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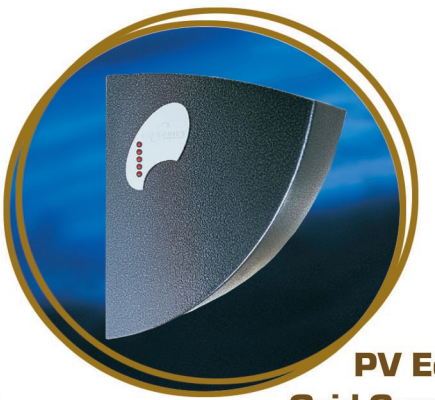

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Issue 86
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features

How to make the most of mains water savings with a rainwater tank.

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Want to know more about rainwater tanks, greywater systems, microhydro or toilet composting? Then check out the *ReNew* water index on page 76.

regulars

Plates, trays and bowls made from potatoes. Products page 88.

From the Editor

About ReNew

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

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

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

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16 January 2004, copy due 2 February 2004.

It never rains, but it pours!

It seems fitting that this edition of *ReNew*, a water special, is put together in the last few weeks of the International Year of Freshwater. The recent drought and depleted water supplies brought home to many people, especially those in metropolitan areas—most rural dwellers already knew—that our water supply is not infinite. Here in Melbourne you cannot miss the save-water message, with television and radio advertisements, billboards and other promotional material saturation.

There are many different measures that individuals can take to help reduce water consumption, from rainwater collection, greywater diversion systems, and simple behavioural changes. However, the bigger picture is not so simple. The future of Australia's water supply seems to be stuck in a political gridlock, with state and federal governments unwilling to make the tough decisions to secure our water resources. As always, the sticking point is money. Who is going to pay for the measures that need to be taken? The National Farmers Federation and the Australian Conservation Council say that $200-$250 million per year for ten years is needed to secure the economic future of rural communities and to restore our river systems back to health.

Kyoto treaty dead?

Just before going to press there were unconfirmed reports that Russia would not ratify the Kyoto treaty in its current form. Without Russian ratification the Kyoto treaty will not enter into legal force. Russian presidential aide Andrei Illarionov who made the statement added that the protocol places significant limitations on Russia's economic growth. There has been no official declaration from the Russian Government with some Kyoto proponents saying the comments from Illarionov is nothing more than political bluster in the lead-up to Russian Duma (Parliament) elections. Lets hope this is all a bit of hot air and that the international effort to combat climate change will continue.

It is ironic that as I write, here at the ATA Solar Workshop we are cleaning up the mess left after Melbourne's most severe thunderstorm in a century, which dumped 100 millimetres of rain in just two hours. It is some of that extreme weather that Hilary Cadman, talks about on page 44.

Talking of the Solar Workshop, the minute this edition is put to rest we will be moving to our new office at the Building Display Centre, just in time for 2004, the International Year of the Built Environment, an area of interest to most of our readers.

Donna Luckman

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Conditions and how to enter

(1) The competition is open to anyone who subscribes to ***oÉkÉÏ*** =or joins the Alternative Technology Association (ATA) during the competition period, including existing subscribers and ATA members who renew their subscription/membership during the competition period, and to ***^q^=pì éé çãÉëëK***

(2) The prize is not redeemable for cash.

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

(4) The competition runs from 31 October 2003 to 24 May 2004. Subscriptions/memberships must be paid by 5pm on Monday 24 May 2004 to be eligible.

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

(6) To subscribe or join the ATA, use the subscription form in this issue (or a copy of it), visit our webshop, or call the ATA on (03) 9419 2440 to pay by credit card.

(7) The competition is only open to Australian and New Zealand entries. ***New Zealand winners must pay the cost of freight from Melbourne, Australia to their destination in New Zealand.***

The *ReNew*/Latronics subscriber competition is proudly sponsored by Latronics, ph:(07) 5491 6988, email: info@latronics.com, www.latronics.com

Russia still no to Kyoto

During his opening speech at the World Climate Change Conference, Russian President Vladimir Putin said that Russia was still undecided about ratifying the Kyoto protocol. Many expected that President Putin would use his speech as an opportunity to announce Russia's ratification. Instead he said they still needed time to check if the Kyoto protocol would benefit Russia. Putin even joked that global warming could be good for Russians as it would save them the expense of buying fur coats.

For the 1997 Kyoto protocol to become legally binding it needs to be ratified by at least 55 countries, including industralised countries that are responsible for at least 55% of developed countries' 1990 CO_2 emissions. So far the protocol has been ratified by 119 countries but seeing as the United States—36 per cent of emissions—refuses to endorse Kyoto, Russia —responsible for 17 per cent of emissions—is seen as the key country to get Kyoto over the line.

There has been much speculation on why Russia has decided not to sign on. It is thought that Russia would do quite well financially with the trade opportunities of the protocol. Due to the break-up of the Soviet Union, Russia's current emissions are below that of 1990—the target set for Russia in the protocol. It therefore has emission quotas it can trade with other countries. There is no doubt that Russia is being lobbied vigorously by proponents for (European Union) and against (United States) the protocol.

A Russian administration source quoted by Reuters says Russia has not made a decision due to serious worries about the treaty, not because it is waiting for the best possible financial deal. Any financial gain would be short term, and the Kremlin feared restricting emissions could harm Russia's economy in coming decades, said the source.

The World Climate Change Conference held in Moscow brought together about 1200 participants from over 100 countries, with presentations and discussions focusing on the scientific aspects of natural and human induced climate change.

Arctic melting faster

According to a recent study conducted by NASA the rate of warming in the Arctic over the last 20 years is eight times the rate of warming over the last 100 years. Satellite data compiled by Josefino Comiso, a senior research scientist at the National Aeronautics and Space Administration's Goddard Space Flight Center, shows that, compared to the 1980s, most of the Arctic warmed significantly over the last decade, with the biggest temperature increases occurring over North America.

'The new study is unique in that, previously, similar studies made use of data from very few points scattered in various parts of the Arctic region. These results show that large spatial variability in the trends that only satellite data can provide.' said Dr Comiso.

This warming of the Artic could greatly affect the climate world-wide. As ice is highly reflective, it reflects the sun's energy back into the atmosphere, unlike water which absorbs it. As the oceans warm and ice thins, more solar energy is absorbed by the water, which can lead to further melting. This can lead to changes in ocean temperatures, ocean circulation and salinity, marine habitats and shipping routes according to Michael Steele, senior oceanographer at the University of Washington Seattle.

Redbank rejected

In a landmark decision the New South Wales Government has rejected the Redbank 2 coal-fired power station due to concerns of the adverse impacts from greenhouse gas emissions. As Minister for Planning and Infrastructure Craig Knowles told the NSW legislature, 'Of particular concern is the fact that Redbank 2 would generate greenhouse emissions higher than the state average and, indeed, at a higher intensity than any other coal-fired power station in the Hunter Valley.'

The proposed 132MW power plant, in Singleton, New South Wales, would have emitted the equivalent of 250,000 cars worth of greenhouse emissions.

'The Redbank 2 proposal was for a highly inefficient coal-fired power station. It would have been 39% dirtier than world's best practice coal power stations or 22% dirtier than current NSW power stations, according to the Environment Protection Authority.' said Anna Reynolds, WWF Climate Change spokesperson.

'This is the kind of vision we need if we are going to tackle climate change. There are cleaner energy options that will deliver power with less pollution.' said Ms Reynolds.

World record time for solar car race

The Nuon Solar team has broken its own world record to win this year's world solar challenge. In a time of 30 hours and 54 minutes, the Nuna II beat its previous world record by one hour and 45 minutes. The Nuna II was one of twenty vehicles who competed in the 3010 kilometre event from Darwin to Adelaide.

Built at the Technical University in Delft, Netherlands, the Nuna II had a new shape and better aerodynamics than the team's 2001 winning vehicle. Using technology developed by the European Space Agency, including solar cells, high performance batteries and innovative plastics. It averaged an estimated 97 km/h.

Crossing the line one hour and 43 minutes later in second place was Victoria's Aurora, followed 20 minutes later by the Massachusetts Institute of Technology's Solar Electric Team.

The Nuna II on its way to a world solar record.

Photo credit: David Hancock

Macadamia power online in Queensland

The worlds first power plant fuelled by waste macadamia nut shells recently came into operation in Gympie, Queesland. The plant is expected to provide enough power to supply more than 1200 homes in its first year.

The three million dollar cogeneration facility is a partnership between Ergon Energy and the world's third largest macadamia processor, Suncoast Gold Macadamias (SGM). The facility includes a 6MW, high-pressure steam boiler producing nine tonnes per hour of steam and a 1467kW steam turbine to generate about 9.5 GWh per annum of electricity

During any hour of operation the plant can convert 1680 kilograms of waste shell into 1.5MWh of electricity. It will initially process 5000 tonnes of shell in its first year. About 20% of the electricity will be used to power SGM's factory, with the rest being exported into the national electricity grid. The plant is expected to double its power output by 2005.

www.ergon.com.au

QLD landclearing deadlock continues

Queensland Premier Peter Beattie announced that he would pass his own laws to control land clearing in Queensland. In May, the Queensland and Federal government announced a $150 million compensation package to Queensland farmers to end broadscale land clearing. The Queensland Government placed a monitorium on any new land clearing permits pending the finalisation of the agreement.

Premier Beattie told the ABC PM program that if the Federal Government does not finalise the negotiations with farmers on the package soon, he will introduce new laws that would phase out the broadscale clearing of remnant bush by 2006.

In the meantime, hundreds of Australian scientists have voiced their concerns over the delay by presenting an open letter to the Federal and Queensland Governments. Called the Brigalow Declaration, the letter, signed by 420 scientists, calls for immediate action to halt landclearing.

'For every 100ha of native woodlands cleared, about 2000 birds, 15,000 reptiles and 500 native mammals will die.'

The scientists are also concerned about the increase of dryland salinity as a direct result of broadscale land clearing.

It is not all bad news on the landclearing front, as the NSW government announced in October a $406 million pledge to end broadscale land clearing and protect 1.2 million hectares of NSW bush.

Climate bill defeated in the US Senate

A bill to impose mandatory caps on greenhouse emissions from industry was defeated 43 votes to 55 in the US Senate. The Climate Stewardship Act, modelled on the 1990 Clean Air Act, would have required industry, but not vehicles, to cut CO_2 emissions to 2000 levels by 2010.

Its proponents, Senator John McCain, a republican and Senator Joseph Lieberman, were not deterred by the vote as it was a victory of sorts, with six republicans joining democrats in supporting the bill, despite opposition from the Bush administration. Also it was the first bill to be put to Congress to help curb global warming. 'We've got to start somewhere', said Senator Mc Cain. 'We will be back'.

Meanwhile the Bush administration backed US Energy Bill has stalled. The Energy Bill, which has been passed by the US House of Representatives, faced its first set-back in the Senate when a cloture vote—which would have ended debate on the legislation and forced a final vote on the bill—was defeated. The Senate leadership announced it will not attempt a second vote until January 2004. The Energy Bill is being championed as the way forward to help free the US from its dependence from foreign oil. However, for opponents it does no more than provide financial incentives for oil and gas development as well as tax breaks for the nuclear industry.

'Oil, gas, coal and nuclear and the energy companies that produce them [are] the big winners. Written in secret by the two Republican chairmen in charge of energy packages, the bill is a gold mine for fossil fuel industries.' said the American Solar Energy Society.

However, the bill does contain some important provisions for the renewable industry and is supported by the Solar Energy Industries Association and

sustainablelivingfestival

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www.sustainablelivingfestival.org

Australia's foremost sustainable living event hits the streets again this year with a renewed program of eco attitude to empower your life. Be a part of the change that is re-invigorating our planet and soak up the atmosphere, as ideas, passion and creativity come alive.

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A place where we all turn our waste into a resource, generate our own power and transform our thoughts into actions. The event draws on the latest sustainable ideas and creativity from around Australia.

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demonstrations to stimulate the taste buds
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exhibits on solar technology
innovative designs for your home
films that ignite your passion
interactive display on the future of our cities
a culture of local live performances
solar cars
sustainable home display
sustainable garden feature
yarra river eco cruise
organic food

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email info@sustainablelivingfestival.org

the American Wind Energy Association. Provisions include a range of renewables tax credits, $300 million solar systems deployment program and a number of measures to support the biofuels and biomass industries.

CSIRO opens new energy centre

Australia's peak scientific organisation CSIRO has opened its new $36 million Energy Centre in Newcastle, New South Wales. The centre showcases new and renewable energy technologies and represents the largest base of energy research and development in the southern hemisphere.

'The new Centre is a distributed energy system in action', says Acting Chief of Energy Technology, Dr Jim Smithham.

'Photovoltaic cells, gas microturbines and wind generators will initially provide most of our power, with any surplus being fed back into the mains grid.' The building also features a waste heat distribution system, with the waste heat from two 60kW microturbines providing space and water heating in winter, and will be linked to novel turbo-chiller technology in the future for cooling in summer.

The centre's opening coincided with the launch of the new National Research Flagship, *Energy Transformed*. Headed by Dr John Wright of the CSIRO, one of the research body's aim is to develop cost effective electricity and hydrogen from renewable energy sources.

For further information go to www.energytransformed.csiro.au

Australians support green energy

A national survey of more than 1000 Australians showed extremely high support at 94% for the federal governments Mandatory Renewable Energy Target (MRET) legislation, while 88% of respondents backed increased government support for the use of clean energy such as wind and solar. The survey conducted by the Australian Research Group on the behalf of the Australian Wind Energy Association (AusWEA) also revealed that 95% supported the use of wind power, 50% supported the use of gas and just 21% supported the use of new coal plants. On wind farm development in country Australia, 91% of those polled thought it is more important to build wind farms than avoid building them in rural Australia. The poll also found that 76% of respondents were willing to pay 5% more on their electricity bill if it meant that 10% more clean energy would be produced.

For the full results go to www.thewind.info

UK offshore wind online

The United Kingdom's first offshore windfarm, North Hoyle, is now supplying renewable electricity for up to 50,000 homes. Welcomed by both Prime Minister Tony Blair and Greenpeace, the 30 turbine windfarm has a total capacity of 60 megawatts.

'Rolling out this first large-scale offshore wind venture is a highly significant step towards achieving Britain's renewables goal.' said Mr Blair.

Building sustainably is BASIX

The New South Wales Department of Infrastructure, Planning and Natural Resources has developed a new sustainable building tool to assist architects, builders and developers to establish buildings that use water and energy efficiency. Called BASIX, the web-based planning tool allows you to assess the potential performance of a building against a set of sustainability indices.

As of July 2004, the BASIX water and energy targets will be a mandatory for all new residential developments in metropolitan Sydney, with the rest of the state to follow in July 2005.

For further information contact the BASIX project on ph: (02) 9762 8034 or www.planning.nsw.gov.au/settingthedirection/basix.html

South Australia's first wind farm

In early October, the South Australian Premier Mike Rann officially opened the Starfish Hill Wind Farm on the Fleurieu Peninsula. The $65 million, 34.5MW wind farm will reduce greenhouse emissions by 2.1 million tonnes during its 25-year operating life. The 23 turbines will produce enough energy to meet the needs of about 18,000 households. The project was developed by a subsidiary of Tarong Energy and constructed by NEG Micon under a 'turnkey' contract. The wind farm is connected to the ETSA grid at Yankalilla by a 25km overhead transmission line.

www.starfishhill.com.au

The ATA has moved!

From here...

Our old office at the Solar Workshop, CERES, East Brunswick was way too small for us, so we have had to move to bigger premises.

The Solar Workshop has been an important part of the ATA for the last 19 years and will continue to be into the future.

We intend on continuing to maximise the use of the Solar Workshop as a place that the public can visit. It will be open on Saturdays and will also be used as a space for training and for most of ATA's courses.

...to here

Our new office is located on the second floor of the Master Builders Association Building, in East Melbourne.

We now have nearly three times the space of the Solar Workshop. This gives us room to expand and undertake new projects, improve our ordering and dispatch system, as well as finally be able to move around the office without tripping over rubbish bins, boxes of stock and each other!

ATA's new contact details are...

Location:	Building Display Centre, Level 2, 332 Albert St, East Melbourne VIC 3002
Postal:	PO Box 2919, Fitzroy VIC 3065, Australia
Phone:	(03) 9419 2440
Fax:	(03)9419 2441
Email:	info@ata.org.au
Website:	www.ata.org.au

Installer sues town over solar panel restrictions

Akeena Solar, a company specialising in the design and installation of solar systems, have filed a lawsuit against the town of Los Gatos for what they claim was the unlawful restriction of the installation of solar panels on the company's own rooftop. The company installed a 2970 watt PV system on the flat roof of their office building in Los Gatos, California. However, the town refused to finalise the building permit since three of the solar panels were partially visible from the street. Appeals by the company to the local planning commission and town council were denied.

'This lawsuit is the only legal remedy we have left.' said Akeena Solar President Barry Cinnamon.

'We believe that the town of Los Gatos erred in their interpretation of their policies that apply to solar energy systems. It is very rare that an industry can help our economy and improve our energy situation while simultaneously improving the environment, so Los Gatos' decisions are particularly difficult to understand.'

www.solaraccess.com

Green electricity scorecard

Electricity consumers can now make an informed switch to a more environmentally friendly electricity company, with the release of the second annual Green Electricity Watch scorecard. Australian Inland Energy and Origin Energy topped the green list, but there were disappointing results from some of the nation's largest retailers.

All 14 electricity retailers in Australia were surveyed for the scorecard and 13 agreed to take part. The questions were designed to gauge retailers' energy efficiency programs, their support for policies to reduce greenhouse pollution and the green power products they offer. **For full details of the survey go to www.electricitywatch.org**

Congratulations to our two winners of the *ReNew*/Alternative Fuels and Energy subscriber competition. Darren Routley of Plympton Park, South Australia and David Brewer of Malua Bay, New South Wales are the happy new owners of a Sun Lizard solar air heater valued at $1980.

For David the heater will fit very nicely into the new solar passive house he is building, while Darren is looking forward to installing it into his own north-facing home.

Thank you to Alternative Fuels and Energy for sponsoring the competition.

End of biodiesel in Australia?

As of 18 September all producers of biodiesel, whether they are commercial producers or backyard users, must have a biodiesel excise licence. While the Federal Government's reform to bring all fuels into the excise system by 2008 comes into effect, there is uncertainty about the future of the biodiesel industry in Australia.

'At a time when governments all over the world are encouraging the use of cleaner and independent sources of fuel, the Australian Government is killing off the industry before it can begin.' said Michael O'Connell, President of the Alternative Technology Association.

'While the Australian excise came into force, Germany removed all fuel taxes from biofuels, due to its environmental benefits.' said Mr O'Connell.

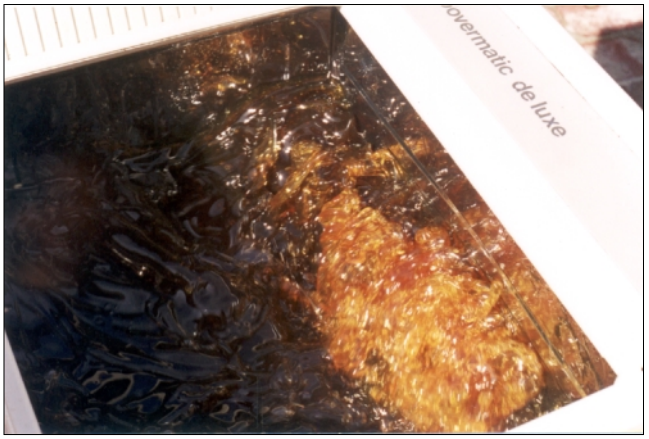
Biodiesel made from waste vegetable oil has shown to be the most greenhouse-friendly transport fuel available, according to a report commissioned by the Australian Greenhouse Office. Biodiesel is now subject to excise duty at the same rate as low sulphur diesel—currently 38.143 cents per litre. According to the Alternative Technology Association the new fuel excise will raise the price of biodiesel above $1.00 a litre, making it uncompetitive with fossil diesel.

Adrian Lake from Australian Biodiesel Consultancy can see some positives in the legislation for commercial biodiesel producers, with the establishment of standard quality and documentation. However, as the industry is still in its infancy with little established infrastructure, the legislation in its current form (at time of printing it is still sitting in Parliament) would 'grow the industry and then kill it'.

Backyard biodiesel to go underground?

For the hundreds of Australians who produce biodiesel in their own backyard for personal use—called home users by the Australian Taxation Office (ATO)—many are wondering whether it is worth the administrative and economic burden to comply or risk the chance of producing biodiesel illegally. Once you have been successful in applying for an excise license (for which there is no charge) you must comply with a number of conditions including:

- Keeping detailed records that cover the process of manufacture, quantity, storage, wastage and disposal of biodiesel for five years.
- Depending on the amount of biodiesel you produce, lodge an excise return weekly, quarterly or yearly.
- Allow tax officers right of entry at all times to inspect the approved premises.



With the introduction of the biodiesel excise tax many backyard users are closing up shop.

- Safety conditions must be to ATO satisfaction or face a fine equivalent to the excise duty on the fuel.

All licenses expire on 31 December each year and need to be renewed annually.

To help offset the cost of the introduction of the excise tax, the federal government has developed the cleaner fuels grants scheme, for which biodiesel is currently the only eligible fuel. However, to be eligible for the scheme, you need to prove that your biodiesel complies with the new standard developed by the Department of the Environment and Heritage. This rebate will exist until 2008 and will then wind down over four years. For many, the cost of testing would make this untenable.

'Currently in Australia there are no labs set up for the specific purpose of biodiesel testing, which we estimate will cost between $1000 to $2000,' said Mr O'Connell.

Steven Hobbs, a farmer in Victoria's Wimmera region, has been producing his own biodiesel for several years. While he has applied for a license he will produce very little biodiesel, if any at all in the future.

'As a farmer, I am both a supplier and an end user of biodiesel. The greatest hurdle with the new legislation is the cost of testing. There is no cost effective means by which to test small scale biodiesel production to claim the rebate,' said Mr Hobbs.

'It is ironic that a renewable fuel that reduces pollution, has obvious health benefits and helps to halt the effects of climate change, has to meet a stringent standard.'

