the MRET is heeded leading to the penalty for non-compliance being increased and CPI indexed, and the over-all MRET rising significantly, it will ensure the industry remains healthy for a long time to come.

However, growth in renewable energy generation is only one side of the coin. It is essential that energy consumption is reduced as well and it's great to see the New South Wales government proposing to address this with its own retailer emission control benchmark (see report in Up Front) which aims to stimulate the renewable energy *and* energy efficiency industries.

Unprecedented growth is also happening a bit closer to home with a more than 15 per cent increase in support for *ReNew* and the Alterative Technology Association. Thank you to all renewing and new supporters of the ATA. We welcome you on board. Already the organisation is off to a great start in 2002 with the ATA being selected for the Australian Greenhouse Office's Victorian Cool Communities program along with the Western Bulldogs and CERES.

One of our happiest ATA members at the moment is Peter Shalless of Minto Heights in New South Wales, who won the *ReNew* Vestfrost fridge member/subscriber competition. Peter already has an appropriate fridge, so has decided to donate his prize to a family member who has hoards of children and a leaky fridge. Congratulations to all of you and thanks very much to sponsors Renewable Resources Workshop, The Energy Shop and Natural Technology Systems.

Kulja Coulston

Win one of four Sonnenschein

Rechargeable 6 volt lantern battery and charger packs

From M + H Power Systems

Valued at around $100

For the next four issues of *ReNew* we have one battery/charger pack to give away for the best build-your-own style article. You don't have to be a tech-head, just have a project, simple or complex, electrical or mechanical, that has appeal to do-it-yourselfers and involves renewable energy or appropriate technology in some form. It may be a regulator, pedal-powered generator, a solar cooker or anything useful, really, but it must be a completed working project.

Just send your ideas to: *ReNew*, PO Box 2001 Lygon St North, East Brunswick VIC 3057, email: ata@ata.org.au
Competition closes Wednesday 1 May 2002.

Wimmera Sustainable Living Fair

Sunday 14 April 2002, Longerenong College via Horsham

Keep this day free to learn about solar power, passive solar design, alternative building materials, organic food and farming, and more!

Also help launch the Alternative Technology Association Wimmera branch.

Site holders should contact Robert Binns for details and bookings. Ph:(03)5362 2222 (bh), email: rybinns@netconnect.com.au

Biodiesel plant trial

The Australian Biodiesel Consultancy and Collex Australia have built a trial biodiesel plant at Wyong on the NSW central coast (just above Sydney), to prove or disprove biodiesel on the Australian market and justify the capital outlay on the best available European technology to process biodiesel. The plant was completed in December 2001 and is expected to reach full production by early March 2002. The trial plant uses a simple base reaction then a very involved refining process that the two companies have developed. It takes eight hours for fats and oils to make their way through the process to produce a fully refined, saleable product. The oil is predominantly a mix of recycled cooking oil and tallow. In time it is hoped more testing will be done on emissions and power through recognised establishments like the EPA and the Australian Greenhouse Office.

For more information contact Paul Martin. Ph: (bh) (02)9891 0038 Fax: (02)9891 0039.

Biodiesel most climate friendly fuel

Biodiesel made from waste vegetable oil emerged as the most climate friendly fuel in a full life-cycle analysis of a range of transport fuel alternatives. The Australian Greenhouse Office used mainly overseas studies to examine the greenhouse gas emissions and air pollutants associated with low and ultra-low sulphur diesel and alternative fuels for use in heavy vehicles. Diesel, biodiesel and canola oil, gaseous fuels, hydrated ethanol-based fuels and 'light vehicle fuels' such as premium unleaded petrol were investigated.

While biodiesel was similar to diesel for affecting air quality, its greenhouse gas emissions were less. The study found biodiesel made from tallow is less climate friendly than that made from vegetable oil, particularly waste vegetable oil, due to the upstream methane emissions from cattle. For more information refer to the full study: http://www.greenhouse.gov.au/transport/lifecycle.html

Supermarket embraces bio-fuel

From April a British supermarket chain will be using chicken waste and cooking oil to power its delivery trucks. The Asda group produces 138,000 litres of cooking fat and chicken waste from its 258 stores. This will now be used to produce biodiesel.

NSW tackles electricity sector GHG emissions

Under a New South Wales government emissions reductions proposal, all NSW electricity retailers will be required to actively reduce the greenhouse gas emissions associated with supplying NSW customers with electricity. Electricity retailers will be required to reduce GHG emissions to five per cent below 1990 emission levels by 2007, or face a penalty. The target in 2007 is for per capita emissions to step down from current levels to 7.27 tonnes of CO_2 per capita. This represents a drop of 14 per cent compared with current emission levels.

Annual benchmarks will be set so that emissions are reduced each year until 2007. Retailers will pay a penalty if greenhouse gases exceed their annual benchmarks. The penalty would be a dollar amount per excess tonne of CO_2 emitted. The penalty rate has not yet been decided but the Government proposes to set the penalty at a level that is at least as high as the cost of complying with the reduction target. If the proposal takes effect as expected in June 2002, it will become the first state Government policy initiative in Australia to enforce GHG emission reduction requirements for electricity retailers. Unlike the Commonwealth's Mandatory Renewable Energy Target and consumer-driven Green Power schemes that focus only on increasing the supply of energy from renewable sources, the proposed scheme also supports energy efficiency and demand-side management activities. Under the proposal retailers are able to choose how they meet their emission benchmark – including measures such as reducing power use, increasing the uptake of renewable energy, running existing and new lower emission generators such as gas, and investing in carbon sinks.

It is proposed that monitoring and enforcing compliance with the benchmark scheme be the responsibility of the Independent Pricing and Regulatory Tribunal. The Government has also proposed that a registry be established to enable retailers to trade abatement, so as to facilitate cost-effective compliance with the benchmarks. It is expected that the scheme will encourage growth in the renewable energy and energy efficiency industries and make a significant dent in the amount of emissions associated with supplying NSW customers with electricity. The NSW Government estimates that the initiative will cost customers just $3.60 extra per annum on an average electricity bill of $650 pa.

Subsidy against sense

In response to price hikes of up to 15.5 per cent in the cost of electricity for rural Victorians, the Victorian government has announced a one-off $118 million 'special power payment'. The decision to subsidise rural customers of Origin and TXU to temporarily off-set the impact of price increases, has disappointed groups working in the area of sustainable technology.'This subsidy is a more than $100 million subsidy against sustainable energy in the regions where it is most cost effective. It is clear that the government cannot continue such a

large subsidy year after year, the sensible thing would be for it to introduce strong incentives for take-up of sustainable energy, both energy efficiency and renewables, in rural areas so that loss of the subsidy in coming years would have less impact on country people or continuation of the subsidy would be cheaper. Where is the $100 million subsidy to accelerate adoption of sustainable energy in rural Victoria, to match this short-sighted market distortion?,' said Alan Pears of Sustainable Solutions.

SHW in public housing

The Victorian government will be installing more than 600 solar water heaters in the public housing sector over the next two years. The initiative will save more than 300 tonnes of greenhouse gas emissions and reduce hot water bills by 60 per cent.

Champion tree choppers

Forest Conservation News reports that Australia's land clearing rate of 564,000 hectares per year is second only to Zambia's 850,000 hectares. It reports that 'Australians, always ready to advise Third World countries on how to manage their affairs, are turning their land from green to brown at eight times the average Commonwealth rate.' Australia is one of the four richest countries in the 54 Commonwealth member nations—Zambia one of the poorest.

FRC hits Victoria and NSW

Victorian and News South Wales households can now choose their own electricity retailer. Full retail competition came into effect on 13 January 2002. For people interested in learning more about the market and your position in it, contact your electricity retailer or see page 64 of *ReNew* for a helpful website.

Wind in the news

It seems that the growing wind industry is big news in some communities and reports that the South Australian government is deliberating on 40 wind farm proposals indicates that it will be for some time to come.

Reports about community opposition associated with siting issues have been most notable. Appropriate siting of wind farm developments is a contentious issue, especially if potential wind sites are located in coastal regions. This has proven the case in Victoria where communities in the Portland region and in South Gippsland are engaged in appeals processes against proposed wind farm developments and the location of wind monitoring towers. The National Trust has also called for a moratorium on wind farm developments in Victoria due to there being a lack of process at the state government level to address potential impacts of wind developments.

In response to localised conflict, the Victorian state government has announced the development of 'guidelines' to wind farm decisions, which are currently being drafted. The guidelines seek to clarify the situation by acting as a guide to the planning process. The guidelines are in line with a similar initiative published by the NSW Sustainable Energy Authority (see review page 68). The Victorian guidelines are expected to be released for comment in March 2002.

World Solar Challenge

The world's premier solar car event is an explosion of cutting edge research and technology plus wild enthusiasm. A field of 38 solar cars from 11 countries left Darwin followed by several demonstration vehicles, while a dozen solar bikes also raced from Alice Springs. Incredibly, the demo Swiss e-bikes zoomed along at 75kph while Hans Tholstrup tweaked less than two litres per 100km over the three thousand kilometre trip in a Honda Insight hybrid. The Annesley College demo car was popular, as it was a converted Holden Barina charged by a small rooftop array with its larger array and spare batteries carried by its support truck.

The advancements in reliability, aerodynamics, tyres, efficiency of photovoltaic panels, hub-mounted motors, controllers and batteries since the 1987 challenge has truly been phenomenal. While the media still likes to concentrate on the lack of air-con and space in these built for speed machines, the demo vehicles showed the long-term benefits of events like this.

Before the race even started, a battery fire got the local firefighters checking their manuals. No cars were hit by lightning this year despite some cars being slowed by huge storms. The usual roos, camels, willy willy's and strong crosswinds were also encountered with one car continuing racing after a third of its array flew off! Innovative mechanics borrowed locals' tools and even resorted to hammer work for some reluctant bolts. Duct tape was used for more than air-sealing when one car hit a sign and had to undergo extensive smash repair. More information: (www.wsc.org.au)

Finish line

The Dutch team, aided by space quality triple junction, 24 per cent efficient solar cells averaged 91.8kph to win this year's challenge. Both Aurora and Nuna threw down the gauntlet to Honda by beating their 1996 record average speed of 89.8kph. The solar cycle race was won by Eastern Fleurieau School with an average speed of 42.5kph, closely followed by the team from Malaysia. At the finish line all the entrants were on display and spectators enjoyed the model solar boats racing down a temporary pool while the model solar cars dashed around a track with a guide rail (www.modelsolarvic.net). One team was seen madly chasing its model car across the carpark!

Serious business! Model solar boats competing in Adelaide last year.

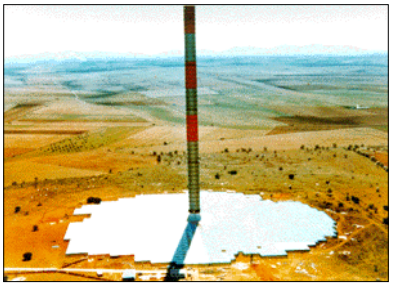
Bringing solar down to earth

With around 700 delegates from 57 countries, the Adelaide International Solar Energy Society and Sustainable Energy Industry Association of Australia conferences were bound to be interesting and challenging, as multiple parallel sessions packed in 14 keynote speakers, 18 forums, 330 papers, excellent poster presentations and a large exhibition hall. Key themes to evolve were energy security through distributed generation, growth in socially responsible investments and the potential revolutions possible through industry engagement, nano and bio technology, building integrated photovoltaics (BIPV), fuel cells and many other research areas. For a full report, see the article on the ATA website: www.ata.org.au

Fun at the fair. Paul and Matilda were just two of the more than 12,000 people who visited the Sustainable Living Fair.

Success @ the fair

Last November's Sustainable Living Fair, organised by the volunteer-based Sustainable Energy Foundation, exceeded most of its pre-fair expectations of food sales and visitors—despite it being a wet weekend. The fair offered something for everyone, with seminar programs, stalls and entertainment. SEF plans to run it again this year—we all look forward to another fantastic weekend.



The demonstration plant in Manzanares, Spain.

Solar chimney for Australia?

There has been a lot of talk about a 200MW solar chimney power plant to be built by Environmission near Mildura in Victoria. The plant is expected to cost $700 million and would be the tallest man-made structure on Earth. While this would be an interesting trial of the technology, it will not be the first by any means.

The first solar chimney power plant was built and commissioned in 1983, in Manzanares, Spain. The 50kW project was funded by a research grant awarded by the German Federal Ministry for Research and Technology.

This solar chimney was in operation for approximately seven years. The successful operation of this pilot plant led to the construction of two small-scale demonstration plants in Sri Lanka.

A 200MW solar chimney is also planned for Rajasthan in India by Energen Corporation. For more information on the proposed Australian project see: www.enviromission.com.au

Pacific Hydro in Chile

Pacific Hydro has signed an agreement to purchase the water rights for a 270MW hydro electric power project in Chile. Located approximately 150km south of Santiago in the Andes mountain range the project will supply power to the central region of Chile. The project is expected to start construction in mid 2003.

Wind best practice guidelines

The Australian Wind Energy Association has released best practice guidelines for wind farm developments in Australia. Designed to be the 'over arching' wind developers reference source, the best practice guidelines will complement the other publications produced to address concerns about the lack of formal planning frameworks for assessing wind developments. Compliance to the guidelines is voluntary, but AusWEA is encouraging all of its members and other developers to take them into consideration. AusWEA is continuing its dialogue with state and local governments to support the inclusion of guidelines in the regulatory frameworks.

[Letters]

Earthing feedback

One of the things I enjoy about *ReNew* is the technical quality of its articles. One I thought very good was the article on earthing in issue 78. It was well written and interesting.

I would like to add a comment on the question of unearthed systems.

The claim that these can be safer because it requires two faults to cause a fatality needs qualification. The claim is only valid if there is some way of detecting the first fault, otherwise once one fault has occurred the system is very dangerous because of the false sense of security it gives the user.

There are systems for detecting the first fault, involving connecting both conductors to earth through a high impedance—sometimes an auxilliary transformer. These have been used in hospital operating theatres, but, like all fault detection systems, can themselves cause faults. I strongly advise your readers to use proper earthing, even in isolated RAPS systems.

John Mills BE PhD FIEE
Chartered Electrical Engineer,
jmills@southwest.com.au

Strawbale home could be better?

I read your latest issue with interest and disappointment in the naivete you have shown in your promotion of Strawbale the 'Green' way...' a luxury home that is absolutely spectacular in its design, materials and sustainable systems'. A cost of $500,000 is a pretty good indicator that the house used plenty of resources in its construction, and one look at the photos reveals a minimal account has been taken of the sun's pathways and its usefulness as a source of heat. Orientation and thermal mass don't get much of a mention in the article despite their significance in environmentally friendly designs.

The house certainly looks spectacular and has an appealing aesthetic. And strawbale is all the rage with the more adventurous at the moment. The Dowmus Biolytic filter does produce unsterile effluent and unless that is chlorinated or treated with UV light (as with Michael Mobb's house in Sydney) then the local council does well to be wary, especially over the long term.

However, what I would like to see is some follow up on this house and others where ATA has featured some thing new and untested, for example, the building in WA where they incorporated a phase-change material into the concrete floor. I often tell visitors to my house about that concept. (In part because the salt production in Adelaide produces 100 tonnes per week of calcium chloride, the material used in the WA example).

I feel it incumbent on ATA to seek out hard data on these shining examples in line with the magazine's many other articles where analysis of ideas forms the backbone of the article and provides credibility to *ReNew*.

I enjoy and promote *ReNew* in many circles and since I commented on an earlier article in a similar vein I feel I must 'put up or shut up'. So, attached is a description of my efforts to build an ESD house which others can feel free to analyse!

John H Smith,
kawanda@senet.com.au

John, while the Greens' home could well have made better use of the sun's free energy, there are always limitations when it comes to suburban blocks, orientation being one of them. The figures from the home suggest that it is performing very well, with temperatures never exceeding 24 degrees in summer, and requiring minimal heating in winter, and let's face it, how it performs is the important thing, not that it sticks to an exact set of rules.

The cost of the home was attributable largely in part to the unusual shape of its features. This meant a great deal of extra labour was involved which increased the cost considerably. The materials used in the home were of low embodied energy and virtually all were of recycled origin. This is a far cry from the all new, high embodied energy of most new brick vaneer homes.

This house has generated enormous interest in strawbale building which has to be considered a positive step.

The phase change material system you mentioned has been looked at twice in past issues of the magazine, most recently in issue 71, where we showed how it is used in a residential heating situation. A follow-up article is certainly possible, and is something we will consider for a future issue.

Readers interested in John's house can contact him directly.

Lance Turner

More earthing feedback

I read with interest the article on earthing in the latest *ReNew* and would like to make the following comments.

I don't agree that it is only necessary to fuse the positive terminal. In my view, it is vital to be able to completely isolate the batteries for maintenance and to achieve this it is necessary to break both the positive and negative poles. We use a combined off-load, fused isolation switch unit, and find that the extra cost (around $200 or so) adds value to the system. Granted, it is a matter of conjecture as to which fuse will blow if there is a fault, but the point is to achieve isolation as well as protection.

If only the positive is isolated, or fused with a removable type cartridge, then there exists the very real possibility of an electric shock caused by either direct contact with part of the battery bank (as you are the return path via earth), or a shock caused by leakage currents across the top of the battery (especially with poorly maintained, dusty

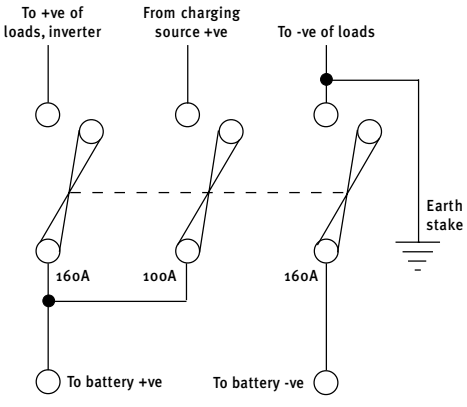
lead-acid batteries, as the dust becomes conductive in damp or humid weather).

Perhaps in very small systems based on automotive equipment in motorhomes and the like, a case can be made for isolation of one pole of the battery only, but as for 24 volt and above systems, electric shock or burns through accidental contact of an earthed structure by a misplaced spanner is a very real possibility.

Our isolation system gives both fuse protection and full isolation, disconnects the charging source at the same time to prevent damage to connected loads if the isolation switch is pulled whilst they are online, and gives the advantages of a solidly earthed battery negative terminal.

Note that the negative end of the charging source can be connected instead of the positive as shown. A solidly earthed battery negative also tends to reduce corrosion and leakage currents and has a lot to recommend it. That said, there is a case that can be made for a floating battery with neither pole earthed.

Regarding 240 volt earthing, in our workshop we use a 2kVA, 240 volt to 240 volt centre-tapped secondary isolation transformer, with the centre tap earthed. This gives a maximum voltage to earth from the output of 120 volts, which doesn't give as severe a shock as 240 volts does (experience talking here!). Of course, double pole GPO sockets are mandatory in this situation.



Transformers can also be used to break up earth leakage currents that tend to upset earth leakage circuit breakers. Such situations can easily be caused when installing temporary generator sets in place of an inverter. Especially since all rental generators are fitted with RCDs and the neutral of the installation is earthed (as it is in a MEN system), the RCD on the generator will trip as soon as it is closed due to the multiple earth paths existing.

As for lightning, if it decides to strike your power system, almost nothing can prevent damage, so keep your insurance cover up!

Peter Laughton,
Yellow Rock Green Power, NSW

Peter, earthing will always be a very difficult subject to write about, and I am sure many readers have different opinions again. However, I am not sure if a $200 fuse assembly will add value to a $20,000 plus system, but a good quality installation sure will.

I agree with the comment about dust build-up on batteries, a similar thing happens to some friends of ours. TV reception gets pretty bad at times, especially after a period without any rain, until some rain washes off the dust build-up on the insulators on the power lines out the front of their property.

As far as isolating just one pole of a battery bank is concerned, you have a valid point, but if I were working on the electrical side of batteries (as opposed to checking acid levels), I would simply disconnect the negative battery terminal, which will isolate the batteries anyway. A fuse in the negative side only saves two minutes of my time, but takes an extra 15 minutes plus the cost of parts to install, at the customer's expense. I doubt I would disconnect a properly installed system with good quality equipment eight times over its life. You just need to weigh up the pros and cons I guess.

The three-way switchable fuse assembly I use will provide isolation of load and charging sources, for around $70 plus fuses. Obviously, permanent connection rather than through a fuse gives a solid negative connection to earth.

As for floating systems, I did mention why there is a case for floating systems in the article, and the reasoning behind it.

As far as the 240 volt isolation transformer is concerned, if everyone had a workshop with testing equipment, I may have covered something similar to this, but keep in mind the article was written for the average person to try and grasp an understanding of why earthing is required, and how to do it properly. I also have a 240/240 transformer, only 300 watt though, which is great for the purposes you mention, but not necessary for home use. (I also have a small quantity of these for sale on my website too, plug plug).

I did actually briefly cover generator installation, including having to isolate the generator frame from earth. If the generator wiring is installed correctly this can be overcome, as the MEN on the genset will actually use the same earth as the system. I am yet to see a large transformer, such as the one you have, sitting in a customer's premises just waiting for a rental genset to come along.

Lightning is very damaging, like the wind turbine strike at Esperance, but not all lightning is that destructive and many strikes can be succesfully diverted away from your system. But keep in mind lightning is not the only cause of ESD, which is why good earthing will help prevent it from becoming a problem in the first place.

***Chris Stork**,*
K & C Stork Solar Power Consultants, VIC
www.kcsolar.com.au

A happy winner

I would like to let you know my solar hot water service I won back in August has arrived. I am absolutely thrilled to

Continued on page 71

So close, yet it feels so far...

Building at Cape Schanck, just over an hour travel from Melbourne, allows Judy and Rob Clayton to live their self-sufficient and quiet lifestyle close to their friends and family and the conveniences of the city

Imagine your children growing up actively conserving water and electricity; that you never had to yell for them to get out of the shower or to turn lights off when they are not being used.

Judy and Rob Clayton have fostered such a set of values in their children by the lifestyle they have chosen. At just three years old their son Brynn turns the television off at the wall when he's finished watching it and is conscious of the amount of water he uses when brushing his teeth. His 17 month old brother Riley will no doubt catch on, as he grows up in an electricity and water self-sufficient home where conserving resources is a way of life.

The Clayton's Cape Schanck home is located on a farm accessible only by travelling through remnant maleluca forest via a long and windy gravel driveway. On one side of their road is the beautiful Mornington Peninsula National Park which makes their property feel like a remote outcrop, far from the city.

Yet they are not so far away. Judy still drives the 1.5 hours to Melbourne's Victoria market every few weeks to stock up on bulk foods, and she and Rob work in nearby Frankston and Hastings. Sorrento, Portsea and other bayside towns are only a short drive away and their families live nearby.

They have neighbours, they just can't see them from their house. Instead their hillside home looks north over Port Phillip Bay and Bass Strait. On a clear day they can see as far as Queenscliff and can see the Spirit of Tasmania passing between Points Lonsdale and Nepean.

As Judy returned from her daily walk in the National Park she greeted us with: 'I bet you didn't know what you'd find when you got to the end of our driveway.' She was spot on. We'd been driving on dirt roads for some time and turned onto what we were sure was their driveway, but which after almost one hundred metres felt more like a very narrow tunnel through trees. We were beginning to think it was a walking track. Or the pathway to a secluded camping ground?

Eventually light ahead indicated a clearing. Then we emerged on an expansive farm and a very modern home and wind turbine came into view.

'There are very strict laws in the shire governing the removal of vegetation, so we applied only to remove the trees we absolutely had to. We took them out one by one and left them in the bush,' explains Judy. She and Rob love bush walking and they take advantage of their proximity to the National Park where they see birds, lizards, echidnas, wallabies and kangaroos on their wanderings.

The property and gardens

The Claytons know they are lucky to live where they are. Houses and blocks around them sell for millions—and that's without their view. Yet the Claytons are a typical young family forging a living and enjoying their lives.

Their property was Rob's inheritance from his family's 200 acre farm. His parents and brother's family also have houses on the farm and together help maintain the land, run cattle and agist horses.

Their house block was an empty paddock before they built the house. They have replanted it with mainly native plants and grow all sorts of fruit trees including avocados, apples, plums, olives, apricots, oranges, lemons. They have strawberries, rhubarb, zucchini, spinach, lettuce, herbs and other seasonal goodies growing in their garden.

The house has been there for just three years but their relationship with the block goes back much further than that. Rob is a sustainable living enthusiast and was determined to live unconnected to the grid and with a renewable energy system. Helped by his profession as an electrician, Certificate IV in Renewable Energy and membership of the Alternative Technology Association, he began planning his renewable energy system and measuring wind speeds on the block a year before they built the house.

Wind monitoring

Rob attached a borrowed anemometer to a six metre mast. He planned to leave it there for 12 months, but gusts of wind up to 150km/h destroyed the anemometer nine months into the monitoring. However, Rob had already gathered enough data to make an informed choice about the kind of turbine which would suit their needs.

The original idea was to run the house from solely wind, with a generator backup. He thought the winds were consistent enough—especially as the turbine would be mounted on a 19.5 metre tower. But what turbine would best suit their needs and conditions? He was tossing up between a Bergy and a Soma turbine and compared the manufacturer's ratings for turbine performance with the wind speeds and conditions he recorded. The process of comparison produced some impressive graphs and effectively made up his mind for him.

Renewable energy system

The Soma emerged as the most appropriate as it was shown to perform better in low wind speeds. While there are very high wind speeds for some of the year, Rob's data showed that there were significant lulls which would threaten their battery reserves and lead to exces-

sive use of a generator.

On a windy day the wind turbine produces up to 20kWh of electricity. Once the 1100 amp-hour Sun Cycle battery bank is charged the turbine dumps electricity to a 600 watt element inside the 370 litre Beasley solar water heater. Taking advantage of the Commonwealth's Photovoltaic Rebate Program, they have added a 600 watt solar array. In the past two years they have used their back-up generator just three times a year because to there was no wind or sun.

Through careful choice of energy efficient lighting and appliances, including an Asko 10505 washing machine and 24 volt Frostbite DC fridge, they require just 2.5 to 3.5kWh per day. Other loads include a microwave, toaster, television, hairdryer and video. They don't run all of the appliances at once—especially if the washing machine is in use as the system struggles. Their cooking is gas and they rarely use lights during the day due to the walls being light in colour and virtually the whole north wall is glazed.

It took some convincing before Judy agreed to live with a fully sustainable set-up including rainwater tanks, bore water and a fully renewable energy system. She didn't know anything about the technology and knew no one who relied on it. 'Before we built the house, I didn't know that it mattered the way a house was oriented on a block. When Rob was designing the system I was petrified it wouldn't work, even right up to when we moved in. But now I love it.

'I wanted to live in a normal house and that is what we have designed. The only thing we don't have is a dishwasher,' said Judy. 'Some of my friends call me a hippy, but we live more comfortably than we did before.'

Passive solar design

Judy is referring to the benefits of passive solar design. The choice of north-facing block was to ensure they emphasised the spectacular views over Port Phillip Bay to the north, but mainly to maximise their solar gain. They worked with an architect and used a builder for most of the work except the electrical side and the trenches.

Their house is guaranteed to remain a comfortable temperature all year round, despite being on the south coast of Victoria. When we visited it was at the end of a week of rainy, overcast Victorian summer weather. The house was still 20 degrees Celsius without any help from the wood heater—which apart from the sun is the only heater in the house. It is also used as a back-up for the solar water heater.

Well insulated and constructed using heable brick and with double-glazed windows in most rooms, the house retains heat in winter and remains cool in summer. So much so that one evening, when there was a cold snap after a fine warm spring day, a snake headed straight for the warmth of their house. Much to Judy's horror it nosed its way through a fly screen door and curled up under the TV, enjoying the warmed tiles.

Solar phone

The main hiccup in the building process was having a phone installed. Telstra told them that if they, at their own expense, dug a trench from their house to the road, its technicians would run a cable and connect them to their neighbour's line. So Rob and Judy hired a trencher and with some help from Rob's brother got to work digging a 900 metre trench to the road. 'It was the worst job of the whole house,' said Judy. 'We worked through the pouring rain and there were just so many tree roots, as you could imagine when you look at our driveway.'