For further information on the biodiesel excise call the ATO on 1300 137 292 or visit their website on www.ato.gov.au

[Letters]

What not to do with the doogie-do

Your last issue of *ReNew* (85), was as interesting and informative as ever, packed with lots of exciting ideas and things to do. However, I just had to write to you to raise my concerns about your article 'What to do with the doggie-do?'. While I am a born-again composter myself, the very last thing I would want to do with doggie-do is to add it to a vegetable garden. This is because doggie-do and kitty litter are not the harmless innocuous organic substances that they appear to be. Like human faeces, they are literally crawling with germs.

The UK publication, Community Composting Pack, states, 'DO NOT COMPOST [dog faeces]. Dog faeces may contain eggs of toxocara, a parasitic worm that can cause blindness in humans'. It also notes that, 'Cat faeces may contain toxiplasma—a disease that can be passed on to humans handling the compost'. The Australian publication, *The Compost Book*, agrees that, 'Excreta from dogs and cats may contain parasites and should not be added to composts'.

Because dogs and cats are a bit similar to humans in their biology, some diseases can be transferred from pets to humans. This means that pet manure should be considered in the same light as human faeces—a potential health hazard which should only be composted under carefully controlled conditions.

Most people would not dream of composting their own faeces in a bucket in the back yard, they would obtain council approval and install a commercial or owner-built system which complies with all the relevant regulations and standards to safeguard their family's health. Similarly, dog and cat faeces should only ever be composted under carefully controlled conditions, so that no-one becomes needlessly ill.

Thank you once again for a very interesting issue of *ReNew*. Have a lovely day, and give my regards to Duva The Wonder Dog.

Trish Morrow, Researcher/Analyst
Centre for Appropriate Technology, NT

Weather station supplier

I just received the October–December *ReNew* magazine, and it is a great read. In it you requested a link for weather stations. I had the same problem with the WM918 disappearing from DSE.

After a bit of web browsing research I found that some people had problems when they tried to get spare parts and the device was inaccurate sometimes. Here is a link that I found that has these and other weather stations available: www.weatherdownunder.net.au

Jeremy Wong,
jeremy.wong@nrjsolutions.com.au

Another reader has informed us that Whitworths Marine (www.whitworths.com.au) also has the wireless version of the WM918 weather station.

Lance Turner

Simple water saver

I can't design a better solar system but here's a really simple tip to save water.

It's not enough to say 'use the half-flush'—it is impossible for me to remember, let alone the kids. I made a simple flap by taping half of an old credit card over the full flush button. With the barrier, it is now easy not to use it. I'm sure there is a credit card or flap to suit every dual-flush toilet.

Andy Carnahan, Aylmerton NSW

Safer dishwasher detergent

I am not sure if your magazine would be interested in this product I have just found, an environmentally friendly dishwasher powder called Enviroclean.

The dishwasher powder contains alkaline salts (rock salts), oxygenated enzymes (not chlorinated but made from vegetable proteins), organic rock salts and citrus fragrance. The company who produces this is called Environmental Marketing Pty Ltd, ph:(08) 9248 4688.

Given the water restrictions in Sydney plus the limited water I have on my farm in Mudgee I thought I would give it a go. I have a small Fisher and Paykel dishwasher, which sends its water directly to my vegie patch. The powder works just as well as that other horrible stuff. The company advises to use brown vinegar as the agent to replace the rinse aid.

They will also give you $1.50 off your next purchase if you return to them the plastic container it comes in.

Hope this may be of interest to your readers. I love your magazine.

Neville,
neville@skyecloud.com

Neville, thanks for that information, Tri-nature (www.trinature.com) also make an enviro-friendly dishwashing powder. However, you must be careful of the sodium content of these sorts of products—too much will cause a salinity problem in your garden. For more information on the issues associated with greywater recycling, see the article 'The grey issues of water recycling' on page 74 of this issue.

Lance Turner

Continued on page 92

Write to us!

We welcome letters on any subject, whether it be something you have read in *ReNew*, a problem you have experienced, or a great idea you have had. No matter what it is, if you think readers would find it interesting, drop us a line!

Send letters to: *ReNew*, PO Box 2919, Fitzroy VIC 3065, email: ata@ata.org.au

Keeping your cool when the heat is on

Summer is a time of fun and holidays, sunshine and surf. It is also the time of power grid overloads brought about by excessive use of air-conditioners. Is there another way to keep your house cool when the heat is on? Dick Clarke explores the options

Once upon a time Australians just sweated and put up with heat waves. That we are no longer prepared to do so is a sign of our affluence and our increasing disconnection with the reality of our climate. We are building bigger houses for smaller families, with little regard for climate in their design.

However, some positive change is beginning to occur, with such things as the Victorian Government's commitment to five-star thermal performance of the building envelope. New South Wales has had an Energy Smart Homes Policy for five years which has successfully eliminated worst practice for new houses. However, neither of these state policies control the use of air-conditioners or other appliances. At best they may limit the heat infiltration whilst these energy-hungry appliances are running.

What's wrong with air conditioning?

Two problems stand out: firstly, there is the extreme energy demand their mass use places on the electricity grid—known as peak demand—for which the whole grid must be designed. It is this fact which makes the whole grid 20% bigger than it needs to be, and every energy bill higher than it needs to be as we pay for the grid to be built. The greenhouse emissions alone are reason enough to be very critical of the uncontrolled use of air-conditioners.

The other less discussed principle is that of disconnection from the real world. Most Australians enjoy a reasonably mild climate—even in the height of summer. Living in air-conditioned boxes makes us less attuned to our immediate real environment, and actually makes us less healthy. It also gives us a false sense of independence from our supporting ecology.

This is far more insidious than it may appear, for it undermines the wisdom of our choices across a whole range of decisions, from menial to major. For example, in the menial: we tend to use air-conditioning if it's there, even if the outside air temperature is 22°; in the mundane: we avoid outdoor activities because we are not used to higher temperatures; and in the major: we do not relate to politicians who speak about the importance of pursuing ecological sustainability.

Some may say 'but where I live, summers are just too hot not to have air-conditioning!' What they are actually saying is that their buildings do not cope with summers in a passive way, and some active system has to be activated to maintain comfort—in this case an electrically powered air chiller. Evaporative coolers work well in dry climates, using relatively lower amounts of en-

ergy, but they do use water, and in some places that is as precious as energy.

The reality is, it is possible and practical to live and work in any part of Australia in a passively cooled building, even if as a culture we seem to have lost sight of how to do it.

How do you do it?

The means of achieving passive cooling varies according to the climate the building sits in—which is exactly what you would expect. Some things are constant, like shading, insulation and ventilation. Other things like thermal mass and night sky radiation are useful partners in inland and southern areas, while they may not work in the tropics. And one constant around the globe is the need to be climatically attuned—to allow your body to respond naturally to the changing seasons.

Little changes for big effects

If you are a renter, you will probably not be able to make physical changes to your house, but your landlord might see the advantage in adding to the value of their property if you put suggestions to them. Owners can easily pick off some things which have a huge effect on comfort.

Fans

Moving air over moist skin is an easy way to lower perceived temperatures. Ceiling fans are the most efficient at this, and their running costs are very low, and installation costs reasonable. Fans should be located centrally in each space—one for each grouping of furniture—so an extended lounge/dining area would need two fans. Bedrooms should have the fan located near the centre of the bed.

Blinds

Keeping sun off the glass is far better than using curtains, which is like shutting the stable door after the horse has bolted—once the heat is inside the glass it is mostly going to stay there—and curtains are powerless to prevent its infiltration into the room. External blinds can be fitted over most windows and doors without interfering with their function, and add a wonderful summer character which reflects the job they are actually doing.

West—and east—facing walls and glazing can be shaded by planting suitable shrubs and trees, but remember that these will keep growing and may end up too big for the space they are in, so choose carefully.

Making bigger changes

Any time a house is renovated is an ideal opportunity to improve its real performance, not just adding more space or opening up a room. Always make things better, never make things worse!

Layout

Redesign the layout to maximise cross ventilation, allowing cooling breezes to pass right through. Windows and doors should be aligned so that weak breezes will get in and out. This can be done within the existing footprint by changing the use of rooms, and moving or increasing the size of windows and doors.

Breezes

Find where the cool breezes come from, then design the windows to encourage them to come into the house: casement sashes work well on the windward side, and louvres or hoppers work well on the leeward side. Tall awning sashes on chain winders provide poor ventilation because the effective opening area is so small. In warm humid and tropical areas, where wet weather accompanies breezes, louvres all round are good, provided they seal well when closed.

Windows

If your existing windows don't work like this, change some or all of them when renovating. Architectural style must be considered, but as has been said before 'it is a good thing for windows and doors to define the style of the building in a way that shows it's suitability for the climate it sits in.' Windows and doors must allow a free passage for air. Where winters are cold, they must not allow heat loss when closed. Double-glazed win-

Insulation, like these foil batts, is very important in keeping a house at a livable temperature.

dows can be made in any configuration, and some, like casements, can open wide: then they work well in both winter and summer. A low emissivity (low-e) coating on the glass will limit heat gain in hot conditions, but use these carefully in areas with cold winters, or winter heat gain will be cut down badly.

Additions

If new rooms are to be added, make sure they are located were they don't block breezes. In tropical areas, maintain a building's perforated layout with large openings on both sides. Solid louvres can be used in the internal walls, so that breezes are allowed to pass right through the building.

Shading

The windows and doors should not allow hot sun to enter the house, but must allow winter solar access in cooler climate zones. Active shading (operable awnings et cetera) allow truly responsive performance, and can add interest and character to outdoor spaces.

For southern Australia (south of Rockhampton and Geraldton) it is critical that the north façade has the correct shading angles if operable devices are not used. This is the linchpin of passive solar design: if they are too short, the house will overheat in the summer, if they are too large the house will be cold in winter. Most existing eaves are too narrow (and many new houses have none at all!), so renovating is an ideal opportunity to correct this. Extend the eaves and add a bit more roof, or add a pergola or shade frame.

If shading cannot be provided because of proximity to boundaries or body corporate rules, use 'smart glass' with heat blocking elements within the glass itself which reduces heat intake. Reflective films can be applied to reduce heat loads on unshaded glass. But the best option is always to shade the glass.

Trees and shrubs

The landscape should interact with the building: tall shrubs and trees can shade the east and west, taller (or maybe even deciduous) trees to the north which will admit winter sun in southern climates. Make sure plants do not obscure breezes, but steer them toward windows and doors.

Insulation

Keep the comfort in by using the correct insulation. In all climate zones summer heat is a significant problem and must be excluded from roofs and walls. Use multiple layers of foil near the heat source for the most effective outer barrier. Foil works by both reflecting heat away, and even more by not emitting it into the building.

In hot conditions, bulk insulation loses effectiveness after several hours unless it is very thick, and many roof construction types do not have sufficient space. Several layers of foil with an air space between each will be more effective in a smaller space.

Add insulation to existing walls wherever possible. When internal linings are removed it is very easy to install insulation to timber framed walls. Cavity construction types may be more difficult, but it is worth pursuing. There are means of insulating even existing cavity brick walls, although specialist consultants may be required.

Thermal mass

This should be added in the right places to improve the passive performance of houses in climate zones with a reasonable diurnal range (the difference in day and night outdoor temperatures).

Concrete slabs or masonry walls should be exposed to solar gain in winter, but ventilated in summer evenings. During the hot day, excess body heat is absorbed by the high mass surfaces, producing the sensation of being cool. At night the house should be ventilated to the night sky to dump that collected heat, ready for the next day's cycle. During heat waves, the house should be 'bunkered down' all day, relying on the thermal mass, insulation, shading, and ceiling fans to provide comfort.

Thermal mass works best if it is placed at the core of the building. Design the internal walls to be high mass

construction in preference to perimeter walls: this maximises the effectiveness of temperature regulation.

Slabs on the ground get a lot of extra benefit from an effect known as 'ground coupling', where the earth's crust temperature from about three metres below the surface is brought up to the surface of the slab, where it should be topped up with winter sun (in a passive solar building) and shaded all summer to provide lower comfortable temperatures.

Climates

Where the diurnal range is not high, extra thermal mass will still provide a benefit, especially so in buildings of light construction. Thermal mass is not thermally beneficial to passive cooling in the tropics, where low mass construction should be used, but you must have good insulation and lots of cross ventilation.

Retrofit

Timber framed buildings (including brick veneer) in non-tropical climates can have thermal mass added using 'reverse brick veneer' construction. In fact, the 'brick' can be any high-mass material, including rammed earth or core-filled concrete block. (See 'Renovating Sustainably' *ReNew* 85, Oct-Dec 2003)

Colours

Reflective colours reduce heat gain. Houses can be painted at any time, and when it's time for that job to be done it is an ideal opportunity to change the colour scheme to reflect heat. Dark colours obviously absorb heat more quickly—so avoid using black or dark greys on roofs. Walls are best coloured in light or neutral tones.

Many councils around Australia prohibit the use of white or light colours on exterior surfaces, to prevent the built environment overpowering the surrounding natural landscape. This leads to a conflict between the need to maintain a green looking suburbia or rural environment with the need to avoid building 'hot boxes'. The best compromise between these two needs is to use lighter neutral tones on walls and mid range roof colours. Mindless uniformity can be avoided by using complimentary trim colours, but always avoid large areas of dark colours.

Dick Clarke is an architect and director of Envirotecture.

An excellent technical resource on passive cooling is the 'Your Home Technical Manual', published by the Australian Greenhouse Office. You can purchase a copy from the ATA shop (see page 80) or you can view it at www.yourhome.gov.au

Australia's water dilemma

As parts of Australia start to recover from the worst drought since records began, debate continues on how to manage our water resources for the long term. Hilary Harper looks at the issues

While Australia is the driest continent on earth, we are the highest consumers of water per capita in the world. Every Australian uses over one million litres of water every year. Most of our water is consumed by agricultural irrigation, accounting for 70%, domestic households 12%, other rural uses 9% and industrial use 9%.

There is no doubt that our current water usage is unsustainable economically, socially and environmentally. According to the National Action Plan for Salinity and Water Quality, a third of the country's rivers are in extreme ill health. At least 2.5 million hectares (5% of cultivated land) is currently affected by dryland salinity—this could rise to 12 million hectares (22%) at the current rate of increase—and land and water degradation is estimated to cost up to three and a half billion dollars per year.

How to address the huge amount of water that has been taken out of the Murray- Darling river system for irrigational purposes is of highest importance. Research into ecosystems in the Murray-Darling Basin has found that regulation of the river since white settlement has disrupted the seasonal variability of flows. Winter floods used to 'flush' the system—triggering bird and fish breeding and vegetation growth—but now the flow pattern is reversed, with dams limiting winter floods. Some wetlands are permanently underwater while others remain permanently undernourished.

National water initiative

In August this year the Council of Australian Governments (COAG) made a historic step forward in addressing future water management by agreeing to the scope of the National Water Initiative (NWI). The major outcome of the initiative is the reform of water allocation to ensure the economic and environmental future of regional communities.

The expansion of a 'more efficient' water market and trading involves factoring infrastructure costs like dam building into user-pays water prices, but also ensuring irrigators have perpetual rights to a proportion of the available water and can trade parts of their allocations.

Other major components of the initiative include:

- returning over allocated river systems, such as the Murray Darling, to sustainable levels
- implementing entire catchment measures to protect environmental assets
- encouraging water conservation in city areas, including better use of stormwater and recycled water.

COAG members also agreed to provide $500 million in funding over five years to address water over-allocation in the Murray-Darling Basin. The details of the initiative are to be finalised at COAG's first meeting in 2004.

Concerns

While all agree this is a good first step forward, there are concerns that without firm targets, time-lines and more money, it will not be enough. Some critics say no-one should have a permanent, private right to water, despite government encouraging irrigators to take this for granted. The water saved goes into increasing farmers' productivity and profit, not back into thirsty rivers or bores. For this reason, Tim Fisher, the Australian Conservation Foundation's (ACF) Land and Water Ecosystems Program Coordinator, says ACF is nervous about the NWI. The scope is broad and the detail unclear.

The $500 million committed to improving the Murray's health is welcome, but it remains to be seen how it will be spent, and there's no room for non-government input into this policy development. This is frustrating not just for the public good, but for the environment's future health.

Murray rescue plan

In November the Murray-Darling Basin Ministerial Council announced the rescue plan for the Murray River. Focusing on six key sites only 500 gigalitres of water will be injected, not the 1500 gigalitres recommended by an independent scientific report by the Murray Darling Basin Commission.

The water would be acquired by a combination of engineering works, better management of river flows, on-farm water efficiency savings and some purchase of available water, but there will be no compulsory acquisitions.

Once again, while these first steps were welcomed, there are concerns that it is not enough to protect the whole of the river.

'Last month's scientific report confirmed that a healthy Murray requires at least 1,500 gigalitres in increased annual flows. Long term, the only solution is a whole-of-river solution.' said

Don Henry, ACF Executive Director.

Other federal initiatives

Other federal programs underway include the federal Water Savings Project, which this year compiled practical water saving ideas for regional areas. Its findings will be released in 2004. The National Guidelines on Water Recycling provide a set of targets to assist local government in advising homeowners on water efficiency. This is also due out next year.

A national Water Efficiency Labelling and Standards (WELS) system will also be introduced next year, which aims to reduce water consumption by over 5% by 2021 and save consumers more than $600 million a year. Toilets, shower heads, washing machines and dishwashers will carry a mandatory water efficiency rating, while labelling of taps and urinals will be voluntary. A national water efficiency regulator will oversee compliance.

These reminders of Melbourne's current lack of water have been popping up all over the city.

State and local initiatives

On the state level there are numerous water conservation projects. One rural program that has received praise is Queensland's Rural Water Use Efficiency Initiative (RWUEI), which supports farmers investing in water-efficient irrigation practices like moisture monitors or drip irrigation, saving around 600,000ML since 1999.

Most state governments have introduced or are supporting rebate schemes for water efficient products and most capital cities in southern states are under water restrictions (refer to the table on pages 22-23).

Lets hope it does not take another drought like the one we experienced in 2003 before action is taken to secure our water resources for future generations. ✲

State water rebates

The tables below contain the catchment levels, water restrictions and rebates for each state. These may differ in regional areas, for further information contact your local council or local water authority

State	Catchment levels	Restrictions	Rebates	Further information
Australian Capital Territory	57.48%	Stage 3 - No sprinklers - Car washing by bucket only, or by commercial car wash using recycled water - Lawns watered only between 7am to 10am and 7pm to10pm on alternate days, with hand-held hoses and buckets - No fountains, no filling new ponds - No filling or topping up pools without an exemption - No window or building washing except by bucket - Wherever possible, non-potable water should be used	- $200 for a rainwater tank (or combination of tanks) between 4,500 and 8,999 litres - $500 for tanks totalling 9,000 litres or more	ACT Electricity and Water Corporation (ACTEW) ph:(02) 6248 3111 www.actew.com.au
New South Wales	57.5%	Apply to Sydney, the Illawarra and the Blue Mountains - No sprinklers or watering systems, only hand-held hoses, drip irrigation, grey water and recycled water on gardens) - Car washing by bucket only - Hand watering any time - No hosing paved areas	No state government rebates Offered by Sydney Water six-month trial in 2003 extended to June 2005 - $150 for rainwater tanks 2000-3999 litres - $400 for tanks 4000-6999 litres - $500 for tanks over 7000 litres - $150 bonus for connecting tank to toilets and/or washing machines - Indoor retrofit rebate program for $22 (usually $135 plus), a licensed plumber visits and installs a AAA rated shower head. They may also carry out other water saving measures	Sydney Water ph:132 092 www.sydneywater.com.au
Northern Territory	Darwin 71.5% Alice Springs (all bore water, no percentage levels known)	No water restrictions	No state government rebates	NT Power & Water Corporation ph:1800 245 091 Alice Springs City Council ph:(08) 8950 0500
Queensland	Hovered around 60% over past six months	No water restrictions	No state government rebates Offered by Brisbane City Council - $500 for new domestic rainwater tanks of 1000 litres or more when connected to at least one internal household fixture, or more than 3000 litres when for outdoor use only.	Brisbane City Council ph:(08) 9423 7777 www.brisbane.qld.gov.au South East Queensland Water Board ph:(07) 3229 3399 www.seqwater.com.au

Note: Catchment levels as at 3 December 2003.

State	Catchment levels	Restrictions	Rebates	Further information
South Australia	Not available	Permanent water conservation measures (replacing harsher level 2 restrictions, except in Eyre Peninsula region) - Public or private gardens, recreational areas, sports grounds or nurseries can be watered by hand, drip-feed irrigation system, or by sprinkler between 5pm and 10am (6pm and 10am during daylight savings) - Vehicles can be cleaned at commercial washes using recycled water, or by tap-filled bucket, hand-held hose with trigger nozzle, or high-pressure, low-volume water cleaner	For tap timers, water efficient shower heads, flow restrictors - $10 per item, max $50 - $20 per item, max $100 for concession card holders Scheme capped at $1 million. Will be reviewed in one year	SA Water ph:1300 650 950 www.sawater.com.au
Tasmania	79%	Level 1 - Sprinkler use only between 6am and 10am and 6pm and 10pm, hoses any time	Offered by Hobart City Council Scheme starts 1 January 2004, amounts still to be finalised - $10 for shower roses - $40 rebates for changing to dual flush toilets - $100 for rainwater tanks (600L or greater) if plumbed to toilet - $60 for washing machines rated AAAA - possibly money available for water audits	Hobart City Council ph:(03) 6238 2711 www.hcc.tas.gov.au www.hobartwater.com.au
Victoria	57.5%	Stage 2 - Automatic sprinkler watering between 11pm and 6am only - Manual watering systems 5am-8am and 8pm-11pm - Hand held hose anytime - No lawn watering - No filling pools or spas without approval - Washing vehicles only with buckets - Only commercial car washes using recycled water or high pressure water cleaning units can operate - No washing of paved areas - No fountains except those that reuse water - Exemptions for councils, schools, golf courses under special arrangements	- $150 rainwater tank, further $150 for connection to toilet - $500 grey water permanent tank system - $50 to replace single or 5/11 toilets with 3/6 litre dual flush - $30 high pressure spray cleaning device - $10 AAA shower rose - $30 water conservation home audit - $30 when purchase $100 worth of water saving garden goods such as flow control valve, mulch, wetting agents, compost bins, moisture sensors, garden tap timers, drip watering systems, trigger nozzles, temporary grey water diverters Some water companies offer Home Audit Services with rebates of up to $30 on the $110 cost of having a plumber assess your home's water efficiency	Department of Sustainability and the Environment ph:13 61 86, www.ourwater.vic.gov.au or www.savewater.com.au
Western Australia	37%	- State wide sprinkler ban for watering during the day Metropolitan areas - Can only use sprinklers two days a week, 6pm-9am - Hand-held hose watering allowed any time - No filling swimming pools	$10 for AAA rated showerheads $100 for washing machines with a AAAA rating or higher $300 rebates are also available for domestic garden bores which can provide a sustainable alternative water supply for the garden $300 for rainwater tanks (600 litre or more capacity) that can provide an alternative water supply for your toilet and/or washing machine. $250 rebate for greywater systems. One product per property, two showerheads. Expires 10 February 2004. Up to $300 total	Water Corporation ph:1300 133 646, www.watercorporation.com.au www.ourwaterfuture.com.au/home.asp

Note: Catchment levels as at 3 December 2003.

Refresh your garden with a shower

Keryn Marley tells us how her family installed the first legal greywater reuse system in Bassendean, Perth, after new guidelines for greywater reuse were introduced by the Western Australia Department of Health

I always felt guilty at the sight of almost clean, sudsy water pouring down the sink. When the garden outside is wilting from water restrictions and the soil is turning waxy from the heat, it seems ridiculous not to get that wastewater from the bathroom and laundry onto the garden.

Over the years, my husband Kevin and myself have tried various methods of reusing laundry and bathroom water but without much success. Bucketing of water from the bath to the garden is the simplest method, but this requires significant time and energy. Another method we tried was tapping into our laundry waste pipe and diverting the water onto the garden, but the pipe eventually became blocked with 'gunge'. We needed to find the right system for our lifestyle.

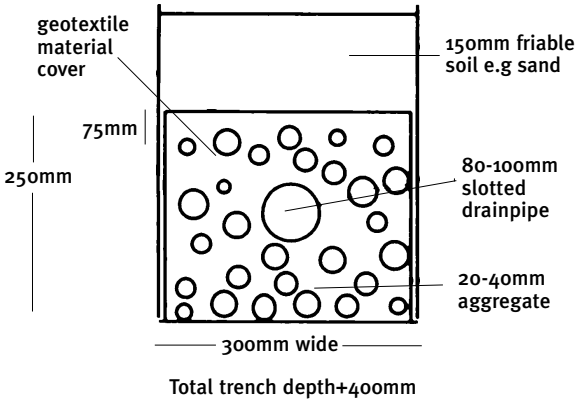
Realising that we needed more knowledge, we sought out Ross Mars, otherwise known as Dr Greywater. Kevin enrolled in Dr Mars' greywater reuse course at the University of Western Australia Extension Program. A couple of weeks before the course was due to begin, Ross asked if we were interested in using our house to set up the demonstration system for the course. We were thrilled, as with expert knowledge, and a deadline, our dream of free water for the garden was sure to become a reality!

Fortunately, we live in an older-style house with the wastewater outlet pipes exposed on the rear wall. Ross explained that we could improve on our earlier, but now defunct, system by putting a filter on the laundry waste pipe and running the pipe into the garden. However, we decided to go for the option of using both laundry and bathroom water.

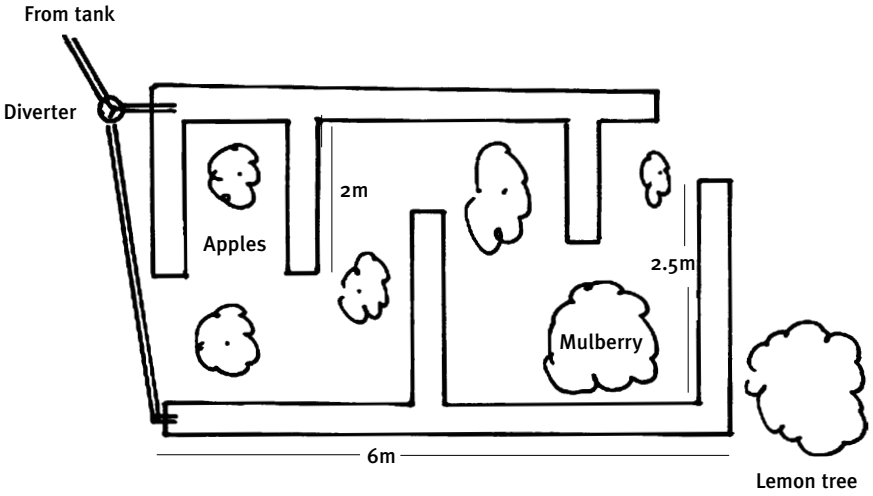
Ross Mars standing on top of our 1000 litre greywater tank, with the machine that ate our garden in the background.

Approval process

Before we could begin we needed to gain approval for the system. In Western Australia the process is relatively simple and painless. Firstly, only approved systems can be installed, and the list of these can be obtained from the Health Department. Secondly, the local authority (Shire Council, or City or Town local government) has to approve the application. Fees for this are usually $130. Finally, after you have chosen what you want, a plumber or licensed installer can fit the system. Much of the work can be undertaken by the householder, as a plumber is only required to disconnect and/or reconnect to an existing sewer or septic system. The local government environmental officer will inspect the installation before it is activated.



Left: Workshop participants place the aggregate in the geotextile-lined trenches.
Right: Typical construction and cross-section of Greywater Reuse System 'Watersave' drain



A sketch of the piped trench layout.

System set up and construction

Our system was installed over a couple of weekends. On the first weekend we hired an excavator to dig the trenches and the hole for the tank. We decided to install a 1000 litre sedimentation tank to deal with the amount of water coming from both the laundry and bathroom. This allows any solids, such as hair or soap, (the gunge that had blocked our earlier system) to settle to the bottom. The outlet pipe is lower than the inlet pipe and the slight fall of the ground is used to gravity feed the wastewater to the underground trenches.

Unfortunately during construction, some of our brick paving crumbled under the weight of the machine. Be aware, retrofitting a system to an established garden can cause some damage. It may be worthwhile getting out the big spade and doing the digging yourself. If possible, it is best to install the system when building or renovating to save having to repair your garden.

On the second Saturday, two dozen participants of the greywater course helped finish off the installation. The trench walls were first lined with geotextile and a thin layer of stone. Slotted drain coil was laid over this, covered with more stone to a depth of 250mm and then covered over with the geotextile.

Finally, the trenches were filled in with sand. For a 1000 litre tank, at least two ten-metre inter-connecting trench systems are required to disperse the water through sandy soils. The trenches need to about one and a half times longer in gravel or loamy soils.

Our system has a ball valve and overflow safety device so that water can be diverted back to the main sewerage system if the ground becomes waterlogged. A conventional 100mm diverting valve is also used to alternate the flow of water between the two trench systems.

Here you can see the safety overflow to the existing sewer line and ball valve to regulate greywater flow to the system. The vent line is shown in the foreground.

Maintenance and monitoring

The system should be maintenance-free for many years. Every five years the settling tank needs to be cleaned out, but the trenches should have enough time to regenerate and recover as we installed an alternating system. This means that half of the trenches are rested for a week or two, and the trenches rotate in this cycle—half working, half resting.

Monitoring hasn't been done as yet, but as this article goes to press Dr Mars is installing two collecting tubes so that samples can be taken and nitrate and phosphate levels determined. We will then be able to compare the greywater nutrient loading in the waste stream with that passing through the trench system.

Is the system cost-effective?

Put simply, yes. The initial outlay was

about $1500. This included $130 application fee to the local council, tank and plumbing fittings for $1000, stone for trenches for $100 and mini-excavator hire about $250. It was calculated that up to 400 litres per day could be redirected into the garden areas. This means over 100,000 litres per year, every year, indefinitely.

The finished result is 15 square metres of irrigated garden. We are now busy planting herbs and fruit trees over the system and hope to soon see a thriving garden which is saving us both water and money. With on-going water restrictions and rising consumption costs, not to mention the amount of water needed to produce fruit and other useful tree crops, the decision to spend money now means long-term savings in the future.

The young fruit trees planted on top of the greywater system. You can also see the top of the monitoring wells.

Green and blue cleaning

Green cleaning is not just about reducing the use of chemical products but also the amount of water. Bridget Gardner tells us how

Why do we seem to need a crisis before questioning our behaviour? The devastating drought in southern and eastern Australia has helped to make even city dwellers aware of the need to conserve our precious water, in all aspects of life. Cleaning is no exception. Unfortunately—as I discovered during the initial stages of my chemical-free cleaning business—environmentally safe products such as bicarbonate of soda can be very water greedy. Although I had tried to address this problem, it wasn't until I moved out to a property reliant on two tiny rainwater tanks that I really learnt how! Here I will outline the tools and techniques I use to save water while cleaning.

With these implements you can help reduce the amount of water you use while cleaning—see the table opposite for further details.

Conserving cleaning water

Rinsing the cleaning cloth continuously under running water from the tap wastes an incredible amount of water. Instead, I rinse my cloth in a small (two litre) bucket, half full with clean water. If the surface is really dirty I use a second bucket to rinse the cloth after washing the dirt out in the first.

To avoid having to constantly change the rinsing water—which defeats the purpose—I use a trick that Healthy Dwelling in Melbourne recommend for their microfibre cloths. I fold my cleaning cloths into four and clean with one side at a time, rinsing it out only when all the sides have become dirty. Although this may seem awkward at first, it maximises the surface area of the cloth, and actually saves time as well as water.

Microfibre cloths

High-quality microfibre cloths reduce or eliminate the need for cleaning agents, so less water is required to rinse the surface or the cloths. Personally, I was reluctant to embrace this latest innovation in cleaning technology, as they are made with non-renewable synthetic fibres (petrochemicals) and imported from overseas. However, although cotton is renewable, a lot of water and pesticides are used in its production. Microfibre cloths are also usually more durable than cotton fibre cloths.

Having said that, the most sustainable and cheapest water-saving way to clean is to regularly wipe down all surfaces with a damp recycled towel, flannelette sheet or nappy—then there will be no need to use lots of water and cleaning agents to remove stuck-on grime.

Reusing water

Reusing the cleaning water on the garden is a great way to understand the impact cleaning can have on the planet. No matter how biodegradable and non-toxic a cleaning product is, I would kill my plants if I watered them with too much of it. Likewise, I'm not doing the environment any favours if I use vinegar by the crate-load. What goes down the drain and into the bin is not the end of the story. The manufacturing, transportation and packaging of millions of cleaning products depletes our planet's resources, and creates waste and air and water pollution.

A large recycled bucket with 'For Garden' written on it sits outside my back door, and the water from my rinsing buckets is tipped into it. Although

How to clean

My aim is to minimise the amount of cleaning products and the water I use, while not compromising their effectiveness. It takes a little experimentation to clean without products that have been 'scientifically proven' to clean a specific task or surface. Therefore it is helpful to think about cleaning as simply the process of removing dirt and microorganisms from a surface. Instead of products, I use a combination of tools: ingredients and implements and techniques.

Ingredients

1. **Pure vegetable oil soap:** Bars of soap from health food shops don't contain tallow, which encourages the growth of mould. Wipe damp cloth over the soap for removing food and grime. Liquid Castile soap from health food shops (supermarket brands contain synthetic chemicals). Dilute a drop in warm water to clean toilets and non-wooden floors.
2. **Bicarbonate of soda**: Buy from supermarket or bulk non-food grade from pool supplies shops. Make a paste on a damp cloth or in a bowl to remove soap scum, grease, fingerprints from white goods et cetera. Store in a dispenser such as a jar with holes in the lid or cheese shaker.
3. **White vinegar:** Cleaning vinegar is available in bulk at some health food shops or independent supermarkets. Dilute a third of a cup of vinegar in two to three litres of warm water for wooden floors or windows.
4. **Eucalyptus oil:** Use only two to three drops to one litre of hot water of pure grade oil from reliable sources. (Supermarket brands are highly diluted). Dilute two to five drops in one litre of hot water to dissolve grease on ovens. It is poisonous to drink, so keep out of reach of children.

Implements

1. **Cleaning cloths:** Recycled towel or terry nappy cut into 30cm square pieces. Microfibre cloths—such as Oates, Healthy Dwelling, Enjo or Ha-Ra.
2. **Drying and polishing cloths:** Recycled flannelette nappies or sheets cut in half or 30cm x 60cm pieces.
3. **Scrubbing brushes:** Toothbrush—save your old ones. Dustpan brush, bristles cropped short to 3cm.
4. **Scourers:** Stainless steel. Orange net bags tied into a knot.
5. **Window and glass cleaners:** Microfibre cloths—such as Healthy Dwelling, Vileda, Enjo or Ha-Ra. Squeegee—professional cleaning supplies with replaceable blade.
6. **Buckets:** Two-litre and ten-litre buckets recycled from delicatessens or recycled ice-cream containers.

Techniques

1. Make sure your buckets, cloths and mops are clean, and you have all your 'tools' ready.
2. Remove dry particles—such as cobwebs, dust and pet hairs—first. Clean from top to bottom.
3. Half fill rinsing buckets with water to dampen and rinse your cleaning tools in, instead of under the tap.
4. Fold damp cleaning cloth into four, wipe surface with one side at a time until it becomes dirty, then turn it over and keep cleaning. Repeat until all sides are dirty, *then* rinse out cloth in rinsing bucket. If the cloth is really dirty, rub with a little pure soap and wash in rinsing bucket.
5. Tip dirty rinsing water into 'For Garden' bucket to reuse on the garden.
6. To soften stuck-on dirt (kitchen surfaces), leave the surface damp for a few minutes, then wipe again.
7. For stubborn grime such as soap scum, stains and grease, wipe the damp cloth, scourer or scrubbing brush once or twice over a bar of pure soap and/or sprinkle with a little bi-carb soda.
8. Use a brisk but light touch. Scrubbing hard wears out the surface, the tool and your arm!
9. Dry the clean surface with an absorbent cloth (flannelette), to polish and retard the growth of bacteria. Never use the same cloth in the kitchen after cleaning the bathroom and vice versa.
10. After cleaning, wash tools in hot water with pure soap, rinse well, then dry them in the sunshine. Tip rinsing water into garden bucket.

water is my main cleaning agent, when cleaning stubborn grime I add a little pure soap, bicarbonate of soda, eucalyptus oil or vinegar.

- Pure soap is 100% biodegradable, if it is dissolved in water. Pure vegetable soap is preferable, as it has no tallow that can encourage the growth of mould.
- Bicarbonate of soda is mildly alkaline, so care must be taken not to use it in strong concentrations or repeatedly on the same area.
- Eucalyptus oil is biodegradable, however it is not advisable to use it to water plants as it is a disinfectant that could affect beneficial soil microbes. As I only use it to remove grease from ovens, or sticky glues or gums, I wouldn't use this rinsing water on my garden anyway.
- Vinegar must be used with care as it could change the pH of the soil and kill important soil organisms if it is too strong. The dilution I use to clean floors—a quarter of a cup of vinegar to two to three litres of warm water—is fine to water larger trees or hardy shrubs, but not repeatedly.

It is important to avoid contact with the plant's stem or leaves when the water contains any of these products. Rotate the spots you water and dilute the cleaning water with the rinsing water in the 'For Garden' bucket. Never use water that contains bodily fluid such as from dirty nappies. Greywater can cause water repellency, salinity and pH problems in your soil. Monitor the health of your plants and test the soil for water repellency or extreme pH values on a regular basis. Your local nursery can help you with this advice.

A few basic natural ingredients, like vinegar, bicarbonate of soda, vegetable soap and eucalyptus oil are all that is needed to clean your house.

The act of tipping food scraps directly onto the garden from the sink or kitchen surfaces is more difficult to give specific advice about, and greywater information advises against it. Food can putrefy in the air or soil, however it is not good for the compost bin to put too much water into it, and definitely not good to add detergents or soap to it!

The best solution is to scrape food scraps from plates and kitchen surfaces directly into the compost bin, so as to minimise the amount of water needed when cleaning them.

Bridget Gardner is the manager of A Fresh Green Clean. There will be demonstrations and workshops on saving and reusing water while cleaning, at the Sustainable Living Festival in Melbourne, February 2004. You can contact Bridget on 0417 519 251 or freshgc@alphalink.com.au

Thank you to Sustainable Gardening Australia: www.sgaonline.org.au

More water saving tips

- To wash cleaning cloths, either hand wash several cloths together with pure soap in a small bucket, or add them to a full load in the washing machine with biodegradable and phosphate-free detergent.
- Clean the shower cubicle just before showering so you won't have to rinse it.
- Place a stainless steel bowl (easier to clean) in the sink to catch drips, water from washing vegetables, hands or the odd cup.
- Place a bucket in the sink and shower to collect the water until it runs hot.
- If washing dishes by hand, begin to clean and rinse glasses as you start to fill the sink and only fill it to 1/3 full, instead of waiting until the sink is full to the top before you start!

Dream home or nightmare?

Many environmentally sustainable building projects have their highs and lows. While the end product may be outstanding there can be a lot of heartache along the way. Kate Hairsine tells us about Lyn Moog's experience

Many people dream of building a house like Lyn Moog's. The stone and timber house is nestled in the foothills at Greendale, about 50 km north of Melbourne. Far enough from the highway so you can't hear the traffic, and within walking distance from the pub. The house is almost completely self-sufficient for its energy and water needs. There's a creek meandering through the block, and a couple of large trees shade a picnic table. Yet Lyn's dream has turned into a nightmare, and it's all because of the creek.

The problem is that the block isn't connected to mains sewerage, and as the creek sometimes floods, all wastewater has to be pumped off site. However, Lyn didn't find this out until after she'd bought the land and applied for a planning permit. Lyn is exasperated because she says that before she bought the land, she checked with the council to make sure that there were no problems.

'As it is on a floodplain, I went to the council to make sure there were no reasons that I couldn't build here. And they said there weren't. No one said I couldn't have a toilet, neither the sellers or the council. But I didn't get it in writing. Once I knew the problem I couldn't have sold it to anyone else in good conscience. And I couldn't afford to lose the money. I just had to struggle away, and I am still struggling away, but I'm getting tired.'

Lyn Moog on the verandah of her home with her son Wayne.

Wastewater conundrum

For the moment, the household wastewater is pumped into a 2275 litre concrete septic tank, which sits on the ground instead of in the ground. A Davey multipurpose sump pump draws water from the septic tank into a 4,500 litre grey water holding tank, leaving the crusty scum in the septic tank. While the septic tank will have to be emptied every few years, the grey water tank was emptied three times last year. And that was when Lyn was living by herself and not running a washing machine. At $200 a pop, when you are living on a pension like Lyn, it starts becoming an expensive process.

Nevertheless, Lyn is a persistent woman and she has paid several consultants to examine the wastewater problem. One suggestion is to pipe the wastewater over the creek to the other side of the block (which doesn't get flooded), and treat the effluent with a reed bed system. Yet this would only get the water 30 metres away from the creek, and under the local council guidelines, treated water needs to be 50 metres from a waterway.

Another problem is that Southern Water, the authority responsible for waterways in the area, says the pipe would need to go under and not over the creek, an option which is too expensive for Lyn at this stage.

Lyn hopes that new technologies, producing cleaner waste water (and with low energy requirements) will eventually allow her to decrease the 50 metres, and treat wastewater on site.

Lyn decided to use local stone for its aesthetic and low maintenance value.

Stone loft house

Despite the problems with the waste water, the rest of the house building seems to have run without many of the hiccups that you would expect directing teams of tradesman, particularly if you are a single older woman.

Lyn's 12½ metre square home is based on Peter Lees' Loft House design. Downstairs consists of an open plan living area, laundry, bathroom and kitchen, with a wide verandah all the way around the house. Upstairs there are two rooms with balconies and a toilet 'for old bladders'.

Lees, an architect, designed his loft houses specifically with low income earners in mind. By using the roof space as additional living area rather than spreading the house out along the ground, the loft house minimises the amount of building materials, and therefore the cost. An additional benefit, according to Lees, is that the smaller surface area reduces the heat gain in summer, and the heat loss in winter.

After admiring other stone cottages in the area, Lyn decided to build the house with local stone from Bacchus Marsh. With colours ranging from soft creams to deep yellows and pinks, the stone work is beautiful. Lyn chose stone because she loved it, but she was also attracted to its low maintenance aspect. 'I decided no plaster and no painting. I didn't want to have to worry about painting or sealing when I am old.'

Radial wood cutting

The roofing is built with radial cut native timber. Radial cutting is a method that involves progressively rotating and cutting logs down their length, to a depth of cut just above the log centre in order to produce wedge shaped boards. The method uses an estimated 40-80% of log volume compared to 20-50% volume consumed when logs are cut conventionally.

Interestingly, radial cutting is seen as one of the potential solutions to the dominance of pine in the Australian tree plantation market. While fast growing pine can be cut after about 15 years, slower growing Australian natives need to be about 50 years old before they can be cut by conventional methods, otherwise the wood shrinks in an uneven

Radial cut native timber was used for the roof, and the upstairs exterior and interior walls.

pattern. Radial milling spreads the stresses in the timber, thereby alleviating the uneven shrinkage pattern. Australian trees can be harvested much earlier if cut in this way.

Lyn was happy not to use pine. 'I was going to use pine, but didn't want to because we have so many cockatoos around here and they eat the soft wood. I also did not want to use old growth wood. I just stumbled over the radial wood option on the internet.'

Although it produces less waste, radial cut timber has uneven outer edges which can put some people off. But in Lyn's house, the mix of stone and uneven wood increases the natural aesthetic of the house. In fact, Lyn liked it so much, she ended up using it on feature walls on the interior as well.

The carpenter, Eddie Leckie, found that radial wood took a bit of getting

The solar tracking array and water tanks. You can see the trees that line the infamous creek in the background.

used to: 'The wood isn't square or parallel, and it's bowed. Every cut has to be at a different angle. Plus it's a hardwood so you have to pre-drill every hole. But it comes up really well. I'd definitely suggest it to another client.'

Eddie reckoned it took twice as long to build than when using normal weatherboard, but he adds, 'It didn't help with the pitch of that roof, if it hadn't been so steep it wouldn't have taken so long.'

Low maintenance home

Lyn thought long and hard about what she wanted in a house, and was particularly concerned that everything should be easy to use and maintain.

'I don't want to have to be a burden on my boys when I get older, so I needed to make everything practical and easy.'

For example, Lyn got rounded corners fitted in the kitchen to make it easier to sweep up dust and grime. The bathroom is small and simple, to avoid having to clean metres of glass and mirrors, while the laundry was specially designed for the washing and grooming of her three dogs.

Because of its floodplain location, the house is raised one and a half metres above ground level. Lyn has incorporated a ramp so she can easily wheel wood inside from the shed.