After they completed the job the technicians arrived and laid the cable, only then deciding that it would be too expensive to extend the line.

'They then suggested a radio antenna with a solar panel,' said Rob. 'Which is exactly what I had said we would need from the outset. We now have 900 metres of cable under the ground doing nothing!'

The phone system they have is the first in Victoria and runs from its own battery and solar panel which ensures they don't have their Selectronic SA31 inverter running just for the phone. When a call comes in or goes out the transceiver is automatically activated.

Water system

All of the water used inside the house comes from two 18,000 litre rainwater tanks. It is a gravity feed system so the rainwater is pumped to a header tank located above the property.

The toilets are plumbed to flush using rainwater on bore water, as they have a temporary connection to a bore located on Rob's brother's property. In rare times of low rainfall, they can swap over to bore water to flush. All of the external taps and irrigators use bore water. Eventually, when their dam is repaired, they will disconnect from the bore.

The local council did not permit a composting toilet system so they chose a septic system with a sand filter.

Future

Unsurprisingly, they never plan to move. Despite being great travellers and having visited almost every continent between them, they have settled on their little bit of paradise. 'I would just love to be able to share this with others,' says Judy. 'Perhaps one day we will build a little cottage down the hill where the best view is so people can come here for inexpensive holidays.'

Until then it's theirs alone—unless you count the resident kookaburras and kangaroos. ✲

10kW Turbine at Wilson's Promontory, Victoria

Retrofitting in the Sunshine State!

Trevor Berrill and Susan Phillips

We trooped into the seventeenth real estate agent's office, bearing our list of about forty energy efficiency/passive solar design criteria. The agent's eyes glazed slightly. 'Er, have you thought about building from scratch?' he asked tentatively. There were only two blocks of land he could show us that were not covered by restrictive building covenants. One was on a tidal flat, and the other was too far from shopping and transport facilities. We had been searching for almost two years for either a building block or an existing home which we could retrofit to meet our exacting requirements.

We had looked at innumerable trendy, Queenslander-style homes in inner Brisbane. Eventually we conceded that despite their undeniable aesthetic appeal, the popular ideal of cool summer verandahs of the Queenslander is not always a reality. The Queenslander often has poor thermal performance due to a lack of insulation and thermal mass. Also, while their roofs can be insulated, the walls of these homes are often partial single skin and can't be improved thermally. However, the brick and tile alternative shown to us by real estate agents, who often didn't even know which way north was, held little appeal.

Our home

Finally we found a home that had some potential to improve its energy performance and that we liked the look and feel of. It was a two storey, 'slab-on-ground' house with brick and western red cedar walls, cathedral ceilings and a metal deck roof. And it was in my favourite location for one of my hobbies, wind energy research (or more commonly called wind surfing). Wellington Point is on the edge of beautiful Moreton Bay and therefore has the moderating climatic effect of the sea breezes in summer. From an energy efficiency aspect, the house had some good and bad features. Even without any modifications I could see that the house would perform moderately well in Brisbane's climate, but there was potential to improve it further and reduce energy use in the process.

The roof fortunately was insulated with a fibreglass/reflective foil roofing blanket but this is always compromised in cathedral ceilings as the fibreglass is squashed between the battens and roof sheeting. Still, some insulation is better than none and it can be improved with added insulation between exposed beams if necessary.

The architect had incorporated some solar design with a large north facing clerestorey to transfer light and warmth (in winter) to the southern rooms. He also located the living areas and kitchen to the north with sleeping areas and facilities to the south. The long axis of the house had to run north-south due to the land shape rather than the preferred east-west orientation. This is not the dilemma that many assume, provided good energy efficient design principles are

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used, but it does make the design process more challenging, particularly in utilising natural light. The previous owner had used trees along the eastern and western sides to provide shading to both the walls and windows.

There were problems though for both winter and summer performance when we moved there in June 1999. In winter, there was too much shading by trees of north facing glass for the living area. The clerestorey was made of a smoked glass with only a 50 per cent transmittance. Both these factors restricted solar gain to the northern and southern rooms. In summer, the dark brick walls act as a good absorber where they are exposed to direct irradiation and there was one large wall of east facing glass that was causing mid-morning overheating in summer and significant heat loss in winter. Inside the home, many lights in the main living area were 100watt incandescent spot-type fittings.

Energy systems and energy efficiency

We started with some simple measures. Some trees had to be pruned and one large silky oak on the north-western corner removed in order to get solar access back to the living room and the northern roof. Fortunately the silky oak was able to be used and has been milled into some very useful timber. The living area now has good exposure to winter sun and a dark slate floor that acts as a great absorber in winter. I have measured 30 degrees in surface temperature on the slate where the sunlight falls directly on it in the winter months. This absorbed energy re-radiates to heat the living area during the cool winter nights.

Our home has now been retrofitted to be fully solar powered. An existing 13-year-old Solahart system was replaced with a new 180 litre Solahart Black Chrome system in July 1999. It was estimated that this would provide over 90 per cent of the hot water energy demand for two to three people. Hot water demand has been reduced by 50 per cent from 100 litres to 50 litres per day through water-saving shower nozzles. LP gas is used to boost the hot water in rainy weather. Gas was chosen as it provides boosting during power outages and is quick to boost if we have guests. This system is very cost effective with government rebates and has already paid for the extra capital cost compared to a high efficiency gas instantaneous water heater.

The north-facing roof now has a 1.36 kilowatt photovoltaic (PV) power system (16 x 85 watt Solarex modules), installed in July 2000. The photovoltaic system is a grid-interactive system and I estimated that it generates about 5.5kWh of energy on average each day. This provides about 60 per cent more energy than our daily demand of 3.5kWh per day. Any excess is sold to the electricity retailer, Energex, to offset greenhouse emissions from our other activities such as car use and gas appliances.

The photovoltaic panels are mounted on adjustable frames. They are set at 20 degrees in summer (the roof pitch), 30 degrees in spring and autumn and 40 degrees in winter. This ensures the maximum amount of energy is collected throughout the year. This system should generate an income of about $400 to $500 per year at current electricity buyback rates from Energex including Renewable Energy Certificates (as of July 2001). This size system would typically cost around $5000 to $6000 to install with Government rebates. Note that this is the most expensive part of our system with a slow return on investment. The easiest option for most people is just to purchase 'green power' from your local electricity retailer. However, our goal was to generate more than we used to partially offset other fossil fuel uses and allow for a small electric vehicle later.

Many energy efficiency measures have also been employed in the home, including energy efficient lights throughout. This immediately reduced the lighting electricity demand by 70 per cent. A five-star front loading washing machine reduces water and energy used. Switching all electrical appliances off at the wall avoids stand-by energy wastage. LPG is used for cooking. These measures have reduced our electrical energy demand to 3.5kWh per day. The gas demand is about six Megajoules per day. This is equivalent to 11.5 Megajoules per person per day of primary energy from coal. By comparison, the average home in Queensland uses about 20kWh per day for 2.2 people. That's equivalent to about 102.3 Megajoules per person per day of primary energy from coal.

The clerestorey smoked glass was reglazed with clear laminated glass to almost double winter solar gain. It was fitted with an adjustable roller shutter (shown partially closed on the lead photo). This shutter is used to control excess summer heat gain and to insulate the glass at night in winter by trapping a layer of stationary air against the glass. I estimated that this would reduce winter heat loss by about 10 Megajoules per night on colder winter's nights as the warm air inside accumulated against the clerestorey glass and the temperature outside dropped to about six degrees. This saves the equivalent of a one-bar electric heater run for about three hours.

Another area of environmental concern to us was out-gassing from any materials that we might use in renovating the interior. The kitchen was renovated using Tasmanian Oak treated with natural oils (OrganOil brand) rather than polyurethane. This finish is lasting very well after 2.5 years and will only require a light rub with an oily cloth every two years. And it smells great. We have used OrganOil products to protect exterior timbers as well. All painting inside has been with low out-gassing plastic paints. New shelves have been constructed in plantation radiata pine rather than particle board.

Living with solar energy

I have been monitoring the results of these various changes since we moved in. For example, temperatures are measured both upstairs and downstairs using indoor/outdoor minimum/maximum digital thermometers. The PV system's output is measured with the separate energy meter provided by Energex. The solar water heater's boosting time is recorded. From this the gas energy consumption can be estimated.

All this has confirmed that my initial computer modelling of the performance of the solar water heating system, PV system and building envelope (using the BERS home energy rating software) was reasonably accurate.

The solar water heating system has provided over 90 per cent of our water heating consumption even though we received more winter rains in 2000 than the average and this is when we need the most hot water. The PV system had generated the estimated 5.5kWh per day on average and we have received two payments for excess energy to date.

The internal temperatures in the building have improved. Winter inside minimum temperatures have risen from 13 degrees Celsius to about 16 degrees when it's 6 degrees outside. In summer, inside temperatures are always cooler than outside in the hottest part of the day. The worst we have had was 31 degrees downstairs and 33 degrees upstairs when it was 38 degrees outside during a heat wave for a few days in summer 2000. Mostly, inside temperatures in summer rise to about 28 to 29 degrees Celsius on 30 plus degree days.

In winter, temperatures are mostly around 18 to 20 degrees Celsius inside from about 10am to about 10pm.

Future plans

We have more to do of course. Future plans include:

- Reflective foil insulation of walls where possible. This is possible in some areas as there are no eaves over two large walls; this allows access to the wall cavity to insert insulation;
- Removal of the eastern glazed wall and rebuilding as an insulated wall with two windows appropriately shaded;
- Shading over exposed eastern and western windows. This will consisted of a slatted pergola with the slats angled to let in winter sunlight but shade in summer;
- Grey water recycling, rain water collection and use, and water efficient toilets and irrigation; and
- A Permaculture garden.

All in all, it's been a very rewarding and empowering experience.

Trevor Berrill can be contacted on:
ph:(07) 3207 5077,
email: tberrill@powerup.com.au

Grid Interactive PV System - Technical Details

Location
Trevor Berrill and Susan Phillips Home
Wellington Point, QLD 4160
Number and type of PV modules: 16 x 85 Watt BP Solarex MSX85

Array
Nominal max power: 1360 watts peak (at 1000W/m^2 and 25°C cell temperature)
Actual measured maximum output: 1050 watts (at 1000W/m^2 and 55°C cell temperature measured in August)
Configuration: One string of 16 modules in series
Typical open circuit voltage: 300VDC (at 55°C cell temperature)
Typical operating voltage at maximum power: 230VDC (55°C cell temperature)
Typical operating array current at maximum power: 4.6ADC (55°C cell temperature)

Mounting Frame
50 x 50 x 3mm aluminium angle with adjustable tilt angle from 20 degrees (summer) to 40 degrees (winter) in normal operation.
Orientation: Magnetic North

Inverter
Fronius grid interactive. Maximum output 1050 Watts, 240VAC, 50Hz
Average Efficiency: 90 per cent

Installation features
Isolation of aluminium frame from colourbond roof with flashing tape.
Routing of cables and flexible conduit to minimise water penetration to J-boxes.
Can raise and lock arrays at 80 degree tilt for maintenance.
Transmission distance: two 25 metre runs for two 8-panel strings connected in series at DC isolator near inverter.
Transmission cable: 2.5mm^2
Measured voltage drop at full output: 2 volts or 0.9 per cent

Measured system performance
Average Daily Energy Output: 5.5kWh
Household Daily Energy Demand: 3.5kWh

Biodiesel car review

Wanting to trade in your petrol guzzler for a fuel efficient 'biodiesel'? Phil Calais shows us what's on the market

Okay, chocolate, ice-cream (chocolate), mangoes, soy milk,muesli...what else do I need from the shop...What the...!!' BLAM! 'Oh, sorry. I didn't see you...' she explains.

So ended my shopping trip as the oncoming Toyota Seca veered across the road and wiped out the front end of my Laser.

Although still drivable, this incident provided further impetus to replace the decrepit old bomb with something a bit more user—and environment friendly. At about 10L/100 km (it's the 'Sports' version of the Laser) it's not difficult to find something more fuel efficient. But what?

My partner, Martina, and I were very interested in the electric-petrol Toyota Prius hybrid, but at $40,000 (which is $12,000 more than it sells for overseas) and, at the time when we were looking, not available in Australia, it wasn't really an option.

How about a diesel vehicle then? Okay, so maybe a Landcruiser or a Patrol isn't the most fuel efficient 'car' around, but if it's running on biodiesel, well then maybe they aren't too bad as far as life-cycle greenhouse gas emissions go. But once again, to get a fairly recent model the purchase price was way over our budget.

How about a diesel car then? A what?

A diesel car! Something small, fuel efficient, cheap to buy, cheap to maintain, and will run on the smell of oily fish and chips!

I knew that these exist, as when I was in Europe a few years ago, diesel cars were (and still are) almost as common as petrol cars. Almost every car manufacturer in Europe makes them—Mercedes, BMW, Volkswagen, Audi, Volvo, Fiat, Peugeot, Ford, Nissan and Toyota. You can even get an Opel Omega diesel—the German GM equivalent of a Holden Commodore! What's more, in many countries such as Germany and Austria, biodiesel is available at many filling stations, and usually for less that petrol and petro-diesel. But in Australia?

Phil's '93 Corolla CE. They get about 5.3 L/100 km or 53 mpg – and that's with the air conditioner on most of the time! This compares with 8L/100 km (35mpg) for the petrol version.

Quite by chance, Hugh, a work colleague of Martina, and who spends his time flitting between a job in Sydney and a secondment in Perth (where we are) recommended a Toyota Corolla. It turned out that while he is in Perth, the university where they work usually hires a car for him—a Toyota Corolla diesel.

My first port of call were some of the local Toyota dealerships in search of a Corolla diesel. 'You wanna what? No such thing! Oiv been working ere fah 13 years and Oiv never seen one!' was a typical response.

Well, next stop, the VW dealer. A friend in Germany has a diesel VW Golf and it really is a superb car. Fast (200+ km/h), fuel efficient, nice to drive and comfortable. You need that when you're stuck for 18 hours in a 50,000 vehicle traffic-jam on the Autobahn. On asking the salesman about a diesel Golf, a rather sad, wistful look spread over his face. He immediately brightened and then asked 'Oh, so you want a really fuel-efficient car do you?' and then the sad look once again appeared on his face. 'We did import some a few years ago, but no one wanted them. We ended up almost giving them away, so we stopped importing them.' He then went on to say that the petrol Golfs are also very fuel efficient and get about 6.5 litres per 100km, to which I commented, 'But the diesel gets about 4.5 litres per 100!'

'Oh no! You don't get anything like that! We found that you should get at least four per 100 and if you're a careful driver you should get 3.8 or so...'

Three point eight! That's 74 miles per gallon. This is the same as the ultra-high-tech Honda Insight petrol-electric hybrid and 20 per cent better than the

Toyota Prius hybrid! But this is not the end of the story. The VW Lupo with a turbo-diesel engine is 30 per cent more fuel efficient than the Insight and nearly 60 per cent better than the Prius.

Anyway, to cut a long story short, I finally found some Toyota Corollas, Camrys and Soarers, some Mazda 626s and Bongo vans, a Nissan Serena van, some Peugeots, and of course, various Mercedes diesels.

So to save people the legwork of running around trying to find their ideal (bio)diesel car, I've compiled a bit of a review to give a few tips and info about buying your dream veggiemobile or mad-cow car.

What's available and a bit of an explanation

As I previously mentioned, small and fuel-efficient diesel cars are available, and the 4x4 urban assault vehicles commonly seen dropping the kids off at kindy or picking up a litre of milk from the corner milkbar isn't the only choice for the aspiring biodieseler.

Many car manufacturers make a wide range of diesel cars but in most cases availability in Australia is limited. I've tried to list what is available here as well as some that aren't but probably should be. While some new diesel cars are imported into Australia, many are second-hand imports from Japan. Unlike in Australia where many folk hang on to their old bombs for ever, in Japan the turnover is very fast and used cars are exported for parts or as-is to third-world countries like India, Mongolia, Peru and Australia. One of the Australian laws regarding imports of these types are that the vehicle must be at least five years old and not imported and available from the main importer. I understand that these laws are about to change and in the future it will be even more difficult to get these sorts of vehicles.

The VW Golf comes in many variations, from the standard 50kW model through to the 110kW turbo-charged four-wheel drive model.

New cars are usually available at the local agent or dealer while the second-hand imports are available from small importers (who can usually import no more than 50 of a particular model) and occasionally at second-hand dealers. Have a look in the Yellow Pages under 'motor vehicles, second hand' or similar.

Something that you need to be careful of if you do decide to buy a second-hand imported car is the availability of parts. While some of the special imports have the same body as the standard models and often the engines are identical to those in four-wheel drives, this isn't always the case, and even something as trivial as a broken windscreen can cause a major drama and a big hole in your pocket as the part may need to be especially imported from Japan or elsewhere.

I haven't listed everything that may be available and it's impossible to give a complete and up-to-date list, as the manufacturers are constantly changing models and the importers of both new and second-hand vehicles import different models from year to year. Occasionally some unusual or rare model (for Australia) may turn up, either as a private import, as a test vehicle or with a batch from a small importer. If you are after a particular model and you're in no particular hurry then it's worthwhile asking the dealer or importer if they can get what you want.

The specifications and figures that I've given are the official ones for the latest model cars and may differ slightly for a model that is a few years old. I've found that the official fuel consumption figures are often rather conservative and you can usually get a bit better than the official test results. There are often three test figures quoted, these being for the American 'highway cycle' and 'city cycle' and the 'Euro' or 'combined cycle' which is based upon a mix of high-speed highway/freeway driving and stop-start city driving.

Finally, in several places I quote the 'Euro' emission specs of the car. In Europe there have been a number of progressively stricter emissions standards introduced over the last decade or so for vehicles and fuels. In Australia, emission control for diesel vehicles (which are preferred by the transport industry) is almost unheard of as a result of the transport industry lobby doing their best to ensure that Australian emission control standards for diesels have lagged by a few decades behind Europe and Japan (where they were pretty antiquated anyway).

The European standards are called Euro 1, 2, 3, 4 and 5 and apply to both petrol and diesel vehicles as well as fuel quality. For diesel vehicles the standards specify the amount of pollutants such as particulates and nitrogen oxides (NO_x) that may be emitted per kilometre while for fuels it specifies such properties as the permissible amounts of sulphur, polyaromatic hydrocarbons and properties such as density and viscosity.

It's interesting to note that our 1993

Corolla is Euro 2 compliant although there is no requirement that new diesel vehicles in Australia be Euro 2 compliant until January 2002 and Euro 3 compliant by January 2006. Most new European and Japanese diesel cars are already Euro 3 or even Euro 4 compliant. Assuming that Euro 4 fuels were to become available (and biodiesel probably is) then a Euro 4 car will have particulate and NO_x emission levels about the same as for petrol cars running on LPG. Of course, with biodiesel the life-cycle greenhouse gas emissions are 50 to 70 per cent less as compared to using LPG.

Holden

Back in the late 1970s and early 1980s, Holden sold a number of Japanese-made (Isuzu) Gemini diesels. From second-hand sources all I heard was bad things about these (smokey and slow). However I recently met a few people that used to have diesel Geminis and they all said that they were fantastic cars. One guy said it was the best car he ever had, praising its fuel efficiency, reliability and low maintenance and he still regrets selling it. I believe they came with a 40kW (55hp) motor and used about 6.9L/100 km (40mpg) but a few simple modifications would substantially improve the performance and reduce fuel consumption.

The VW 3L Lupo – the world's most fuel efficient mass-produced internal combustion engined car.

Toyota Corolla

Once you've discovered your local diesel Corolla importer, you probably won't want to go any further.

These are available as a sedan and station wagon and are a very neat, cheap and versatile car. Be warned however that parts for the station wagon (panels, rear and side windows et cetera) may not normally be available in Australia! The sedan has supposedly the same body as the petrol version and the same motor as the older two litre diesel 4x4 Hilux and *shouldn't* pose any problems. To date the only problem I've experienced was with a towbar, as the bolt holes didn't quite match up.

Most imported Corollas have automatic transmission but there are a few five-speed manuals around. As well as being a bit more fuel efficient, they also accelerate faster, are quieter and generally nicer to drive. Models with different seats, mediocre or very mediocre radio, power windows and others options are available.

Toyota Camry

The Camry is similar to the Corolla but somewhat larger. It is also available with the two litre engine as well as a 2.4 litre and I believe there are also some turbocharged versions about. Probably, the 2 litre Camry, being a bit bigger and heavier than the Corolla, would be a bit slower. I'd expect the 2.4L and turbo versions would perform quite well but as I haven't been in one, so I can't say for sure.

Toyota Soarer

The Soarer is the larger, luxury Toyota sedan and I believe it's also sold with the Lexan badge. The father of a friend has the petrol version and reckons it's a

Manufacturer	Model	Engine	Turbo	Power (kW)	Power (hp)	Torque (Nm)	Gears man/auto	Curb weight (kg)	Acceleration 0-100km/h	Fuel consumption L/100 km (mpg)			Emission control standard	New price (RRP)	Secondhand price	Notes
										City	Highway	Combined				
GM Holden	Gemini		No	40	55		4					6.9 (41)				Manufactured late '70s - mid-80s
GM (Opel)	Omega	2.2 L	No	88	120	280	5	1670	12.5	9.6 (29)	5.6 (50)	7.1 (40)	Euro 3			German version of Holden Commodore
Toyota	Corolla CE100	2.0 L	No	66	88	220	5/4	1120	12.9			5.8 (47)	Euro 2		$9,000 - $12,000	I got 5.3 to 6.5 L/100 km.
	Camry	2.0 L													$12,000 - $17,000	
	Camry	2.4 L													$14,000 - $18,000	
	Camry	2.4 L	Yes												$14,000 - $18,000	
	Soarer	2.0 L													$15,000 - $20,000	
	Soarer	2.4 L													$16,000 - $20,000	
	Soarer	2.4 L	Yes												$17,000 - $25,000	
Mazda	626	2.0 L	No	81	108		5		11.5	6.4 (44)	4.5 (63)	5.2 (54)	Euro 3			
	626	2.0 L	S/C													Supercharged
Volkswagen	Lupo 3L TDi	1.2 L	Yes	45	60	140	5/4	930	14.7	3.6 (78)	2.6 (110)	3.0 (95)	Euro 4			Not available in Australia
	Polo 50 SDi	1.9 L	No	50	67	150	5/4	1236	16.9	6.8 (42)	4.1 (68)	5.1 (55)	Euro 3			In the past, a few biodiesel Polos and Golfs have been imported but currently are not.
	Polo 60 TDi	1.9 L	Yes	60	80	180	5/4	~1200								
	Polo 81 TDi	1.9 L	Yes	81	108	225	5/4	~1200	10.7	6.5 (43)	4.0 (70)	4.9 (57)	Euro 3			
	Golf 50 SDi	1.9 L	No	50	67	133	5/4	1169	17.2	6.9 (41)	4.2 (67)	5.1 (55)	Euro 3	~ $35,000	$20,000 - $25,000	Imported ~ 96 - 98
	Golf 66 TDi	1.9 L	Yes	66	88	210	5/4	1303	13.1	6.6 (43)	4.2 (67)	5.0 (56)	Euro 3			
	Golf 74 TDi	1.9 L	Yes	74	99	240	5/4	1205	11.3	6.5 (44)	4.2 (67)	5.0 (56)	Euro 3			
	Golf 81 TDi	1.9 L	Yes	81	108	235	5/4	1212	10.6	6.5 (44)	4.0 (70)	4.9 (57)	Euro 3			
	Golf 85 TDi	1.9 L	Yes	85	113	310	5/4	1237	11.0	8.4 (34)	5.0 (56)	6.2 (45)	Euro 3			
	Golf TDi 4Motion	1.9 L	Yes	110	147	320	5/4	1366	8.6	8.1 (35)	5.1 (55)	6.2 (45)	Euro 3	~$55,000	$25,000 - $35,000	Four-wheel drive
Peugeot	XT HDi 306	2.0 L	Yes	67	89	211	5		13.0	6.9 (41)	4.3 (66)		Euro 3	$28,100		Current model
	SRDT 405	1.9 L								7.0 (40)	4.8 (58)		Euro 2		$6,000 - $20,000	Imported 1989 - 1997
	ST HDi 406	2.0 L	Yes	82	109	255	5		12.5	8.0 (35)	5.2 (54)		Euro 3	$42,170	$20,000 - $35,000	Current model
	607 HDi	2.2 L	Yes	98	131	314	5/4	1610	10.7	8.9	5.5	6.7	Euro 4			High-temp catalytic converter. Not available in Australia (yet?)
Mercedes	C200 CDi	2.15 L	No	85	113	250		1505	12.1	8.8 (32)	4.7 (60)	6.2 (45)	Euro 3 (?)		$1,000 - $2000	Imported late '60 - mid-70s.
	C220 CDi	2.15 L	No	105	140	315		1520	10.3	8.7 (32)	4.6 (61)	6.1 (46)	Euro 3 (?)		$2,000 - $4000	Imported late '60 - mid-70s.
	E200 CDi	2.15 L	No	85	113	250		1590	12.5	8.5 (33)	4.8 (58)	6.2 (45)	Euro 3 (?)			Availability in Aust unknown
	E220 CDi	2.15 L	No	105	140	315		1590	10.4	8.5 (33)	4.8 (58)	6.2 (45)	Euro 3 (?)			Availability in Aust unknown
	E250 CDi	2.5 L	No										Euro 3 (?)	$75,880	$30,000 - $62,000	Imported mid - late '90s
	E270 CDI	2.7 L	No	125	167	400		1600	8.9	9.7 (29)	5.1 (55)	6.8 (41)	Euro 3 (?)	$90,980	$70,000 - $80,000	Current model
	S270 CDi	2.7 L	No	125	167	370		1600	8.9	9.7 (29)	5.1 (55)	6.8 (41)	Euro 3 (?)			Availability in Aust unknown
	S320 CDi	3.2 L	No	145	193	470		1905	8.8	11.4 (25)	6.0 (47)	8.0 (36)	Euro 3 (?)			Availability in Aust unknown
	S400 CDi	4.0 L	No	184	245	560		1970	7.8	14.2 (20)	7.0 (40)	9.6 (30)	Euro 3 (?)			Availability in Aust unknown

fantastic car. I would assume that the (bio)diesel version is also.

Mazda

I've seen a few Mazda 626 diesels around and these are available as both sedans and station wagons. One person I know has a two litre sedan and another has a supercharged station wagon. Both seem to go well, although the owner of the supercharged version has complained that he is always having problems with the supercharger and has threatened to rip the damn thing off one day.

Volkswagen

The diesel '3L Lupo' is a small car (similar to, say, a Holden Barina) and isn't available in Australia although it should be. What does the '3L' stand for? Why three litres per 100km of course, and that's the conservative combined cycle figure. On the highway cycle it gets about 2.5L/100km or 110 miles per gallon and on the standard city cycle it rates about 3.6L/100km or 78mpg.

Polo

I believe that there are a few diesel VW Polos around in Oz but haven't actually seen any. These are great little cars and I once drove one from Frankfurt in Germany down through the Black Forest and then through Switzerland, through the Alps and down to Nice and Monaco and then back to Frankfurt. I think that I only filled the tank twice on that trip.

There are a number of variants available (but probably not in Australia) including the normally aspirated engine (SDI) and several turbo-charged versions (TDI).

Golf

The Golf is probably the best of the lot. A small/medium sized car and available (at least in Europe) as a hatch, sedan, stationwagon, four-wheel drive and sports model and comes with a wide range of engines and options.

All models from the basic 50kW version to the 110kW four-wheel drive sports model have excellent fuel consumption figures and the speed, comfort and all the quality you would expect from a German car.

I've seen a few advertised in newspapers as private sales and they seem to hold their price very well.

Peugeot

Peugeot is one of the few car companies that imports new diesel cars into Australia, and has been doing so for a number of years.

In Europe there are quite a few models available from the cheap and basic up to luxury models. In Australia, only the luxury market is catered for, starting with the XTHDi 306 at $28,000.

Second-hand (bio)diesel Peugeots can be found without too many problems—I went down to the local Peugeot dealer and he had one second-hand 405 and had just sold a second-hand 406 the day before.

The XT HDi 306 is Peugeot's new (bio)diesel car with a turbocharged 2.0 litre alloy engine and comes standard with electric windows, CD stereo, remote central locking, auto rain-sensing windscreen wiper system, velour trim, passive electronic engine immobiliser, height and lumbar adjust on the driver's seat, electrically adjustable rear view mirrors, as well as front and rear fog lights.

The 405 is one of the older models but still fetches quite a good price on the second-hand market. These are a mid-sized car but still offer very good fuel economy and most of the features you would expect in low-end luxury cars. The 405 has now been superseded by the ST HDi 406 which features a 82kW turbocharged and inter-cooled 2.0 litre alloy head engine.

The pride of the Peugeot biodiesel fleet (not yet available in Oz) is the 98 kW 2.2 litre turbocharged and inter-cooled HDi 607. The latest model has a particulate trap and regenerator that collects the particulates and then automatically incinerates them every 500 kilometres or so which gives the 607 a Euro 4 rating.

Mercedes

Mercedes diesel cars have been available in Australia for some time now and older models aren't too hard to find. A friend use to have an old Merc C200 CDi and claimed that it was a fantastic car but very dangerous due to the acceleration. He reckoned that if you weren't careful while accelerating away from the lights you would fall asleep and a little old granny would ram into the back of you... But then this guy spent most of his time doing monos on his GPZ1100 motorbike.

Actually the diesel Mercs are great cars. They are robust, safe and have all the luxuries you'd expect. As with Peugeot, there are quite a few models available in Europe, with some models having full warranty when run on biodiesel! However the range in Australia is very limited—as is the warranty option.

And for the eco-yuppie that's made it big-time, the E-class (bio)diesel Merc. If you have enough money to get one of these you can hire someone to go scrounging around at the fish and chip shop....

When I was looking around I went to a Merc dealer called 'Diesel Motors' just around the corner from where I live. Turning up on my bike wearing jeans and a casual shirt, I was ignored by the salespeople and so I can't really report on what the new (bio)diesel Mercs are like to drive. However I would imagine that they are superb.

So if you are looking for a new diesel Merc and want to be taken out to a nice café by the sales manager, then turn up wearing a suit and tie in a Limo otherwise they will tell you to bugger off.

It's also pretty hard to find any info about the Mercs regarding fuel efficiency (or inefficiency) as the Merc people seem to assume that if you have enough money to buy a Merc then you won't be concerned with how much fuel it uses. Actually, the (bio)diesel Mercs are really quite fuel-efficient. The C220CDi uses only 4.6L/100 km (61mpg) on the highway cycle and even the big S400CDi with a four litre V8 still only uses 7L/100 km (40mpg) on the highway cycle.

Second-hand diesel Mercs are reasonably common in the motoring for-sale section of the newspapers and are very robust and reliable and can often be a real bargain. Usually, even an old model will have plenty of life left in it.

A few final notes

One of the issues that you should be aware of is that of vehicle warranty. While in Europe, many of the vehicles come with a full warranty that extends to their use on biodiesel made to DIN 51606 or

similar. In Australia if you ask the dealer about running on biodiesel you will either get a blank look or an emphatic no. Most likely, running a new vehicle on biodiesel, particularly homemade juice, will void the warranty. You can always run on diesel until the warranty period is up and then change over to biodiesel. Alternatively, be prepared to flush the tank and fuel lines with petroleum diesel before taking the vehicle in for a service or any warranty work.

One last point—if you really want to reduce your energy consumption, limit greenhouse gas emissions, prevent nitrogen oxides and particulate emissions, then ride a bike and only use your shiny new (bio)diesel when you have to!

Wanna diesel Commodore? Get this 48mpg version, but only in Europe as the GM Opel Omega.

Web Sites

Most of the major vehicle manufacturers don't give any information about diesel cars on their Australian websites. The two exceptions I found were at www.mercedes_benz.com.au and www.peugeot.com.au. Some overseas websites are quite useful, the best I found were the German sites such as www.mercedes_benz.de, www.peugeot.de, www.volkswagen.de and www.toyota.de. Some of these sites had English pages as well as the German. The English, North American and French sites were pretty dismal and I suspect that the Japanese sites were quite good but it's hard to tell when all you get are weird symbols! The site www.biodiesel.de lists a number of cars for which the warranty covers biodiesel as well as some other interesting stuff.

Phillip Calais: calais@ieee.org

Social change in action

CERES exists to initiate and support environmental sustainability, social equity, cultural richness and community participation, writes Zanni Waldstein, CERES teacher and historian

Twenty-five years ago a group of inspired and dedicated people came up with the concept of a centre that would provide a community focus. A centre that generated environmentally and socially sound jobs and was a space for community gardening. A 'city farm' that would demonstrate environmental design initiatives. Such a place would also be a nucleus for a score of other dreams and projects.

Architects of a dream

Twenty years ago this group secured the lease for a 10 acre piece of land. It was an area of polluted, lifeless wasteland dominated by piles of rubbish and high tension powerlines. Up until 1980, the area had been farmed, quarried, used as a rubbish tip and finally as a council depot. But under the care and guidance of dedicated members of the community this land was to become the inspiring and dynamic CERES Environment Park—the dream incarnate.

On initial visits to the site, you could light a flame in the cracks that ran through the ground because of methane being released from the landfill below. The soil was bubbling with gases, according to early workers. Strikingly, life returned to the site once the first gardens and worm farms were started and some organic matter was introduced.

An early co-ordinator of CERES, Bruce Hedge, remembers the struggle to bring the site back to life: 'There were layers of bitumen on the ground, as this site used to be an old batching plant. At the end of each week they would empty the bitumen trucks on the ground. The layers of bitumen we had to cut through to plant the trees was an interesting exercise, but to visit today and see the large canopy of bird-attracting foliage is intensely satisfying,' he said.

Genevieve Timmons, the first paid worker of CERES, also recalls this early period: 'Finding the first snail in the community gardens busily chomping on someone's lettuce, we didn't know

whether to be flattered that a snail would grace the site with its presence, or to kill it for eating our precious plants which had struggled to get going on what was clearly a fairly alien and challenging moonscape.'

The CERES of today is an Eden-like contrast to that moonscape, an urban oasis thriving as a community environment park in Brunswick. This year, CERES will be celebrating 25 years of existence and 20 years on its current site; the transformation of dream into reality.

CERES encompasses gardens, community vegetable plots, a bushfoods and permaculture nursery, an organic farm, market and café, and regular festivals and events—all of which are designed to draw together and strengthen the local community and encourage sustainability. There are educational facilities, cultural villages, renewable energy demonstrations and energy conservation exhibitions supporting a plethora of environmental and cultural educational programs.

The current site houses many other community groups and businesses. These include the Alternative Technology Association (ATA), a worm farm eco-business, sweat lodge, a LETS (Local Exchange and Trading System) group, a chicken collective, and groups dedicated to bread baking, bicycle recycling and

Above: the CERES site as it was 20 years ago. Right: Early CERES workers. Former page: School children check the dam for tadpoles as part of their environmental studies

Japanese drumming. To say that the site is well used is an understatement! It is an environment where diverse community initiatives flourish.

CERES came from much of the same 'ideas pool' as the Centre for Alternative Technology (CAT) in Wales. They both emerged within a similar timeframe and context. Dr Chris Ryan was involved in the initial stages of both.

'There was this idea of doing a centre. A physical site where we have a demonstration of what it is we are talking about as well as an organisation that can continue to research in this area,' he said.

While both centres have many similarities (they are both on old quarry sites, CAT on an old slate quarry and CERES on a bluestone quarry) they have manifested their ideas in diverse ways.

For example, the difference in funding had an enormous impact on the culture of each organisation. CAT started off with an injection of money from a private financier, whereas CERES had to source its own funding as a conglomeration of small community groups, and relied on local council support and land.

The context

The impetus for setting up centres like CERES and CAT grew in the 1970s. Influential books were published in the early 1970s including *Blueprint for Survival* and *Limits to Growth*, which started to shake the Western world out of its complacency over affluence and resource availability. Unemployment in Australia, and particularly Brunswick in the northern suburbs of Melbourne, was high, and innovative social and environmental alternatives were emerging in a variety of areas.

Melbourne has had a long history of radical left wing counter-cultures, both within mainstream politics and demonstrated through an active and healthy alternative movement. Throughout the 1970s a range of social change organisations sprang up in this fertile atmosphere, which remain well respected as peak environmental organisations. Within the five-year period of CERES' inception, many other groups started in Melbourne, including Collingwood Children's Farm, Friends of the Earth Melbourne, Community Radio 3CR, Permaculture Melbourne and the Wilderness Society. These groups all interacted with CERES.

A range of predominately Brunswick-based groups were also involved with CERES, including Brunswick Unemployment Group (BUG) , Brunswick Secondary Education Council (BRUSEC), RMIT, Melbourne University, Brunswick Electricity Supply Department and the ATA. All of these groups were involved in the development and concept of CERES and trying to make the idea a reality. It was this fusion of groups—each with their own priorities for the project—that made CERES the vibrant, diverse entity that it is now.

Bringing together so many different groups was the project's major challenge. Bruce Hedge reflects on the early days.

'CERES was and is an extraordinarily important groundbreaking development which demonstrated several innovative ecological principles in a practical way. It was a focus for ethnic gardeners, idealistic conservationists, ecologically sustainable developers, alternative technologists, dreamers, some movers, some shakers. All in one spot!' said Bruce.

'Throw in a chook group, a native food nursery, a group proposing only endemic species be planted, and we

ended up with some interesting and challenging decisions needing to be made to accommodate all interests.'

The project initially started on land adjoining Brunswick East High School. As the scope of the CERES project developed and it became obvious that that site would not be available in the long term, it became clear that another site would be needed. This prompted the move to the current site in Lee St, East Brunswick in 1982.

'I remember when we discovered the site. We were looking at all these aerial photographs … and we saw this huge area of land that seemed to be set aside as 'not for development'.

Once the site was formed a lot of groups began to relate to it and materials and assistance came from everywhere. The train carriage arrived, which was the first 'building' onsite. The idea was to source as many 'waste' materials from the local area as possible and make use of them. For instance, there was a period when there was an agreement with carpet companies around Brunswick to donate unused or damaged underfelt. Most of the community gardens area has a layer of this underfelt.

Some of the first projects were setting up the community gardens and housing animals on site, building a dam and the establishment of the first curbside recycling collection in Melbourne. The Low Energy House was moved to the site, retrofitted and opened for people to visit and learn from. The ATA built its passive solar building (in 1984) and the Trees Galore Program was established, which eventually became the Victorian Indigenous Nurseries Co-operative (VINC). Later on came the African Village, the stables, the school education component and the café. Today CERES celebrates its achievements with festivals and events throughout the year.

The Return of the Sacred Kingfisher Festival is one of the park's most well-known celebrations. Thousands of people from the local area flock to see the parades and musical performances. The Harvest Festival is another popular celebration which incorporates cooking displays, pasta making and food harvesting from the CERES gardens. CERES is open in daylight hours every day of the year and it's free to enter. The cafe and nursery on site are open every day. Night-time events are frequent, with live music performances every week through the summer months, and its use as a venue sees it being used more regularly for launches and entertainment events. There is a Saturday organic fruit and vegetable market where visitors can buy veggies while watching the animals. It has come a long way in just 20 years and continues to grow and change in response to community needs.

If you would like to hear more about the stories that made CERES, come to the anniversary celebration over the next few months and keep your eyes peeled for the *History of CERES* which will be published later in 2002.

⋆21 & 22 April: Celebration weekend including a 'Walking History' around the site, with guest speakers from the last 25 years talking about their involvement, anecdotes and reflections at different locations.

⋆ 5 June: Formal dinner celebrating CERES anniversary for World Environment Day with guest speakers.

Call CERES on (03)9387 2609 for more details and hopefully we'll see you at our birthday! ✲

Producing power off-road

Collyn Rivers shows us the options for powering mobile homes, what to do and how to do it so that your system won't let you down

Campervan and motorhome electrical systems are based on vehicle charging systems designed to provide electricity for vehicles that are moving, not for those that remain at rest away from mains power. Standard vehicle charging systems will perform this latter function, but not very well.

Based on the above system, commercially built campervan and motorhome electrics have sufficient energy storage for a night or two (but rarely three) without recharging the battery. Attempting to stay longer on site, without supplementary energy, flattens their batteries. If done repeatedly, battery life is drastically reduced.

Attempting to avoid or fix these problems can be puzzling and frustrating. Increasing battery capacity helps a bit—but usually less than expected. Installing a larger alternator hardly helps at all. On top of this, batteries still need frequent replacement.

The front axle has neither broken nor is falling off! Illustrating the huge axle movement of these vehicles, the opposite front wheel is on a rock over 1200 mm high.

The fundamental problems

There are several fundamental problems that must be addressed. The most serious relates to the characteristics of lead-acid batteries and vehicle charging systems.

Lead-acid batteries dislike being discharged at all—any charge/discharge cycle shortens their life! A reasonable compromise is to keep them as fully charged as possible, and to discharge them only to 50 per cent.

A standard vehicle regulator ensures that the alternator's output (and hence charging voltage) does not exceed 14.2 to 14.4 volts. This output voltage is a compromise. It is too low to fully charge a conventional lead-acid battery in less than 40-50 hours, yet not sufficiently high to cause overcharging in any form of realistic usage.

In practice, starter or deep-cycle batteries rarely exceed 70 to 75 per cent of full charge. This is fine for the starter battery because a 70 per cent charge is adequate to start an engine, and the 3 to 4 amp-hours drawn (if you don't believe me, work it out) are replaced in a few minutes.

But a 70 per cent level of charge is hopeless for a deep-cycle battery that can only be discharged to 50 per cent without drastically shortening its life. In practice, and at best, a 100 amp-hour deep-cycle battery is good only for 25 to 30 amp-hours. And that's when it's new.

Fitting a higher output alternator will bring a deeply discharged battery to that 70 per cent level of charge a bit faster, but as it's the regulator that controls the charging pattern a higher output alternator will not charge a battery much beyond the previous level. A voltage of 14.2 to 14.4 is simply not high enough for campervan/motorhome usage for charging conventional lead-acid batteries.

Compounding this problem, with many such systems, is that (according to a survey undertaken by the Campervan and Motorhome Club of Australia Ltd) over 50 per cent of all campervans and motorhomes are used only once a month or so—or simply for extended holidays each year. Between trips their batteries sit there sulphating.

The solutions

Fortunately, there are various remedies, the choice of which depends mainly on vehicle usage.

For the electrically-minded, a good starting point is to exchange or modify the voltage regulator to obtain a more suitable charging regime.

A voltage regulator is a basic switching regulator that, by controlling the

alternator's field current, attempts to maintain system voltage at 14.2 to 14.4 volts. It is essentially a quasi-constant voltage source. The difference between that voltage and the prevailing battery voltage determines the rate of charge.

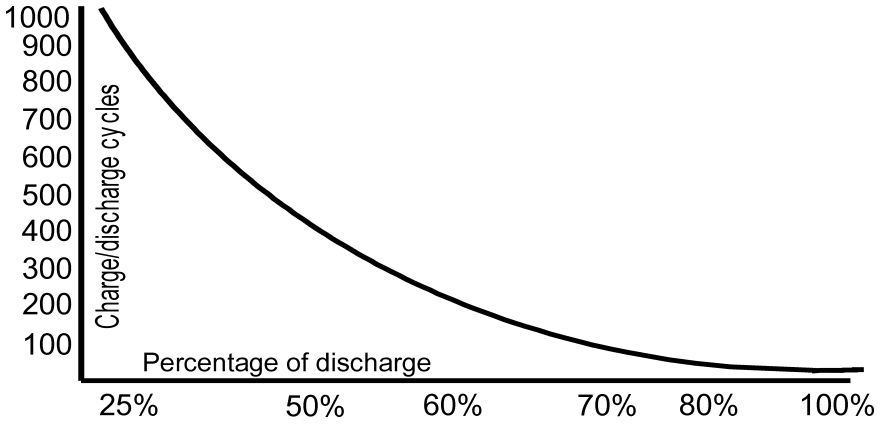
The charge rate can be readily and safely increased by intensifying the field current. This can be done by replacing the existing regulator with a 'smart' regulator (Americans refer to these as 'three-step' regulators) or inserting a diode or resistor bank in series with the line from the battery to the regulator in order to fool it into thinking battery voltage is lower than it is.

This approach has been used by yachties for decades. Several commercial manual regulators do just that (they are over-priced 50 watt rheostats). They work fine in boats but need constant adjustment and attention to avoid frying the alternator and batteries. A more 'sophisticated' version has a time switch.

Many of these basic versions can be fitted in parallel with the existing regulator—handing control back to that unit after the manual device has done its thing.

Far more sophisticated versions are available from companies such as Ample Power and Cruising Equipment Co. These regulators have complex optimised charging cycles and charge big battery banks to 90 to 95 per cent of their nominal capacity quickly and safely. Battery companies by and large support their usage.

A 'smart regulator' fixes one problem—that of arriving on site with charged batteries, and of being able to recharge them rapidly next time you drive. Also, by charging the batteries to 90 per cent or more, they increase usable battery capacity—from 20 to 25 per cent to 40 to 45 per cent. That's still a lot less than you may have thought you had bought—but nevertheless close to doubling it.



The relationship between depth of discharge and battery life (in charge/discharge cycles). For mobile usage the most economic discharge level is 50 per cent.

But it still leaves two problems yet to solve.

1. How to prevent batteries sulphating when the vehicle is not used.

2. How to generate power on-site when the batteries run out of usable puff.

Depending on desire and usage, the former can be solved at the same time as the latter—or separately.

Discouraging sulphation

Unless the vehicle is used at least weekly (and always left with close to fully-charged batteries), you need either a semi-permanently connected solar module and regulator, or a like-wise connected smart battery charger. Either will keep the batteries at optimum voltage and will greatly extend their working life. But do not even think of using a non-smart charger, nor a 'self-regulating' solar module (which operates on much the same basis that starvation is a self-regulating diet).

If you intend to stay only two or three days on any one site, and have ample battery storage, this is probably sufficient. You will start off with fully charged batteries, have sufficient energy on site, and the ability to recharge deeply and rapidly if you then drive for three or four hours.

However, if you intend to stay longer on site you need a supplementary source of energy, for which solar modules are an excellent, clean and silent source.

Solar modules

Scaling solar module capacity would seem obvious: calculate consumption, establish system inefficiencies, buy solar module capacity accordingly. But it isn't that simple.

Solar modules are rated by their manufacturers by measuring their output current and voltage, drawing various graphs and plotting wattage output at whatever combination produces the most felicitous results. This tends to be between 16 and 17 volts.

If you read the technical data you will find an '80 watt' panel generates about 4.9 amps. But watts being as they are, to do that the panel must be operating at 16.3 volts. Pumps can cope with this, but not motorhomes. The latter run on 12 (or 24) volts, and at that voltage the module can only produce 4.9 x 12 volts (or 14.2 volts if nitpicking).

Thus, at best, our 80 watt panel can only produce around 70 watts. But things get worse.

Standard operating conditions

The industry measures cell output using what it euphemistically calls 'Standard Operating Conditions'. These, in

effect, require a module to be measured on top of Mt Kosciuzko on a very cold day, at solar noon under a hot sun.

The cell temperature, for example, must be 25 degrees C, and the industry does not mean 25 degrees ambient. It means cell temperature. Under irradiation sufficient to produce anything near peak output, that cell is more likely to be at least 50 degrees C.

As mono and polycrystalline cells lose voltage as they heat up this can, in some circumstances and applications this can reduce output by up to another 10 per cent or so. In reality a module produces about 70 per cent of its marketed rating. So one needs more modules than expected (Uni-Solar modules do better than most but, being less efficient, are larger per watt).

Work out your estimated daily usage (which is at least halved by using a three-way [gas/240/12V] fridge running on gas on-site), add 10 per cent for anything driven by an inverter, plus a further overall 10 per cent for system losses.

To stay indefinitely on-site, the above is the amount of energy you need to create from solar modules or whatever.

Establishing the number of modules is straightforward. Take about 70 per cent of the module's marketed rating and multiply that by the number of sun hours where you expect to be, using the Bureau of Meteorology's sun hour maps (downloadable from www.bom.gov.au).

Solar modules are probably best mounted flat on the vehicle roof. The loss is not huge in most of the places where you actually want to be. Having them portable obviates the vehicle needing to be in the sun, but vastly increases their chances of being stolen or damaged.

If you have a trailer, mount them on the trailer's roof, but use seriously heavy cable to connect them to the regulator and batteries—which need to be in the main vehicle.

The OKA

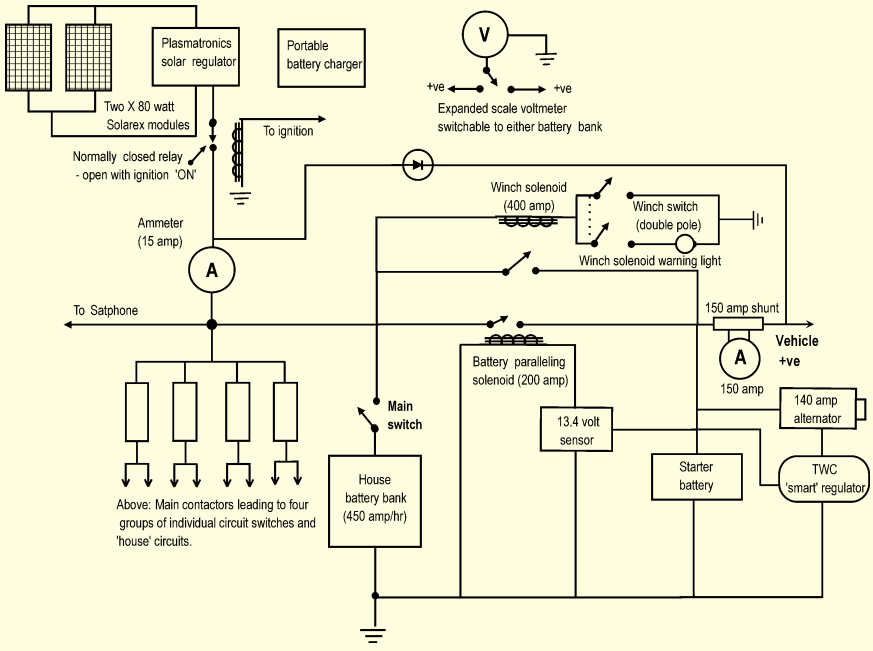
The author has a 1994 Western Australian built OKA that is used extensively as a test-bed/motorhome. In the past six years the vehicle has been taken twice around Australia, including to the very tip of Cape York, the long route across the Simpson desert, and along most of Australia's major and minor inland tracks.

The 5.5 tonne vehicle has four-wheel drive with locking differentials front and rear, and sufficient diesel tankage for a range of close to 3000 km.

The basic charging system is a 140 amp/hour Bosch alternator with its regulator replaced by a TWC unit until recently marketed by Hella. Figure 1 shows the charging procedure.

The above regulator charges a 450 amp/hour house battery bank (initially at up to 100 amps) plus the excellent Federal 1000 CCA starting battery. The house system is paralleled across the charging system via a voltage sensing device that delays switching the main connecting solenoid until the starter battery is over 13.4 volts.

Two nominally 80 watt Solarex solar modules and regulator provide ample power for the vehicle's 10 halogen lights, Westinghouse satellite phone/fax, 70 litre AutoFridge, electronic rust protection, radio, TV and other devices. A laptop computer is also run from the system via a small inverter. The Canon bubblejet printer runs directly from the 12 volt system.



Simplified drawing of the OKA's electrical system. The normally-closed relay in the solar feed opens when the engine is running to prevent interaction between the vehicle's smart charging regulator and the solar regulator—each of which otherwise perceives the other as a battery in various states of charge! In practice, the 13.4 volt sensor operates a secondary relay (not shown) to handle the demand of the 200 amp switching solenoid.

Battery capacity

The minimum is that amount which will provide 10 hours use before the batteries fall below 50 per cent charged. The maximum should be determined by charging ability. Do not have more battery capacity than can be brought from 50 per cent charge to 80 per cent charge in one day.

If you really must have a generator, the most economic by far is to build your own using a 12 volt vehicle alternator and a home-made basic smart regulator.

Gel cell and other batteries

Gel cell and AGM batteries have some advantages. They can be charged safely, and to a higher level at high rates, and while theoretically provide fewer charge/discharge cycles than a well-maintained conventional lead-acid battery, in practice they often do better.

On the down-side, they are rapidly damaged by excess charging voltage and are larger, heavier, and more costly per ampere/hour.

The commonly given advice that they may be housed in unventilated compartments has recently been rescinded. Their manufacturers now state that they must be ventilated to outside atmosphere. The previous claim that they could even be located upside down has also been withdrawn.

Accessories

Even more than with domestic solar systems, it is vital to minimise consumption. As previously mentioned, the refrigerator is by far the biggest energy guzzler. The only realistic choices are a three-way unit running primarily on gas, or a compressor-driven extra-low voltage refrigerator—of which the Australian-made 70 litre AutoFridge is probably the most efficient.

Extra-low voltage halogen lights are reasonably efficient but they are intended to run on alternating current and their life is quite substantially shortened if run on DC. Compact fluorescents are extremely efficient (and in warm white form) are pleasant to use, but most require an inverter.

Diaphragm type extra-low voltage water pumps are by far the most efficient, and energy consumption can be reduced further by adding a pressure accumulator and avoiding losses by using at least 16 mm piping.

Collyn Rivers is an ex automobile research engineer. He recently wrote and published *The Campervan & Motorhome Book* and is currently completing its companion volume *Campervan & Motorhome Electrics*.

The ultimate DIY solar water heater?

Michael Gunter fancies himself as a bit of an innovator in the deregulated energy market, and gives us the lowdown on a solar hot water system that he claims can be installed by any 'talented amateur plumber'

Now that the Victorian and NSW energy utilities have launched into full retail contestability there are new customer incentives to use more electricity, as they are offering financially attractive off-peak electricity tariffs, among other initiatives. I believe the new tariffs are a temptation to pollute, and to extend the financial viability of baseload coal-fired power stations.

To fight back and help address the Australian greenhouse gas emissions problem, we need a cheap but effective energy market competitor that we alone control—a solar water heater. Better still, a 'do it yourself' solar water heater has the added advantage of saving money. It is disappointing to see just how expensive some commercial solar hot water systems are becoming, as they get more and more high-tech. Their price also seems to have escalated since the introduction of government rebate schemes.

Innovative concept

This solar water heater has one novel feature: the use of a very small photovoltaic panel to directly drive an efficient DC water pump, with the components carefully matched for power ratings to ensure the pump only moves water when there is sufficient solar radiation to provide some water heating.

A solar water heater collects radiant energy from that huge nuclear reactor in the sky (the Sun!) and traps it in a flat sheet of metal. Water tubes then transfer the heated water away for storage and later use.

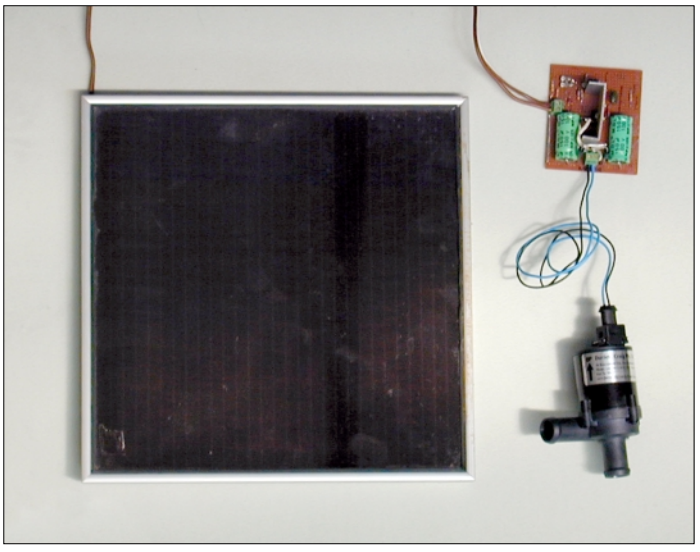
Cheap and easy to install

Let's be honest—big tanks on roofs are often really ugly. The beauty of a 'split system' is not only improving the aesthetics of your house, but it is much easier and quicker not having to lug a 100kg water tank onto your roof, and not having to strengthen the roof trusses.