Solar power system

Lyn was determined to be self-sufficient from mains power and water. The solar power system consists of 16 BP solar panels—six 75 watt and ten 80 watt. These were originally going to be roof mounted, but wouldn't have been able to meet her energy requirements, which include running a computer, DVD, stereo, washing machine and fridge. Although the fridge could have run on gas, this didn't fit with Lyn's idea of self-sufficiency. The solution was a Davey solar tracking system, which increased the energy output by around 30% for a cost of about $2000—which includes the system, mounting pole and concrete foundation.

The main difficulty with the solar system was getting the panels away from the shadows cast by the trees and surrounding hills. So the final location isn't perfect because the bottom third of the panel is in shadow for a couple of hours with the lower winter sun.

The system is designed for three kilowatt-hours hours per day, which in reality gives about two to two and a half kilowatt-hours in winter, and between five to six kilowatt-hours in summer. The rest of the system is made up of a Selectronic SA32 inverter, Plasmatronic PL60 regulator and Stanbury, Scarf & Lord 60 amp charger.

When Lyn was living by herself last year, the solar system covered all of the household energy needs. However now that her son is staying with her, the Gentech 6 back- up generator gets a little bit of use.

A Beasley 280 litre solar water heater provides most of the hot water for the house, which is backed up in winter by a stainless steel water jacket fitted on the wood heater.

While Lyn loves her house and its location, she will not be satisfied until the water can be treated on site.

'What annoys me most of all is that I wanted to build an environmentally friendly self-sufficient house, and I haven't got it.'

Thanks to Lyn Moog, Chris Stork (installer), Steve Gale (plumber) and Eddie Leckie (carpenter) for their help.

Why build or renovate when you can move?

For Tim Tutt and Kait Brown, relocating a redundant house to their land seemed to be an economical and environmentally sustainable option. However to do it smoothly and cheaply requires foresight and planning

The concept of house relocation meets many principles that environmentalists and 'sustainabilists' abide by—refusing new products, and reusing old products. In addition to the obvious environmental advantages of reusing a house, it is a win-win situation for both parties. Demolition is a cost to people wanting to build where a house already exists. In our situation, a beloved but outdated holiday house needed to be removed from a block in Anglesea, to make way for Tim's parents' retirement dream home. With a bit of tangential thought, the concept of moving the house to Tim's empty three-acre block near Warrnambool, in Victoria's great south west, evolved.

As young potential home-owners, the idea of a house for 'free' held great appeal indeed. We were very lucky though, as in most instances the house will come with a price on it. As a rough guide—depending on its condition and how desperate the owners are to get rid of it—the price of a removal house can range from $5000 to $20,000.

Having said this, nothing's ever as easy as it seems, and while we've had a really positive experience with our relocation, there are certainly things that we'd change if we did it all again. If we'd known at the start what we know now, the whole process would have been much more streamlined, so we're hoping that our experiences can help others to recycle a house with efficiency and pleasure.

The house divided into three trailer loads and ready to hit the road.

Finding a relocator

We looked locally in the Warrnambool region and approached one operator. In passing conversation at work and around the traps, the general feeling was that he was a competent and good operator. Shortly thereafter he inspected the house and provided a rough quote.

Costs

As a ball-park figure, it costs about $10,000 per trailer load. As a general guide, trailer loads are sections up to seven metres wide (VicRoads limits) and up to 15 to 20 metres long. As always, there are exceptions, and in the case of house relocation, access roads leading to house sites will also dictate the number of pieces and therefore trailers.

Our house would almost have fitted on one trailer. However, due to the orientation of the house on the block and the narrow street, we ended up having to remove it in three pieces—this ended up costing us $30,000.

Initial planning

If, at the outset, you can clarify a fairly detailed plan of your end product, the planning and coordination of getting there will be much easier. It should be noted that some councils do not allow, or frown upon, house relocations, so this should be the first port of call.

In the preparation stages, the paperwork can be pretty laborious and bureaucratically slow. Our planning permit ended up taking about two and a half months to get approved. Our first attempt was sent back as we got the scale wrong. For the building permit, we got a building surveyor on board who dealt with the fine details. House relocations are dealt with in pretty much the same

way as a new house—you need to demonstrate that it will meet current building standards.

How we wanted our house to look in the final picture was a little unclear, and thus the path to get there was also. As a result some efficiency was lost, in terms of time, energy, materials and as always, money! A good example in our case was the raising of the house onto stilts and the addition of 100m^2 of deck area. We had decided to go high for two reasons—to maximise views of the crater lake and ocean out the back door, and to create useable space under the house. The decision for a large deck area was fairly simple—we like spending time outside.

In hindsight, we would have approached an architect or engineer to do one complete design for the house re-stumping and decking! However, at the time, we were uncertain about how to utilise the space under the house, how much deck we should have (read 'afford') and where the stairs should go. As a result of this uncertainty, we did things in bits.

To achieve useable space under the house, every second house stump needed to be removed. We got an engineer to do this job, and he specified large timber stumps and also additional bearers. This created five bays along the length of the house, each of which are three metres wide and the house width long. This has enabled us to use this space as carport areas, and in the longer term will also be a shed-cum-garage arrangement for Tim's other recycling projects—making furniture out of pre-loved surfboards, to mention just one—but that's another story.

After the house was actually moved on site, Tim drew up plans for the deck, which then had to be approved by the building surveyor separately to the rest of the plan, all adding to the drawn out timeline.

Making it real—cutting it up

While we knew that our house would be cut into three pieces, we were not really sure how that would be done, or how many 'cut marks' might be visible at the end of the job. To start with, the guys took a texta and marked the cutting lines. Cladding and roofing iron was taken off in order to provide the removalists with access to the studs and rafters that needed to be cut. Windows and doors were also removed, and carpets rolled back, before three very clean cuts were made. No wild brandishing of chain saws here, the guys made very precise, straight, and easily refilled cuts.

Once the house was cut into three, and the stumps had been separated from the house bearers, hydraulic jacks were placed under the pieces, one by one. Semi-trailers were then extremely skilfully backed under the elevated pieces—a feat we think was best for us not to have been there to watch considering how tight the block was—then the jacks were lowered down, placing the pieces onto the trucks. Pieces of bracing timber, galvanised iron and heavy canvas tarps were then tacked up, to make the pieces semi-watertight, and structurally sound enough for the move.

All in all, removal preparation took about three days. On the fourth day the trucks began their move. The relocator needed to get a special VicRoads permit for the trucks as they were over length and width limits. As part of the permit, VicRoads specified the time and travel route—in our case the trucks left at about 10am, but often house removals occur at night time, when roads and traffic conditions are at their quietest. We didn't travel with the house, which in retrospect was probably not a bad thing. I'm not sure the nerves would have stood up to six to seven hours of watching our house in limbo.

...and putting it back together again

At the other end, holes were dug for the new stumps, then the trailers were lined up very close together (another feat of amazing truck-driving prowess), and the jacks were used to lift the pieces off the trucks. The stumps were then put in place and set in concrete overnight, before the trucks drove out and the jacks lowered the pieces to their final resting places. Each trailer took about a day to unload. Once all three pieces were lined up and secured to the stumps, the process of replacing windows, doors, cladding and roofing began. This took another day or so, and by the end of it, the house looked remarkably like it had pre-cut, pre-move, and pre-patch-back-together.

The relocated house, elevated and in the process of being 'decked' out.

Because we live in windy Warrnambool, we had to do a mega bolting and bracing effort, to securely fix the house to its new stumps. This process actually ended up being quite time-consuming and significantly expensive. This was certainly a 'hidden cost' that we hadn't really accounted for.

Other planning considerations

Another aspect to consider in the planning stages is the age and condition of the house and whether any repairs or upgrades need to happen in order for it to be both liveable and environmentally friendly. In our instance, the ceiling was already insulated, but the walls and floor were not. The possibility of insulating the walls was only realised half way through, when we saw how much of the cladding had to be removed as part of the removal process. In hindsight, this would have been the ideal time to quickly and easily insulate the walls, before the cladding was replaced, but because we were not organised, the guys had the cladding back up before we could get it done.

Tradesman timing

Another factor which resulted in the whole process being somewhat drawn out was that we had not booked tradespeople in advance. While we knew that there were a myriad of jobs to do before the house could be even remotely habitable—reconnecting plumbing and electricity, plastering up cut-lines, not to mention aesthetic details such as a new paint job. Booking tradespeople for definite dates was difficult, as our relocator was fairly vague regarding timelines. The house was originally going to be removed in May, but it ended up being at the end of July. As a result, we ended up organising tradespeople on the hop, which is not easy.

Hindsight

We learned a great deal through our relocation experience. We were in effect 'owner builders', with Tim as the project manager (or thereabouts), and little experience or familiarity with the ins and outs of the building industry. It's still a work in progress, but we love our new house. At this stage, it still needs painting and the shed-cum-garage is yet to be filled in, but the deck's finished, and the scenery is calling…bring on the summer beers and barbies!

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Why buy a car, when you can share one with your neighbours. Not only does it save you money, it also helps reduce greenhouse gas emissions. Bruce Jeffreys from Newtown CarShare tells us how

Newtown CarShare member Leila Rodin only ever needed a car to indulge her passion for gardening, which made it hardly worth owning one.

Hands up if you own a car and feel guilty deep down? Well imagine if you got rid of the old bomb, swapping it for access to a fleet of new low-emission cars parked near your home that you only paid for when you used them. Sounds like a great idea. It's not an idea, it's a reality. The service, called Newtown CarShare, has been running successfully in Sydney since June this year. It has worked a treat for residents who only need a car now and then, saving them the hassle and expense of owning their own car.

Car ownership goes hand in hand with car dependency. We all know the score—as soon as you own a car it becomes the default mode of transport no matter what the trip because it's just sitting there waiting to be used. Take away car ownership and you radically change the equation. Members of the Newtown CarShare can now weigh up which is the best way of getting to where they are going. And more importantly, they save money when they don't drive, giving them a financial incentive to catch the bus, train or ride a bike.

How was it set up?

About three years ago I was intending to buy a car. Living in Sydney's inner west I would not need the car all the time, so I wanted to make it accessible to my neighbours. In my research with Newtown CarShare co-founder Nic Lowe, we came across an article about San Francisco Car Share. We then researched further, looking at car share programs that provided successful everyday services throughout Europe and North America. In August 2002 we founded CarShare Australia to bring car sharing to Australia.

How does it work?

It is really quite simple. You sign up as a member by filling out an application form, pay a $25 application fee and $500 deposit, then attend a half hour orientation session. Members also have to supply a drivers licence history as all members are required to have clean

driving records with no drink driving convictions. We then give you an access card, a member number and a password.

When you need to use a car you either go online on the web and make a booking or call our telephone booking system, 24 hours, seven days a week. You can book a car for as little as an hour and up to two days. All you do then is pick up the car, drive, and return the car to the same spot. CarShare partners, Marrickville and South Sydney City Councils, have provided parking locations for the vehicles.

Members are invoiced monthly, with charges starting at four dollars per hour along with a 0.35 cent kilometer charge. You do not have pay for petrol, as each vehicle comes with a fuel card and you refill whenever the petrol gauge falls below the quarter full mark. Every time you re-fuel the car, you receive a three dollar credit on your Newtown CarShare account.

We developed the necessary technology (website, touch-tone booking system) ourselves, as having reliable locally-sourced technology is key to the long-term development of car sharing in Australia. We conducted a trial with 12 members over four months to test our business and IT systems, which performed extremely well.

We currently have three vehicles, all of which are fuel efficient, including a Toyota Corolla that runs on biodiesel. We'll continue to run it on biodiesel even though the Federal Government has now made this un-economic, with the introduction of the biodiesel excise tax.

Start up hurdles

As a green business there are plenty of people around that find more reasons for why it won't work than why it could. We had to step through a lot of hoops to get to where we are today, including negotiating Australia's first insurance contract for car sharing, the first fleet leasing contract, securing dedicated parking, and developing the business processes to make it work.

Having said this, we have received great support from local residents and organisations in the Newtown area. We've been quite blown away by the amount of goodwill that exists from the local community for the service—I guess it makes a tangible difference to peoples lives

Who uses the service?

Our members join up for various reasons. Leila Rodin, one of our members, is quite happy using public transport to get around, especially to work. She realised that the only reason she owned her car was for the odd trip to her local nursery as carrying potting mix on a bus is not the easiest of tasks. She joined Newtown CarShare, sold her car and now spends a fraction on those odd trips, loving the fact that she can grab a ute for those really tall plants! The dual-cab ute is also very popular for people moving house.

We are currently expanding Newtown CarShare by inviting businesses and organisations to join the service. The first business to join was Persephone Designs, led by Director Kylie Stubbles, a graphic designer based in Erskineville.

Kylie prepares special handcrafted exhibits for magazines and exhibitions, often delivering the delicate cargo using the ute. For her, the benefits of car sharing stack up. While she can work most of the time without a car, booking a car for her typical three hour trip comes in handy for those jobs that just need to get done. She also appreciates returning the vehicle to its dedicated spot—saving the hassles of searching for car parking. We are working towards having 200 members and 20 vehicles by June 2004.

Instead of going grey waiting for government to back up their talk on 'sustainable transport' with some action we have done it ourselves. Now that we've proven it works in Australia we're looking forward to it expanding beyond Newtown.

For more information on Newtown CarShare check out their website on www.newtowncarshare.info

Newtown CarShare gathering interest at the Glebe Festival

Feeling the heat

The global consequences of climate change is a burden shared by all nations. However, it is the residents of developing countries that are most at risk. Stephanie Long elaborates

The Pacific islands are home to approximately seven million people, who in total produce 0.06% of the world's current greenhouse gas emissions. Yet the Pacific islands are listed as amongst the most vulnerable to climate change by the Intergovernmental Panel on Climate Change (IPCC).

Countries such as Australia, with the highest per capita level of greenhouse gas emissions in the world, are directly responsible for impacts of global warming on our Pacific neighbours. In fact, based on a per-capita measure of an equitable share of greenhouse gas emissions at a level that would stabilise climate change, Australians are currently taking up 18 times greater than our fair share of atmospheric space.

Herein lies the central principle of climate justice: that all peoples are entitled to a fair share of environmental space. Yet structural inequity enables a minority of the world's population to cause climate havoc for all, and threaten the livelihood and sovereignty of the world's poor.

Human cost of climate change

The predictions from the IPCC of the impact of climate change include temperature increases, sea-level rises, extended dry seasons, shorter but more intense seasons and more frequent extreme weather events, such as cyclones. Due to the size and location of our Pacific island neighbours, the implications of climate change are far more drastic. It is no wonder that the small islands of the Pacific are referred to as the 'canary' of climate change impacts.

The most immediate concerns are food security, freshwater security in the face of rising sea-levels, vector-borne diseases (such as malaria), and more cyclones and flooding of greater intensity. Of the 22 nations across the Pacific a number of islands are less than two metres above sea level and are merely atolls made up of coral. When your island home is small enough to see one coastline from the other, the options for residents to move to less affected areas are limited.

Food and water insecurity

Food security is already an issue on Pacific islands due to an increase in soil salinity. Rising seawater gets into the ground table making foods inedible and garden areas too saline to support plants. In Tuvalu this is causing families to grow their taro, a root staple, in metal buckets rather than in the ground.

Similarly, freshwater is at great risk of contamination through salinity and this will occur in two ways. Firstly, rising sea levels will increasingly contaminate the freshwater lens atop of the ground water on atoll islands. Secondly, as tide lev-

Photo: Pene Lefale

els also rise, high tides wash into the freshwater lagoons close to the coastline and contaminate major fresh water supplies. This is already occurring in the Federated States of Micronesia, and is exacerbated by the drought-like conditions of climate change as rainfall patterns have become more erratic. The droughts of 1998 in Papua New Guinea, Federated States of Micronesia, Marshall Islands and Fiji have been attributed to changes in climatic and oceanic conditions.

Coral reefs are another major food store for islander peoples. Subsistence agriculture, fishing and tourism are the basis of the economy for many islands, and are under threat by coral bleaching and die-back as a result of climate change. The effects of sea-level rise are exacerbated by coral bleaching as the degraded reef systems, particularly around atolls, are increasingly unable to protect islands from storm surges and high and king tides.

Land lost

Loss of land is probably the biggest impact of climate change, most often associated with small island states. The IPCC predicts global rises in sea level of an average of five millimetres per year. Loss of territory from sea-level rise and impact on subsistence food systems have already forced some families in Tuvalu, the Duke of York atolls, and in the Carteret Islands to relocate to other islands.

Health and disease

There is growing concern about the increase in vector-borne diseases due to the effects of climate change. Malaria and cholera are linked to changing El Niño weather, and there are documented outbreaks of cholera in the Federated States of Micronesia and Marshall Islands.

In the highlands of Papua New Guinea and also Solomon Islands there have been reports of malaria in areas where previously it was too cold for the mosquitoes to survive. In October 2003, scientists from the World Health Organisation stated that their research indicated that as many as 160,000 deaths per year are attributable to global warming, largely due to the expansion of malaria and malnutrition. These figures are set to double by 2020.

Climate refugees

Debates about climate refugees have been escalating in the past year with predictions that climate change could lead to 140 million environmental refugees by 2050. Environmental scientist Norman Myers predicts that 70 million people will be climate refugees in the Asia Pacific region by 2050.

The International Red Crescent Society recorded that 58% of people displaced in 2000 were forced to move due to environmental reasons. In 2001, 170 million people were affected by disasters, 97% of which were climate related. All of this creates a compelling argument for the recognition of environmental refugees, yet the Australian government has so far refused to review immigration laws or give special consideration to Tuvaluans who, as residents of amongst the most low-lying atoll nations in the region, have sought migration rights to Australia.

This collage of information brings together a picture of impacts of the Pacific that threaten the cultural sovereignty of the most diverse geographical area of the world. Again, the Pacific islands are leading the way in demonstrating commitment to clean technology. Tuvalu was the first nation to sign the Kyoto Protocol, and this year committed to move towards a 100% renewable energy system. In the World Summit for Sustainable Development Regional Assessment, Pacific island nations made strong calls for renewable energy technology and funding of research and development to assist island nations to design renewable energy systems for their own peoples and landscapes.

However—and pardon the pun—if Australia were in the same boat as Tuvalu, would we be doing anything different?

Stephanie Long is the Climate Justice Campaigner for Friends of The Earth (FOE) Australia

Friends of the Earth is conducting a Climate Justice speaking tour through east coast cities of Australia from 24 April to 9 May 2004. The tour will include two guests from the Pacific island's who will share their stories about the impact of climate change on their communities. For further details check out the FOE website, www.foe.org.au/climate

Friends of the Earth are also raising funds for the Climate Justice Tour through sales of the book *Time and Tide: The islands of Tuvalu*

This unique publication is a beautiful photographic record of the people of Tuvalu and their lifestyle.

Created by internationally acclaimed photographer Peter Bennetts and Lonely Planet co-founder Tony Wheeler, Time and Tide is a pictorial tribute to the impacts of global warming on the peoples of this small island nation.

The Honourable Fiamalaga Luke, Prime Minister of Tuvalu writes in the forward of Time and Tide: 'This books is a gift. In it I hope you sense the loneliness Tuvaluans sometimes feel because of who we are and the vulnerabilities we persistently face…the islands of Tuvalu are nothing less than home.'

You can purchase this book for the reduced price of $25.00 (plus $5.00 postage) by contacting Stephanie Long on ph:(07) 3846 5793 or email: stephanie.long@foe.org.au

Expect more extreme weather

There are more droughts, hailstorms and scorching summers on the way according to the latest predictions from scientists. Hilary Cadman reports

Reports from the World Meteorological Organization (WMO) do not normally create much of a stir. But in July 2003, the WMO hit headlines around the world with a press release highlighting record climate change and extreme weather. This United Nations organisation collects information on weather from 185 countries, and usually produces staid scientific reports at the end of the year. However the results for 2003 were so alarming that unusual measures were called for, and the scientists decided to share their findings with the world. Data coming in from around the globe showed that extreme weather events such as high or low temperatures, high rainfall or drought, were increasing in both number and intensity.

Australia shared in these extreme weather events, experiencing the worst drought in living memory and extensive bush fires. The Australian Bureau of Meteorology reports that 2002 was one of the driest, warmest years on record, with daytime temperatures higher than normal over almost the entire country. The bureau attributes these extreme conditions to a combination of global warming, and a particularly severe El Niño effect, which is caused by unusually warm water in the Pacific Ocean. In recent decades El Niño events have been happening more frequently, they are also becoming more severe.

Global warming accelerating

According to the WMO, the global average surface temperature increased by about 0.6°C over the twentieth century, with the temperature increasing three times faster after 1976 than in the previous 75 years. The change in Australia is even greater—the Bureau of Meteorology estimates that the continent has warmed by 0.7°C since 1910. That may not sound like much of an increase when temperatures can vary by 10°C or more in a single day, but the small increase in average temperature masks large changes in the numbers of very hot or very cold days. For example, last summer Canberra experienced 10 days where temperatures reached more than 35°C, rather than the four days the capital would normally expect.

Predictions for 2003 to 2004

What can we expect in the coming year? Short-term predictions are difficult because Australia's climate is naturally highly variable, and the study of climate change is still in its infancy. The Bureau of Meteorology is forecasting that at least one severe tropical cyclone is highly likely to affect Australia's northwestern coast early in 2004. On the bright side, we can be fairly confident that last year's widespread drought will not be repeated in 2003 to 2004. The bureau predicts that the last three months of 2003 are likely to be wetter in the northeast and west of the country, but drier than average in the far southeast, mainly due to higher than average temperatures in the Indian Ocean.

More change likely

The CSIRO, Australia's peak research organisation, uses global climate models to predict climate change. In 2001, the organisation released predictions for 2030 and 2070. If current trends continue, we can expect warming of up to 2°C by 2030, and up to 6°C by 2070, which would translate into many more hot days, and far fewer cold days. To put this change into perspective, Australia has warmed by only 5 to 6°C over the 12,000 years since the last glacial period.

The CSIRO also predicts that there will be less rainfall in the south and east of Australia (although summers may be wetter inland and on the eastern coast), a rise in the number of torrential downpours, (which in turn will increase the likelihood of flooding and landslides), higher wind speeds (making storms and tropical cyclones more extreme), and rising sea levels.