This design can be installed as a retrofit to an existing 300 to 400 litre ground-level mains pressure storage hot water tank for under $2000 with half a day's DIY labour, though a plumber should make the final connection. It should provide a tax-free 10 per cent return on that investment for around 20 years (maybe much more depending on the cost of gas and electricity in the future).

The schematic of the solar water heating system can be seen in Figure 1. The list of main components required to complete the conversion can be seen in Table 1.

Sundry items to complete your plumbing will include two 19mm hose barbs, two short lengths of 19mm radiator hose, four hose clips, various elbows, compression fittings, costing perhaps another $50. (The hose barbs, hose clips and radiator hose are necessary to adapt the EBP automotive pump to 13mm copper pipe water circulation system). To comply with plumbing regulations you should get the work performed, or at the very least checked, by a licenced plumber before connecting your system to the water mains. The EBP is rated to 135 degrees Celcius, but at this stage Davies Craig is unable to give a recommended operating pressure limit. The prototype installation has a 350kPa pressure reduction valve on the cold inlet, a 500kPa TPR valve at the top of the solar collector array (see Figure 1) and a 750kPa TPR valve at the top of the storage tank. In practice this means that in the hottest part of the afternoon, when the tank water is expand-



The solar panel, Davies Craig pump and maximiser.

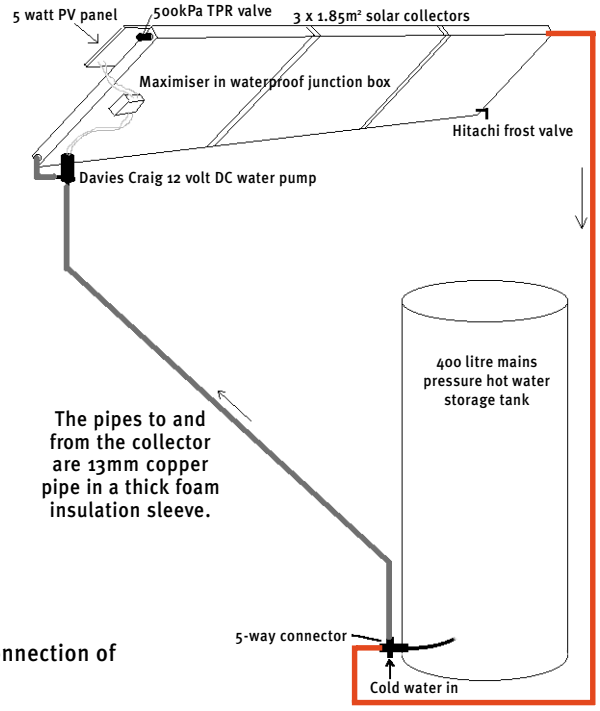


Figure 1. The layout and connection of the major components.

ing because it is being heated, there will be a pressure of up to 500kPa in the circuit, at which point the TPR relief valve in the solar panel begins to open. So far the water pump has worked flawlessly at this pressure, at temperatures of up to 80 degrees Celsius.

Test the pump first

It is a good idea to connect your mini-maximiser, solar photovoltaic panel and EBP, so that you can test the EBP in a bucket of water, remembering it is not a submersible pump! It should commence pumping when, under a bright cloudy sky, the PV panel is delivering about 80mA into a short-circuit (when tested with an ammeter or the current range on a multimeter). This is the sort of radiant sky which will make a black car dashboard comfortably warm, and is therefore the same level of radiation at which your solar collectors will be able to start delivering usefully warm water into the hot water storage tank.

To emphasise the amazing characteristics of the mini-maximiser, please note that with a conventional DC power source, the EBP pump will remain stalled until 1.5 amperes is flowing through it, but will start and run with only one-twentieth of that current from a 12 volt PV panel, if the mini-maximiser is present in the circuit.

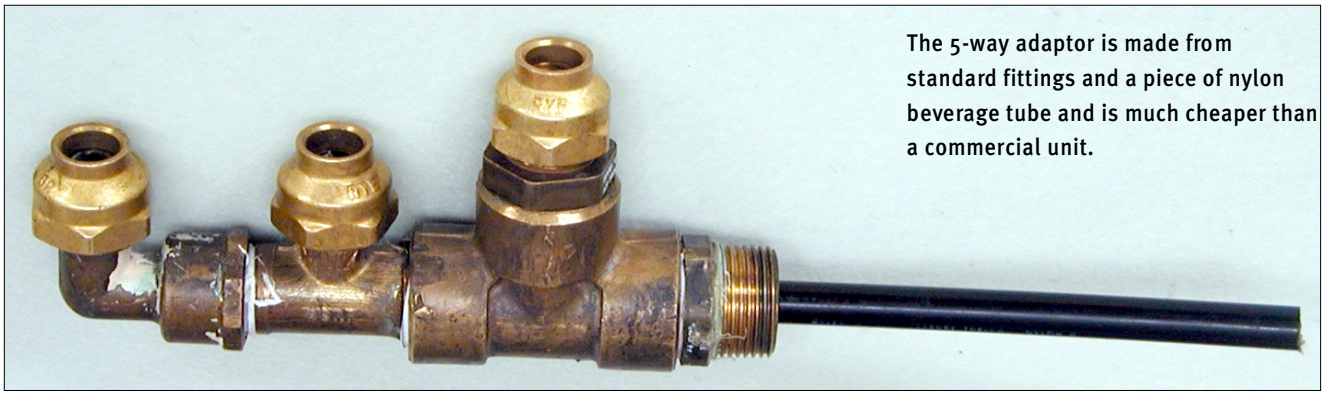
Note well that the circulation pipes contain no non-return valve, and inevitably a small amount of warm water will flow back up into the solar panels each evening. This is minimised or eliminated by taking care to: 1. Keep the plastic tube on the five-way adaptor very short: protruding only 100 to 150mm inside the bottom of the storage tank. 2. Install a tank which has a booster element; and 3. Disconnect the main (bottom) electric heating element.

Purging the air

When fully assembled and checked, your plumber must pressurise the tank and bleed all the air out of the highest points in both the storage tank and in the solar panels. No bleed valve is necessary, but the highest compression fitting must be accessible so that it can be loosened until air and water escape. However, a gate valve at the topmost connection makes removing air locks much easier, and allows for periodic flushing of sediment that can otherwise accumulate and reduce the circulation flow rate after a year or two of operation.

Warning: if it is a sunny day, escaping scalding water can burn your hands, so thick rubber gloves may be required. Failure to perform this operation will result in a non-functioning system, as the EBP will not provide a forceful enough flow to flush air down to the tank at ground level (not from a five watt PV panel, at any rate).

In sunny weather you will be able to tell that the system is working by feeling that the return pipe from the solar collector feels considerably hotter than



The 5-way adaptor is made from standard fittings and a piece of nylon beverage tube and is much cheaper than a commercial unit.

the other pipe. The pump makes a faint whining noise because the maximiser feeds it with brief pulses of DC current, and this sound usually indicates that the pump is spinning, but not necessarily.

Optimal performance

If you buy a new car, you don't normally drive around with the handbrake applied. If you have a bright lamp, you don't hide it under a bushell. Similarly, now that you have invested all that hard-earned money in your new hot water system, it is a good idea to consider the best way to optimise its performance, and return on capital investment.

After 20 years experience living with an electric-boosted solar hot water service, I suggest the following strategies.

Disconnect the heating element at the bottom of the tank, and use the booster element at the top alone. Check with your power company if you can still get cheap tariffs with this configuration (probably not).

If you replace the upper boosting element with a 2.4kW element, it can be run from an ordinary 10 amp power point via a time switch. If you set the time switch to be off from 7am to 4pm each day, this can greatly reduce electricity requirements, though peak-rate electricity will cost a lot more, thus extending the payback time for your investment.

Set the booster element thermostat to the lowest possible temperature setting. If it is not adjustable, then get your electrician to install an adjustable one. Provided it is not against local regulations, I strongly recommend a setting of 40 to 45 degrees Celsius (on at 40, off at 45). This can save you very many dollars in a year, and adaptable individuals can cope well with showers, if not baths, at these temperatures. Despite the lack of evidence that lukewarm water from a solar hot water tank is harmful to health, solar heaters are being made less competitive because new regulations are requiring them to be operated at higher temperatures. If we have to bend a few rules to save the planet, it will be worth it in the long run.

Turn off all electric supply to the heating elements, and 'see how you go' for the six months from spring equinox (21 September) to autumn equinox (21 March). You will fairly soon learn to judge which family member is wasting water in sunny weather, or how many days of normal usage and cloudy weather result in unacceptably low supply temperatures.

You may find that you can even leave the electric boosting off for several days

Quantity	Description	Indicative Price
3	1.9m² solar collectors @ $450ea. (any Aussie-made brand will do. Mine were "Sunbather" from Albury Consolidated Industries, but see text for another suggested brand)	$1,350.00
10 metres	13mm copper pipe	$75.00
5	2m lengths black foam thermal insulation ID 16mm	$50.00
1	Davies,Craig EBP 12 volt water pump short version 9002	$201.45
1	5-way adapter fitting	$50.00
1	5-watt photovoltaic panel	$135.00
1	Mini-Maximiser	$33.00
1	Hitachi frost protection valve	$100.00
	Total cost without tank	**$ 1,986.45**
If you need to buy a hot water tank, add this		
1	400 litre twin element tall cylindrical hot water storage tank (eg Rheem Optima)	$1,100

Table 1: The components with indicative retail costs (October 2000).

at a time during sunny winter weather. Such a strategy will significantly shorten the period for a 'full return on investment'.

Without any electric heating element, this system makes a perfect preheater for an existing gas-fired storage water heater. Just cascade the hot outlet from this tank into the cold inlet of the gas hot water service. Again, it would be nice to be able to shut down and bypass the gas system for six months each year.

The problem of frost

Since I published the plans of this design on my web site 15 months ago I am aware of at least two systems being installed in Tasmania. One has had problems with burst pipes in the solar panel, and water damage to the pump electronics. The sensible place for the pump is down off the roof sheltered from rain and from cold clear skies. In a really cold location it will also need to be lagged with insulation to prevent costly frost damage.

The solar panels are also at risk on cold clear nights, but I recently learned that Rheem has a new range of solar panels with tapered risers and insulated headers. I understand Rheem is confident enough of this clever design to warrant the panels against frost damage, but personally I would still use a frost valve as well just to be sure.

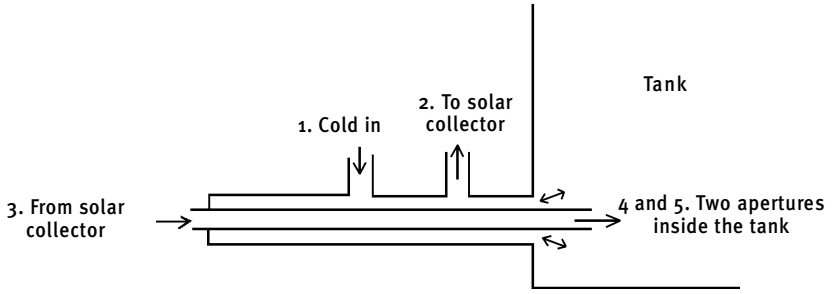


Figure 2. The 5-way adaptor in cross section.

Another possibility is to have a thermostat switch which connects the PV panel to a 6 to 9 volt, 200mA plugpack whenever the solar thermal panel goes below four degrees Celsius. This 'night sun' will run the pump just enough (via the mini-maximiser of course!) to prevent the panels from freezing.

Rebates and Renewable Energy Certificates

If we retain more control over the energy we are using and where it is coming from, and thumb our noses at RECs trading and government handouts, we not only assert our independence, but have the satisfaction of making it harder for polluters to buy RECs to meet their Mandatory Renewable Energy Targets. *(See Pears Report page 66 for another view on this, Ed).*

***ReNew* cautions all readers to comply with local plumbing and building codes by employing the services of a professional plumber when connecting it to the household pipes. Michael Gunter's overtly hostile attitude to the electricity industry is not necessarily the view of *ReNew* magazine or of the Alternative Technology Association.**

The use and mention of commercial products is not an endorsement of any individual manufacturer or their product. If you can find equivalent products from other manufacturers, then please use them. The original version of this article is available as a free PDF document to download from my web site: show it to your plumber today!

Links

www.daviescraig.com.au
www.voltscommissar.net

Notes and errata

ReNew issue 78

In the Solar Panel Buyers' Guide, one major distributor of Uni-Solar amorphous solar panels was omitted form the list of contacts. They are: Arrid Power (Australia) P/L, U4/12 Kewdale Road, Welshpool WA 6106, ph:(08)9258 9299, fax:(08)9458 1977, email: sales@uni-solar.com.au, www.uni-solar.com.au

In the solar water feature article, a supplier of Oase pumps was left out of the table. They are: The 12 Volt Shop, U4/12 Kewdale Road, Welshpool WA 6106, ph:(08)9458 1212, fax:(08)9458 1977, email: sales@12volt.com.au, www.12volt.com.au

Rating green power products

Which electricity retailer has the highest quality green power? Environmental groups from around Australia put retailers to the test with a detailed survey. Tim Hollo presents a summary of the results from *Green Electricity Watch—First Report*

In January 2002, the NSW and Victorian electricity markets became fully contestable. This means that all consumers in these states now have the power to choose the retailer from which they would prefer to purchase their electricity. It is likely that South Australia and the ACT will not be far behind, with Queensland and Tasmania possibly following suit at a later time. Contestability may occur between different retailers based in one state or between retailers based in different states. Thus a NSW consumer may be able to buy electricity from a Victorian retailer and vice versa, although barriers to market entry may delay this.

'Full Retail Contestability' offers the opportunity of choice to consumers, but it also gives retailers the opportunity to differentiate themselves on various grounds. One of these will undoubtedly be their environmental credentials, particularly in relation to greenhouse gas emissions. Low emissions energy products such as 'Green Power' schemes are likely to become a key marketing tool.

The environmental imperative

Given the serious environmental impacts of electricity generation and use, contestability may provide consumers with a unique opportunity to use their choice to drive positive change. Consequently, it is vital for the effective operation and ecological sustainability of the contestable market that consumers are provided with independent information which will enable them to make informed choices.

With this aim in mind, eight of Australia's key environment organisations have joined forces to survey all energy retailers who will operate in the contestable market.[1] The companies were asked to answer a series of questions regarding their green electricity products. These focussed on the sources of energy and technologies accepted, their energy efficiency or demand management programs, their investment in new generation and other greenhouse-related policies. This information has been collated and all green electricity products that will be available in the contestable market have been ranked.

This is a summary of the First Report. There will be a second report, as a number of products are still under development and it will be necessary to monitor the market and ensure that products are offered as expected. The First Report provides only a snapshot of the current products and is not able to take into account unconfirmed future plans. Further, it is not yet possible (due to market barriers) for all the companies to enter the various state markets. However, this is likely to change over the next year and the environment groups will undertake a second report during 2002.

Nevertheless, this First Report gives a clear indication of a product leader and the opportunities for consumers in each state to purchase green electricity.

Rating

Almost all the green electricity products on the market are formally accredited by the National Green Power Accreditation Program, a cooperative government program which assesses generators

Continued on page 41

Benefits of sustainable living

Of all of the owner-builder stories published by *ReNew* over the past few years, the cover story featuring Asphyxia's inner city Melbourne mudbrick cottage (*ReNew* issue 69) is one which seems to remain foremost in readers' minds. And understandably so—it is an attractive sustainable house that she built herself without any former, or formal, building experience. The cottage cost just $10,000 to build.

It incorporates a plethora of sustainable features including passive solar design, a solar water heater, greywater system and home-built composting toilet. All of the electricity comes from a small solar system (there is no connection to the electricity grid). The house is surrounded by self-sufficient vegetable gardens and she has four chooks which roam around freely. She is genuinely, and proudly, living lightly on the planet.

ReNew thought it was time to revisit Asphyxia when we heard that she had plans and planning permission to build another little cottage with her partner, and was concurrently starting a environmental design consultancy business.

Over the five years she has lived in her place she has had few problems with the sustainable technology systems she implemented, and will use them again in her new house. However this time she will build using recycled timber rather than mudbricks. 'They're messy to work with and heavy to lay,' she explains. She will also incorporate a commercial rather than home-built composting toilet. 'The one I built really works, and the end result is fantastic. But the maintenance through the decomposition period is a bit stinky.'

Since our last visit she has extended the house to include a small, dedicated bedroom and a rainwater tank. But the biggest surprise has been the huge amount of interest she has received. Some people have recognised and stopped her in the street, and others have sought her advice on how they can incorporate elements of what she has achieved into their own homes.

Picture: Mara Ripani

'I have actually been quite overwhelmed by the response from so many people—and their enthusiasm for the lifestyle I have chosen,' she says.

'Now that I have decided to build another house, the number of people who have asked me if they can live in my house when I move has made me realise that what I've done really appeals to people.'

Busy with her work as a performer and acrobat, she has found time to help some people. But as the queries keep coming and the interest in sustainable housing grows, she has decided to establish her own business, Talisman Design Consulting, to formally assist people to make the changes they would like.

'Since I moved into my house and had a fair bit of publicity relating to it, a lot of friends, acquaintances and even

people I'd never met before have asked me for advice in setting up gardens, greywater systems, solar electricity and so on,' says Asphyxia. 'I have several times visited people's homes informally to advise them and often have ended up sitting down for a few hours drawing up a design for them or calculating what it would cost.

'I have also imparted lots of knowledge that I've gained in doing my own research for the house I live in now and also the new house I am building. Off the top of my head I can tell someone the pros and cons of strawbales versus mudbrick for walls, how to calculate the right size solar panels and batteries for particular situations, how composting toilets work.

'I've never considered myself an expert but friends have made me aware that the research I have done and the practical experience I've had is actually more considerable than I thought,' she said.

Asphyxia believes the time is ripe for businesses such as hers to begin assisting people to build more sustainable homes and gardens. Interest in this area of building has burgeoned over the past few years, especially as people take advantage of government rebates on renewable technology and taking note of the environmental performance of buildings and appliances. But are people willing to pay for 'information' as well as for design and installation?

'I hope so,' says Asphyxia. 'People like me won't pay. I prefer to do my own research and learn as I go along. But I know of a lot of people who would like a solar-powered pond or a greywater system, for example, and who would prefer someone else to organise it all for them. I can just draw up designs for people, or if they wish, I can see the project through to completion.'

Asphyxia will start out providing advice for domestic building projects, renewable energy systems and gardens. Eventually she will produce a book of background briefing papers and house design plans. She will work with her in-house draftsperson and architect to produce finalised designs and follow projects through the local council planning processes.

'I would love to leave a trail of environmentally friendly houses behind me in my life, knowing that all the inhabitants are now living a lower impact lifestyle. Starting Talisman is the next step for me—rather than just being an example and inspiration for others, I would now like to use the knowledge I have gained to help other people too.'

Her new cottage will be built next door to her current one and she will knock the fence down to ensure she can keep her garden. It will be a little larger, but the project is really for the love of it.

'I am building a new house with my partner mainly because I was feeling a bit lost and aimless last year and decided a building project was just what I needed to rev myself up! It's worked a treat and I've thoroughly enjoyed doing all of the research to make the choices about building products, designing and layout, appearance and functional aspects of the house and planning the stages of building.

'Soon we'll start the actual construction and I can't wait to spend my days armed with a hammer and spirit level again!'

A few hours in her company and you can see why. When on the subject of her new home she emanates inspiration and is full of ideas. She is a great conversationalist, and speaking with her is highly engaging due to her knowledge and enthusiasm, but also because she converses in sign language as well as voice. Asphyxia is deaf, and while her housemate Paula was participating in our interview acting as an interpreter, this was not essential as she lip reads and I understood almost everything perfectly. We spent much time admiring her garden without the need for Paula's involvement.

To set up initial conversations email asphyxia on: (asphyxia@nemesis.com.au). Interviews will take place at her home if people are seeking inspiration or to see technology in action, or at their house for tailored system designs. ✲

Picture: Mara Ripani

Continued from page 40

against a set of criteria before granting the Green Power tick of approval.

However, in a competitive market, such compliance is not sufficient to differentiate a product. This survey was designed to reveal which products are simply complying with the rules and those which lead the way in moving 'beyond compliance' towards best practice.

A national comparison is presented to demonstrate Australian best practice and to demonstrate the extent of improvement needed from most retailers. The ranking is intended not only as consumer information, but also as a signal to those companies entering the emerging markets of the environmental credentials that they will need to achieve.

The survey included questions about a range of issues of environmental concern in regard to the provision and regulation of energy. Information was sought on:

- the sources of energy for the product (wind, solar, hydro or biomass);
- whether sustainability guidelines were applied to these sources (particularly for biomass energy);
- whether new renewable generation is encouraged or required;
- the encouragement of effective demand management programs, vital for the reduction of greenhouse gas emissions by reducing consumption or replacing fossil fuels with zero emission sources based at the household, and their integration into the product;
- how the product will be audited;
- how it will be publicised.

Two issues were deemed to be of particular importance in the ranking process. These were:

- the burning of native forest wood 'wastes' for energy production which is then sold as an environmental energy product specifically, or for other renewable energy requirements such as Renewable Energy Certificates, or RECs
- other waste biomass projects without effective sustainability guidelines in place.

Combined environment groups Residential Green Energy Product Ranking

Market leader

Origin (VIC)	Green Earth Plus

Beyond compliance

Australian Inland Energy and Water (NSW)	Green Power
TXU (VIC)	Enviroenergy
Origin (VIC)	Green Earth
Integral (NSW)	*Solar for Schools (special case)
Aurora (TAS)	*(special case)

Compliance only

ActewAGL (ACT/ NSW)	Green Choice
EnergyAustralia (NSW)	Pure Energy
Western Power (WA)	Natural Power
AGL (SA/VIC)	Green Energy
Pulse (VIC)	Clean Green Energy
Country Energy (NSW)	(yet to be given a consolidated name)
Integral (NSW)	*Residential Green Power
PAWA (NT)	*(no name given)

Failed to respond to survey

Citipower (VIC), Energex (QLD), Ergon (QLD)

*It should be noted that, although these products do not contain energy from the combustion of native forest wood waste, the companies that provide them have not ruled out the purchase of such energy for their other renewable energy requirements, such as the Federal Government's *Renewable Energy (Electricity) Act 2000* (Renewable Energy Certificates, or RECs).

Methodology

A questionnaire was compiled and sent to all 27 companies in Australia registered as electricity retailers under the National Electricity Market Management Corporation (NEMMCO). Many of these companies are licensed to retail electricity but do not and are not planning to use that licence in the residential and commercial market. Consequently, these companies were removed from further consideration. This left a survey total of 15 companies in the electricity retail market. Of these, three did not respond, even after reminder requests.

The survey consisted of three introductory questions, 16 questions regarding the company's general approach to greenhouse issues (Part 1), and 10 questions regarding the company's green electricity product (Part 2). This report, being focussed on green electricity products available in the competitive market, is almost entirely concerned with the answers to Part 2 but does take into account a number of issues exposed in Part 1.[2]

Once the completed surveys had been received, each company was contacted by telephone. This was to discuss and clarify the responses and to obtain fur-

ther information, particularly in regard to the sources of energy that make up the product and the demand management programs in place.

The responses have been measured against each other, the National Green Power Accreditation Program (NGPAP) Guidelines[3] and the Climate Action Network of Australia's policy documents on renewable energy[4] and given marks as set out in the full report (available on request). The allocation of marks and the ranking was scrutinised by all groups involved and companies were given the opportunity to respond to a draft of their results.

Market Leader

The products which were ranked highest were those for which the company has demonstrated that they are not only aware of greenhouse and environmental sustainability issues, but have also implemented positive policy responses and achieved these to a high standard.

The market leader, **Origin's Green Earth Plus**, is 100 per cent new wind energy (often considered the cleanest form of electricity generation currently available). This will be linked to the active promotion of demand management programs such as home energy efficiency, efficient appliance sales and solar hot water system rental. Additionally, if a customer purchases only 40 per cent, **Green Earth Extra**, the remainder will be old independently audited hydroelectricity instead of fossil fuel power.

'Compliance' and 'Beyond Compliance'

Australian Inland Energy and Water's Green Power is in the 'Beyond Compliance' category as it has limited its green energy to wind and solar (with some hydro power) and is focussing strongly on energy efficiency in power supply and consumption. **TXU's EnviroEnergy** is highly ranked as it has put in place solid sustainability guidelines for its renewable energy purchases which go beyond the Green Power accreditation requirements, as well as engaging in demand management at various levels. **Origin** also offers a basic **Green Earth** product, which is 20 per cent wind and 80 per cent hydro. These proportions allow it to be offered at a flat tariff of $1/ week, making it by far the cheapest zero-emissions product on the market, but too heavily reliant on old hydro power to be ranked as a market leader.

Two special cases have also been placed in the 'beyond compliance' category. Firstly, **Integral Energy** offers a product called **Solar for Schools** which is simply a customer financial contribution to installing solar power in local schools, thereby contributing to investment in renewable energy. Secondly, **Aurora Energy**, the Tasmanian retailer, is almost 100 per cent powered by hydro-electricity and runs effective demand management programs. However it does not invest significantly in non-hydro renewable energy technologies. Each of these products has been considered in the light of the company's refusal to rule out the purchase of native forest wood waste power for RECs requirements.

All of the other green electricity products available in the market are doing little beyond merely complying with the requirements of the National Green Power Accreditation Program. Consequently, they are failing to actively differentiate themselves on environmental grounds. **ActewAGL's Green Choice** has been ranked in the 'compliance' category as its stated policy of only accepting projects which offer 'multiple environmental benefits', has not been released for public examination. Additionally, **Country Energy**, **Integral Energy** and **PAWA** have refused to rule out purchasing native forest power for their RECs obligations.

Three companies, **Citipower**, **Energex** and **Ergon** declined to answer the survey and therefore cannot be included in the ranking. Readers are welcome to draw their own conclusions from this lack of transparency.

It should be noted that the market leader, **Origin Green Earth Plus**, is only available in Victoria at this point, as is **TXU's EnviroEnergy**. NSW customers will find that, until Origin enters the NSW residential market, the products from **AIEW** and **ActewAGL** are ranked highest in the state. This situation is likely to change in the near future as barriers are overcome and the market develops.

If you would like a copy of the full report, please call the Nature Conservation Council of NSW on (02) 9279 2466 or visit the website: www.nccnsw.org.au.

Notes

1. Participating groups are: The Nature Conservation Council of NSW, The Total Environment Centre, Greenpeace Australia Pacific, The Australian Conservation Foundation, The Wilderness Society, Climate Action Network Australia, Friends of the Earth Australia and the Alternative Technology Association.

2. However, one issue that became clear in responses to Part 1 which deserves mention is that at least nine of the companies surveyed were in favour of the imposition of compulsory minimum greenhouse benchmarks for the electricity industry.

3. Available at www.greenpower.com.au

4. Available at www.climateaustralia.org

Managing climate change

Last November, government negotiators in Marrakech finally agreed on the text of the Kyoto rulebook, after a tortuous 12 year process and numerous concessions to keep countries such as Japan, Russia and Australia on board. Meanwhile, some oil companies are positioning themselves as central to the solution to climate change. Is this an advanced form of corporate double-speak or hands-on environmentalism? Greg Muttitt and James Marriott investigate

It is said that power lies in the ability to ensure that others carry the burden of change. Certainly the greatest burden of climate change will fall on the powerless in poor countries of the world. But the changes to the climate create an imperative for change at another level—change on the other side of the wealth divide—change in the patterns of production and consumption of fossil fuels.

Solutions old

BP and Shell, in contrast to ExxonMobil—the other of the 'Three Sisters' in the oil industry super-league—both publicly admit that climate change is a real threat. In a surprise move during the November 2001 climate talks, BP went further and spoke in favour of ratifying the Kyoto Protocol.

Both BP and Shell are cutting their emissions of greenhouse gases by 10 per cent from 1990 levels—Shell by 2002 and BP by 2010. As a key part of its strategy for achieving this, on 1 January 2000, BP became the first company in the world, way ahead of any nation state, to introduce a company-wide emissions trading system, whereby one part of the company can 'sell' part of its quota for emitting greenhouse gases to another part of the company which is struggling to meet its target. Shell followed soon after.

BP and Shell have both also invested in renewable energies. In fact, BP is now the largest manufacturer of solar photovoltaic panels in the world.