Australia's disappearing rain

Even more dire predictions are now coming from climatologists, who have a new theory to explain the continuing disappearance of southern Australia's winter rainfall, which has fallen by nearly 20% in the last seven years. As the rest of the world warms, Antarctica is becoming cooler due to the thinning of the ozone layer. Scientists now believe this change is causing the Antarctic Vortex—a huge natural tornado that spins over the Antarctic—to speed up. As it spins ever faster and tighter, the vortex is pulling the winds and pressure belts that deliver rain to southern Australia down towards the Antarctic, so that they may miss the Australian continent entirely, with devastating consequences for southern Australia.

Final thought

The predictions discussed here assume that the trends we have seen towards the end of the last century continue. However, an even more dramatic change could be in store. Historical records trapped in ice cores provide a picture of the climate over the past 250,000 years, and show that gradual warming can suddenly change to abrupt cooling. It seems that when a complex system like the Earth's climate reaches the limits of its ability to adapt to change, it suddenly flips into a totally different state. Thus, the global warming that we are currently experiencing could suddenly become a global cooling, which would have even more devastating impacts than those envisaged in the current scenario. ✲

Size does not matter

You do not need the biggest rainwater tank on the block to save mains water. As Jake Budgeon explains, success is all in building an integrated system

With increasing awareness of water quality and supply issues, urban Australians are rediscovering rainwater tanks. However, there is little readily available information on how to set up such a system. In this article I will address a number of factors that need to be considered before purchasing a new tank.

With good design, rainwater tanks need not look ugly, but can actually be put on display.

How to maximise tank water savings

To gain maximum savings from a rainwater tank it is important to consider the following four factors:

- Expected rainwater usage.
- The amount of roof area for rainfall collection.
- Rainwater tank size.
- Local rainfall characteristics

Figure 1 on the page opposite shows the amounts of water supplied by rainwater tanks of different sizes for a connected roof area of 150 square metres located near the Adelaide Airport, which has rainfall of 450mm per year. A 90% capture efficiency is assumed, as some water will be lost through first flush diversion—which gets rid of all the collected rubbish from the roof and piping—or evaporation.

In the graph we see a pattern of diminishing returns, as an increase in tank size does not equate to an equivalent increase in tank yield. The rate of rainwater consumption and the connected roof area are more significant than the size of the rainwater tank.

Water usage

All of the tank yields shown in Figure 1 are substantially greater than the yields from tanks which are used only for garden watering or drinking. Drinking requirements are very small, while the supply of rainwater is poorly matched to the seasonal demand for garden watering. During the wet season the garden is watered by the rain and the tank is full, while during the dry season the garden is dry and the tank empties very quickly. If you are using your rainwater tank only for drinking and or garden watering you are only achieving relatively small water savings.

However, if you live in an area with substantial winter rainfall, a good design should allow you to run part of your entire house on rainwater for a substantial part of the year while providing drinking water all year round.

Design considerations

If you already have a rainwater tank

What condition are your tank, downpipes, guttering and roof in? If they are all about to fall apart it may be worth starting from scratch. If they are in reasonable condition you have a lot of the infrastructure already in place. However, your tank will probably need a clean.

Is a significant proportion of your roof area connected to the tank? If not, can any alterations be made? Remember that the amount of connected roof area is one of the key determinants of your rainwater system's yield—the more of it the better.

Most importantly, how can you make best use of the water in the tank? I will get back to that one a bit later.

If you want to install a rainwater system at your existing house or business

Unfortunately, it is very rare for all the stormwater from a building to be directed to one location. Even if it is, this

may be a poor site to place a rainwater tank. Good design becomes a compromise between aesthetics of the tank location, maximum connected roof area, proximity to water usage and access to mains power. Rainwater tank systems don't have to look ugly and can even be put on display.

To maximise water savings I generally recommend plumbing the rainwater into the mains line and running the whole house on rainwater. Maintaining water quality is important if this approach is taken. A reasonable alternative is to use gravity (or a small pressure pump) and feed one or two specific applications, for example the toilet cistern and laundry.

Pump technology has improved, particularly in respect to dry run protection, and so it doesn't matter if you run out of rainwater. I encourage the use of manual switching from mains to rainwater and vice-versa. It is quite straightforward to manage this using a simple water level indicator.

In many buildings the locations of mains water feeds into the wet areas are very uncertain. One solution is to connect from the pressure pump into the nearest 19mm mains line. The building is switched over to rainwater by turning the mains off at the water meter and the rainwater on at the connection to the mains. The pump pressurises the mains line all the way back to the backflow prevention device, located near the water meter (see photo page 47).

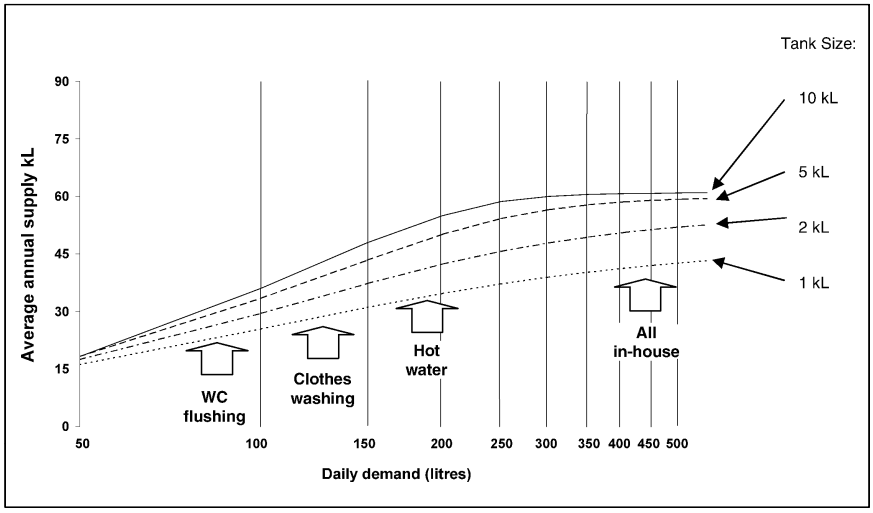


Figure 1. As the graph shows, an increase in tank size does not equate to an equivalent increase in tank yield.

If you are running an evaporative air-conditioner it should be run on a mains pressure supply at all times, as their trickle flow rates are incompatible with pressure pumps.

If you want to integrate a rainwater system into a new construction

If you are building or undertaking extensive renovations this is an excellent opportunity to develop an integrated water system.

At a minimum, integrate the rainwater system into the building design from the very beginning and consider the following questions:

- Where should the tank go? Decide if you want it below or above (the cheaper option) the ground and make it part of your plans.
- Can the roofline be designed to deliver the captured rainwater from the entire roof to the one tank? This should lead towards a simple roofline, which will also be cheaper to build.
- Can the tank be located right next to the hot water system and wet areas? This will save you energy and water. Carefully sized water tanks placed in

The rainwater is fed into the home's water piping by the use of a pump.

side buildings can also act as thermal mass—a lot less energy intensive than other high mass building materials. Internal tanks can also give you the option of circulating water through a floor coil to the hot water service to provide indoor cooling and hot water pre-heating.

Conclusion

Water efficiency (through behavioural and technological changes) and making effective use of rainwater are the two simplest and most effective ways of reducing domestic water consumption. Using rainwater provides additional water quality as it is unchlorinated and low in salinity. Just as owners of photovoltaics enjoy watching their electricity meters spin backwards, owners of integrated rainwater systems experience a similar feeling.

Jake Budgeon is Director of Sustainable Focus.
www.sustainablefocus.com.au

Above: The pressure pump is connected to the closest 19mm mains line.

Right: Here you can see the backflow prevention device which is placed near the mains water meter.

Pedalling your way to battery health

By Bob Rich

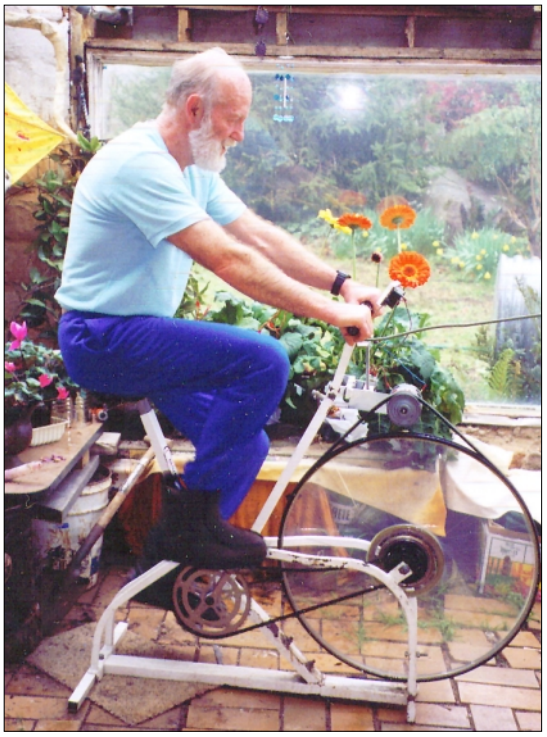
Over two years ago now, the Products section in *ReNew* featured a 12 volt motor that could be used as a DC generator. Upon seeing it, I had the bright idea to rig it up to an exercise bike to put power into my batteries. It seemed to be a more useful way of keeping fit than running somewhere, only to run back again.

So I sent an email to the vendor, and in due course received a nice little cylinder in the mail. I also bought an old exercise bike at the local opportunity shop for $15. That was two years and a couple of hundred dollars ago.

I won't go into the marathon of all the things that went wrong. They were excellent learning experiences in how not to do it, and hopefully a description of the eventual, successful setup will save others a similar history of frustrations.

As the photo below shows, the motor is mounted on a simple bracket above and to one side of the wheel, so that the 40 mm diameter pulley is directly above the bike wheel. With a 25 inch (630 mm) bike wheel, the ratio is 1:15.75. The motor bracket pivots on a length of threaded rod, and a vertical threaded rod allows the V-belt tension to be adjusted.

After considerable experimentation, my helpers and I found that having a large (52-tooth) sprocket chainwheel driving a 13-tooth sprocket on the wheel gives an overall speed ratio that's just right. When the chain was on the second-smallest sprocket of the wheel, the electric output was not worth the effort. In another setup, the generator speed was so high that it blew anything that was plugged into it, including both the high and low beams of a car headlight that were powered simultaneously. With the current setup, 140 pedal pushes per minute produces five amps at 12 volts (or 60 watts per minute).

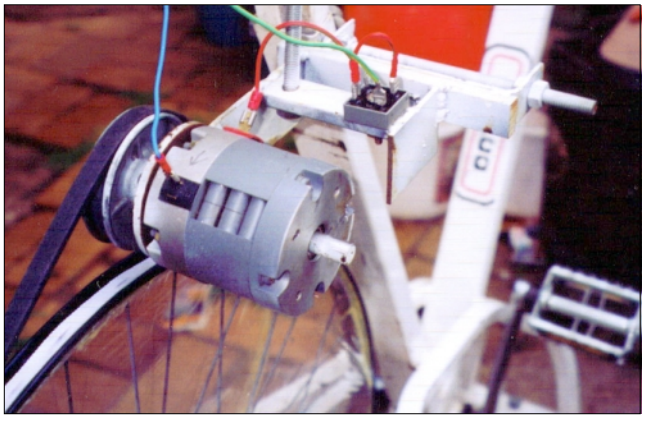


Connected in series with the generator is an ammeter that was salvaged from a defunct battery charger, and a blocking diode. (This is a good idea, otherwise as soon as you plug the system in, the motor will start to drive the bike!)

While 60 watts doesn't seem like a lot of exercise, you have to add friction, and the air resistance produced by the wheel. The comparative pedaller's output is well above 60 watts. A friend explained to me that the effort-to-output ratio is non-linear because of the turbulence caused by the spokes cutting through still air. Indeed, pedalling at seven amps was two or three times as difficult as doing so at five amps.

The solution was to reduce resistance by making the bike wheel solid. Last year, I bought a plastic double-glazing kit from *Winter Windows*, and had some plastic left over. Contact adhesive proved to be ideal for gluing the plastic to the hub and rim, but to make sure, I reinforced it with electric insulation tape. I then glued a cloth ribbon inside the rim for the V-belt to grip without damaging the plastic. After this, heating with a hair dryer nicely tightened the film into place.

My pedal generator now works well, giving me regular exercise, whilst helping the solar panels feed the batteries.



The generator setup is quite simple. Note the power diode (actually two diodes from a bridge rectifier paralleled) to stop the motor running when no-one is pedalling!

This pedal-powered generator will be on display at the first Mt Toolebelwong Landcare Festival, which will be held at Moora Moora, near Healesville, on 28 February 2004 (see the advert on page 19).

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www.climateprediction.net

This website is the homepage for the climate prediction project. This project, which is a collaborative effort between several UK universities and government departments, aims to investigate the approximations that have to be made in state-of-the-art climate models. By running the model thousands of times it is hoped to find out how it responds to slight tweaks to these approximations. This will improve the understanding of how sensitive climate models are to small changes in variables that represent weather components such as clouds, and also to things like changes in carbon dioxide and the sulphur cycle.

In the past, estimates of climate change have had to be made using one or, at best, a very small number (tens rather than thousands) of model runs. By using what is known as distributed computing, it is expected that the project will be able to improve understanding of, and confidence in, climate change predictions more than would ever be possible using the supercomputers currently available to scientists.

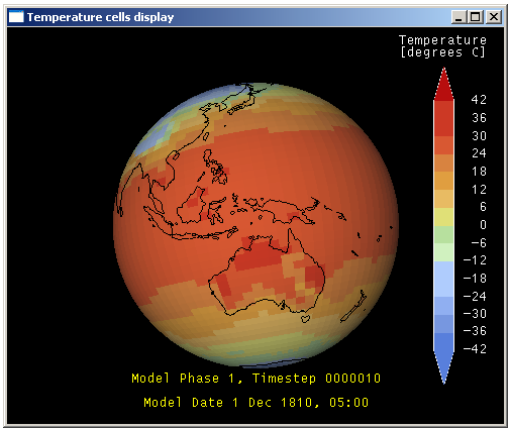
But what is distributed computing? Well, basically it means that you download the climate prediction model software and run it on your computer in the background. This means that when your computer is doing very little (which is a lot of the time with most computers), it can actually be doing something useful. It will download and process model data whenever it has the time and an internet connection.

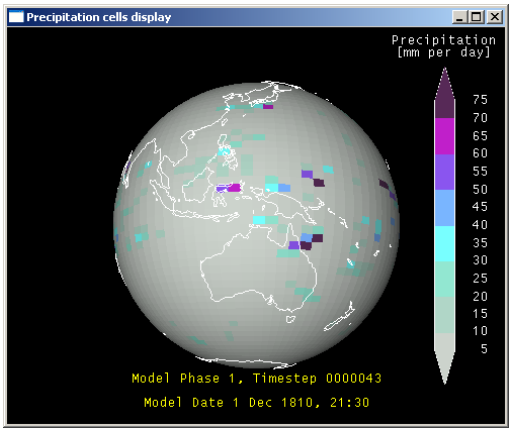
Probably the most well-known distributed processing project is seti@home, where literally tens of thousands of people downloaded and ran software that then processed millions of blocks of accumulated radio-telescope recorded data, thus producing results in a time that would be otherwise impossible.

So, what is the environmental advantage of the climate prediction project? Well, firstly, it means that scientists will gain a better understanding of what is happening with climate change, and will hopefully be able to predict changes more accurately and sooner.

Secondly, it means that all those millions of PCs all around the world that usually sit there running, but doing very little, can make use of the energy they are otherwise wasting.

So if you have a PC that is underworked, download the climate prediction model software and put it to good use.





The temperature cell map, left, and the precipitation cell map, right, are two of several data maps the software can display.

Middle earth in central Victoria

Rob Hadden has constructed his house and workshop almost entirely by hand using medieval timber-framing building techniques. The results are simply stunning. John Kelly reports

Building your own home is no mean feat, especially when seeking to incorporate the best of sustainable building practices. Turning a house into a work of art in the process is another thing entirely. Rob Hadden's timber-frame house and workshop at Lower Widdecombe, his property near Castlemaine, are beautiful examples of what can be achieved with a bit of passion and a lot of hard work.

Inspired by the old-English architecture of Devon and Wales, simple living is a key theme in what Rob has done. He reused and recycled materials in building the house and workshop and has sought to have as little negative impact on the environment as possible, even rehabilitating the once degraded and eroded site. The main beam running through the centre of the workshop came from a discarded 130 year old tree in the Castlemaine Botanical Gardens, a piece of history living only five minutes from where it grew.

Simple living! The front entrance of Rob's home.

Cosy home

Rob began building the house in 1994 and took five years of painstaking work to finish. The level of care and attention that went into this hand-built masterpiece can be seen in every detail, inside and out.

Compared to modern expectations the house is tiny, measuring only eight-and-a-half squares, but makes a comfortable home for two people. The ground floor features a kitchen, bathroom and open hall/living area. A spiral staircase leads to a small mezzanine overlooking the living area below. Upstairs there's the bedroom, with easterly windows.

It is a light-filled, airy place, with a large fireplace in the downstairs hall and exposed, hand-carved beams throughout, adding a sense of other-worldliness and quiet contemplation.

Using local materials

Guided by his desire to live harmoniously with the environment, Rob has incorporated a range of sustainable principles into building the house.

Many of the materials used came from the block of land, while recycling and the use of non-toxic materials has been a feature of the project.

The house walls are made from bricks fired from soil found on the site and are 450mm thick. The floors are tiled with hand-made, one-inch thick terra-cotta tiles providing a good thermal mass, thus regulating the temperature in the house throughout the year.

The windows are recessed because of the thickness of the walls and to allow in plenty of afternoon light. Internal walls have been given a lime plaster render, while externally the bricks have been lime washed to give a soft green colour.

Right: The hand crafted internal beams of the house.

Below: The cosy living area of the house with the open fireplace.

Unconventional passive solar

Rob has been interested in the responses the house has inspired in visitors. People familiar with passive solar design are surprised that the house operates as well as it does. The high gabled roof and wide lintels on the windows are not textbook sustainable design, but are techniques that have been used to great effect for a long time, albeit in a climate cooler than here.

'Some people don't believe the house can work well according to passive design principles. With this place the theories don't seem to work, but I think there are just many different ideas and methods.'

The house maintains a fairly constant temperature, dropping down to around 14 degrees on a cold winter morning and only really heating up when the temperature is over 35 degrees. A wood fire provides warmth and comfort through winter and a Stanley cast iron slow-combustion stove provides hot water.

While connected to mains electricity, power use is minimal, reserved for

Rob's occasional use of power tools and the computer which is the only real nod to modernity in the house.

DIY sandstone

Another feature is the carved 'sandstone' found both inside and out. However look closely and you'll notice something peculiar. Rob creates his 'stone' from blocks cast from a mix of sand and cement, that when shaped looks almost identical to sandstone.

A wire brush roughs the blocks to the right texture and quarrying marks give an authentic look and feel. Steel bars can be added at the casting stage to reinforce blocks that will bear weight over windowsills, doors and so on. This casting technique also allows Rob to carve and sculpt designs into the blocks, further adding to the minutiae of detail he has achieved.

The eye-catching external feature is the ingeniously twisted chimney rising 24ft above the ground. It is on the side of the house facing the road and Rob has often found passers-by pulled over wondering at it.

Workshop

Rob has expanded on the techniques and experience he gained building the house to begin construction of his workshop. The technique he used is called English face side carpentry and involves scribing, working off full scale plans to shape, cut and fit the timbers without using modern building materials such as nails, screws or glue.

Continued on page 54

Above left: The eye catching spiral chimney stops many passers-by.

Left: Rob's second project, the 75 foot workshop, office and guest room constructed using the English face side carpentry technique.

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Uni-Solar US-21	1.5A	$ 249
Uni-Solar US-11	0.7A	$ 199
Uni-Solar US-5	0.33A	$ 99

WIND DRIVEN GENERATORS

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

LVM 612/624	12/24v	120 / 360 watts	$2350
Ampair 300	12/24v	300 / 400 watts	$NEW
Soma 1000	24/48v	1000 / 1200 watts	$4171

PLASMATRONIC REGULATORS

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

PL-20	12/24/48 volt 20 amp smart controller	$ 299
PL-40	12/24/48 volt 40 amp smart controller	$ 399
PL-60	12/24/48 volt 60 amp smart controller	$ 599
PLI	Serial interface for PC/modem	$ 119
PLS 2	Shunt adaptor (AD converter) for PL regs	$ 149
SH200	Shunt, 200 amp, 50mV	$ 79

TRUE SINE WAVE INVERTERS

		Inc GST
Latronic LS-412	12v 400 / 1500 watt	$ 690
Selectronic SE-12 / 12	12v 600 / 1500 watt	$ 1084
Unisun TS650-12	**12v 650 / 1950 watt**	**$ 799**
Latronic 47-BKZ-12	12v 700 / 2800 watt	$ 1135
Unisun TS1200-12	**12v 1200 / 3600 watt**	**$ 1199**
Selectronic WM1200-12	12v 1200 / 3600 watt	$ 1668
S.E.A SEAP-12-1K3	12v 1300 / 3900 watt	$ 1942
Latronic 412-BKZ-12	12v 1300 / 4000 watt	$ 1805
Unisun TS1800-12	**12v 1800 / 5400 watt**	**$ 1726**
Latronic 518-BKZ-12	12v 1800 / 5500 watt	$ 2205
Latronic 48-BKZ-24	24v 800 / 3200 watt	$ 1175
Selectronic WM1000-24	24v 1000 / 3000 watt	$ 1459
Unisun TS1200-24	**24v 1200 / 3600 watt**	**$ 1199**
Selectronic WM1500-24	24v 1500 / 4500 watt	$ 1851
Unisun TS1800-24	**24v 1800 / 5400 watt**	**$ 1726**
S.E.A SEAP-24-2K2	24v 2200 / 6000 watt	$ 2571
Selectronic SE-32	24v 2400 / 7000 watt	$ 2899
Latronic 525-BKZ-24	24v 2500 / 7500 watt	$ 2442
Latronic 530-BKZ-24	24v 3000 / 9000 watt	$ 2714
S.E.A SEAP-24-3K0	24v 3000 / 9000 watt	$ 3222
Latronic 535-BKZ-48	48v 3500 / 10500 watt	$ 2805
Selectronic SE-42	48v 3600 / 10000 watt	$ 3354
S.E.A SEAP-48-3K8	48v 3800 / 10500 watt	$ 3434
P.S.A. RAP-5-48	48v 5000 / 10000 watt	$ 8498
Latronic 915-GI-72	72v 1500va Grid feed	$ 2714

ENERGY STORAGE BATTERIES

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

All volts & sizes available. Free freight to major centres.