A contradiction

Yet these are oil companies. BP and Shell are among the most ambitious companies in the world in their targets for increasing their rate of extraction of oil and gas. Shell aims for increases of five per cent a year, and BP of between 5.5 and seven per cent. The cuts BP and Shell have promised are in greenhouse gas emissions from their own business operations—from gas flaring, from pipeline leakages, from energy usage (for example, in powering refineries)—not in those from their core products.

The point is well symbolised in BP's solar-powered petrol stations. The focus is put on *consumption* of fossil fuels (the petrol station has used photovoltaic panels to reduce its consumption), rather than on *production*, and provision, of fossil fuels.

There is, of course, a fundamental contradiction in the companies' positions. The amount of fossil fuels consumed in the world is necessarily equal to the amount produced. So what is to happen to BP and Shell's increased production of oil and gas, if everyone fol-

lows their good example and cuts their consumption in line with the Kyoto Protocol? Do they hope that other oil producers such as Saudi Aramco, with no stated environmental commitment, will cut their production? Of course not. In fact, it seems perhaps consumption is not intended to be cut at all.

The oil companies have been challenged on this since soon after they announced their policies in 1997—most notably with the 'No new exploration' positions of organisations such as Oilwatch and Greenpeace.

Solutions new

Over recent months, this contradiction has finally begun to register in the debate. Shell now talks of the 'carbon intensity' of its products. It publishes the average amount of carbon released per unit of energy of its products, and plans to reduce this by about 2.5 per cent between 2000 and 2005. This is made possible by the general trend of energy markets towards use of gas in power stations rather than coal (a trend driven mainly by economic factors). Unfortunately, over the same period, Shell plans to increase its hydrocarbon output by 28 per cent (the cumulative effect of a five per cent/year increase). This far outweighs the lower 'carbon intensity' of that output.

Apart from the rhetoric, the more concrete aspects of the companies' approach are also evolving in response to the production/consumption contradiction. Three new elements have emerged, all of which aim to allow increased consumption of fossil fuels.

1. BP and Shell are actively participating in the Clean Development Mechanism (CDM). This is one of the 'flexible mechanisms' within the Kyoto Protocol. Industrialised countries can avoid cuts in greenhouse gas emissions by investing in emissions-reduction projects in developing countries, and claiming 'carbon credits'. Shell, for example, has identified eight projects for potential inclusion within the CDM, and aims to pilot three of these. BP is exploring four case studies. Both companies are strong public proponents of the CDM. Shell, for example, commented, 'We believe it is essential to ensure that each of these mechanisms (emissions trading and CDM) is structured in such a way as to attract private capital. It is crucial to make people, and companies, want to do these things'.
2. They are investing in forests, to be used as 'carbon sinks', which it is hoped will reduce CO_2 in the atmosphere through photosynthesis. Shell has had a plantation forestry division for 20 years. It is used mainly for pulp and paper manufacture, but has an in-

creasing interest in building materials, furniture, and use of wood for energy (biomass burning). In relation to biomass burning, the forestry business has now been consolidated with Shell Renewables. Shell is now incorporating forestry into its strategy on climate change: one of its action points is to 'directly contribute to a reduction in atmospheric CO_2 by expanding our forestry business and planting more trees'. Shell estimates that its 135,000ha of plantations sequester 1.2 million tonnes of carbon a year. For comparison, carbon emissions from Shell's hydrocarbon products can be estimated at about 180 million tonnes. BP sold off its forestry businesses during the 1980s and 1990s, and does not aim to develop a production business from it; however it is now exploring options for gaining carbon credits from forestry, and is running a pilot project in south-west Australia, planting 500,000 trees a year.

3. They are exploring new technological fixes, in particular 'end-of-pipe' mechanisms. These are designed to capture CO_2 at the point of emission. Last year, Shell, along with Siemens, began developing a pilot gas power station in Norway (which provides electricity to offshore oil rigs) to 'capture' its carbon dioxide emissions using solid oxide fuel cells. BP and Ford have sponsored a US$20 million, 10-year research project into carbon sequestration at Princeton University—the largest corporate grant in Princeton's history.

The approach now is at least logically consistent. However, while it gives the oil companies a set of policy options which do not undermine growth in their core business, whether they will mitigate against climate change is open to question. The CDM, for example, operates outside the reduction targets of Annex 1 countries (those with reduction targets under the Kyoto Protocol), so depends on some way of determining 'additionality' (that is comparing emissions with what 'would' have happened without the CDM investment) and there is no clear agreement on how this might be done. Forest sinks have been widely challenged in terms of their longer-term effectiveness—how long they are able to store carbon, and indeed how forests will fare in a changing climate. Meanwhile, pumping CO_2 underground is an optimistic attempt to reproduce geological processes in short time-frames; long-term stability of stored CO_2 is poorly understood, and doubted by many, and the cost of 'capture' is extremely high.

Politics

BP's recent statement of support for Kyoto was unexpected by all industry

www2.shell.com

Shell solar factory in Gelsenkirchen, Germany

observers. Until that point, BP had made no statement which concretely conflicted with the anti-climate policies of US President George W Bush.

Much of the blame for Bush's opposition to Kyoto has been attached to American corporations. We tend to think of BP and Shell as European companies. Yet 36 per cent of BP's shares are held in the USA. Twenty-six per cent of Shell is American. In 2000 BP gave US$889,000 to Bush's Republicans—the fourth largest political contributor from the energy sector, after Enron, Southern Co and ExxonMobil.

BP is backing both horses in the race, both pro-climate and anti-climate, in much the same way as most corporations in the USA back both Democrats and Republicans (for example, BP gave the Democrats a sizeable sum in 2000). Meanwhile it is an indication that political realities have shifted, both in the USA and in the climate process. BP evidently now feels that its political position in the USA is secure, and that the climate agreement is sufficiently toothless to be unharmful to its interests. Indeed, WWF has estimated that with all loopholes and sinks included, the Bonn Agreement negotiated last July will cut emissions by only 1.8 per cent instead of Kyoto's 5.2 per cent. And that is just for the countries participating, and is before the further concessions agreed at Marrakech in November 2001.

What is more, it seems to be an expedient moment to begin to support the Protocol—when it has been watered-down, and is about to be finalised anyway. Thus BP can continue to be seen as ahead of the governments on the issue.

Renewable energy

What of BP and Shell's investments in renewable energy? Aren't they genuine? Well, in a sense they are, in that they are being treated as real businesses. However, clearly the use of renewable energy will not prevent climate change in itself, it will only do so in so far as it allows a decrease in the use of fossil fuels. A Shell scenario for future energy supply reckons that renewable energy will provide around 15 per cent of world energy by 2030; however this is within the context of expanding total energy consumption—and oil and gas production will almost double over that period (Shell has quietly withdrawn its more optimistic scenario of 50 per cent renewable energy by 2050). Clearly, despite the renewables growth, we still have a massive problem.

Perhaps we should ask whether it makes sense for the organisations providing the solution (expanding renewable energy supply) to have an interest in perpetuating the problem (expanding fossil fuel supply).

But perhaps the expansion of fossil fuel output is not necessary? Couldn't a progressive oil company make a transition into a renewable energy company? Greenpeace, for example, has argued that 'if today's companies want to remain going concerns they will have to transform themselves into sustainable energy companies... Renewable energy will be the growth market of the 21st century and that's where the smarter investors will be putting their money'.

In theory, this may be possible. In practice, to shift from oil and gas to solar or wind power (markets with very different financial structures, not to mention different physical technologies) would mean writing off a vast amount of capital. Not just physical capital (oil rigs, pipelines et cetera), but also 'relationship capital' (the companies' contacts and relationships with people, organisations, companies and governments), 'intellectual capital' (knowledge of geology, of markets, of how to extract; skills, training and strategy); and even 'emotional capital' (their belief in the value of what they are currently doing).

The difficulty is compounded by the fact that—in financial terms—BP and Shell compete as much with Vodafone and GlaxoSmithkline (in providing returns on capital) as they do with ExxonMobil or Chevron. Thus even if there were long-term advantages to shifting the energy base, even if to be a renewable energy company were an at-

tractive proposition, investors would not allow an oil company to absorb the costs of converting to one.

Issue management

So what is to be gained by the position on climate change?

Perhaps the greatest clue to understanding how these companies see climate change comes from the 'Shell Report' series. Published annually, these reports provide the framework for Shell's discussion of environmental and social issues (including climate change), and for reporting on its own progress. It is connected with these reports that Shell has produced a series of advertisements, including *Cloud the issue... or clear the air?*, which have had enormous newspaper exposure over the last three years.

Six months after the publication of the first Shell Report, entitled *Profits and Principles—does there have to be a choice?*, Shell was named winner of the W Howard Chase Award, by the Issue Management Council. Chase, a pioneering PR guru, commented in presenting the award, 'The demonstrable excellence and broad impact of the Shell Program represents the epitome of issue management, producing not only benefits for the organisation in its worldwide business operations, but setting an example for other organisations to follow'.

Are BP and Shell 'managing the issue' of climate change?

We can identify three core strategic aims of the companies in relation to climate change:

1. To be seen as progressive on the issue, especially for the benefit of staff morale and recruitment. Shell, for example, certainly does not want more reputation crises like the Brent Spar or the Ogoni issue. While immediate profits were little hurt by the issues, Shell acknowledges that the reputation problem led to its employees even being embarrassed to tell people where they work.
2. To prevent any government interference in or regulation of their business—by focusing attention on energy consumers rather than producers, and emphasising voluntary action. For example, the UK's climate change levy is targeted at (industrial) consumption of energy, and has a strong voluntary element for major energy users. What's more, by moving early companies have the opportunity to play a key role in influencing the terms of the Kyoto mechanisms. For example, Shell has commented that 'With the implementation of STEPS (Shell's emissions trading system), we are on a steep learning curve, but I believe that our experience will enable the group to be an active participant in the design of national emissions trading systems'.
3. To ensure that markets for oil and gas do not at any point decline, in particular to discourage societal pressure for radical change. Through clever positioning on the issue, the aim is that positive action on climate change will generally be seen as compatible with the use of fossil fuels. In other words, you can save the planet and fill up your car at BP.

In these terms, BP and Shell are having fantastic success. After the international climate negotiations in the Hague (COP6), the World Energy Council commented that 'Long negotiations on the main areas of disagreement, such as the details of the Kyoto flexibility mechanisms: Clean Development Mechanism, Joint Implementation and Emissions Trading; compliance related issues and carbon sequestration have not brought the expected results... meanwhile industry is getting on with the job of market driven solutions which address the problem'. As long as they can continue to argue that companies are moving forward more effectively than governments, it is to them that people look for a solution. There is little call for mandatory regulation on climate change.

BP and Shell have plans to curb greenhouse gas emission from their operations.

Meanwhile, the companies remain completely in control of the pace of change. While Shell boasts that it is investing an extra US$100 to US$200 million a year in its renewables businesses, it invested US$4.5 billion in oil and gas exploration and production in 2000. Far from bringing about a transition in the energy economy, the company is working hard to maintain the status quo.

However virtuous BP and Shell may be relative to their competitors, they clearly have other agendas as well. As one might intuitively expect, there are natural conflicts between being an oil company and providing the solution to climate change. What is desperately needed is for civil society to reclaim management of the climate problem, to wrest control of the issue from the corporations.

Greg Muttitt and James Marriott work at PLATFORM, carrying out strategic research on the oil industry, and its social and ecological impacts.

This is an updated version of an article first published as 'Cynics or saviours?' in *The Ecologist* July/August 2001.

Simple solar ventilation

Lance Turner looks at a cheap and simple way to help reduce the temperature inside your home—without using an air conditioner!

It never ceases to amaze me how much money people spend on air-conditioning systems to avoid the summer heat, yet forget to do a number of simple things that can greatly reduce the need for air conditioning in the first place, or reduce its energy consumption.

Some of these things are obvious, and include shades over windows (put the shades outside, not inside), proper insulation, and the often overlooked roof cavity ventilation.

Indeed, a great deal of heat can enter the home through the roof, which is why insulation above the ceiling is so important. However, insulation merely slows the progress of heat into living spaces below, and it makes a lot more sense to reduce the temperature above the insulation in the first place.

One way is to have the roof coated in a light colour. White is obviously the best, but most light colours will reflect a reasonable amount of heat. Unfortunately, though, most homes have much darker coloured roofs, and indeed, here in Melbourne, the trend seems to be towards dark grey and even black roof tiles, which is about as foolish a choice as could be made. The temperature inside an unventilated roof cavity with dark tiles on a hot summer's day can come close to 70°C, and the only thing stopping this heat entering your home is the insulation in the ceiling.

Wouldn't it make a lot more sense to reduce the temperature in the cavity so that there was a lot less heat trying to transfer into your home? Of course it would, but it is so rarely considered it does make me wonder!

There are a number of methods that can be used to ventilate a roof cavity.

The simplest is a large vent at the peak of the roof with other vents down low in the roof space, usually in the eaves (unfortunately, it has also become common practice for architects to leave off the eaves in modern designs, thus providing no protection for windows during summer), so that natural convection will cause a slow but steady airflow through the roof cavity. While this is the simplest approach, it is less effective than other methods due to the slow rate of air exchange in the cavity.

What is really needed is forced ventillation. The most common form is the rotary wind powered ventilators, such as the Whirly Bird and similar units. While these work well if the wind is blowing, there are unfortunately quite a few hot, still days where they revert to ventilating only by natural convection. What's more, they also vent out any warm air on sunny winter days, thus eliminating any possible heating effect from this air.

What is really needed is a ventilator that works hardest when it is needed most, yet can be turned off when you want to keep the air in the roof. The obvious solution here was a solar ventilator. However, the only ventilator I could find designed for this purpose was made by Edmonds (www.edmonds.com.au) and cost around $600! Way out of my price range, especially for a rented house, so I decided to build a unit instead.

I started with a 24 volt DC motor bought from Oatley Electronics some time back for use in a robot. I think it was originally out of a poker machine. It had a gearbox attached, which I didn't want, so I removed that. I also replaced the bearings, as they seemed a bit worn.

Next I needed a good set of fan blades, which I found in an old fan heater. Indeed, the fan was about the only thing in good order in this heater, so I removed them from the 240 volt motor and put them onto my 24 volt motor—they were a tight press fit which was just what I wanted!

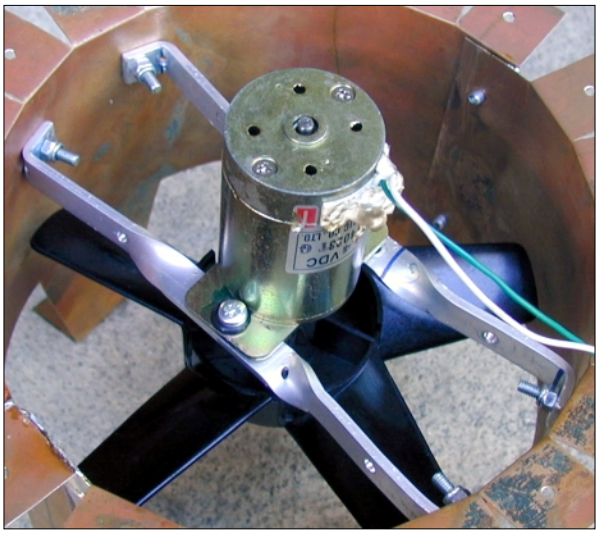
Now I needed a vent for the fan to sit inside. I checked out my local hardware stores for a suitable Chinaman's hat style vent, but the biggest they seemed

to stock was a 125 mm unit, and my fan blades were 165 mm across. So, once again, I decided to make my own.

I did this from a sheet of copper that I had lying around, but could just have easily used thin galvanised iron sheet, which is readily available and cheap. As the copper sheet was not long enough for a single piece to form the tube, I made it from two sections soldered and rivetted together along the seams. I put flanges on the bottom so that it could be attached to thin aluminum flashing, and also to the top so that I could fit a dome to prevent rain entry.

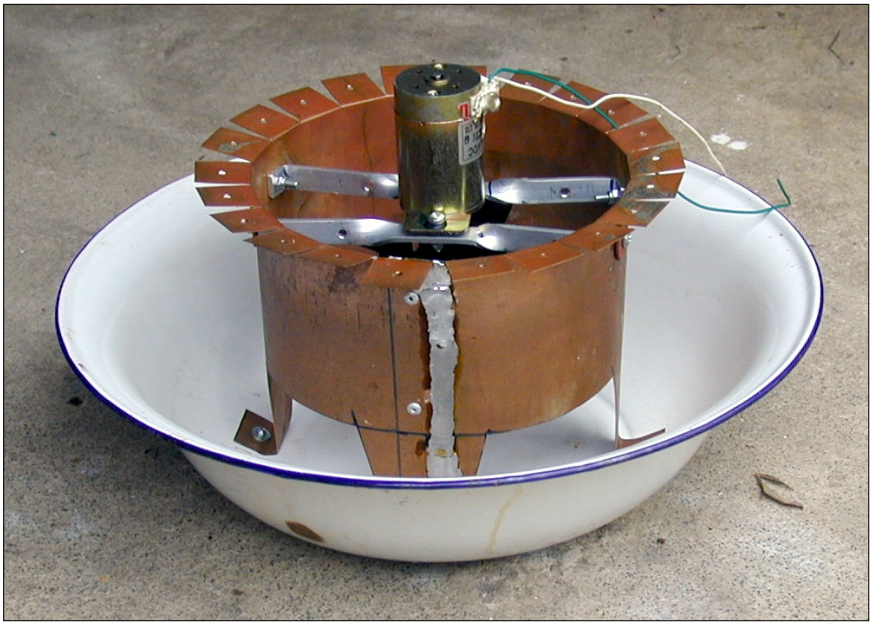
The dome also turned out to be an easy find. My flatmate was going to the local market and asked me if there was anything I needed. I showed her the vent and told her I needed a dome. An hour later she came back with a large enamelled steel bowl that was perfect for the job.

I drilled and rivetted it onto the vent tube, and then set about working on the motor mount. This needed to be strong but to also keep vibration to a minimum. I ended up using a couple of pieces of scrap 12mm x 3mm aluminium flat bar drilled and bent at the approriate places so that they could be bolted to the motor and also to the inside of the vent tube near the bottom. The motor was mounted to them with 4mm bolts and nylok nuts so that they would not vibrate loose. I used rubber grommets under each side of the motor to reduce vibration. This setup worked quite well.



Closeup of the motor mounting brackets. Note the rubber grommets used to reduce vibration.

Before painting, I tested the setup by connecting it to my workshop solar power system and leaving it running for quite some hours. All worked well, and the fan was moving a great deal of air, so I was happy with the final result.



The roof vent before being fitted to the flashing and being painted.

Now I decided to take some temperature measurements in the roof cavity. On the next hot day (36 degrees Celsius) the maximum temperature in the roof just above the insulation was around 52 degrees Celsius, with the temperature hovering close to 50 degrees for several hours. Obviously, on a hotter day with no cloud (this day was partly cloudy) the temperature could have exceeded 60 degrees. The maximum temperature inside the house was around 30 degrees. This showed that there certainly was a great deal of heat caught in the roof cavity.

The following weekend I installed the fan in the roof by removing a roof tile. The fan was fitted into place, and the flashing sealed to the roof to prevent water ingress.

As I already had a 12 volt solar power system, I decided to hook straight into that system rather than fit a second panel. I ran power from the panel to the motor via a switch, which could be used to turn the fan off in the cooler months. While this will not stop warm air leaving the cavity entirely during this time, it will slow it down somewhat.

Performance

The day after it was installed we had a hot day similar to the one when measurements were taken previously. With the fan running, the roof cavity never reached

The painted vent with the gutter mesh installed to keep unwanted animals out of the roof. The mesh was just wrapped around the vent and held in place with cable ties.

more than 46 degrees Celsius. Also, when the sky clouded over, the temperature in the cavity had dropped to 30 degrees Celsius within less than an hour. This showed that there was a lot of hot air being removed from the roof.

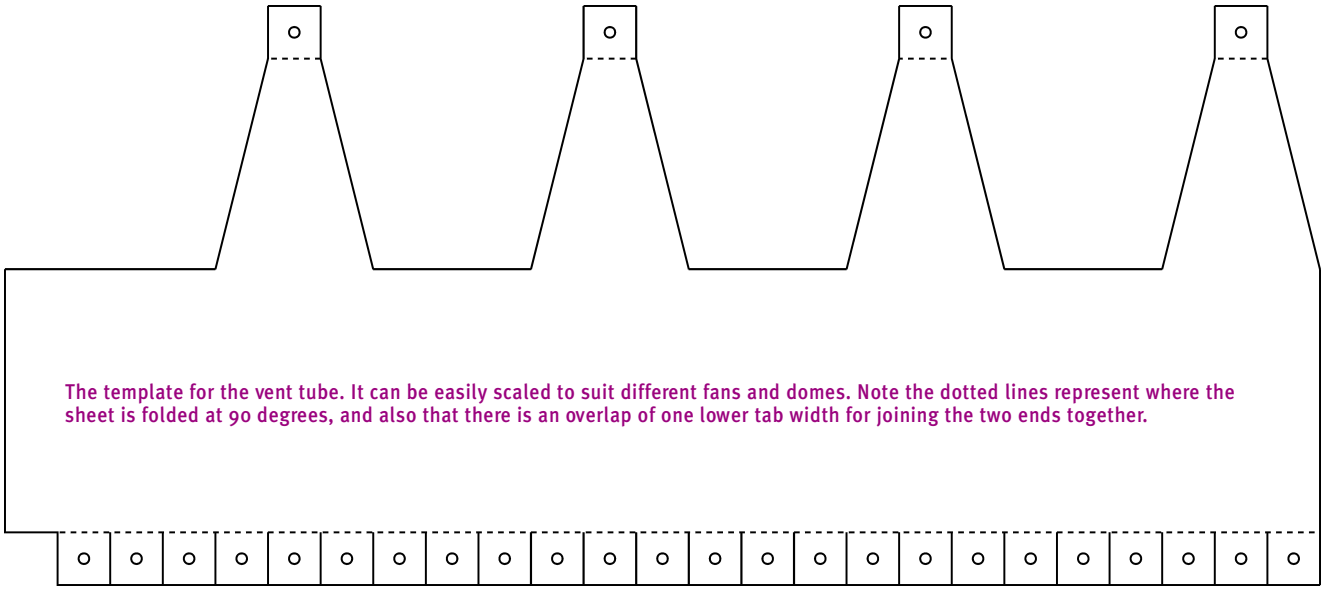
The all important inside temperature was not reduced by as much as hoped, only by 2 to 3 degrees Celsius, but it was certainly a worthwhile improvement, especially considering that the total cost of the ventilator was less than $40, including $20 for the aluminium flashing, but not including the solar panel.

I suspect that our house has a few more air leaks that also need to be sealed to reduce the influx of warm air.

One important thing to remember is that in order for your fan to be able to extract air from the roof, air from outside needs to be able to flow in to replace it. This is where the eave vents come in, but if your house doesn't have eaves, then low-mounted gable vents are also okay. It is best if the replacement air does not come from inside the house, as ultimately this will draw in hot air from outside. Also, the inlet vent and the fan need to be a good distance away from each other, as you want good cross ventilation through the whole roof cavity, if possible. The ideal setup is to have the fan in the middle of the roof with eave vents either side of it as far away as is possible.

Alternative options

There are many ways to set up roof ventilation. A simple method would be to combine a large Chinaman's hat vent with a standard 200mm or 250mm diameter exhaust fan. This would be activated by a cord switch mounted on the ceiling below it and run directly from 240 volts. Energy consumption of these fans is tiny compared to an air conditioner, yet this system could make a huge difference to roof cavity temperatures. Of course, it would need to be installed by a qualified electrician. ✶



The template for the vent tube. It can be easily scaled to suit different fans and domes. Note the dotted lines represent where the sheet is folded at 90 degrees, and also that there is an overlap of one lower tab width for joining the two ends together.

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A timer for 24 volts

Lance Turner

Way back in issue 40 of *Soft Technology* we showed you how to convert a Kambrook KD86 240 volt digital timer for use on 12 volts to turn garden lights on and off at appropriate times. This has always been a regular request from readers, but with the KD86 no longer available we thought it about time we investigated the timers currently available.

I dropped into our local K-Mart, and there were two timers available, a Ringgrip and an Arlec. I chose the latter, a model PC797, as at the time it seemed to be a bit more versatile.

The conversion

If you have the original article from issue 40, you will know that the conversion was simply a matter of running a short jumper wire across two components—a resistor and a capacitor—that were used to provide a 12 volt internal supply for the electronics of the timer directly from the 240 volt supply.

I opened up the timer by removing the two screws on the back of the unit. This allowed the rear cover to be removed and the bottom circuit board containing the power relay and power supply components to also be removed.

The Arlec model uses 24 volt internals, and hence a 24 volt relay, so I decided to see how easy it was to convert it to 24 volts first, and then see what else needed to be done for a 12 volt conversion.

This timer also used a resistor (100 ohm) and capacitor (0.33uF) to provide a 24 volt internal power supply, however these components were not together in the active side of the circuit. The resistor was in the active, and the capacitor in the neutral. An odd layout, but it probably made for a more compact design. However, it does mean that the electronics is floating at a voltage closer to 240 volts than to ground!

Anyway, a quick check of the rest of the circuit showed that the power flowed from these two components into a bridge rectifier and was then clipped to 24 volts via a one watt Zener diode. Because there is a Zener in the circuit, and because a 24 volt power system often reaches voltages up to 30 volts, I decided to leave the 100 ohm resistor in circuit so that the Zener would not get fried. The resistor will limit the current through the Zener to a reasonable level.

This was the theory, so it was time to try it out. To allow DC current to flow, the 0.33uF capacitor was bypassed with a simple wire link soldered to the copper side of its circuit board connections. And that was all that was needed to make it into a 24 volt timer.

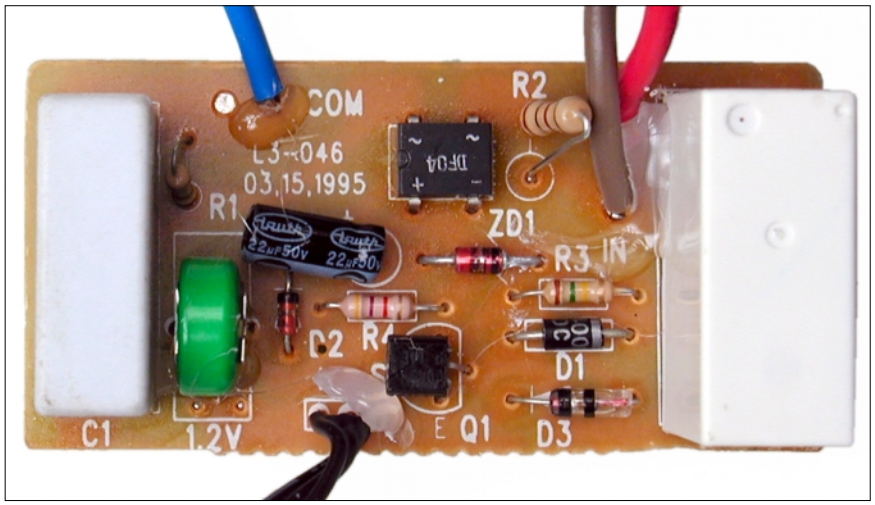
Testing

With the timer still disassembled, I hooked up a variable power supply and set the current limit down low so that any problems would not cause the timer to be damaged. I set the voltage to 24 volts, then tried the manual override button. This made the relay click in and out, just like it should, so things were looking good. Next, I turned up the voltage to 30 volts and checked the various components for excessive heating.