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

Solar Technology Designers Catalogue 2004

Now entering it's 15th year, this compelling 150 page master design manual / catalogue is endorsed by thousands of enthusiasts as their renewable energy bible ! This edition is substantially revised, and written in a clear and innovative style for your renewable enlightenment, by leading solar engineer and pioneer Christopher J Darker. cdarker@unisun.com.au

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

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

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

The scope of this undertaking becomes clear when you see the dimensions Rob is working to. The entire structure consists of a 40ft x 19ft workshop and a 20ft x 19ft office and guest room, with a 15ft wide driveway separating the two. That makes a 75 foot-long structure to be put together like an intricate puzzle by one person. However, Rob enjoys the challenge.

'Some days you really push for motivation. I'd have to force myself some days to get up and get into it. But the end result makes it all worthwhile.'

'It's got to be fun, otherwise what's the point?'

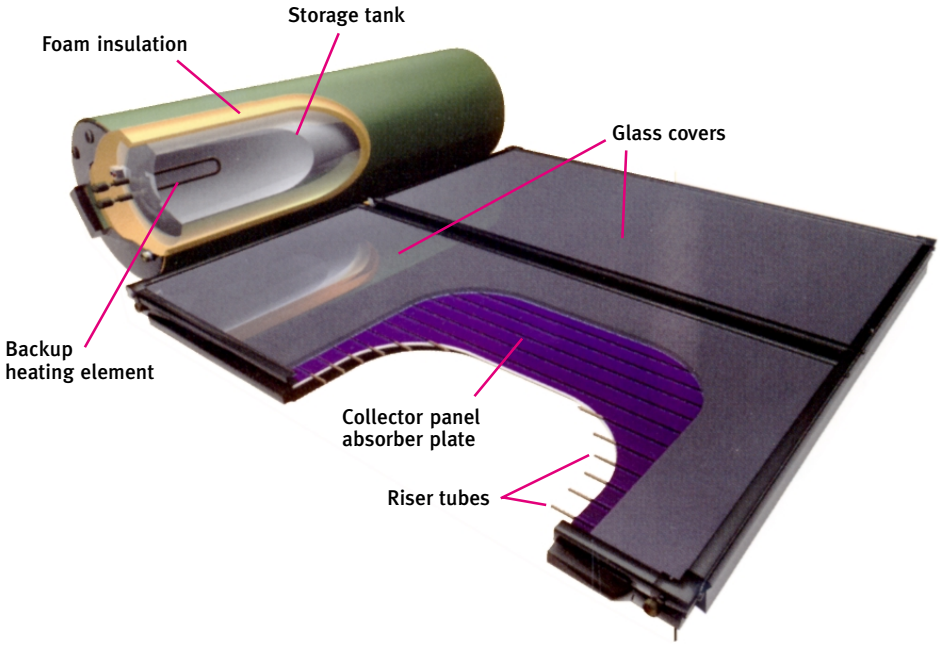
Indeed. Looking at what he has achieved you can see that Rob is a true artisan. His ongoing work at Lower Widdecombe serves as a unique demonstration of the beauty that can be created through devotion and diligence. ✲

The roof of the workshop. Here you can see the beams cut to fit the original design.

Solar water heater buyer's guide

With the continued improvement of solar hot water system rebates in several states, we thought it would be a good time to take another look at what systems are available. Updated by Jason Bond

There are many reasons to choose a hot water system that uses solar energy over a conventional gas or electrical powered unit. One important benefit is that of greenhouse gas emission reduction. This benefit has been recognised by many state and local governments and is encouraged in the form of rebates taken off the purchase cost off a system. The initial purchase price will probably be higher than an equivalent conventional system but the savings made in operating costs will generally pay for this difference in less than 10 years. A solar system generally has about twice the expected lifespan of it's fossil fuelled cousin, so financial returns can be impressive over the system life.



A cut-away view of an Edwards close-coupled solar water heater, showing the major components.

How does it work?

A solar hot water system usually consists of a hot water storage tank connected via pipework to solar collector panels. These collector panels are placed on a north facing roof and at an angle of no less than 15° to the horizontal. The tank can either be situated immediately above the panels on the roof, above and a small distance away from the panels within the roof cavity, or at ground level, in which case a pump is required to circulate water through the panels.

Most solar water heater collector panels consist of a collector plate to which a network of pipes is bonded. This arrangement is then placed in a metal box with insulation behind it and a glass cover on the top.

As the sun shines on the panel the water in the pipes becomes hot due to conduction from the collector plate. This heated water rises through the panel and out through a pipe to the insulated storage tank. Cooler water from the bottom of the storage tank enters the panel at the bottom to replace the warmer water.

This is called the thermo-syphon process and requires no pumps or other devices, and is very simple and effective. However, it does require that the storage tank be situated above the collector panels.

The collector panel is the driving force for the circulation, so due care must be taken with its mounting and orientation to get maximum benefit from it.

If the tank cannot be located above the collectors, a pump and a differential temperature controller must be used to provide water circulation. The controller also turns the pump on when the temperature drops to 5°C as an anti-freeze function.

Collectors

The collector plate is usually copper or aluminium, however Solahart uses mild steel for most of its models. This plate is coated with special treatments to increase the absorption of the solar heat energy. These are a big improvement on plain matt black paint, which earlier models used.

Bonded to this plate are copper pipes, or, in the case of the Solahart, steel collectors formed into many small channels. In all cases these pipes or channels are connected at the top and bottom to head-

er pipes which also provide the connection points to the external pipework.

One company, Solco, manufactures a system with the panel and tank made from one integral piece of roto-moulded polyethylene, eliminating the need for pipes between the tank and collector.

Most manufacturers are now using low-iron tempered glass in their collectors for its greater absorbency and reduced re-radiation. It is also stronger than normal glass. Again, Solco has opted for the polymer option, using clear acrylic sheet in place of glass. This has the advantage of improved smash resistance, but will eventually degrade, unlike glass.

Beasley, Rheem, Solahart and Edwards make their own panels while Albury Consolidated Industries have taken over the business of manufacturing Sunbather collectors. They also supply complete systems, as well as conversion kits for existing electric water heaters. The Sundowner panels from AB&S Solar Industries have now been discontinued.

Tanks

For mains pressure systems the tank must be strong enough to hold pressures of 1000kPa and above. This means they must be made of steel. Some companies (Beasley and Edwards) use marine-grade 316 stainless steel while others use mild steel with a coating of vitreous enamel (glass). Solahart, Rheem and Quantum use glass-lined tanks.

Glass-lined tanks must have a sacrificial anode (a metal rod inside the tank, usually made from magnesium or aluminium) fitted which is designed to be eaten away by galvanic (read corrosive) action in preference to the tank material. These anodes should be checked at regular intervals to assess wear and be replaced if required. With good-quality water this replacement time may be every five to seven years. If the water quality is poor then the replacement time will be much shorter. Failure to replace the anode when required will generally result in premature failure of the tank.

The Solco tank, being plastic, is immune to corrosion, but cannot be run at pressure, and so is a gravity fed system. Another company, Sola-Kleen, makes its tanks from copper and runs them at a reduced pressure using a pressure reducing valve on the inlet. This has the advantage of better supply pressure than a gravity-fed system, while still giving the corrosion resistance and extreme long life of a copper tank. Beasley also make some remote-coupled systems that use copper tanks.

Low pressure, gravity feed, constant pressure systems are all very similar and usually use copper tanks. These tanks are placed in the roof and are open vented. This allows direct connection to the heat exchanger on a wood stove. They are suitable for most water conditions and give many years of service before failure, usually due to corrosion or failed seams. A heat exchange coil can enable a low pressure tank to deliver mains pressure hot water.

Mains pressure tanks can be set up as gravity feed systems by adding a header tank. This may be desirable where there is no available roof cavity but the incorporation of a combustion stove for boosting is planned.

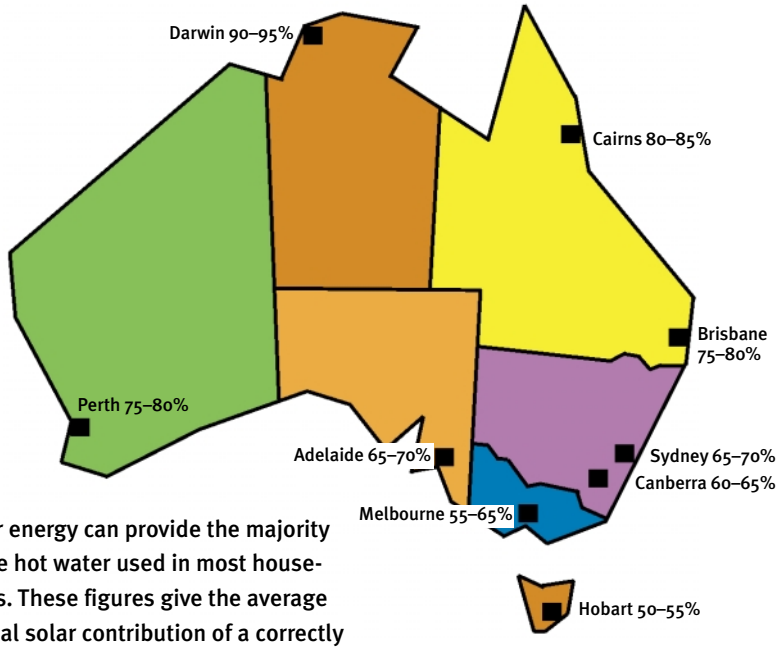
Insulation

Mains-pressure tanks are insulated with polyurethane foam. The normal industry standard foam is CFC free. Some manufacturers build the horizontal tank such that the insulation on the top is thicker than on the bottom, which makes a lot of sense considering the hottest water is at the top of the tank.

Boosting

All heaters on the market incorporate some form of boosting for times of insufficient insolation (sunshine). People on remote area power supply (RAPS) systems use woodstoves or LPG for boosting. Townsfolk have the option of gas or electricity.

Electric elements are the most common, as they fit in well with night rate tariffs and are much cheaper to fit. Gas burners and control equipment cost much more than an electrical element (up to over $1000 on the Solahart range) and this is reflected in the price of the systems. Environmentally, gas is preferable but not all systems have the ability to override the gas during the day so that the sun, not the gas, heats the water.



Solar energy can provide the majority of the hot water used in most households. These figures give the average annual solar contribution of a correctly sized flate-plate collector system.

A solution to this problem is an instantaneous gas booster, this type of heater can be installed on the outlet pipe of a solar system and will contribute any additional heating required for the volume of water actually being used. Instantaneous heating may however require a higher capacity gas line as it burns hard to heat water quickly. Solar compatibility requires the booster to be able to operate with a low temperature differential between the hot water coming in from the solar system and the final hot water temperature desired at the taps.

Frost protection

All manufacturers offer frost protection on at least some system models. This is important for anywhere that a frost may occur. A commonly used system involves dump valves which open when the temperature drops to around 4°C. As warmer water from higher in the system passes out through the valve it closes again. This process is repeated until the temperature rises again.

Several manufacturers including Solahart and Edwards offer a system with a heat exchange fluid which flows through the panels and into an outer tank around the main storage tank. The fluid in this outer circuit contains propylene glycol (or a similar glycol), an anti-freeze additive, and does not require dump valves. However the level of fluid in this circuit must be checked regularly and replaced after an interval as recommended by the manufacturer. This fluid is more slippery than water and has been known to slip right out through the panel connectors. Owners should look out for this and replace the seals and fluid before irreparable damage is done to the collector panel. The Solco units do not require frost protection as their flooded plastic panel can stretch should ice start to form inside.

What size will I need?

Systems are usually sized the same way as off-peak electric hot water systems, as they have a similar window of access to the booster, be it the sun or off-peak electricity. The sun is most effective during the six hours in the middle of the day. Night-rate tariffs commonly run for six hours, from 1am until 7am. Check with your electricity retailer if you are not sure.

For a one- or two-bedroom house a 180 litre system is recommended. For a three-bedroom house a 300 litre system is desirable. Four to five bedrooms should be served by a 440 litre system. This sizing looks at the potential maximum number of residents rather than the actual number, as the hot-water service is a fixture in the house but the residency can easily change.

What about heat pumps?

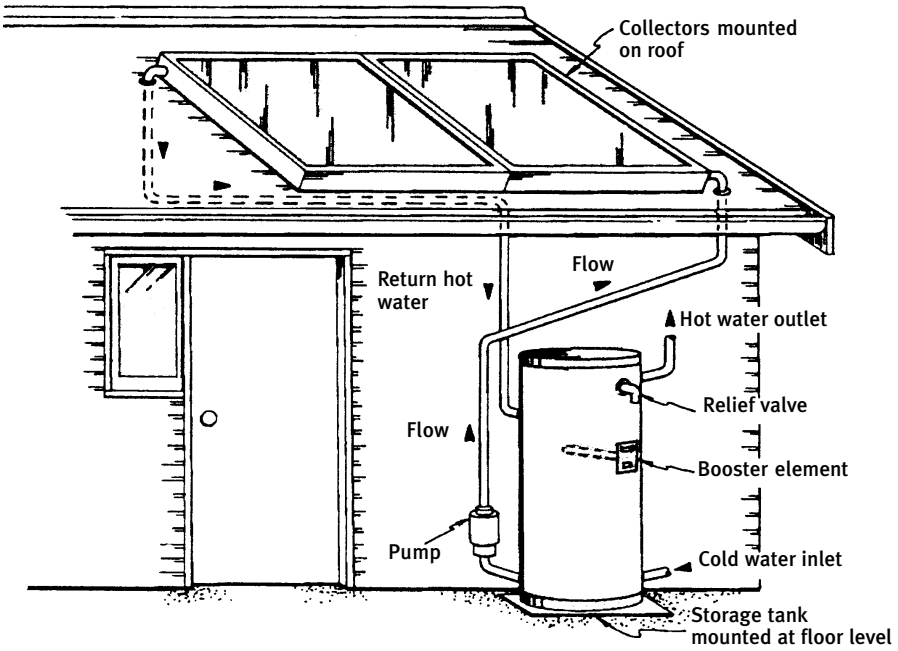
A heat pump is a process used in refrigeration where heat is moved, or 'pumped', from one medium into another. Air conditioners and refrigerators are the most common forms of heat pumps. In a refrigerator we pump heat from the food and dump it to the air outside the fridge through the coil at the back.

The Quantum and Solahart Sorcerer systems pump heat from the air and dumps it into the water storage tank. They are very efficient heaters, having a coefficient of performance (efficiency) of around 300 per cent. Unfortunately they need to be operating all the time with a duty cycle of eight to 10 hours per day. This means they are not suitable (or acceptable) for off-peak tariffs.

In situations where shading is a big problem for conventional systems, and drastic tree surgery is not an option, then heat pumps deserve strong consideration.

Temperature control

Under the plumbing code AS3500.4 it is a requirement that all water heaters connected to an uncontrolled heat source (solar and wood stoves) must have a 'tempering' valve fitted. This valve limits the maximum temperature for hot water to sanitary fixtures (bath, shower and hand basin) to a maximum of 50°C by mixing cold water with the hot water coming from the solar water heater.



Split system with storage tank on the ground. In systems like this a pump must be used to circulate the water or antifreeze from the tank through the panels.

Installation

The installation of any system should be carried out by appropriately qualified and experienced tradespeople. Unfortunately, too many systems have been badly installed in the past, resulting in poor performance and a loss of faith in solar water heating technology by the owners. Solar hot water systems do work, and work well if properly sized and installed.

Getting the most out of your solar hot water system

To optimise the performance of your system, hot water usage should occur in the morning as much as possible. This means showers in the morning and possibly putting on a tub of washing, as well as the dishwasher (if you have one) before going to work. This way the sun has the first go at heating the water before the booster kicks in at night. If the sun has done its job well the booster may not be required.

Solar hot water rebates

There are now rebates available for the installation of solar water heaters in most states, with the exception of Tasmania. Below we have outlined what the rebates are available for, how much they are, and given links to relevant web sites for further information. As you will see, the schemes vary widely from state to state.

NSW

If you are building or renovating a home in an Energy Smart council area, you may be eligible for $500 off a solar or heat pump hot water system. If you install a gas boosted solar, you may be eligible for a $700 discount. www.seda.nsw.gov.au/athome_hotwater_body.asp

Victoria

To help increase consumer uptake of renewable energy, the Victorian Government has introduced a rebate program to support the installation of solar water heaters. Rebates of up to $1500 are available for accredited systems, with the amount of the rebate depending on the performance of a system. The rebate may take the form of a point-of-sale discount, however, some manufacturers pass on the rebate after being reimbursed by the Sustainable Energy Authority.
www.seav.vic.gov.au/renewable_energy/shw_rebate/

ACT

The average Canberra household can save an average $1000 by applying for a rebate when installing a solar water heater. Rebates of between $500 and $1600 are available under the Solar Hot Water Rebate Scheme that was launched in April 2002. The Territory Government is committing $1.1 million to fund this program to April 2005 with the aim of reducing the cost of installing solar hot water systems to ACT households.
The Solar Hot Water Rebate application form and guidelines brochure enables you to determine whether you are eligible for a rebate and the amount that you will receive. www.environment.act.gov.au/airandwater/solarscheme.html

Queensland

To encourage the installation of solar hot water systems, the Queensland Government has introduced the Solar Hot Water Rebate Scheme (SHWRS). It has been designed in consultation with the solar water heating industry and provides rebates of:

- Up to $750 for solar hot water systems (dependent upon efficiency)
- Up to $200 for replacement panels and tanks

For further information, call the Energy Advisory Service on 1300 369 388 (8.00am to 6.00pm).
www.epa.qld.gov.au/environmental_management/sustainability/energy/solar_hot_water_rebate_scheme/

NT

Solar hot water systems installed after 1 April 2001 attract renewable energy certificates (RECs). RECs can be sold to Power and Water through the solar hot water rebate scheme and provide significant savings on the purchase price of a new solar hot water system. Current buying price for RECs is $36 which means that the average rebate for replacing a standard 300 litre system is between $700 and $1100. www.nt.gov.au/powerwater/html/newsinfo/proj_recs.html

SA

The South Australian solar hot water rebate scheme provides for rebates up to $700 on the cost of a new solar hot water system purchased in South Australia.
www.sustainable.energy.sa.gov.au/pages/advisory/rebates/rebates.htm

WA

Subsidies of up to $1000 off the cost of a solar hot water system purchased after 31 January 2003 are available.
Householders are eligible for a subsidy if they install a new and accredited solar hot water system from a manufacturer approved by the Sustainable Energy Development Office and satisfy the requirements of SEDO.
www1.sedo.energy.wa.gov.au/pages/subsidy.asp

Make	Model	Capacity (litres)	Type	Tank material	Insulating material	Total collector area (m²)	Number of collectors	Collector material	Glass type	Boosting	RRP	Comments	Warranty
Albury Consolidated Industries, ph:(02) 6021 2200 fax:(02) 6040 6667	SYS1	250	Mains pressure pump assisted	Stainless steel or enamel lined mild steel.	Styrofoam beads	3.7	2	Copper	Cushion mounted prismatic glass	Twin element electric	POA	Uses CSIRO Nickel Black surface coating. Prices include GST	Call
	SYS2	315				3.7	2						
	SYS3	400				5.6	3						
	SYS4	250	Gravity feed	Copper	Styrofoam beads	3.7	2 (squat)			Electric with wood stove option			
	SYS5	315				3.7	2 (squat)						
	SYS6	400				5.6	3 (squat)						
	CONV1	-	-	-	-	3.7	2 (squat)			-		Conversion kits consisting of panels and fittings. Prices include GST	
	CONV5					5.6	3 (squat)						
	CONV2					3.7	2						
	CONV3					5.6	3						
	COLL1	-	-	-	-	1.85	1			-		Squat collector	
	COLL2											Standard collector	
Beasley Industries, Bolton Ave, Devon Park SA 5008. ph:(08)8340 2299 fax:(08)8340 0829 www.beasley.com.au	26S/1801RG	180	Close coupled	316 stainless steel	Polyurethane	2	1	Copper	Low iron	Instantaneous gas using Rinnai Infinity 26 continuous flow heater	$3690	All systems use Amcro selective surface in their panels. Heat Transfer Module can be fitted to most systems	Warranties vary from 5 to 10 years, ask your dealer
	26S/3302RG	300				4	2				$4690		
	26S/4803RG	440				6	3				$5690		
	12S1601200RG	160	Split system			2	1				$4090		
	12S3152200RG	315				4	2				$5090		
	12S3153200RG	315				6	3				$5790		
	26S180HTM	180	Close coupled			2	1			Electric	$2420		
	26S330HTM	330				4	2				$3286		
	5S2802P	280	Gravity feed	Copper	Polystyrene	4	2			Electric and solid fuel	POA		
	5S3702P	370				4	2						
	5S3703P	370				6	3						
	5S4503P	450				6	3						
	5S2802P	280				4	2						
	5S3702P	370				4	2				$2760		
	175SC2P	280				4	2			Gas and solid fuel	POA		
	5MC3702P	370	Gravity and mains pressure			4	2			Electric and solid fuel			
	5MC4503P	450				6	3						
Dux Hot Water, PO Box 209, Moss Vale, NSW 2577. Sales 1300 365 116 www.dux.com.au	250F2/T2	259	Mains pressure pump assisted	Vitreous enamel lined mild steel	Urethane	-	-	-	-	Twin electric element	POA	Requires SunPro pump and Controller. Optional closed circuit heat exchanger avaliable for frost prone areas	5 or 10 year depending on system
	315F2/T2	324				-	-	-	-				
	400F2/T2	416				-	-	-	-				
	15BC	-				1.5	-	Copper	Low iron glass	-			
	2BC	-				2	-			-			
	2SP	-				2.1	-			-			
Edwards Energy Systems PO Box 1415 Canning Vale WA 6970. ph:(08) 9334 4222 fax:(08)9334 4200 www.edwards.com.au	LX180-1	180	Mains pressure close coupled. Heat exchange frost protection	316L Stainless steel	Polyurethane	2	1	Australis*	Low iron tempered	Electric	$2286	*Australis panel aluminium with copper tubing. *Titan and Titan plus panels use titanium coated copper. New "Ground Tank" system with 100% frost protection due early in 2004. L Series for no frost areas $200-$600 cheaper than LX Series	Up to 12 years on both replacement and labour
	LX305-2	305				4	2				$3217		
	LX305-2	305				4	2	Titan*			$3795		
	LX305-2	305				4	2	Titan Plus*			$4217		
	LX440-3	440				6	3	Australis*			$4472		
	LX180-1 GS	180				2	1			Instantaneous gas using Edwards Comfort 200. Comfort 100 & 300 also avaliable	$3603		
	LX305-2 GS	305				4	2				$4555		
	LX305-2 GS	305				4	2	Titan*			$5065		
	LX305-2 GS	305				4	2	Titan Plus*			$5575		
	LX440-3 GS	440				6	3	Australis*			$5764		

Make	Model	Capacity (litres)	Type	Tank material	Insulating material	Total collector area (m²)	Number of collectors	Collector material	Glass type	Boosting	RRP	Comments	Warranty
Quantum Energy Systems PO Box 301, Cardiff NSW 2285. ph:1800 644 705 fax:(02) 4953 7244 www.quantumhotwater.com	270-S2-S Solar boosted	270	Mains pressure solar collector system	Vitreous enamel lined mild steel	Polyurethane	4.6	3	Aluminium			$2955	Heat pump systems. Prices include GST	7 years on tank and evaporator, 2 years on most other parts
	270-T2-S Solar boosted	270				5.9	4				$3310		
	340-T2-S Solar boosted	340				5.9	4				$3570		
	340-Ti-S Solar boosted	340				9.2	6				$3990		
	270-T2-EC	270	Mains pressure air sourced system			-	-	-	-	-	$3190	Compact solar models. Install similar to standard electric unit	
	340-T2-EC	340				-	-	-	-	-	$3480		
	340-TI-EC	340				-	-	-	-	-	$4470	Split system can utilise waste heat	
Rheem Southcorp Water Heaters, 13 Rachael Cl, Silverwater NSW 2128. ph:(02)9748 5400 fax:(02)9648 3722 www.rheem.com.au	Loline- 260gas	260	Mains pressure split system	Vitreous enamel lined mild steel	Polyurethane	-	1	Copper	Low iron or toughened glass for cyclone areas	Gas	POA	Pumping controller based frost protection	Up to 10 years
	Loline - 270	270				-	2			Electric			
	Loline - 340	340				-							
	Loline - 430	430				-	3						
	Solar Hiline 52T160	160	Mains pressure close coupled			-	1					No frost protection system	7 years
	Solar Hiline 52T300	300				-	2						
	Solar Hiline 52F300	300				-	2					Has frost protection	
Solahart 126 Pilbara St, Welshpool WA 6106. ph:(08)9458 6211 fax:(08)9351 8034 www.solahart.com.au	151K Gas	150	Mains pressure close coupled. Closed circuit heat exchanger	Vitreous enamel lined mild steel	Polyurethane	2	1	Mild steel	Low iron	Gas	$3219	Range includes close coupled J series heat exchange & L series open circuit. F series Black Chrome collector and S series evacuated tube collector. Active split systems & Heat pump systems also avaliable	Ask dealer for warranty information
	181K Gas	180				2	1				$3489		
	221K Gas	220				2	1				$3787		
	302K Gas	300				4	2				$4842		
	443K Gas	440				6	3				$6099		
	151K	150				2	1			Electricity	$2067		
	181K	180				2	1				$2337		
	221K	220				2	1				$2636		
	302K	300				4	2				$3690		
	443K	440				6	3				$4984		
Sola-Kleen, 24 Bassendean Rd, Bayswater WA 6053. ph:(08)9271 5725 fax:(08)9271 6136 www.sola-kleen.com.au	SK 180L	180	200kPa max pressure	Copper	Treated polystyrene and wool	2	1	Copper	Low iron	Electricity	$3200	All systems are 100% recyclable	10 years
	Sk 300L	300				4	2				$3200		
	SK300LFB	300				4	2				$3800		
	SK 240LHX	240				4	2				$2900	Heat exchange units	
	SK300LHX	300				4	2				$3200		
	Single Panel	-	-	-	-		2			-	$850	7 risers	
	XL Panel	-	-	-	-		3			-	$1100	15 risers	
	XXL Panel	-	-	-	-		4			-	$1300	22 risers	
Solartech (Solco Industries) 126 Sheffield Rd, Welshpool WA 6106. ph:(08) 9356 2833 fax:(08) 9351 8290 www.solco.com.au	Genius 200	200	Gravity feed close coupled	Polyethylene	Polyurethane	2	1	Poly-ethylene	Acrylic	Electricity and solid fuel	$1595	Rotomoulded plastic units with integral panel and tank	10 years
	Genius 300	300				3	1				$2115		
	Genius 200	200	Low pressure tank to mains pressure outlet			2	1				$2390		
	Genius 300	300				3	1				$2910		

Build a mini solar power system

There are lots of uses for this tiny solar power system, from sheds and weekenders to mobile homes and caravans, or just about anywhere you need to run lights and low-power DC appliances. Lance Turner tells us how to make it

Here at *ReNew* we get a lot of inquiries about running small appliances or just a few lights on solar power. While you would think this to be an easy thing to purchase, there are not many ready-made solutions out there. And, of course, if you are a tinkerer, why buy when you can build it yourself and save some money in the process!

So here is a simple design for a small solar electricity system that will run a light or two for several hours each night, as well as any small DC appliances within the capabilities of the system.

The specifications of the system can be seen in the box on page 66. The system is quite small, but the design is flexible and if you wanted to increase the battery and panel size, there would be little change required, other than a bigger battery box.

The battery is a 12 volt, 7 amp-hour Panasonic sealed lead-acid type. This type of battery is maintenance free and easy to use, and will generally last several years or more in most applications.

The battery is charged by a Uni-Solar US11 amorphous solar panel. This unit was chosen due to its good performance and relatively low cost, and the fact that, having no glass, it is very robust. Of course, you could use any panel that was suitable for the regulator and battery size.

Power from the solar panel goes to the battery via a Plasmatronics PR1210L two-stage regulator. This regulator has none of the LCDs or flashing LEDs of many regulators, and is so tiny it is easily incorporated into even the smallest of control panels. It is Australian designed and made, and costs around $79 (although this unit was kindly donated by Plasmatronics for the project).

That is the basic overview of the system, but how was it built? Well, let's take a look at the building process, and examine some of the requirements of such a system, as well as any problems encountered.

Battery box

In all renewable energy systems that use batteries, the batteries are supposed to be kept separate from the rest of the system. This even applies to sealed lead-acid units, as under extreme overcharge conditions, they can vent some hydrogen gas—though this is extremely rare. They also need to have their terminals protected from accidental contact with foreign objects, and I decided to enclose the battery for this project in a sealed plastic box. This also allowed the fitting of a safety fuse close to the battery.

The battery measures about 150 x 65 x 95mm, and so I selected a sealed ABS box large enough (measuring 222 x 146 x 75mm externally) to take the battery with room to spare for the fuse holder. The battery is mounted inside one half of the box with double-sided adhesive tape. It connects to the rest of the system by a two-metre length of 2.5mm^2 twin core automotive cable. The panel-mount fuse holder is wired into the positive cable before it exits the battery box.

I also decided to include an indicator/safety light to the system by using a superbright 5mm LED and running it at a very low current—less than 1 milliamp. This allows the light to stay running all the time if desired without imposing much of a load on the system. It is surprising how useful such a small amount of light is when you walk into an otherwise totally dark room!

To finish the battery box, the cable is terminated in a Molex-style plug. These are simple nylon plugs that are usually bought with their matching sockets and are supplied with crimping pins for the cable. They are polarised, so once assembled it is impossible to accidentally connect the plug and socket the wrong way around. They are commonly used in automotive applications, and are reliable and robust and are rated to at least 10 amps continuous current.

Control box

This part took a lot more time than the battery box. This was in part due to the higher level of complexity, but also in part to the wrong parts being supplied—but I will get to that later.

The control box needed to be able to do pretty much everything—regulate charge going to the battery, provide

switching and fusing for the loads, provide a means of plugging the loads in, and provide some form of basic metering.

The first thing was to find a suitable regulator. A quick search of the Plasmatronics website, and a phone call to them, provided the PR1210L regulator. Note that the L in the part number stands for low voltage—this regulator has lower set-point voltages than the standard unit, making it more suitable for sealed batteries.

The regulator comes attached to a three-way terminal block that is actually bigger than the regulator itself! As I needed to use a longer terminal block for the other connections, I removed the one on the regulator. The inside photo at right gives a good indication of the layout of the system.

The regulator is mounted on a terminal strip, which is mounted inside the box on a couple of the internal pillars. Two short flying leads are connected to the terminal block to provide inputs for both the battery and the solar panel (you can see them exiting the bottom of the box). They are both terminated with the Molex-style connectors used on the battery box—the battery lead obviously had the plug to match the plug on the battery box lead, while the solar lead has the opposite plug so it is impossible to plug the battery box into the solar lead, or the solar panel into the battery lead.

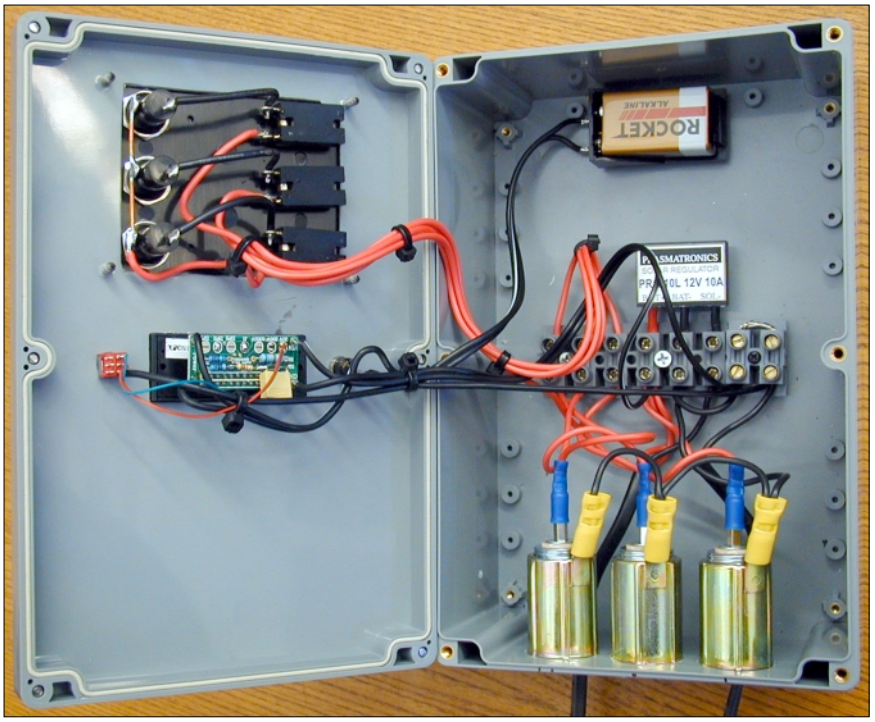
For the appliance connectors I decided to use that very common DC connector, the cigarette lighter socket. These are readily available and will usually handle a lot of current, though they are a little bulky. Three of these are fitted into the bottom of the control box as power outlets. This allows for two lights and a small appliance, or three lights or whatever you want to run at one time without the need of unplugging leads. If you use a bigger enclosure, you could have more sockets if you wished. These are wired back to the terminal strip as you can see in the photo.

Now to the switching and fusing. I looked through my catalogues and found a neat little pre-wired switch panel designed for marine use from Jaycar Electronics. One of these is fitted into the lid of the enclosure and wired back to the terminal block.

At this stage, the control box was ready to run, but it didn't have any method of checking battery voltage. I looked at a number of options, including LED bargraphs, analogue, LED and LCD panel meters. I even considered designing a display that uses just one RGB LED that displays voltage by changing colour (a future project maybe?). I settled on the LCD meter due to the low cost, high accuracy and low power consumption.

The first glitch

I bought what was supposed to be a meter that could share a common ground with the voltage it was measuring. Indeed, that was the model that was marked on the box, but once I set it up to measure the battery voltage it became clear that what was marked on the box and what was in the box were two different things! The common ground version of this meter requires a five-volt power supply, but when I connected the meter to five volts, there wasn't enough voltage to get the decimal point to display, so I knew there was a problem. Jacking up the voltage to nine volts solved that problem, so I knew I must have the nine-volt, non-common ground version. It makes you wonder, though, how many of these meters have been discarded as broken simply because they are not the correct one! It was more hassle than it was worth to

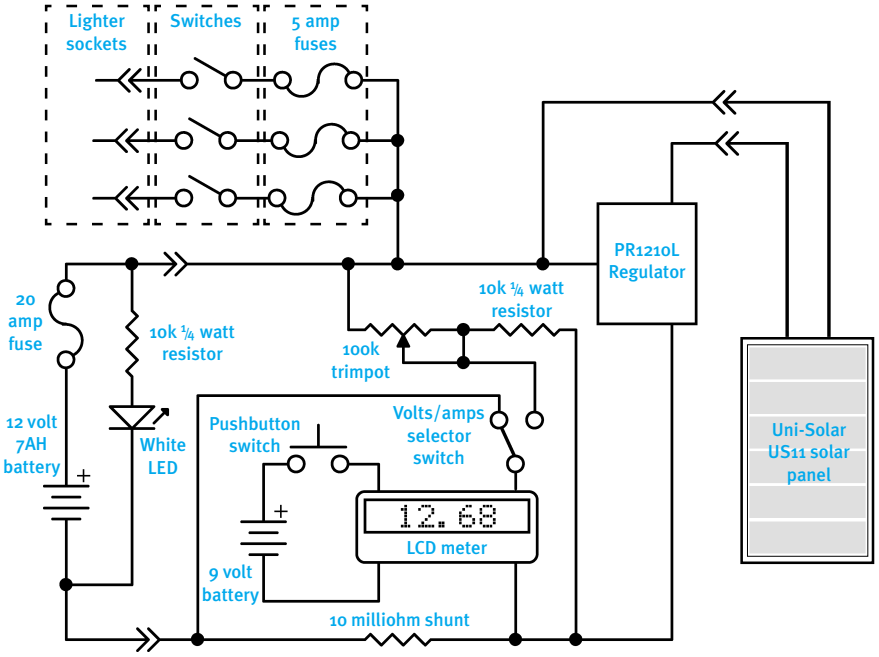


Inside the control box. As you can see, it is pretty simple, as you would expect for such a small system. Note the tiny Plasmatronics regulator. And yes, that is a nine-volt battery at the top of the box. See the text as to why it was needed!

return it, so a fix had to be found.

According to the literature that comes with the meter, even the nine-volt powered unit (the one I ended up with) can share a common ground if you connect it with the appropriate resistor network. However, after trying their network layout, the problem persisted (the display just reads over-range), so I decided that I had spent enough time on this and elected to power the unit from an isolated supply. The two options here were either to make a small switchmode DC to DC converter power supply (I have used one before for just this purpose that was made using a 555 timer IC, an audio coupling transformer and a few other bits) but not having the time to whip up another one, I went for a nine-volt alkaline battery instead.

This solved the problem nicely, but I was worried about the system chewing up nine-volt batteries, so decided to only have the meter powered when a pushbutton switch on the front of the control box was pressed. I could have used a toggle switch, but that makes it too easy to just leave the display turned on, thus killing the battery in a few weeks. With a pushbutton switch I expect the battery will last close to its shelf life—at least three years.



The schematic of the solar lighting and power system. Note that the negative connections for the lighter sockets are not shown for neatness.

This worked out nicely, and I had another idea—why not use the meter to better effect, and have it selectable as either a battery voltage or battery current meter? This required the use of a current shunt, and not being able to find a suitable shunt at the time, I made one from a length of 14 ohm-per-metre nichrome wire folded five times to give 32 layers. This resulted in a shunt somewhere in the vicinity of 10 milliohms, which was what I needed, but it was difficult to be sure of the exact resistance.

The shunt is wired into two spaces on the terminal block, and connected into the rest of the system. Two wires, one from each side of the shunt, are wired back to the meter via a single-pole, double-throw switch (I actually used one side of a double-pole switch, as it was what I had available). This allows switching of the meter between the shunt voltage, which should be no more than 200 millivolts at 20 amps current flow, or the divided battery voltage. Incidently, the battery voltage must be divided, as LCD meters usually have a 200 millivolt input.

Inside the battery box—not much there! Note the fuse holder and the LED, top right.

Parts and pricing

Battery Box

12 volt, 7 amp-hour battery	$40.00
Sealed ABS enclosure	$25.75
3AG fuse holder	$1.65
5mm LED	$2.00
2.5m cable	$4.00
Molex-style connectors	$2.25
Miscellaneous wire et cetera	$0.50
Total	$76.15

Control box

Sealed ABS enclosure	$35.95
Switch/fuse panel	$18.95
Plasmatronics regulator	$78.90
Terminal block	$2.55
Panel meter	$23.95
Add-on board for meter	$7.50
SPDT switch	$2.95
Pushbutton switch	$1.20
Battery holder	$0.90
Battery	$3.95
Cigarette lighter sockets (3)	$16.05
Molex-style connectors	$2.25
Miscellaneous wire et cetera	$2.00
Total	$197.10

Solar panel

Uni-Solar 10 watt solar panel	$199.00
Panel extension lead	$6.00
Total	$205.00

Lights

Fluoro fittings (2)	$79.90
10 metres twin-core cable	$4.80
Cigarette lighter plugs (2)	$2.20
Three 1 watt LEDs	$30.00
Constant current driver	$8.00
Miscellaneous wire et cetera	$1.00
Total	$125.90

System total $602.15

Note that the above prices are recommended retail and were mostly bought from Jaycar Electronics. There are many other sources of these parts, and system price will vary depending on where you buy them and the options you include.

As I couldn't easily adjust the accuracy of the current shunt, I decided to adjust the meter to suit the shunt (the meter has a tiny adjustment control on it) and then adjust the divider for the battery voltage to suit the meter settings. This wasn't too hard, and just required the replacement of one of the divider resistors with a 100k trimpot and a 10k resistor. Note that the divider network is actually part of an add-on board available for the meter. You can see it, and the added components, in the photo on page 64.

Once I had spent all that time playing around setting things up, I tested the meter by connecting its nine-volt battery and switching the selector switch between the voltage and current positions. By applying a known load to the system, I could set the meter to read correctly on the current setting. Then, by switching to the voltage setting and adjusting the divider network trimpot until the meter reading was the same as the actual battery voltage, the whole thing was set and ready to go. Note that when there is current flowing out of the battery the display reads in minus amps, whilst when current is flowing in during charging, the display reads positive, so you can see at a glance what is going on in the system.

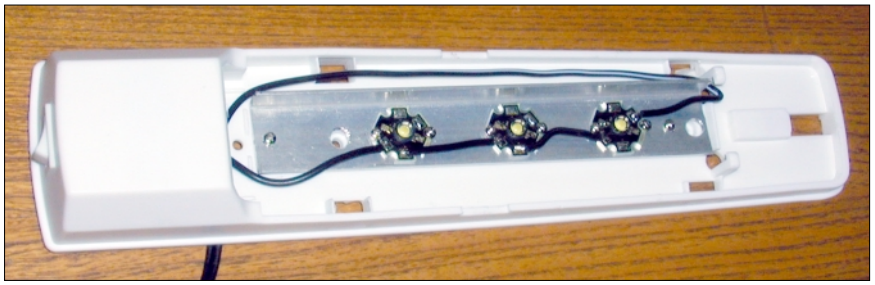
While all that sounds quite messy (and it was, to some degree), it was actually not that hard. However, I would recommend most people look for meters that are already set to read voltage and/or current. They will cost more than this setup, but will be a lot easier to get going!

And that was about it for the control box. The last step was to connect the appropriate plug to the solar panel (it comes with a flying lead several metres long already attached) and hook everything up to test it. At this time I also made an extension lead for the solar panel, in case the attached lead was too short. I used lighter 0.75mm^2 wire for this lead, as the maximum solar panel current is around 0.7 amps.

Lights and action!

Obviously, to test the system, I needed to have some suitable loads, so needed to get at least two lights to try out. Fluorescents being the most efficient form of lighting readily available, I bought two 11 watt PL tube fittings from Jaycar and decided to convert one of these fitting to use three of our one-watt Luxeon star LEDs. I decided to use our 'as-new used specials', which are priced at $10 and have a very good light output.

The standard fluoro draws about one amp to start with, then settles down to about 0.8 amps as it warms up. It also has a small three-watt bulb that you can use in place of the fluoro for less current draw. The Luxeons only draw 0.3 amps, so I thought it would be an in-



The converted fluoro fitting with the clear cover removed. As you can see, the conversion is very simple. The constant current driver is mounted in the left-hand end of the fitting.

teresting comparison.

On the previous page you can see the converted fluoro fitting. I removed the tube and inverter and fitted a piece of aluminium to mount the LEDs on. This lets them run nice and cool in even the hottest ambient temperatures, and made them a lot easier to mount. They are connected in series and are powered by one of our 300mA constant current circuit kits which we developed for just this purpose.

Unfortunately, these fittings are not overly well made, and getting the clear cover off resulted in part of the cover being broken off. If I were doing this project again, I would look for a different fitting.

To finish the lights, I removed the token effort leads they are supplied with, and connected about four or five metres of cable to each one, terminating them in a cigarette lighter plug.

Final testing

Now it was time to finish hooking it all together and see how it worked. Doing just that showed that everything worked exactly how it should—the battery charged quite happily to 14.2 volts, cycling up and down as controlled by the regulator.

The meter showed the current cycling up and down too, and flipping the switch to measure the voltage showed that that part of the circuitry was also working well. Now for the load test.

This was pretty simple—I just plugged in the two lights and turned them on. As expected, the meter displayed a negative current for the loads, and was pretty spot on, showing around 0.82 amps after a few minutes of running for the fluoro, and 0.3 amps for the LEDs. Interestingly, it didn't look like the fluoro was putting out several times more light than the LEDs, and it should have been, so I tested them side-by-side in a dark room. While the fluoro did an okay job of lighting the room, it was really no better than a five watt, 240 volt compact fluoro, so it seems the cool white tube in this fitting and the very basic inverter design leave a lot to be desired.

In fact, the LEDs were not far behind, even though they were drawing far less current, and I would definitely use them rather than the fluoro, as run times would be about three times as great.