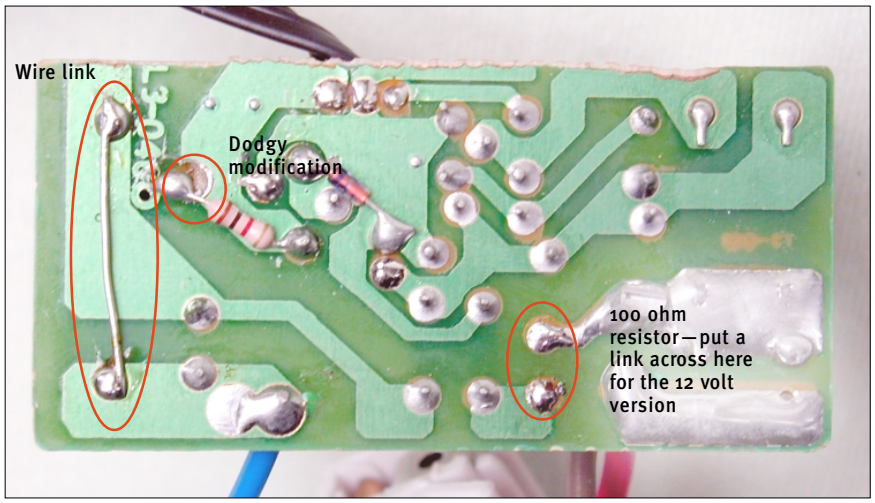
The only component to get appreciably hot was, surprise, surprise, the Zener diode. A quick check of the voltage across the 100 ohm resistor showed about 4 volts. There is some voltage loss in the bridge (1.2 volts), and the Zener voltage actually increases as it gets hot, which accounts for the rest

of the voltage. With the relay off, the Zener temperature rose to close to 80 degrees Celsius, as it was absorbing most of the current flowing through the 100 ohm resistor (about 40 milliamps). Multiply this by the Zener voltage, around 25 volts at this current, and you get exactly one watt, which means the Zener should be okay at this input voltage level.

When the relay was on, it absorbed a lot of the current flowing through the resistor, and so the Zener current, and hence temperature, decreased. If the diode getting this hot worries you, then simply remove it from the circuit. With a controlled input voltage from the batteries, it is not needed, although it will clip any high voltage spikes that may otherwise upset the electronics of the timer. I left it in place as I had no reason to remove it.



Here is the circuit board that needs to be modified. The relay is the big white block on the right, while the 0.33uF capacitor is the white block on the left. The 100 ohm resistor is labelled R2 at the top of the board. The Zener diode, labelled ZD1 can be removed if it gets too hot.



Here you can see the copper side of the circuit board. Note the wire link across the capacitor terminals on the left. Also note that the two added components, and the dodgy looking modification to the board, were straight from the factory!

After the timer was reassembled, it was ready for use on our 24 volt system.

Using it on 12 volts

If you want to make a 12 volt timer, then you need to do two more things to the timer. The first is to bypass the 100 ohm resistor with another wire link. The second, which can be more difficult, is to remove the 24 volt relay and replace it with a 12 volt unit of the same size, shape and pin configuration. There is not a lot of extra room in the case, so the replacement relay can be no more than about 2mm higher than the original. I looked through the usual catalogues, and found a 12 amp low-profile unit with the same pinout available from Farnell Components (www.farnell.com/australia/index.html) for $8.44 plus GST. The part number for this relay is 320-6002. There is also a 16 amp version for $9.60 plus GST, part number 320-6040.

Once that is done, the unit should work quite happily on 12 volts. I tried it on 12 volts using the 24 volt relay, but it would not activate reliably until the supply voltage reached 18 volts or so, although the rest of the circuit worked fine.

By twisting the earth pin 90 degrees, it can't be accidently inserted into a 240 volt power point.

Safety

You must label the timer clearly that it is for 12 or 24 volt use only! We suggest that you glue or screw an 'International' adaptor onto the back of the timer so that it can be used only on those sockets, and then use those sockets for the extra-low-voltage circuits in your house. These sockets are ideal, as they have large square robust pins suitable for high-current use. They are available from some electrical suppliers, as well as stores like RS Components.

A cheaper, though less desirable, alternative is to put a 90 degree twist in the earth pin of the timer. This will prevent it being plugged into a standard 240 volt outlet. Then you just wire the extra-low-voltage circuits in your house with conventional power points with the earth hole drilled out large enough to accommodate the twisted pin. The earth pin is generally not required in extra-low-voltage wiring.

Also remember that the standard switches in AC power points are not suitable for DC use, so just use plain unswitched sockets with suitable DC switches.

So there you have it, a simple timer conversion that can be used to turn your 12 or 24 volt lights and appliances on and off whenever you want.

RAPS fridge buyers' guide

Peter Wood examines fridges suitable for RAPS systems, what they cost and where to get them

In the western world, refrigeration is something that we tend to take for granted. It seems easy—we buy food, stick it in the big white box and eat it days, weeks or even months later. However, actually choosing your fridge in the first place is not so simple if you are concerned about energy efficiency, especially when you are also making your own electricity.

This buyer's guide looks at what makes a fridge efficient and some of the high-efficiency alternatives available including those designed with the independent home in mind.

High efficiency 240 volt AC fridges

The first option is a high efficiency 240 volt AC fridge. They are pretty much the same as any other fridge you would find in your local whitegoods shop, except that they are designed to minimise power consumption.

They use a compressor system, where a gas is compressed by a motor-driven pump to form a liquid, and pumped into the evaporator plate inside the fridge. Here it expands back into a gas and, in doing so, absorbs heat. The heated gas then moves to the condenser coils on the back of the fridge where it cools. The process is then repeated.

The overall efficiency of the fridge depends on the following:

- the efficiency of the motor that drives the pump which makes the fridge cold in the first place
- the amount of insulation used to keep the cold in (or the heat out), and
- how efficiently the condenser coils disperse the heated gas and therefore reduce the work load of the pump.

Another factor is the defrosting system used. Frost-free fridges use a system of heating elements in the cabinet and doors to rapidly remove ice from inside the fridge by melting it. The compressor then has to remove all of the heat they have dumped inside the cabinet by running excessively. This may offer convenience, but is very wasteful. The efficient alternatives to look for are either push-button or cyclic defrost systems.

To help you find an energy-efficient fridge, the Commonwealth Government has devised an energy-rating system for domestic appliances including fridges. An appliance is awarded between one and six stars. The more efficient it is the more stars it gets. The rating system is explained fully on the web site www.energyrating.gov.au, which also includes a list of 240 volt fridges with their star ratings. The fridges that stand out in this list are made by Vestfrost (details of suppliers are at the end of this article) and the Wine Cabinet from Bosch.

If you make your own electricity and are considering using a 240-volt fridge, you should weigh up the cost of extra solar panels against the cost of a more efficient extra-low-voltage fridge.

Extra-low-voltage DC

These fridges are aimed primarily at the independent home as well as the caravan and boating markets. Therefore, they are designed with high efficiency in mind.

The extra-low-voltage fridge uses the same refrigeration system as its big AC brother discussed above. The only difference is that a 12 or 24 volt battery powers the motor. The motor in a DC fridge is generally more efficient than one in a 240 volt AC fridge, and therefore uses less power. As with an AC fridge, other factors affecting efficiency are the amount of insulation, how well the condenser coils do their job, and the defrosting system used.

If you are running your home solely on 240 volts from an inverter, you will need to run a separate extra-low-voltage circuit for a DC fridge.

If you are connected to the grid, you can still run an extra-low-voltage fridge from a regulated 12 or 24 volt power supply. Some DC fridge suppliers sell these power supplies for use with their fridges. The cost of running it can be between a half to a third of that of the average AC fridge. However, the initial

cost will be higher as DC fridges are significantly more expensive than AC equivalents.

Gas and kerosene fridges

The last option is a gas or kerosene fridge. These use the absorption method of refrigeration, and are driven by the heat from a gas or kerosene burner, or electric element. The three-way fridge has both a burner and electric element so that you can switch between power sources: gas for the burner, or 12 volt DC or 240 volt AC to heat the electric element. The absorption system has the advantage that there are no moving parts such as compressors and motors to wear out, but the disadvantage is that they don't work too well in high ambient temperatures.

Is it environmentally friendly?

Some years ago, most compressor fridges used chlorofluorocarbon (CFC) gases as a refrigerant. However, since the realisation that these gases were highly destructive to the ozone layer, and their subsequent phasing out, none of the fridges now on the market have CFC refrigerants. All of the compressor fridges in this guide use the newer gas R134a, which is a hydrofluorocarbon, or HFC. This gas is supposed to be far more environmentally friendly than CFCs.

The insulation materials used in some fridges may contain CFCs. This is more likely to be so if the cabinet is imported. If this concerns you, ask the supplier. If they don't know, then it might be best to go somewhere else.

The refrigerant used in an absorption fridge is ammonia, which is not destructive to the ozone layer.

If you are concerned about minimising greenhouse gas production, the DC fridge is by far the better option. So long as it is powered by a renewable source of energy such as solar or wind power, it is not producing any greenhouse gases while running.

Gas fridges, on the other hand, do produce greenhouse gases from their burners, mostly in the form of carbon-dioxide. A typical 220 litre gas fridge, for example, would produce around 500kg of CO_2 per year, which is about 10 tonnes over its expected 20 year life.

How you can increase efficiency

There are a couple of simple guidelines that will help increase the efficiency of your fridge. The most important one is to consider the temperature outside the fridge. If possible, position your fridge away from sunlight, water heaters and ovens. Also, the back of the fridge should be well ventilated so that the condenser will cool down as quickly as possible.

Other more commonsense guidelines include keeping the door closed as much as possible, avoiding putting hot food in the fridge, and defrosting regularly.

What's available?

In our last refrigeration buyer's guide in 1998, there were few choices for people with independent power systems. While putting together the current guide, we were quite surprised to see the increase in the number of different makes and models.

This guide has been restricted to fridges suitable for domestic refrigeration. There are many other fridges on the market, including those sold as 'car fridges'. These range from cheap 'car coolers' which use Peltier devices for cooling (these are not very efficient), up to the quite advanced 'Eutectic' fridges, such as the Autofridge, which have very low power consumption requirements.

However, many people consider these too small or inconvenient for home use, so they have not been included. One manufacturer, Betts Boat Electrics, manufactures primarily for the marine market. Its fridges are extremely energy efficient and have fibreglass cabinets that are highly corrosion resistant. They make many models designed to be built into or under benches, so if you are building or remodelling your kitchen they may be the best option.

Norcoast Refrigeration makes the Trailblaza and several other models that are not listed in this guide. These were not included as they are aimed at the vehicle market, although some of the larger units could be suitable for small homes.

Both Keepikool and the 12 Volt Shop supply a very large range of DC fridges along with a range of associated accessories.

About the tables

There are two tables in this guide, the first of which covers fridge-only units and combined fridge-freezers. For most people, this is all they will require, but some will need longer-term bulk storage that only a deep freeze can provide. These appear in Table 2.

The tables should give you all the information you need to make your decision, so let's examine them in more detail.

Capacity: The fridge capacity is the size of the refrigeration section of the cabinet. The same goes for the freezer capacity. Adding these two figures gives the total cabinet capacity.

Type of fuel/voltages available: Almost all of the DC fridges are available in either 12 or 24 volt versions, and some of them, such as the Frostbite and ICEER, are dual voltage units. They have electronic controllers that allow the same fridge to be connected to either system voltage without problems. This

may be useful if you are thinking about upgrading your system at a later date, but want to buy your fridge now.

All of the gas fridges use LP gas as their fuel, and should not be run from natural gas unless they are correctly set up for it. This usually requires at least a change in burner jet size.

Fuel consumption: The figures given for the DC fridges should not be taken as gospel. There are many factors that will affect fridge performance, including ambient temperature, the amount of 'turnover' of food in the fridge, and how often the kids (and adults) stand there with the door open for 10 minutes. So really, the figures are only a relative measure of efficiency, but are none-the-less useful for comparing different models.

The fuel usage figures for the gas fridges have been given in grams used per day. This allows the running time to be easily calculated from a given size of gas bottle. It should be noted here that, unlike a compressor system, the amount of fuel used does not vary with ambient temperature—the burner runs all the time with a gas fridge—though the flame size, and thus the cabinet temperature, can usually be set from the front panel.

The rest of the tables detail fridge dimensions, prices and warranties. The prices include GST.

Suppliers

ARRID: The 12 Volt Shop, Unit 4/12 Kewdale Rd, Welshpool WA 6106, ph:(08) 9458 1212, fax:(08) 9458 1977

Bushman: DP Refrigeration, PO Box 1175, Research VIC 3095, ph:(03) 9437 0737, fax:(03) 9437 1570, email: kotto@techinfo.com.au; Going Solar, 320-322 Victoria St, North Melbourne VIC 3051, ph:(03) 9328 4123, fax:(03) 9328 1249

Coolmatic: The 12 Volt Shop, Unit 4/12 Kewdale Rd, Welshpool WA 6106, ph:(08) 9458 1212, fax:(08) 9458 1977; Waeco, 2 Mary St, Blackburn VIC 3130, ph:(03) 9894 7470, fax:(03) 9894 7480, email: sales@waeco.com.au

Consul: DP Refrigeration, PO Box 1175, Research VIC 3095, ph:(03) 9437 0737, fax:(03) 9437 1570, email: kotto@techinfo.com.au; Going Solar, 320-322 Victoria St, North Melbourne VIC 3051, ph:(03) 9328 4123, fax:(03) 9328 1249

Electrolux: Kleenheat, 372 Warburton Hwy, Wandin North VIC 3139, ph:(03) 5964 4424, fax:(03) 5964 2094; The 12 Volt Shop, Unit 4/12 Kewdale Rd, Welshpool WA 6106, ph:(08) 9458 1212, fax:(08) 9458 1977

Engel: Going Solar, 320-322 Victoria St, North Melbourne VIC 3051, ph:(03) 9328 4123, fax:(03) 9328 1249

Fisher and Paykel: Quirk's Victory Light Co, PO Box 340, Botany NSW 2019, ph:(02) 9700 0960, fax:(02) 9700 0964, email: energytoday@quirks.com.au

Frostbite: Davy Industries, RMB 1036, Banawartha VIC 3688, ph/fax:(02) 6026 7711; Going Solar, 320-322 Victoria St, North Melbourne VIC 3051, ph:(03) 9328 4123, fax:(03) 9328 1249

Frostek: DP Refrigeration, PO Box 1175, Research VIC 3095, ph:(03) 9437 0737, fax:(03) 9437 1570, email: kotto@techinfo.com.au

Kelvinator: Quirk's Victory Light Co, PO Box 340, Botany NSW 2019, ph:(02) 9700 0960, fax:(02) 9700 0964, email: energytoday@quirks.com.au; Keepikool Refrigeration, Shop 7/63 Winnellie Rd, Winnellie NT, ph:(08) 8984 3733, fax:(08) 8947 0483

Lemair: Windpower Australia, 200 Ninth Ave, Austral NSW 2171, ph:(02) 9606 0033, fax:(02) 9606 0720

ICEER: Betts Boat Electronics, 185 Esplanade South, Deception Bay QLD 4508, ph/fax:(07) 3203 3046

Trailblaza: Norcoast Refrigeration, 50 Grigor St, Caloundra QLD 4551, ph:(07) 5491 1849, fax:(07) 5491 7627

Tucker Box: Windpower Australia, 200 Ninth Ave, Austral NSW 2171, ph:(02) 9606 0033, fax:(02) 9606 0720

Vestfrost: Renewable Resources Workshop, 1 Railway St, Colac VIC 3250, ph:(03) 5231 3593, fax:(03) 5231 1844, email: rrws@bigpond.com; The Energy Shop, 27-29 Sydney Rd, Goulburn NSW 2580, ph:(02) 4822 2777, fax:(02) 4822 2590; Natural Technology Systems, 120 Prospect Road, Prospect SA 5082, ph:(08) 8344 7298, fax:(08) 8344 7298

Vitrifrigo: Keepikool Refrigeration, Shop 7/63 Winnellie Rd, Winnellie NT, ph:(08) 8984 3733, fax:(08) 8947 0483

Wemo: Keepikool Refrigeration, Shop 7/63 Winnellie Rd, Winnellie NT, ph:(08) 8984 3733, fax:(08) 8947 0483

Westinghouse: Quirk's Victory Light Co, PO Box 340, Botany NSW 2019, ph:(02) 9700 0960, fax:(02) 9700 0964, email: energytoday@quirks.com.au; Keepikool Refrigeration, Shop 7/63 Winnellie Rd, Winnellie NT, ph:(08) 8984 3733, fax:(08) 8947 0483

Table 1. Fridges and fridge/freezers

Make	Model	Fridge capacity (litres)	Freezer capacity (litres)	Type of fuel/ voltages available	Refrigeration system	Fuel/power consumption	Number of doors	Dimensions H x W x D (mm)	Comments	Price	Warranty
ARRID	FC90	78	12	12/24V DC	Compressor		1	910 x 560 x 480		$1,399	12 mths
	FC140	122	18				1	930 x 610 x 670		$1,648	
	FC170	150	20				1	1080 x 610 x 670		$1,850	
	FC220	180	40				2	1450 x 610 x 670		$2,100	
Bushman	320G	276	74	LP Gas	Absorption	545 gms/day	2	1695 x 595 x 750		$2,744	12 mths
Consul	QD22F (QD22G)	220	30	LP Gas (QD22G-gas or mains electricity)	Absorption	454 gms/day 1750 Wh/day @25°C	2	1450 x 595 x 692		$1,845, ($1,980)	12 mths
Coolmatic	MDC-50	41	4	12/24V DC	Compressor	288 Wh/day @ 32°C	1	620 x 425 x 445		$959	24 mths
	MDC-65	55	10			417 Wh/day @ 32°C	1	673 x 485 x 475		$999	
	MDC-90	80	10			489 Wh/day @ 32°C	1	830 x 485 x 475		$1099	
	MDC-110	97	13			561 Wh/day @ 32°C	1	805.5 x 525 x 547		$1299	
	RD-50B	48				384 Wh/day @ 32°C	1	540 x 417 x 450		$899	
	RD-65B/F	65				432 Wh/day @ 32°C	1	555 x 505 x 550		$999	
	RD-80B/F	80				486 Wh/day @ 32°C	1	660 x 535 x 535		$1099	
	RD-110B/F	110				594 Wh/day @ 32°C	1	775 x 580 x 566		$1299	
	RD-115NC	115	N/A			432 Wh/day @ 32°C	1	735 x 520 x 510	Pigeon pair with RD-115DF freezer, door hinged left or right	$1649	
	HDC-160	142	16			864 Wh/day @ 32°C	1	1045 x 540 x 553		$1549	
	HDC-190	142	45			1008 Wh/day @ 32°C	2	1245 x 540 x 553		$1749	
	HDC-220	172	46			1080 Wh/day @ 32°C	2	1405 x 540 x 553		$1949	
Electrolux	RM 4211	56.3	3.7	12V DC, 240V AC, LP gas	Absorption	348 gms/day	1	618 x 486 x 474	Door changeable left to right	POA	
	RM 2330	80	10			312 gms/day	1	766 x 550 x 565	No exterior skin- designed to be built-in		
	RM 2453	95	15			432 gms/day	1	948 x 632 x 627			
	RM 2553	135	15			432 gms/day	1	1104 x 632 x 627			
	RM 4601	139	47			480 gms/day	2	1427 x 632 x 668			
	RM 4401	91	12			432 gms/day	1	805.5 x 525 x 536	Door changeable left to right		
	RGE 400	177	47	240V AC, LP gas		504 gms/day	2	1612 x 592 x 623			
	RKE 400	169.5	47.5	Kerosene		1 litre/day maximum	2	1657 x 635 x 641	Has a 14 litre kerosene tank		
Engel	SRT 568	55	N/A	12/24V DC 240 AC	Compressor	345 @ 25°C	1	545 x 450 x 550		$1049	
	SRT 5108	80	N/A			460 @ 25°C	1	780 x 520 x 550		$1349	
Fisher & Paykel	P120	115	6	12/24V DC	Compressor	500 Wh/day @ 28-35°C	1	819 x 525 x 550	Cyclic defrost	$1,670	24 mths
	F160	164	N/A			380 Wh/day @ 28-35°C	1 - top opening	893 x 611 x 662		$1,895	
	C170T	115	57			600 Wh/day @ 28-35°C	2	1207 x 525 x 550	Cyclic defrost	$2,020	
	C250T	191	57			900 Wh/day @ 28-35°C	2	1595 x 525 x 550	Cyclic defrost	$2,155	
Frostbite	140	130	10	12/24V DC	Compressor	300 Wh/day @ 25°C	1	860 x 500 x 595	Automatically detects system voltage. Cyclic defrost	$1,579	12 mths written warranty
	170									$1,877	
	220	172	48			500 Wh/day @ 25°C	2	1375 x 510 x 600		$1,936	
	300	226	74			600 Wh/day @ 25°C	2	1590 x 600 x 660		$2,330	
	360									$2,854	
ICEER	100	75	23	12/24V DC	Compressor	360 Wh/day @ 25°C	2	620 x 950 x 460	Top opening	$3080	24 mths
	105	75	30			360 Wh/day @ 25°C	2	620 x 1100 x 480		$3080	
	130	96	30			480 Wh/day @ 25°C	2	840 x 1130 x 400	Top-opening freezer, front-opening fridge		
	160	120	38			480 Wh/day @ 25°C	2	840 x 1130 x 500		$3960	
	150	106	20			360 Wh/day @ 25°C	1 - top opening	750 x 800 x 600	Fibreglass cabinet	$3,080	
	upright 150	96	30			360 Wh/day @ 25°C	2	830 x 620 x 750	Top-opening freezer, front-opening fridge	$3,080	
	upright 170	170	N/A			288 Wh/day @ 25°C	1 - front opening	1060 x 610 x 750	Fibreglass cabinet, door changeable left to right	$3,080	
Kelvinator	C220F-R	177	43	12/24V DC	Compressor	825 Wh/day @ 25°C	2	1370 x 500 x 610		$1626	12 mhs
	P170F	159	11			600 Wh/day @ 28-35°C	1	1020 x 500 x 590	Cyclic defrost	$1,833	24 mhs
	C220F	166	50			850 Wh/day @ 28-35°C	2	1395 x 500 x 590	Cyclic defrost	$1,947	
	K-C360F	254	104			1200 Wh/day @ 28-35°C	2	1510 x 644 x 784	Cyclic defrost	$2,430	
	CS250F	250	N/A			900 Wh/day @ 28-35°C	1	1395 x 500 x 590	Cyclic defrost, pigeon pair with F210F freezer	$1,980	

Table 1 continued

Make	Model	Fridge capacity (litres)	Freezer capacity (litres)	Type of fuel/ voltages available	Refrigeration system	Fuel/power consumption	Number of doors	Dimensions H x W x D (mm)	Comments	Price	Warranty
Lemair	130	130	N/A	12/24V DC	Compressor	695 Wh/day @ 30°C	1	850 x 497 x 540		$1,529	12 mths
	240	213	27			700 Wh/day @ 30°C	1	1250 x 580 x 600		$2,090	
	300	240	60			950 Wh/day @ 30°C	2	1610 x 600 x 600		$2,211	
Trailblaza	150			12/24V DC	Compressor		1	750 x 675 x 1175	Twin compressors, 125mm thick insulation	$2,000	
	200						1	900 x 675 x 1175		$2,300	
Vitrifrigo	C37	37		12/24V DC	Compressor	252 Wh/day	1	420 x 405 x 405	External compressor	$1,255	12 mths
	C 45 L	41	4			468 Wh/day	1	540 x 390 x 400	External compressor	$1,174	
	C 60 I	52	8			324 Wh/day	1	615 x 470 x 460	Available with cold release plate option	$1,085	
	C 75 L	67	8			336 Wh/day	1	615 x 470 x 460	External compressor and cold release plate	$1,265	
	C 85 I	82	8			360 Wh/day	1	785 x 485 x 470		$1,318	
	C900 N	81	11			432 Wh/day	1	831 x 485 x 480		$1,306	
	C115 I	110	8			456 Wh/day	1	765 x 525 x 550		$1,428	
	C 1200 N	107	13			516 Wh/day	1	805 x 525 x 550		$1,633	
	DP 150 I	120	30			1008 Wh/day	2	1095 x 525 x 580		$2,414	
	C 130 L	122	8			468 Wh/day	1	765 x 525 x 550	Available with external compressor	$1,417	
	C1300 N	117	13			516 Wh/day	1	805 x 525 x 550	External compressor	$1,754	
Wemo	900	80	10	12V DC	Compressor		1	780 x 488 x 475		$1,396	12 mths
	1200	105	13				1	755 x 525 x 570		$1,694	
Westing-house	RA 141S	140	N/A	12/24V DC	Compressor	500 Wh/day @ 28-35°C	1	860 x 500 x 294	Manual defrost	$1,671	24 mths

Table 2. Freezers

Make	Model	Freezer capacity (litres)	Type of fuel/ voltages available	Refrigeration system	Fuel/power consumption	Number of doors	Dimensions H x W x D	Comments	Price	Warranty
Coolmatic	RD-115DF	115	12/24V DC	Compressor	600 Wh/day @ 32°C	1 - front opening	735 x 520 x 510	Pigeon pair with RD-115NC fridge	$1649	
Fisher & Paykel	F160S	164	12/24V DC	Compressor	820 Wh/day @28-35°C	1 - top opening	893 x 611 x 662	Manual defrost	$1,895	24 mths
	H220X	216			880 Wh/day @ 28-35°C		893 x 746 x 662		$2,030	
Frostbite	120	120	12/24V DC	Compressor	350 Wh/day @ 25°C	1 - front opening	860 x 500 x 590	Automatically detects system voltage Manual defros	$1,591	12 mths written warrantyt
	150	150			400 Wh/day @ 25°C	1 - top opening	900 x 560 x 660		$1,746	
	210	210			530 Wh/day @ 25°C		900 x 720 x 660		$1,884	
	300	300			672 Wh/day @ 25°C		915 x 1000 x 615		$2,472	
Frostek	TEK 240	160 or 240	LP gas	Absorption	568 gms/day	1	970 x 1130 x 790		$3,295	
ICEER	60	60	12/24V DC	Compressor	480 Wh/day @ 25°C	2 - top opening	590 x 1000 x 400		$3,080	24 mths
	71	71			480 Wh/day @ 25°C	2 - top opening	590 x 1140 x 400		$3,080	
	75	75			420 Wh/day @ 25°C	1 - top opening	680 x 800 x 600		$3,080	
Kelvinator	F210F	210	12/24V DC	Compressor	880 Wh/day @ 28-35°C	1	1395 x 500 x 590	Pigeon pair with CS 250F fridge	$1,980	24 mths
Lemair	120	120	12/24V DC	Compressor	790 Wh/day @ 20°C	1	855 x 555 x 630		$1,859	12 mths
	200	200			1120 Wh/day @ 20°C	1	1310 x 600 x 600		$2,420	
Tucker box	150	150	12/24V DC	Compressor	1100 Wh/day @ 30°C	1	920 x 560 x 660		$2,299	12 mths
Westing-house	FD213	210	12/24V DC	Compressor	825 Wh/day @ 25°C	1	900 x 715 x 670	Top opening	$1510	12 mths

Soft Tech and **ReNew** back issues

Available back issues of ReNew (formerly *Soft Technology*). All back issues up to issue 77 are $6.00 including postage within Australia. Issue 78 is $7.00 including postage.

Soft Tech Issue 41
Wind power buying guide; Build a window box greenhouse; rammed earth housing; Global warming quiz; 'Alternative' lifestyles in the country and city; Water saving shower roses; Electromagnetic radiation; Green cleaning products; Vanadium redox battery.

Soft Tech Issue 46
The Solar Grand Prix; A $5000 recycled house; Environmentally friendly loos; Getting started with windpower; RAPS battery buying guide; Do-it-yourself solar in the city; Water powered railway; Build your own solar water purifier, 12V fluoro inverter; 'A smart' regulator; Heating with your fridge.

Soft Tech Issue 47
Micro-hydro buying guide; Solar on the road; Earth-covered housing; RAPS around Australia; Ducted air central heating; Better light from halogens; The Electric mini; Make a 'Putt-Putt' boat; Build a solar panel sun tracker; Solar airship.

Soft Tech Issue 48
The 'green' small office; Kit homes with character; Human-powered speedsters; Detergent buying guide; Mudbrick cavity wall construction; Build a solar still; Power from hot air engines; Low-voltage washing machine controller; Regulator buying guide.

Soft Tech Issue 49
Nontoxic alternatives: cleaning, cosmetics and gardening; Make a model solar boat; Inverter buying guide; Cut your energy bills; D-I-Y solar hot water; Loft housing; The Green Grid; Build a portable power pack; Sewage treatment with UV; Cruising on an electric boat.

Soft Tech Issue 50
Ethical investments; Sustainable life in the city; Tips for conserving water; Make your own sundial; Solar garden lights; Convert your Esky to a fridge; The solar-powered college; Windpower for the community.

Soft Tech Issue 51
Selling power to the grid; Chemical-free pest control; D-I-Y solar-powered caravan; Insulation buying guide; Build your own inverter; Gorgeous gardens with less water; 101 uses for a dead tyre; Harnessing kinetic energy; Solar-powered caravan.

Soft Tech Issue 52
RAPS package buying guide; Build your own battery charger; Storing the sun with salt; Green living centre in Wales; Earthships; Renewable-energy credit card; Why economic growth is bad; Passive solar house with a twist; Car of the future; Solar power in the developing world.

Soft Tech Issue 53
Solar roof tiles; A water-powered pump; Build your home with 'good' wood; Hydrogen fuel cells; Battery charger buying guide; Earthworms: turning waste into profit; The history of solar technology; Fuel cells: past, present and future.

Soft Tech Issue 54
Soft Tech hits the Internet; Make a solar garden light; Solar salt ponds; Building with bamboo; Fuels for the future; Household recycling; Refrigeration buying guide; Electric car conversion.

Soft Tech Issue 55
Critical mass; Solar renovation on a budget; Wave power's turbulent history; A solar-powered bicycle ferry; Run an office printer on 12 volts; Hemp: a new Australian industry?; Make a model wind turbine

Soft Tech Issue 56
Turning a tip into a recycling centre; Keep your home warm in winter; Energy efficient landscaping; Canberra's Solar Boat Race; Sydney's green Olympics; Electric vehicles; Portable sawmills in PNG; Good firewood; Green Jobs; Tully Millstream; Buying back the bush; Convert a desk lamp to 12V; Make: a hand powered spin-dryer and a torch that runs for 10 hours.

ReNew Issue 57
Moora Moora- a solar powered community; Jackie French's water powered house; Companion planting; A hydro-powered eco-resort; Home energy efficiency tips; Solar sailing; Electric bicycles; Recycling the dead; Solar food drying; Living with chemical sensitivity; Ecosub- replanting seagrass; Solar panel buyer's guide; What's new in batteries; How to make solar Xmas tree lights.

ReNew Issue 58
Feeding power into the grid; Bush food garden; Eco-tourism resorts; New Zealand wind farm; Green computing; Renewable energy worldwide; Solar hot water buyer's guide; Model solar boating; World Solar Challenge; A solar powered workshop; Smart Builders; Keeping your house cool in summer; Make your own: solar water feature, wind speed meter.

ReNew Issue 59
Hydro-powered log cabin; 100 percent wind powered house; Saving energy with your fridge; The Sunrace; Solar bushfire lookout; Battery buyer's guide; Renewables in California; Power from sewage; Buying renewables by mail; Biodegradable plastics; Soldering made easy; Low voltage cable sizing guide; Build your own: water pump, shunt regulator.

ReNew Issue 61
Solar cooking; A self-sufficient family; Electric delivery van in Melbourne; Sustainable office design; Green Power in NSW; Composting toilets—avoiding the pitfalls; Vortec wind turbine; Cathodic protection using micro-hydro; Fighting for wind power; Living in the '70s; When the oil runs out; Phantom loads; 12 or 240 volts—the pros and cons; Build your own: Compost tumbler, low-voltage converter, fixing a Suntron tracker.

ReNew Issue 62
Solar hot water; Wind and solar at Wilson's Prom; Composting toilets in the city; Solar cooking tips; Monument to migration at Point Cook; Energy efficiency on a low income; Fuel cells; Cogeneration; Renewable energy course guide; Sustainable schools; Tools; Build-your-own: Ceiling fan, backup generator.

ReNew Issue 63
Grid-interactive system in WA; Solar power your shed; Intelife–breaking the unemployment cycle; saving energy in the ACT; Coal world; Chemical-free architecture; Wind turbine buyers' guide; Choosing a wind tower; Solar BBQ; Appropriate technology; Solar in Nepal; Mass transit beyond 2000; Make your own solar water heater.

ReNew Issue 64
Green renovations; Solar struggle in Warrnambool; Building Australia's biggest solar suburb; Solar at the zoo; Life without a car; 20 years of Going Solar; Ethical Investment; Making milk paint; Sinewave inverter buyer's guide; Should environmentalists eat meat?; Uranium mining; Monitoring your system; three-way fridge review; Wind buyer's guide addendum.

ReNew Issue 65
The Veggie Van; Solar sailing; Sustainable real estate; Australian solar still; Simple solar herb dryer; Victorian wind farms; Wind farms in California; 200kW solar power station; Regulator buyer's guide; Sinewave buyer's guide addendum; Flies in composting loos; The Grameen Bank; Product review: Davy Industries solar tracker; Waterwheel-powered pump; The C-Tick fiasco.

ReNew Issue 66
Free showers from the sun; Solar hot water for small business; Crookwell wind farm; Solar house on Phillip Island; Clocking up a solar surplus; More on the Newhaven Village; Solar air-conditioning; Sustainable development in the South Pacific; History of solar boating; National energy competition policy; Stirling engines; RAPS fridge buyer's guide; Air-powered water pumping; Build your own electric go-cart.

ReNew Issue 67
Citipower Sunrace '99; ReNew's new office; Solar charging into the suburbs; Sailing around the world on renewables; Going Solar fair; Energy-efficent house design; Using your fridge efficiently; Getting more out of ceiling fans; Motor-assisted HPVs; Farming on city rooftops; Water pump buyer's guide; The millennium bug.

ReNew Issue 68
Wind Co-ops; Wind and solar powered home; Wind and solar on French Island; Solar vs heritage issue; Two wind turbines on one tower; Sewerage treatment systems; Wood smoke pollution; Wood heater buyer's guide; Are you buying more power than you need?; An industrial sized solar food dryer; Investing in renewables; Build your own: Heat shifter, solar box heater, solar water heater, methane digester.

ReNew Issue 69
A house for $10,000; Genetic engineering; Veggie oil fuel; Veggie oil powered tractor; Electric bike rally; Large wind turbine maintenance; Generator buyer's guide; Hidden Phantom loads; Wind energy conference report; Compact Fluoros; LED lighting update; Build your own greywater system.

ReNew Issue 70
Solahart PV solar concentrator; Earth covered house in the suburbs; Studying renewable energy; Environmental education for kids; SHW at the zoo; Renovating for hot weather; Going bush with renewables; Solar panel buyer's guide; Sustainable Energy Foundation; Pulsing LEDs; DIY: Composting toilet, small Savonius wind turbine.

ReNew Issue 71
Sustainable house ideas; YHA eco-hostel; Solar-powered school; Bushfoods; Independent power in suburbs; BYO electric bike; Make biodiesel in a dishwasher; Wood-fired power stations; Insulation buyer's guide; Going Solar fair; Solar TAC billboards; TEAP; Converting old computers to data loggers.

ReNew Issue 72
Sustainable inner city living; Electricity industry deregulation; Indonesian environment centre; DIY micro-hydro; Micro-hydro buyer's guide; Community gardens; Products index; Articles index; Oatley regulator modifications; ATA's power system; Home-made solar bread.

ReNew Issue 73
Servicing remote power needs; Renewables for renters;Renewables in Germany; On the road with renewables; Avoiding RAPS mistakes; Diverting rubbish from landfill; ATA turns 20; Solar hot water buyer's guide; Solar turbine; DIY: datalogger.

ReNew Issue 74
Biodiesel for sale; Corporate green revolution; Save 100,00 litres of water; Driving LEDs from any voltage; A 3-phase workshop on renewables; Car-free days; Giving old bikes their second wind; Birds and wind turbines; Australia's largest wind farm; Sinewave inverter buyer's guide; How much is a solar system; DIY: solar light dimmer, freezer to fridge conversion, solar air conditioner.

ReNew Issue 75
1MW solar power station; ReNew inspires new house; Fuel cells; Hybrid vehicles; A dialysis centre's solar backup power supply; YHA solart hot water; Solar heated spa; Light pollution; Getting into a SCRAP; Grid connect hassles; Deregulation and contestability; Green Power buyer's guide; Wind powered water pump; Automatic solar lighting system; Solar scarecrow.

ReNew Issue 76
Appropriate design in Arnhem Land; An energy efficient retrofit; Buying a sustainable house; Renewable energy investments; Solar powered entertainment system; Solar and wind powered mobile cinema; Fruit trees for passive solar; Energy efficiency ideas; Battery buyers' guide; ReNew's solar office part 2; Datalogger add-ons.

ReNew Issue 77
Solar windows; Gothic strawbale in the suburbs; Wind industry consults community; Sydney Earthcare Centre; Victoria's first wind farm; NEM fails energy efficient households; RECs; Coolangatta school farm; LEDs on the seafront; Solar powered darkroom; 'Free energy' bike light system; Simple pumping solutions; DIY solar space heating; Windpower buyer's guide; Hideous solar houses.

ReNew Issue 78
Community power; Rural wind power; Low energy home in the Kimberleys; Fixing contaminated tank water; Solar water features; LEDs in Nepal; Teaching sustainability; Newcastle's Ecohome; Rechargeable batteries; Singing biodiesel's praises; Solar panel buyers' guide; Earthing your power system.

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79/02

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Make a donation today and make a difference.

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79/02

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Adult Education Courses

We have the following courses coming up this year:

3 Mar, 14 Apr, 28 Apr, 19 May, 23 June	Grey water, rainwater and composting toilets
26 May	Solar electricity
2 Jun	Wind power
31 Mar, 16 June	Batteries for stand alone power systems
21 April	Low energy homes
5 May	Solar hot water

For further details contact the Centre for Adult Education, ph:9650 1111, email: courses@.cae.edu.au www.cae.edu.au

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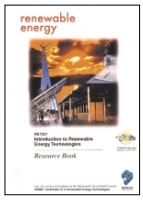
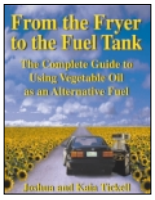


Introduction to Renewable Energy Technologies

Brisbane Institute of TAFE
Price: $73.70 Paperback, approx 300pp
One of the resource books from the Certificate IV in Renewable Energy Technologies, this book contains a wealth of information on renewable energy systems, their sizing and design. *Item code: IRET*



From the Fryer to the Fuel Tank

Author: Joshua Tickell
Price: $34.95 Paperback, 160pp
A great book that shows the reader how to make a clean-burning renewable fuel from waste vegetable oil. Includes detailed instructions on making and using the fuel in a standard diesel vehicle. *Item code: FFTFT*

ATA Booklets

Price $6.90 each (inc postage)
Available titles include Solar electricity, Solar hot water (2nd edition), Solar workshop, Building a Savonius rotor wind turbine, Solar fruit drying, Low-voltage appliances and Green cleaning.

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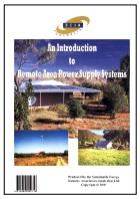
Harnessing the Sun–Solar Drying Your Own Produce

Author: Bob Fuller
Price: $19.25 Paperback, 74pp
Bob Fuller explains how to successfully prepare and dry many types of foods for preservation. Includes six plans for making your own solar food dryers. *Item code: HTS*



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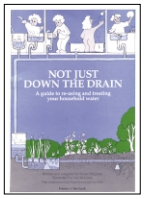

Not Just Down the Drain

Author: Stuart McQuire
Price: $16.45 Paperback, 59pp
Provides practical solutions for on-site treatment and re-use of water. Stuart helps you to assess whether your house is suitable for water recycling and what kind of recycling is most appropriate. *Item code: NJDTD*

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Sustainable House

Author: Michael Mobbs
Price: $38.50 Paperback, 188pp
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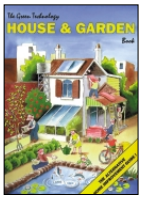

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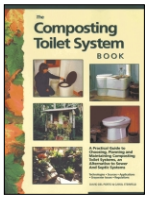
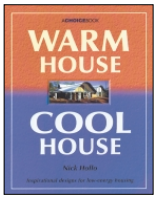


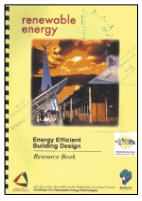
The Composting Toilet System Book

Authors: David Del Porto & Carol Steinfeld
Price: $43.90, Paperback, 234pp
Covers many different composting toilet systems including those available in Australia and thorough general information about composting toilets. Includes a chapter on greywater. *Item code: CTSB*



Warm House, Cool House

Author: Nick Hollow.
Price: $33.00 Paperback, 172pp
An easy to read introduction to the principles of energy-efficient housing design. Covers a broad range of topics and contains an abundance of drawings, plans and photographs. *Item code: WHCH*



Energy Efficient Building Design Resource Book

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Covers basic principles of passive solar and energy efficient building design with sections on thermal mass, insulation, building orientation, landscaping and much more.
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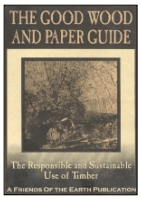

The Good Wood and Paper Guide 9th edition

Anthony Amis (ed) Friends of the Earth, 1999.
Price $20, Paperback, 172pp. Reviewed in ReNew #71
Whether you are building a house or buying copy paper for the office, this book provides essential information to help you make the right choice for the planet. *Item code: GWPG*

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- Free back issue of *Soft Technology* or *ReNew* (New members only)
- Subscription to *ReNew*
- *The Sun*, a bi-monthly members newsletter, detailing events, meetings and branch contact details. You can receive it by post or email
- Discounts on ATA Adult Education courses such as Solar Electricity, Batteries, Greywater and Windpower. (Courses held in VIC only)
- The chance to participate in member activities such as field trips and seminars
- Access to the ATA's renewable technology library
- Members card
- The chance to network with over 1800 other members throughout Australia

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- EcoSouth: $150 off RAPS or Grid-connect systems.
- Gordon Wilson Solar: 10% off all products.
- Cycletrek Bunbury WA: 5% off bikes, 10% off parts, accessories and bike hire.
- Sandford Electronics and Solar: 10% off 12V to 48V Woods battery chargers for ATA members in the Wollongong area.
- Sola-Kleen: 10% off retail price on all solar water heaters.
- Going Solar: 10% off all BP/Solarex panels up to 40 watts. Excludes specials. Retail store only.
- K & C Stork: Discounts include 10% off Edwards solar systems and KCS inverters (Conditions apply. Contact Olivia (03)9388 9311 for details).
- Solar Energy Australia: 10% off all products.
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See the latest issue of The Sun newsletter for details.

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Alternative Technology Association, PO Box 2001 Lygon St North, Brunswick East VIC 3057, Australia

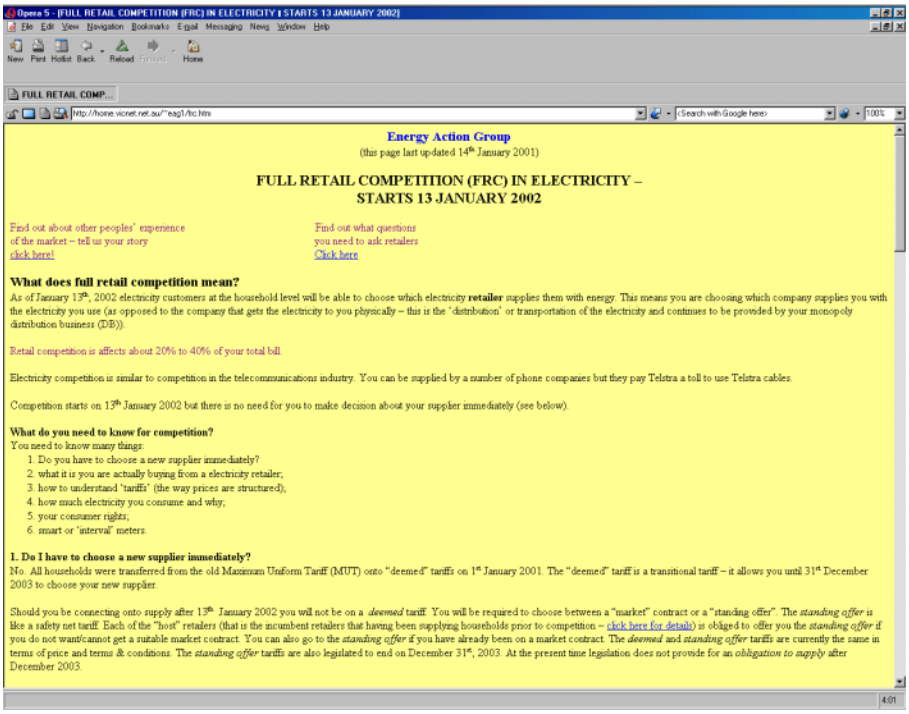
Browser

home.vicnet.net.au/~eag1/frc.htm

Now that contestability has come into play in Victoria and NSW, residential electricity customers can purchase their power from any one of up to 15 retailers. But who to choose? And is it worth changing anyway?

Energy Action Group Inc of Victoria has a web page dedicated to what you need to know about the new energy market. While it is not a pretty web site, it is informative, and provides most of the links you need to get further information.

It includes questions you should ask any potential electricity retailer, including: Will I be paying per quarter?; Is there a minimum consumption level?; Are there different charges for summer?; What is the length of the contract?; Is there a penalty if I want to get out of the contract early? and many others.



Energy Action Group

(this page last updated 14th January 2001)

FULL RETAIL COMPETITION (FRC) IN ELECTRICITY – STARTS 13 JANUARY 2002

Find out about other peoples' experience of the market – tell us your story click here!

Find out what questions you need to ask retailers Click here

What does full retail competition mean?

As of January 13th, 2002 electricity customers at the household level will be able to choose which electricity **retailer** supplies them with energy. This means you are choosing which company supplies you with the electricity you use (as opposed to the company that gets the electricity to you physically – this is the 'distribution' or transportation of the electricity and continues to be provided by your monopoly distribution business (DB)).

Retail competition is affects about 20% to 40% of your total bill.

Electricity competition is similar to competition in the telecommunications industry. You can be supplied by a number of phone companies but they pay Telstra a toll to use Telstra cables.

Competition starts on 13th January 2002 but there is no need for you to make decision about your supplier immediately (see below).

What do you need to know for competition?

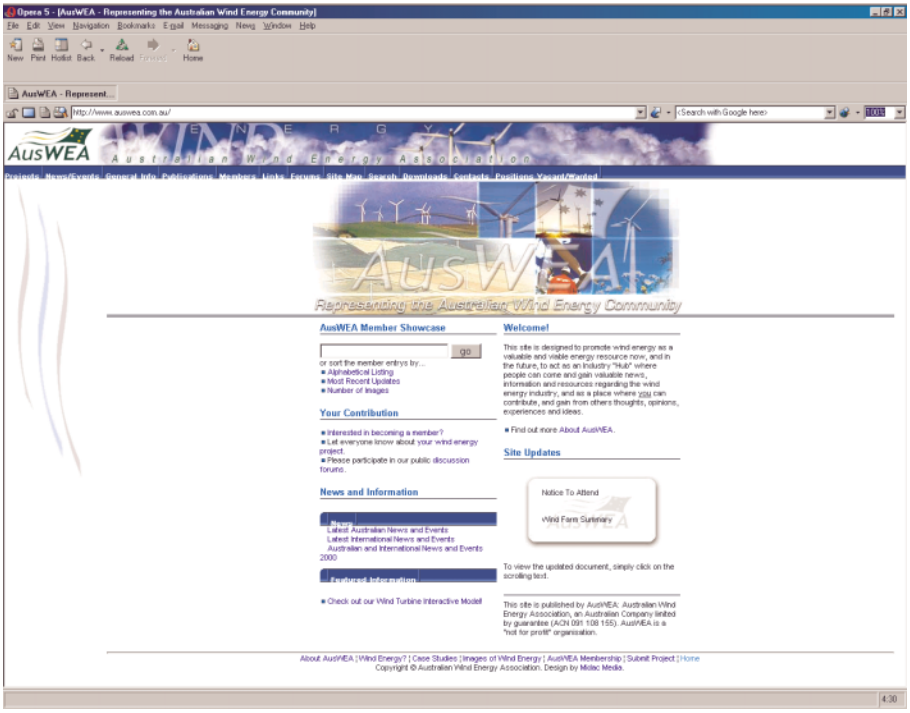
You need to know many things:

1. Do you have to choose a new supplier immediately?
2. what it is you are actually buying from a electricity retailer;
3. how to understand 'tariffs' (the way prices are structured);
4. how much electricity you consume and why;
5. your consumer rights;
6. smart or 'interval' meters.

1. Do I have to choose a new supplier immediately?

No. All households were transferred from the old Maximum Uniform Tariff (MUT) onto "deemed" tariffs on 1st January 2001. The "deemed" tariff is a transitional tariff – it allows you until 31st December 2003 to choose your new supplier.

Should you be connecting onto supply after 13th January 2002 you will not be on a *deemed* tariff. You will be required to choose between a "market" contract or a "standing offer". The *standing offer* is like a safety net tariff. Each of the "host" retailers (that is the incumbent retailers that having been supplying households prior to competition – click here for details) is obliged to offer you the *standing offer* if you do not want/cannot get a suitable market contract. You can also go to the *standing offer* if you have already been on a market contract. The *deemed* and *standing offer* tariffs are currently the same in terms of price and terms & conditions. The *standing offer* tariffs are also legislated to end on December 31st, 2003. At the present time legislation does not provide for an *obligation to supply* after December 2003.



AusWEA

Australian Wind Energy Association

Representing the Australian Wind Energy Community

AusWEA Member Showcase

Welcome!

Your Contribution

Site Updates

News and Information

www.auswea.com.au

This is the site of the Australian Wind Energy Association. It is designed to promote wind energy as a valuable and viable energy resource now, and in the future. It acts as an industry hub where people can gain valuable news, information and resources regarding the wind energy industry, and as a place where you can contribute, and gain from others thoughts, opinions, experiences and ideas.

The site has the latest news and events, information on all large wind farms in Australia, and a download area where you can find high resolution images of many Australian wind power projects. There is evan a positions vacant and wanted section for those wanting to get into the industry.

[The Pears Report]

Renewable Energy Certificates

Alan Pears discusses the fine print and the need for amendments

We're now seeing schemes where buyers of solar hot water systems units and small renewable electricity generators are being asked (or required) to sign over the rights to the Renewable Energy Certificates to another party in exchange for a discount or rebate when they purchase the technology. For example, to qualify for the Victorian government solar hot water rebate, you must assign the RECs to the government. At least one solar water heater manufacturer has negotiated discount deals through electricity retailers in exchange for the rights to certificates. But is this such a good idea?

It depends. If you want to save money on your own renewable energy technology, it will certainly help. But if your aim is to maximise the contribution of renewable energy in Australia, it's not so good. The RECs you assign to another party can be used to comply with the Mandatory Renewable Energy Target, so your renewable energy may be captured by an electricity retailer and would would fulfill a portion of the (quite small) target. If you keep your RECs, or do not generate them with the Office of the Renewable Energy Regulator, the renewable energy you generate (or the electricity use you avoid, in the case of solar hot water) is additional to the amount generated to comply with MRET. On this basis, I would be inclined not to sign over my RECs if I buy a solar hot water system, and I would not generate RECs if I installed a renewable electricity system. But I would miss out on some attractive discounts!

The situation is further complicated in Victoria (and possibly elsewhere), because the government requires you to hand over your RECs if you accept a solar hot water rebate, but has not stated whether it will sell them to electricity retailers or quarantine them. In reality, the Victorian government could hoard these certificates and sell them at any time until 2020 to electricity retailers who need them to comply with MRET. While this government may have no intention of doing this (but I am not aware of any public statement of its actual intent), any future government could reverse this position, and undermine future development of renewables by flooding the market with hoarded RECs.

A change in the commonwealth legislation could overcome this problem. One option would be to allow the owner of a REC to cancel it at any time. This would help in various circumstances.

First, it would allow the operators of green power schemes to cancel RECs associated with electricity sold through their schemes, further ensuring this electricity was additional to the mandatory target. Green power administrators have already stated that the scheme will be additional to the MRET, but the ability to cancel certificates would provide a clear mechanism to guarantee this.

Second, it would allow individuals and organisations that wish to support growth of renewable energy to gather and then cancel certificates on the certificate market, increasing the amount of renewable energy generated. This strategy may be preferred by some to buying green power, because RECs may be cheaper than green power in some circumstances, and you can buy any quantity of certificates, while the amount of green power you can buy is limited to the amount of electricity you consume. Environmental groups could even organise cooperative certificate groups!

Third, it would mean governments that implement incentive schemes for renewable energy could be held accountable for cancelling the associated certificates, ensuring that their actions were additional to the MRET. Lastly, state governments could introduce licence conditions on electricity retailers operating within their state to submit RECs (which could be required to be sourced within that state, and from preferred mixes of energy sources). State governments could then use the MRET accounting system to influence the direction and scale of renewable energy development within their jurisdictions.

A second option, which could be introduced separately or in addition to the first, would be to limit the time for which each certificate can be 'banked' to, say, three years before cancellation. At present, there is no time limit, so a certificate generated in 2002 could be used in 2020. This change may generate opposition from speculators, and those who fear a limit may reduce the value of certificates, reducing the benefits to renewable energy generators. On the other hand, such a measure would reduce the risk of the market being flooded with hoarded certificates in future years.

Energy efficiency

The last couple of years have seen a dramatic acceleration of the mainstreaming of renewable energy in Australia. Green power schemes, the Mandatory Renewable Energy Target, Greenhouse Office programs, solar hot water rebates and GST offset programs negotiated by the Democrats have driven this transition. And a great thing it is, too. Much more is needed, but we now seem to have a critical mass. The financial sector and an increasingly influential renewable energy industry will drive development because the private sector can now see ways of delivering renewable energy profitably. Government Ministers will be able to open new renewable energy facilities, ensuring they gain appropriate electoral mileage from such development, and building their support for more.

Unfortunately, the same cannot be said about energy efficiency improvement. Various government agencies have been working hard to implement programs such as appliance and building rating schemes and standards. However progress has been slow, and take-up of measures in the field has been sluggish. The restructured energy supply industry has largely abandoned support for energy efficiency and demand-side management, while promoting growth in energy consumption.

At best, energy efficiency improvement is difficult to promote, as it is abstract. It involves actions that cross traditional business boundaries – for example, building developers bear the capital costs of energy efficiency while the occupants benefit from the savings. It seems that energy markets around the world have not been able to deliver energy efficiency. Yet many of the largest and most cost-effective greenhouse emission reduction options rely on energy efficiency, so we have to make it work if we want to deliver rapid and effective greenhouse response.

A couple of proposals bear serious consideration. The Sustainable Energy Industry Association (SEIA www.seia.com.au) has proposed expansion of the Mandatory Renewable Energy Target (MRET) to become a Mandatory Sustainable Energy Target (MSET), with separate sub-targets for renewable energy and energy efficiency. As for MRET, the government would set targets, and energy retailers would have to collect enough MSET certificates to meet their share of the target by pursuing approved energy efficiency measures or by buying certfiicates on a trading market.

A second proposal floated by SEIA some time ago is a 'reverse carbon tax' - the use of some of the revenue from emissions trading or carbon levies to pay companies and individuals who invest in approved energy efficiency measures an incentive linked to the size of the lifecycle savings in greenhouse gas emissions. This approach provides a way of encouraging appliance and equipment manufacturers, builders, car manufacturers and others who influence emissions but don't benefit directly from the savings to invest in energy efficiency and emission reduction.

These two strategies are complementary. The MSET framework creates an incentive for energy suppliers to deliver some energy efficiency – dependent of course on the level of targets set. The incentives for those who influence energy use target a key group who would otherwise focus limited attention on energy efficiency. These are the kinds of broad policies we need if the enormous potential of energy efficiency is to be captured. ✲

NSW Wind Energy Handbook 2002

Sustainable Energy Development Authority. ISBN 0 7313 9191 8, 86 pages, $33. Order directly from SEDA. Ph:(02)9249 6100, www.seda.nsw.gov.au

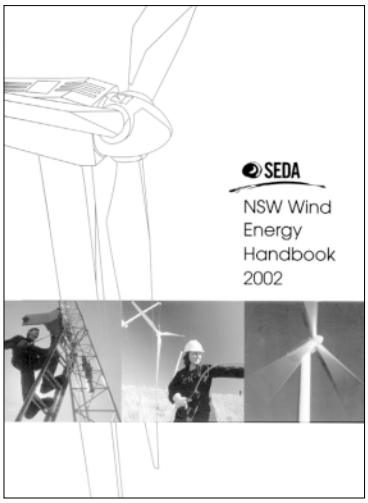
The Sustainable Energy Development Authority has brought together and condensed the disparate bits and pieces relevant to commercial wind energy and let some graphic designers make it all into a book.

The handbook has been 'compiled specifically for use by developers, consultants, councils, landholders and communities'—and it is this bringing together of everybody that is the publication's strength. Presenting the operation of the national electricity market, government planning approval processes, local community consultation as well as technological jargon, all in the one place, may not only facilitate greater mutual comprehension by stakeholders, but also serves to define their grouping together as 'wind energy stakeholders'.

It is unashamedly a 'pro' wind development presentation, but still the details and issues are covered suprisingly well given the concise format. At the same time it seems that the importance given to producing an attractive, modern-feel designer book has overshadowed the strength of the written information. Indeed, of the 80-odd ring bound-pages (even the numbering made stylish with well chosen but meaningless additional characters), around one quarter of them are filled purely with unannotated and generic 'feel good' images.

The written content also strives to be as generic as possible—while quite strictly staying within the NSW border. And interestingly, the approach totally denies a historical perspective. References to the situation overseas, or even interstate, are rare indeed, let alone the important details of *experience*. But then, you could say the title is on the ball—this is the 2002 handbook for NSW.

On the technological side the attempt to remain generic does lead to some minor problems. The blanket statement that 'lighting arrestors built into the turbines mean that no risk is posed' isn't really convincing by itself (see burning turbine in *ReNew* issue 78). And if 'embedded' wind generation is relevant to much of NSW, then why does the normal site selection require proximity to high voltage transmission lines?—but then, is 'embedded' really the same as 'distributed'? The strength of this book is as a concise compilation, it was surely never intended to be an authoritative reference to the pickier details of any of the individual fields it brings together.



SEDA has taken the initiative and put together a invaluable common reference for all involved—something that remains sorely missed in many other locations.

Review by Andrew Taylor

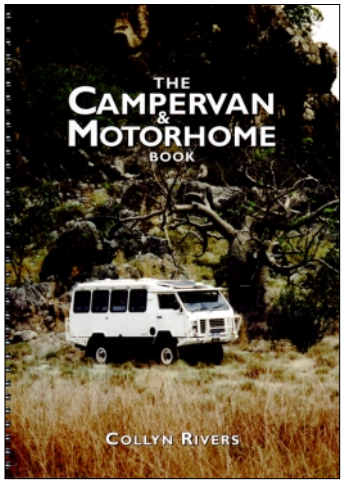
The Campervan and Motorhome Book

Collyn Rivers
ISBN 0 9578965 0 6, $37 inc postage. Order directly from Collyn. Ph:(08)9192 5961, email: collynr@bigpond.com

At first glance, this book is probably not the sort you would expect to see reviewed here in *ReNew*, but once you delve deeper into the topics covered, there is certainly some overlap of subject matter.

The book is basically a manual on how to set up a campervan or motorhome for touring around Australia. It covers all the traps and pitfalls you are likely to encounter, and includes sections on setting up power systems for the road.

It covers the use of solar power in such systems, as well as other topics that would be usefull to the RAPS owner, such as water pumping and refrigeration systems, though it has to be remembered that they are discussed in the context of mobile living, where there are considerable space and weight constraints.



However, if you are a traveller, especially one who likes to take their home with them, the book will appeal.

Briefly, it covers the topic right from what to look for when selecting a vehicle, how to fit it out, what you will need, what you won't, materials to use, tools and spares required, safety, registration requirements and many other aspects of setting up for life on the road. Even though I am not a campervan owner, I found the book interesting nonetheless.

Review by Lance Turner

[Sustainable technology events]

Send details of events to *ReNew*, PO Box 2001, Lygon St North, Brunswick East VIC 3057, Fax:(03) 9388 9322, email: ata@ata.org.au. For event updates see our web site at www.ata.org.au

ATA workshops

CERES site, Lee St, East Brunswick, VIC

- Greywater: 3 Mar, 14 Apr, 28 Apr, 19 May, 23 June
- Solar electricity: 26 May
- Wind power: 2 June
- RAPS Batteries: 31 Mar, 16 June
- Low energy homes: 21 April
- Solar hot water: 5 May

Fee: $110 for ATA members/concession, $120 for non-members (inc GST). Contact: CAE on ph:(03)9650 1111, email: courses@.cae.edu.au, www.cae.edu.au

Recycled Products Expo

6 March, 2002, Whitehorse Centre, Nunawading VIC

Aimed at anyone interested in knowing about recycled content products for office, garden, home and business.

Contact: Kirstin Coote, City of Whitehorse, ph:(03)9262 6433, email: kirstin.coote@whitehorse.vic.gov.au

EcoGeneration 2002

13-15 March, 2002
Star City, Sydney

Covers cogeneration, renewables, waste-to-energy generation and distributed generation. Fees are $1495 for non-members, and $1075 for members of the Australian EcoGeneration Association.

Contact: Conference Secretariat, ph:(03)9530 6777, fax:(03)9530 6526, email: services@profconferences.com

Renewable Energy Home Show

16-17 March, 2002
Highfields Cultural Centre, Highfields QLD

A two-day family expo featuring the latest renewable energy technologies. There will be eight guest speakers and demonstrations of how householders can cut energy bills.

Contact: Stuart Shaw on ph:(07)4632 1505, email: info@trec.org.au

Enviro 2002

7-12 April, 2002
Melbourne Exhibition Centre, Melbourne VIC

Includes Enviro 2002 Convention and Exhibition and the IWA 3rd World Water Congress, with four conferences on: Waste, Water, Odour and Business of the environment.

Fees: $1425 for members, $1570 for non-members, $475 for students/retired. Technical tours, social events and tours extra.

Contact: Quitz, ph:(02)9410 1302, fax:(02)9410 0036, email: quitz@bigpond.net.au

Wimmera Sustainable Living Fair

Sunday 14 April, 2002
Longrenong College via Horsham

Passive solar design, solar, alternative building materials, organic food and farming.

Contact: Robert Binns, ph:(03)5362 2222, email: rybinns@netconnect.com.au

CERES Walking History

21-22 April, 2002
CERES site, 8 Lee St East Brunswick VIC

Tour and guest speakers from the park's 25-year history.

Contact: CERES, ph:(03)9387 2609, www.ceres.org.au

WindEnergy International Trade Fair

18-21 June, 2002, Hamburg Exhibition Centre, Germany

An independent specialist fair covering all aspects of the wind power industry.

Contacts: Hamburg Masse, ph:+49 40 3569 2120, fax:+49 40 3569 2171, email: heiden@hamburg-masse.de, www.windenergy-hamburg.de

World Renewable Energy Congress VII

29 June - 5 July, 2002, Cologne, Germany

Aimed at ensuring renewable energy takes its proper place in our future. Covers policy, low energy architecture, PV technology, solar thermal, wind power, biomass, materials and fuel cells.

Contact: Professor Ali Sayigh, Congress Chairman, 47 Hilmanton, Lower Earley, Reading RG6 4HN, UK, email: asayigh@netcomuk.co.uk, www.wrenuk.co.uk

Renewable energy course

July 2002, Rockingham, WA

Designed for people who are considering installing a renewable energy system. Fee: $55.

Contact: Naragebup Environment Centre, ph:(08)9591 3077, email: rrec@southwest.com.au

The Lurujarri Dreaming Trail

1-10 July, 2002, Broome WA

The trail follows the coast 80km north of Broome from Minyirr (Gantheame Pt) to Minarriny (Coulomb Pt). It traces part of a traditional song cycle that maintains the living memory of people who have been in the country for thousands of years.

Cost of the trail is $1000, $750 concession, $440 for children 12-16 years old (includes all food).

Contact: Joseph Roe and Margie Cox, ph:(08) 9192 2959, Frans and Des, ph:(08) 9192 3337 or, in Melbourne, Judy Rogers at RMIT, ph:(03) 9925 3518.

RACV Energy Breakthrough

22-24 November, 2002

A technology and environmental educational program catering for a range of ages, technical abilities and actively encouraging female involvement. Includes pushcarts, HPVs and hybrid classes.

Designed to provide opportunities for students, teachers, parents and local industry to work together to design and construct a vehicle, a machine or an innovation in technology that will represent an energy breakthrough.

Contact: Martin Mark, ph:(03)5461 0621, fax:(03)5461 0665, email: martinm@cgoldshire.vic.gov.au or John Stafford, ph:0419 316 337, email: staffos@vicnet.net.au

Send us your questions

If you have a problem you just can't solve, or want to know the answer to a general question about sustainable technology, drop us a line and we will do our best to answer your query.

Send your questions to:
ReNew, PO Box 2001, Lygon St North, East Brunswick VIC 3057
Ph:(03) 9388 9311
Fax:(03)9388 9322
Email: lance@ata.org.au
www.ata.org.au

What's in a charge?

I find your glossary regarding batteries very informative and useful. However I have a query which I think you won't mind answering:

What is the difference between trickle charging and float charging and how are each acheived?

Diepak Mehtani,
diepakm@yahoo.com

A trickle charge is generally a constant current charge, usually from C/20 to C/100, regardless of battery voltage. A float charge is a fixed voltage charge to a pre-defined voltage setpoint. Current is usually not controlled in a float charge, other than by the internal resistance of the battery. A float charge is normally done after a bulk charge, and so the float current is relatively small, as the battery is already charged.

Lance Turner

Stepping up voltages

Being a member of the association for many years, I have come to appreciate your expertise and common sense in all the projects you have been involved with over the years. I have a problem in that I wish to increase the voltage of two lead-acid mining lamp batteries fitted in a steel case, nominal 8 volt to 12 volt.

I do not want to fit another battery due to weight and changes to the charger, also I have six units already made and have used them for years with Everready 6 volt shed fluoro lights which are now unobtainable. The local scout group of which I am a leader use these units for tent lights but now wish to replace the gas lights used in the dining fly with Coleman fluoro lights using eight D dry cells to provide 12 volts. I have tried three circuits of voltage doublers but although I get the voltage the current draw of 750mA kills them. I would appreciate your help in finding a circuit.

Peter Netting,
pnetto@bigpond.com

Peter, Oatley Electronics has a kit that is designed to charge 12 volt batteries from a car system. What it does is step the voltage up from 12 volts to 13.8 volts for charging. These can deliver 2 amps or more, so would be ideal. They should work as is, the MOSFET only needs about 8 volts to turn on fully, but if you find the FET getting too hot, then you can just swap it for a decent logic level FET, available from places like Farnell components.

Certainly, running lights on D cell disposable batteries is not the way to do it, this would be a much better option. Bear in mind that the inverter kit will draw almost twice the fluoro lamp current, so your batteries may not last that long if they are small. The kit number is K091 and the price is $27.

Lance Turner

Compact fluoros and gensets

I seem to make a habit of blowing compact fluoro bulbs (two different brands) when used in conjunction with my standby petrol genset. Am I doing something wrong? Are gensets dirty power (funny harmonic frequencies)? Do they produce surge spikes? There is a clipsal bodyguard in the circuit. Your suggestions would be welcome.

Bernard White,
bwhite@hotkey.net.au

Bernard, it could either be another appliance creating voltage spikes that the CFLs don't like, or it could be that, with small loads like the fluoros, the genset's output voltage is too high. They are often unregulated, and their voltage can vary widely depending on load.

The easiest way to check this is to measure the output voltage with a suitable multimeter. Remember to be very careful when doing this—the voltage from the genset is just as lethal as the mains. If it is much over 250 volts, then that could be your answer, as many CFLs sold here are made for 220 or 230 volt use. If you open one up, you will most likely find that the main filter cap inside it is a 350 volt rated device. At 250 volts AC, the voltage across this cap will most likely be the full 350 volts, and running a component at its maximum rated voltage is never a good idea.

Of course, you may have just had bad luck, and it was a coincidence that the CFLs died early, some brands do this.

Lance Turner

Continued from page 11

have it and I would like to thank you for running the competition and chasing it up for me. It is such a useful thing to win—I am stoked! Thank you, thank you.

Tracey Gill, Minlaton SA

Charging at low wind speeds

I've just read Viv Rendall's query in the Q&A page of *ReNew* 78 on boosting the voltage from their wind generator. I have an Air 403 12 volt turbine and live on the south coast of NSW. We regularly get constant on-shore sea breezes and while the turbine would spin fairly fast no power would go into our system. A measurement of the output voltage read about 9 to 12 volts. At this voltage I could draw off about 2 to 3 amps without stalling the turbine.

I constructed a switching boosted power supply that progressively increases the load on the turbine as the voltage (wind speed) increases and have been running this system for the last 18 months or so. The booster cuts in when the turbine voltage is about 5 volts.

Although not a great amount of power is available at low wind speeds, these small turbines can benefit from a bit of voltage boosting. Mine will put about 2 amps into my batteries at just below the cut in speed. If I get eight hours with just a sea breeze then 16 amp-hours will be gained—not a bad improvement!

Mark Saunders, rtron@acr.net.au

Recycling appliances not so easy

I spoke with ATA on the phone regarding getting rid of some old, broken electrical gear and you asked me to report back to you with any findings. Well, I've found that it's really difficult to get rid of this stuff in any way other than taking it to the tip. I haven't done that, yet, but may have to. I rang EcoRecycle as you suggested and as mentioned in the latest *ReNew*. They told me about a few recycling centres around Melbourne and gave me the number to my 'nearest' one in Ringwood (I live in Eltham). I rang them and although they will take the items they only actually recycle the metal casings and then dump the rest at the tip. They'd take my old VCR, for example, for free because it has a metal casing which they can recycle, but my computer and cordless phone are made of plastic so I'd have to pay them to dispose of those items. It's not really worth the drive to Ringwood to do this.

I rang Reverse Art Truck, as you also suggested, and as we expected they only take 'art' waste, or things to make art out of. They knew of nowhere to take old electronic bits, either.

I've rung my local council who said to take it to the tip in Epping (that's where everything goes when the council has their 'hard rubbish' collections each year, by the way). I've checked the phone books and internet directories for other places that might take them and found nothing within an hour's drive of where I live. I've made stacks of calls and spent many hours doing this to no avail. It's not very comforting, is it?

I'm moving interstate in six weeks time and really need to get rid of this stuff before then. If you or anyone else at the ATA hear of any places or have any other ideas I'd welcome them.

Guy Hancock,
guy@soundobject.com.au

Noel's Treasures from Trash

To make your own water savers you will need:

- A two or three litre milk or fruit juice bottle
- A two-litre soft drink bottle

One of the problems with hot water systems is that when you turn off the hot tap, a couple of litres or so of hot water stays in the pipes and eventually cools down.

To save this water for your herbs or other indoor plants, you can make a simple water saver from empty milk or fruit juice bottles.

Start by poking a hole in the milk or juice bottle near the top of the handle. This hole allows air to flow in and out of the bottle easily. Now take the soft drink bottle and cut the curved top section off it to make a funnel that fits inside the top of the juice bottle.

To use the saver, just hold it under the shower head when you turn the shower on until the hot water starts to come through. Put the now full water saver bottle aside for use later and hop in the shower!

No fumes, no mess mowing

We have featured a couple of rechargeable electric mowers in past issues, and we have found a third one, the Enviromower.

The mower is powered from a battery pack consisting of two 12 volt, 9Ah sealed-lead-acid rechargeable batteries which power a 24 volt, 500 watt DC motor. It comes with an external charger that runs on either standard 230 volt or 120 volt AC mains power, with recharging time being 12 hours or less and can recharge to 75 per cent of its capacity in three to five hours.

The mower features over an hour of run time per charge, battery power remaining indicator and an audio warning signal when the battery gets to less than five per cent of power remaining. It has a six-position single lever height adjustment, has pushbutton starting and weights only 23kg. It can be used as a mulcher mower.

rrp:$699 including GST. $5 from the sale of every mower goes to Greening Australia.

Manufactured by Enviromower Pty Ltd, PO Box 19, Fawkner VIC 3060, freecall: 1800 468 467, ph:(03) 9357 1900, fax:(03) 9359 0880, email: info@enviromower.com.au, www.enviromower.com.au

Grid-interactive inverter series

A recent addition to the range of grid interactive inverters in Australia is the Sunmaster QS series from Mastervolt. There are four inverters in the range: the QS1200, QS2000, QS3200 and the QS5000. The inverters feature a large input voltage window, allowing strings of solar panels ranging from five to 12 panels in series. The larger two inverters have multiple maximum power point trackers, allowing strings of different panels with different specifications to be connected to the same inverter and still gain maximum efficiency from them.

Other features include LCD readouts, LED indicators, the ability to communicate with and program QS inverters from a computer and collect data from them. There is even a wireless remote display option that eliminates cables.

Note that some of the models will not be available until later in the year.

rrp: QS1200 is $2970; QS2000 is $4339; QS3200 is $5479; QS5000 is $7689. Prices include GST, and may change when the inverters are released.

Manufactured by Mastervolt Australia, PO Box 122, Redcliffe QLD 4020, ph:(07) 3880 1789, email: office@powersolutions.com.au, www.powersolutions.com.au

Make your torch rechargeable

In the last issue of *ReNew* we looked at rechargeable batteries to replace disposable dry cells. While there are many rechargeable cells on the market, one size of battery where they are relatively few options is the 6 volt lantern battery, as used in many large torches.

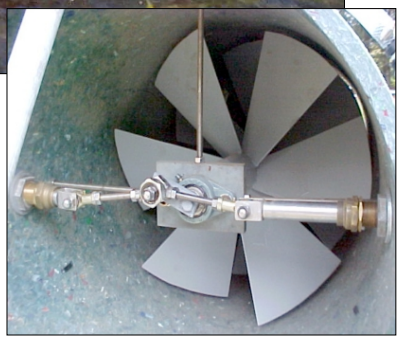
The Sonnenschein lantern battery is a gel type rechargeable lead acid battery designed for just this purpose. The battery has a nominal C100 rating of 5 amp-hours, and an inbuilt polyswitch to prevent short circuits of the terminals from causing damage or starting fires.

The battery is suitable for anyone with high battery use requirements. Being rechargeable hundreds of times, the battery and battery and charger kit will pay for themselves many times over.

rrp: $53.90 inc GST for the battery, $48.50 for the LB711 fast charger.

Contact M+H for your nearest distributor on 1800 801 433 or visit www.mhpower.com.au

Rapids River Pump



There are very few water powered water pumps on the market, but when you think about it, the flow of water in a river or creek is a logical source of pumping power.

The Rapids River Pump uses a set of large rotating blades inside a plastic pipe which is placed in rapids in the creek to drive a piston pump. It comes in two versions: a low head, high flow unit, and a high head, low flow version. Both feature a positive displacement piston pump with twin pistons, three different stroke settings for different heads, and stainless steel bearings to reduce the problem of rust and provide an estimated life of 20 years. The pipe is also made from recycled plastic.

The low head version can pump up to 5000 litres per day to a head of 25 metres, depending on head and river flow, while the high head version can pump up to 2000 litres per day to a 40 metre head, also depending on head and river flow.

The pump measures 650mm x 2 metres long, and weighs approximately 50kg

rrp: High pressure pump: $1990.00, low pressure pump: $2190.00

Manufactured by Grant McRostie, Emerald Park, Licola Rd, Jamieson VIC 3723, ph:(03) 5777 0569 (bh), ph:(03) 5777 0800 (ah), mobile: 0428 539 188

They're getting brighter!

It seems that LED manufacturers are making huge leaps in efficiency and light output with their products. Such is the case with the latest range of white LEDs from Oatley Electronics.

There are three new devices available, all in the standard 5mm case. They have specified outputs of 6, 10 and 15 candela. We tested the two higher output ones, and would rate them at around 6 and 9 candela respectively, which still makes them the best value white LEDs we know of available in Australia.

rrp: $2.50 for the 6 candela, $4 for the 10 candela and $6 for the 15 candela.

Available from Oatley Electronics, PO Box 89, Oatley NSW 2223, ph:(02)9584 3563, fax:(02)9584 3561, email: sales@oatleyelectronics.com, www.oatleyelectronics.com

Smaller Selectronic inverters

The LD range of inverters from Selectronic Australia are suitable for mobile installations as well as household power systems. There are four inverters in the range, the 200 watt and 450 watt 12 volt models, and 250 watt and 550 watt 24 volt units.

All models feature true sinewave output, reverse polarity protection, low and high battery voltage shutdown, a two-year warranty and are electrically isolated DC to AC. The larger two models also feature autostart.

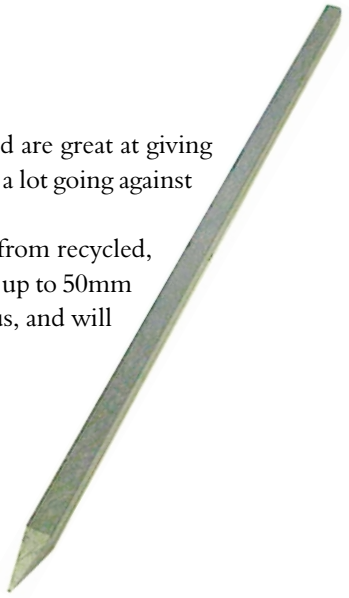
rrp: LD200-12: $561; LD250-24: $583; LD450-12: $1023; LD550-24: $1089

Manufactured by Selectronic Australia, ph:(03)9762 4822, fax:(03)9762 9646, email: sales@selectronic.com.au, www.selectronic.com.au

Plastic vampires beware!

Keen gardeners will know that wooden stakes always break at the most inopportune times, and are great at giving you splinters. What's more, they eventually rot and are often made from forest timbers, so have a lot going against them.

Now there is an alternative to standard timber stakes. H R Products make a range of stakes from recycled, UV stabilised plastic. They come in numerous sizes, from 23mm square and 300mm long right up to 50mm square, 2400 long monsters. Being plastic, they don't rot, are impervious to termites and fungus, and will last a great deal longer than wooden stakes.



rrp: From around $1 for the small 300mm stake up to around $25 for the 2400mm unit.

Manufactured by H R Products, 207 Bannister Rd, Canning Vale, WA 6155, ph:(08) 9455 1677, fax:(08) 9455 1680, freecall: 1800 998 037, email: hrproducts@bigpond.com, www.hrproducts.com.au

Life could be a dream (pot)

Haybox cookery (where food is heated to boiling and then placed in an insulated box to continue to cook in its own heat), has been known for centuries, but in this world of modern convenience, it is almost unknown, which is a shame, as it is a great method of cooking and can save a lot of time and fuel.

The Dream-Pot is a modern version of the haybox cooker, consisting of a stainless steel and plastic insulated outer pot into which fit a stainless steel inner pot.

Cooking with the Dream-Pot is simple—you put all the ingredients into the inner pot, bring it to the boil and then place the food and inner pot into the the outer pot and close the lid. The food continues to cook without use of gas or electricity while you get to do other things.

The Dream-Pot comes in three sizes: 3, 5 and 6 litres. Being highly insulated, it can also be used for other things, including yoghurt making, keeping food warm, or as an ice bucket.

rrp: 3 litre Dream-Pot (limited stock): $135, 5 litre Dream-Pot: $220, 6 litre Dream-Pot: $255. Freight is $15 inside Australia.

Manufactured by Dream-Pot Australia, 259 Denison Street, Rockhampton QLD 4700, ph:(07) 4927 3300, freecall:1800 636 073, fax:(07) 4922 4862, email: gbw@dreampot.com.au, www.dreampot.com.au

Brushless DC pump drive

If you rely on solar pumping for your water needs, then you need a pump that is reliable and efficient. The SUN-DRIVE brushless DC pump drive motor from BW Solar can be coupled to a number of different wet ends, including Grundfos, Pumpmaster and Lowara.

The drive can be used on systems from 24 to 55 volts and up to 600 watts of power. Maximum efficiency of the motor is up to 92 per cent, and the motor comes complete with a matching drive controller.

BW Solar also supplies the SUN-DRIVE motor complete with the ETA-PUMP helical rotor pump which can pump to a head of 80 metres.

rrp: $2200 including GST for the motor/controller (wet ends extra)

Distributed by BW Solar, PO Box 771, Scarborough WA 6922, ph:(08)9341 8711, fax:(08)9341 8790, email: bitt@perthpcug.org.au

Solar hot water conversion system

Solahart Industries has developed a new hot water system—called the CollectaPak—that converts an existing gas or electric water heater to use solar energy.

The CollectaPak consists of collector panels that are installed on the roof to absorb solar energy and a module which clips onto the side of an existing hot water cylinder to transfer the heat from the collector panel into the water tank.

Solahart states that because it uses the existing hot water tank, it is cheaper than standard solar hot water systems, with prices starting at $2900. Note that while this may be less than an equivalent complete Solahart system, this does not make it cheaper than some competitor's complete solar water heating systems.

For more information, contact Solahart on ph:1800 154 256, www.solahart.com.au

But does it fly?

There are not many vertical axis wind turbines (VAWTs) made commercially today, but a new turbine from Solwind in New Zealand looks interesting.

The 10/4800 turbine electrically self starts at a wind speed of 1.5 knots and achieves its full rated output of over 4800 watts at 10 knots. The manufacturers claim that it is very quiet even at 30 knots.

The 10/4800 comes complete as a stand-alone unit complete with 10/4800 turbine, six metre tower and brake assembly, 4500 watt grid-interactive inverter/charger, 48 volt, 400 amp-hour storage battery, a 6000 watt back-up multi-fuel generator, system enclosure, wind speed control system and automatic/manual overide braking system.

rrp: $55,000 ex factory New Zealand.

Manufactured by Solwind, PO Box 4295, Kamo Whangarei, New Zealand, ph:+64 (09)433 7213, fax:+64 (09)433 7273, email: info@solwind.co.nz, www.solwind.co.nz

There's sand in my tyres!

Well, not quite, but the new K406 Silica compound range of tyres from Hankook Tyres offers some interesting advantages.

Firstly, they are designed to reduce rolling resistance by up to 40 per cent, thus reducing fuel consumption from 2.5 per cent up to 7.5 per cent, according to Hankook.

Secondly, wet weather performance is improved by as much as 15 per cent, another advantage from the use of silica in the compound.

Thirdly, there is a reduction of around 30 per cent of carbon black emissions (considered carcinogenic) due to the use of silica.

The tyres are available in a range of sizes to suit most cars.

Available from tyre dealers around Australia and New Zealand. Manufactured by Hankook Tyre Australia, ph:(02) 9929 7670, email: calvin@hankooktyre.com.au, www.hankooktyre.com.au

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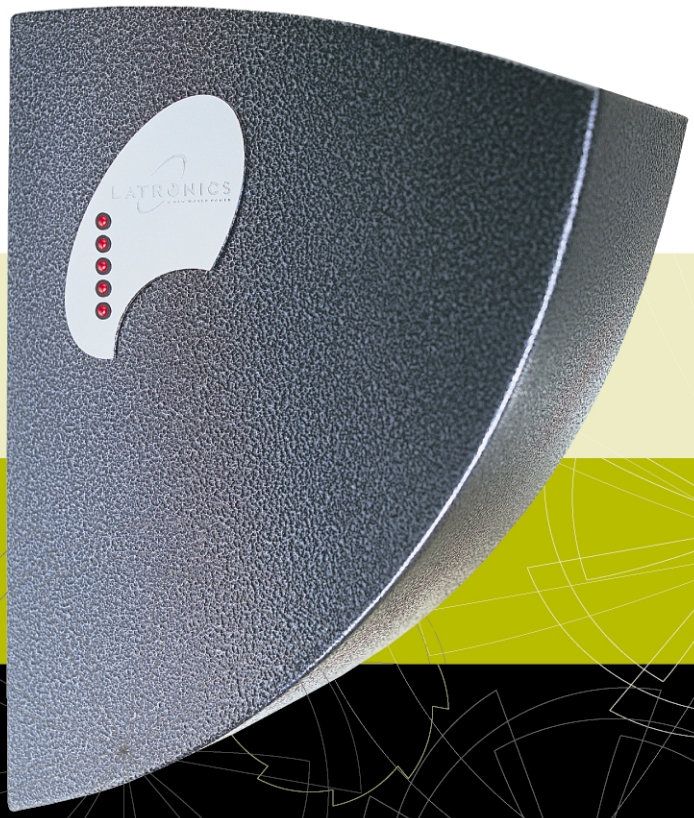

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