If you would like to purchase the system outlined in this article, please call the ATA office on ph:(03) 9419 2440 or email: lance@ata.org.au

The national picture

In this issue, ReNew's regular policy columnist Alan Pears discusses Australia's Kyoto crisis

In September, the Australian government proudly announced our 2001 National Greenhouse Inventory. Using the Kyoto accounting methodology, it shows that Australia's 2001 emissions have fallen to the same level as in 1990. And government projections indicate that we are close to meeting our 2010 Kyoto target of 108% of our 1990 emissions, without needing to engage in international emissions trading or other mechanisms. Indeed, our government can now claim that we are much closer to our Kyoto target than are most countries that have ratified, and that have been critical of Australia's failure to ratify: we are now taking the high moral ground!

How can these outcomes be reconciled with the staggering 29% growth in greenhouse gas emissions from Australia's fossil fuel use since 1990? Simple. First, Australia received a 'free kick' by being allowed to include its emissions from land clearing in the 1990 baseline—120 million tonnes—22% of the total. These fell by almost 80% by 2001. Second, Australia's target was generous: most countries agreed to cut emissions below 1990 levels, while Australia's target is 108% of the 1990 level. These generous conditions were hard won through Australia's tough negotiations at Kyoto, at the expense of international good will.

In the last paragraph of its press release, the government notes that, despite being on track to meet its 2010 Kyoto target, 'emissions for 2020 are projected to be 126% of the 1990 level on an indicative basis, reflecting the impact of ongoing growth in emissions in the energy sector'. In other words, growing fossil fuel use means we are a long way from the 'lower emission signature' the government knows we need.

The wrong solution

The danger of this situation is that apologists for the present weak approach to climate change may now argue there's no need for much action until 2010, by which time we'll have developed geosequestration (storing CO_2 underground) and we'll be building a hydrogen economy. This could undermine development of renewable energy and energy efficiency, both of which are cheaper and quicker. Why upset the powerful vested interest groups to pursue something the vast majority of the community want?

This perspective can be seen behind the recent decision of the Prime Minister, reported by Michael Bachelard in the *Weekend Australian* of 30 August. Apparently, on advice from the coal, minerals, power generation, paper, chemical and aluminium industries, the Prime Minister overturned a joint proposal by Treasury and the Environment Department for introduction of emissions trading from 2013. The problem is that this decision won't solve the problem. There will eventually be a price on greenhouse gas emissions. The question is when and how.

It is obvious to Australian business that more will have to be done on global warming. But the resolute resistance of the Australian government to provide clear signals and effective response frameworks means business is in limbo. If anything, global warming seems to be happening faster than most scientists expected. And people are realising that global warming is not just benign: it means ongoing shifts in rainfall and weather patterns, more powerful and frequent cyclones and tornadoes where they haven't happened before, and human deaths from heatwaves.

Economic development uncertainty

As the gap between the Opposition (including minor parties) and Government on global warming widens, business must start planning for the possibility of a dramatic flip in policy. This makes investment decisions and planning difficult, and is probably already undermining Australia's economic development, as businesses delay commitments to new projects. Even the industries that are driving the government's resistance to action will be reviewing their own investment strategies, knowing that policy action cannot be delayed much longer.

Most state governments are not much different. Queensland, Northern Territory and Western Australia are nervous about upsetting the energy-intensive resource-based industries that they have pinned their development hopes on. Victoria is a hostage to the

brown coal-fired power stations (which employ the enormous total of 1500 people!) and the Australian car industry's commitment to making fuel-guzzling cars and four-wheel drives. Mind you, the New South Wales Carr government's decision to block development of the Redbank 2 power station on greenhouse grounds, as well as their Greenhouse Benchmarks scheme, shows that things can be different.

Australian global warming policy is in serious crisis, yet we will not pay the price for a few more years. John Howard and most current state Premiers will have retired by then. After all, it's the next election that really matters in politics.

Lomborg and global warming

I don't particularly want to enter the big debate about environmental sceptic Lomborg, but I can't resist commenting on his position on global warming. Essentially, Lomborg's view seems to be that, since the cost of acting to limit global warming is enormous, it would be better to spend our money on more immediate environmental problems like clean water for people in developing countries.

But Lomborg assumes that the cost of greenhouse response is high. This position relies on economic modelling studies that ignore most of the potential for cost-effective energy efficiency improvement and generally assume relatively high costs for renewable energy, while setting the cost of global warming's impacts at zero. There is increasing support for the view that global warming response is low cost, or even profitable, while the cost of failing to deal with this issue is becoming more apparent.

The increasing discontinuity...

There seems to be something seriously wrong with the fundamentals of Australia's energy-related development in the context of sustainability.

At present, new houses are becoming bigger, with many new homes exceeding 300 square metres and having two or even three storeys. Yet the number of household occupants is declining— now 2.6 people—with 55% of households being one or two people. Our population is ageing: how will we cope with the stairs?

A new Falcon can accelerate to 100km/h in under eight seconds and reach a top speed of 200km/h, while 50km/h speed limits are being introduced in urban streets to tame car speeds and make streets safer. And, despite technology improvements, the average new passenger vehicle uses as much fuel as one built a decade ago because it's heavier and more powerful.

In Victoria, electricity distributors who manage street lighting are fined if lights don't work at night, but it's okay if they're on during the day, wasting energy. And governments continue to encourage the energy supply sector to expand our fossil fuel-based system, to ensure they don't lose votes due to power blackouts.

Both Martians and people living in developing countries must see this behaviour as bizarre and arrogant, yet most people just don't see a problem—yet.

Maybe we can learn something from recent strategies on water management. Where are the advertisements to 'dob in an energy waster'? What about providing energy users with feedback to tell them if they are energy wasters or angels? And rebates for energy saving equipment? Somehow it's okay to do these things for water, and even offer rebates for solar energy, but not for energy efficiency. Part of this difference can be explained by the obvious reality that water supplies are limited by rainfall. Also, water is much more tangible than energy. In contrast, many see energy supply problems as a failure of governments or energy markets to build enough power stations. It's much easier to focus on blaming, than managing demand for energy. ✶

Summer solar cooking

Sunny Miller tells us how to make a simple and effective solar cooker in less than an hour

There's nothing like cooking your summer BBQ using just the power of the sun. This cooker (I call it the 'triangle cooker') is quick and easy, and makes an ideal holiday activity for kids and adults alike. All you need is sun and the easily obtainable equipment listed below, and you can build it anywhere.

Equipment needed:

- Cardboard box around 600mm on a side, such as a television box
- Aluminium foil 300mm wide, 10m long
- 250ml bottle of PVA glue
- Matt black paint
- Scissors
- Knife
- Paint brush
- Heavy duty sticky tape such as 'gaffa'

Get ready for summer cooking by making this simple but effective cooker.

Construction

To start, cut the cardboard box in half along the diagonal—refer to diagram 1 on the opposite page. Cut off the two top flaps of one half. The bottom flaps are probably fixed together. If not, glue them together. If the floor is not flat already make it so by gluing in extra pieces of cardboard.

With the leftover half, cut off the bottom flaps but keep the top ones. Turn it upside down and glue it to the outside of the first half of the cooker making sure the flaps hang out the back. These flaps will act as 'wings' on which heavy objects such as bricks or stones can be placed to help keep the cooker steady.

To create a front reflector, cut a leftover piece of cardboard to the length of the front opening of the triangle (the hypotenuse). With the 'gaffa', tape it to the bottom of the cooker. This front reflector will direct the sun toward the food, as well as help keep it upright.

Cover the whole inside of the cooker with aluminium foil. The best way to apply foil onto cardboard is to make a mixture of equal amounts of water and PVA glue. Brush the mixture onto the dull side of the foil. If you apply the mixture onto the cardboard it will dry very quickly. Foil is non-porous so it will stay wet until you place it on the cardboard. You may want to get someone to help you with this, as it can be a bit tricky with only two hands.

When you are ready to cook, adjust the front reflector according to the position of the sun. As you adjust the reflector your cooking pot will get brighter as more sunlight hits it. I sometimes raise the cooking pot off the bottom of the cooker with an empty tin to get it higher into the 'focal area'.

Variation

A participant in a recent workshop modified his cooker so it could be carried flat by SAS troops. He did this by making the floor in two halves, which neatly fitted together without any adhesive. With the cooking pot and stones in place, the cooker is pretty stable.

Operation

Using the cooker is simple. Put your cooker in a spot where there will be no shadows as the sun moves overhead. Put the lidded vessel in place, cover it and lift the front reflector until you notice the vessel getting brighter. Rotate the cooker slightly ahead of the sun's current position—experience will tell you how much.

You can cook anything you usually

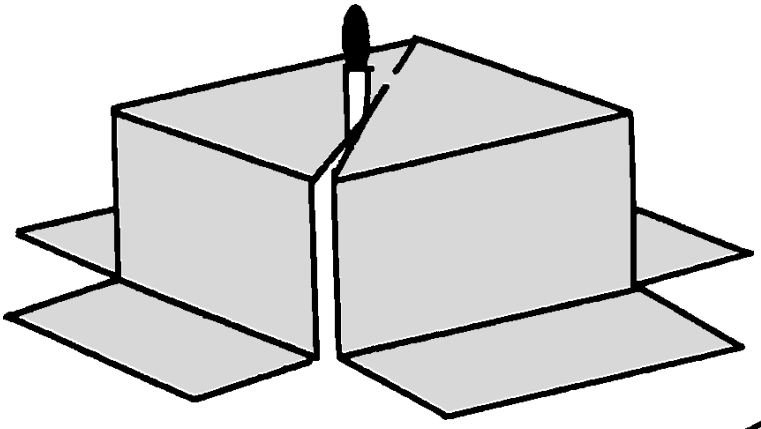
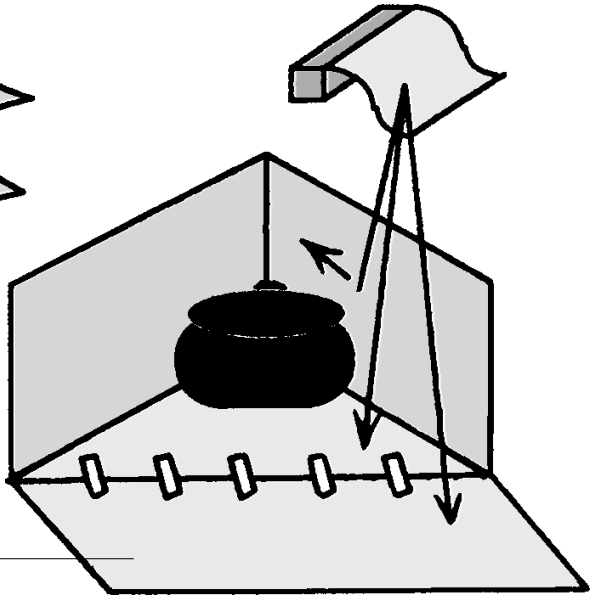


Diagram 1. Cut the cardboard box in half along the diagonal.

Diagram 2. Place foil on all the cooker's surfaces.



would cook in a slow to moderate oven. In about half an hour your cooker will easily get to over 100°C and can reach up to 135°C. If cooking high-protein foods such as meat, make sure you have a very sunny day. If the day has around 25% cloud cover, cook low-protein foods such as damper, cakes or leftovers. If clouds roll in or the food is not steaming it may not be completely cooked. In that case go back to your old-fashioned fossil-fuel cooker to finish it off.

Best cooking methods

For best results you should cook food in black containers or cooking pots. If you are cooking tinned food such as baked beans, paint the outside of the tin with matt black paint (remove the label first). I usually punch a hole in the top of the can to relieve the pressure of the food as it warms up and expands. The food may bubble over a little but at least the can does not explode! If using a glass jar, when painting, leave a clear sight line so you can observe the cooking. Do not tighten the lid, as once again the pressure build-up could lead to a dangerous situation.

The best cooking temperatures are achieved when a cover, preferably glass, is placed over the cooking vessel. The glass does not have to be anything fancy, I have even used an upside-down fruit bowl. At the annual Western Power World of Energy Solar Cook-off some students used an upside-down aquarium. With a glass fruit bowl cover it takes about three to four hours to cook a chocolate cake, ratatouille or lasagna. Make sure the glass cover sits on the bottom of the cooker so no cool air can get in.

For best results use black cooking vessels.

The parts of the cooker made by the SAS workshop participant. All the cardboard parts can be carried flat and fitted together in the field.

Beware not to let food sit in the shade. This sort of solar cooker has no insulation and food will cool rapidly once the sunshine stops. If in doubt, reheat. Also, minimise the opening of the cooking vessel as it will let out valuable heat.

Though water is hard to boil you can also use the triangle cooker to 'boil the billy' when camping. The water will boil just around the edge of the vessel but the water temperature will be around 99°C.

Happy summer cooking!

Plans for this and one other cooker are in 'How to make, use and understand Solar Cookers'. The cost is $14 including postage. Contact Sunny for a copy.

If you have recipes or other related information to share, please contact Sunny at 23 Morley Street, Maddington WA 6109, ph/fax:(08) 9459 3606, email: sunnymiller@iinet.net.au

Where the standards are at

In his last column for *ReNew*, Ray Prowse discusses the current standard of renewable energy systems

By the time this edition of *ReNew* goes to press I will have taken on a new role outside the Business Council for Sustainable Energy (BCSE). In my last column for *ReNew* I would like to mention some of the things that have come to my attention in my time administering the accreditation program for designers and installers of renewable energy systems.

By far the single biggest cause of disputes between installers and their customers has been the lack of communication between the parties. This is now covered by AS4509.3 *Stand alone power systems—Installation and maintenance—Section 12 System Documentation*, but note that this section states what documentation should be provided, rather than shall be provided. It is not mandatory, but it will go a long way towards eliminating disputes, predominantly over contractual issues.

The importance of documentation

The necessity for this documentation stems from the fact that living with a stand alone power system (SPS) is different from living on the electricity grid. Owners do not have a bottomless bucket of electricity to dip into and they must learn to live with their system if they are going to get maximum performance and longevity from it. This does not mean it should be arduous to live on an SPS system, but system owners bear some responsibility in ensuring that their system performs as it was designed to.

The biggest issue is that the system must be designed to meet specific load requirements. If the load changes then the ability of the system to meet the load also changes. Typically, what happens in many disputed scenarios is that the system might be designed to meet a specific load. Shortly after the system is commissioned the owners decide to purchase new electrical items, such as a freezer, or they want to start a veggie garden and they need to operate the water pump longer each day in summer. This means that, firstly, the battery bank is too small to meet the load, resulting in a greater average daily depth of discharge, and secondly, the photovoltaic (PV) array cannot bring the batteries back to float on a regular basis. The net result of this is that the batteries fail well before their design life is reached and an annoying and costly exercise has to be undertaken to replace the battery bank.

More often than not, the owners have not been made aware of the ramifications of exceeding their design load or, if the system installer has provided the owners with the relevant information, the owners simply did not understand what they can and can't operate. Good communication is vital and BCSE is in the process of developing a standardised system estimation form and, for those who want to continue to use their own forms, a list of all relevant inclusions in any such form. Allied with this is a new document, available to all system designers and installers, which will help educate consumers. Watch the BCSE web site at www.bcse.org.au for the release of these documents.

Not up to standard

I have also found that some systems have simply not been designed to meet best practice guidelines and the Australian standard: *AS4509.2 Stand alone power systems Part 2: System design guidelines*. This standard has been available since early 2002 and every system, whether it qualifies for a rebate or not, should be designed around it.

Paralleled batteries

Another reason for system failure, which fortunately has become less prevalent, is the practice of installing smaller capacity batteries in parallel, to build up overall battery bank capacity. Unless done very carefully there will always be a preferred current route through one of the strings and the net result is that one string will do most of the work. That string will have a larger average daily depth of discharge and will fail earlier than its design life. The other strings will stagnate and sulphate, again leading to premature failure of those strings. Early replacement of the battery bank is the only thing that is certain.

Generally however, system quality is improving. Whether as a result of the accreditation process, the rebate programs, general industry developments or a combination of all these factors is uncertain. However, one thing I have noticed is that the quality of case studies submitted by installers as part of their accreditation upgrade or renewal has improved significantly over the last few years.

***ReNew* would like to thank Ray for his contributions and wish him well in his new role of Manager of the Centre for Sustainable Energy Systems at the Australian National University.**

[Conference review]

The grey issues of water recycling

Ralf Pfleiderer gives us the lowdown on the latest research and developments in greywater systems discussed at the On-site '03 conference

On-site '03 Future Directions for On-site Systems: Best Management Practice

Armidale, New South Wales, 30th September to 2nd October 2003

On-site '03 was the third biannual conference for on-site wastewater treatment and management. This event brings together designers, installers, researchers and regulators in a friendly environment to network, exchange ideas and knowledge, and to offer constructive criticism in an open and honest forum. Representatives from all Australian states and territories, as well as New Zealand, came for three days of discussion on a broad range of subjects.

Discussions focused primarily on new research and regulatory developments in the on-site wastewater industry. Here, I will give a brief overview on the main issues discussed at the conference, however I will focus on greywater as this is my main area of interest and speciality.

Greywater

Greywater is a hot topic across Australasia and at all levels of government. One-fifth of the conference papers related directly to greywater, as well as two of the five discussion groups. The big regulatory bodies in Victoria (Environmental Protection Authority Victoria) and New South Wales (Department of Health) were pushing for 'controlled' reuse of greywater with other states contemplating similar policies. The drought and water shortages we are currently experiencing in Australia have greatly increased the interest in greywater. Significant public pressure is also contributing to this new focus.

The presentations given outlined various research projects being conducted and reflected the different attitudes of the represented states. Victoria seems to be leading the way with government policy. Clear regulations on greywater treatment requirements have been developed and it is the only state in Australia that also allows urban and rural residents to directly divert greywater into the garden. New South Wales has also recently developed policy on greywater and wastewater reuse, while Western Australia and Queensland are still restricting the reuse of greywater. The other states and territories were not officially represented in the On-site '03 discussion groups.

New Zealand has an approved greywater treatment system for toilet flushing reuse. Australia does not have such an approved system suitable for urban areas. However, the New Zealand manufacturer signed to an Australian distributor at the conference, so we may have one soon.

Health and safety issues

The major concern of regulators and council health officials is the potential risk (however low) of disease and bacteria associated with greywater reuse. Subsurface garden reuse seems to be the only 'comfortable' step forward at this point. If so, the effect of salt and nutrients on soils needs to be researched more intensively, as does the pre-treatment requirements of the irrigation system options.

Toilet flush greywater reuse was also a topic that attracted lively debate. Health concerns relating to the potential disease pathways from the aerosols released when flushing water into the bowl was again the main concern of the regulators. The regulators insisted that the flush water needs to have a very low coliform count—indicator bacteria used to determine potential human faecal disease risk—despite the fact that the water sitting in the bottom of the bowl already has a very high level of coliforms.

This leaves manufacturers of such systems with only one option, disinfecting, with chlorinating the cheapest alternative. The major drawbacks of chlorination are the expense and the known health and environmental issues of chlorine. Thinking laterally, the risk of aerosol contamination would be decreased if the toilet bowl cover was sealed and placed down before flushing. Alternatively, the toilet could have its own room, as opposed to being in the bathroom where the aerosols may come in contact with your toothbrush, et cetera.

Greywater costs

The high water quality standards cur-

rently asked for by the regulators restrict the uptake of effective greywater reuse and potable water displacement systems. A direct diversion system—not an option looked upon favourably at the conference—can cost less than $100 to set up. A treatment system for garden reuse generally costs between $500 and $1500. However, a greywater treatment system that would pass current regulators' dream standards for toilet reuse will set you back at least $5000. With the current price of water not reflecting the true cost of delivery and treatment, such reuse systems are not seen as viable on a purely economical basis.

Interactions of soils and wastewater

The long-term effect of irrigating with greywater will be an issue that will need to be tackled in the near future. There is some research currently being undertaken but there is a need for more. The detrimental effects of salinity in soils are well known. To avoid a saline backyard you need a low groundwater table, good draining soils and seasonal flushing rainfall. The alkalinity and temperature of some greywater discharges are also of concern, particularly when they are not treated.

For the consumer there is a need for further information on the composition of cleaning products and whether they are safe to use in greywater systems. (Refer to "Green and blue cleaning' on page 28 and 'Choosing laundry detergents suitable for water recycling' in *ReNew* 81). Unfortunately, most 'green labels' are not that informative and there is no guarantee that a product is ecologically benign. Without comprehensive product labelling consumers cannot make an educated choice between different manufacturers.

As previously mentioned, the interaction of nutrients and chemicals in the wastewater and in the soil (which are often asked to be the final treatment mechanism) are being heavily researched. The driver for this has been the high failure rate of the common septic system. Generally, this comes down to maintenance, education and better treatment quality. Healthy soil is a thriving mass of bacteria and bugs ready to consume the unwanted material in wastewater. But overloading, particularly of the heavy subsoil clays which dominate most of Australia, is very easy.

Several papers discussed the different aspects of soil's ability to deal with various components contained within wastewater. The research needs to continue more widely to be of greater use. However, it is clear that better maintained and more effective treatment systems than the simple septic tank should be mandatory and the sodium and pH levels in detergents need to be addressed.

Advances in systems research

Several new systems were discussed at the conference. Vermiculture systems expanding on the Dowmus principle are currently popular. Using peat as a medium to treat wastewater was put forward and seems to have great merits as long as the mining of the peat is carried out sustainably.

The reliability and robustness of sand filters and reed beds were again proven and people are still wondering why these simple and cost-effective systems are not more prolific. There was a suggestion by one paper that owner-built composting toilets are outperforming manufactured systems in treatment quality in the Lismore area. Again, owner interest and education were seen as the significant drivers for this.

Life cycle analysis—eco currency

Several papers tested the sustainability of on-site systems using life cycle analysis (LCA) testing models. LCA studies showed that on-site systems performed well. This indicated that decentralised or on-site systems, principally when the water was reused, were more sustainable than 'business as usual' centralised sewer networks and recycling. The big drawback is the financial cost of on-site systems, which are not subsidised like the centralised systems.

The gap between research and regulation

Several papers were critical of existing government policy, standards and codes that do not reflect current scientific knowledge and research on on-site wastewater. This criticism has occurred ever since the codes and standards for on-site domestic wastewater treatment were first written back in the seventies. While recent rewrites of the codes have closed the gap, researchers are sometimes still left wondering on what premise seemingly arbitrary rules are based on, especially if the same rules change from state to state.

Overall the conference was an interesting and insightful gathering of like-minded people. The highlight occurred during the comedy dinner debate on whether the 'outback dunny' was outdated. Clearly the joy of reminiscing about the bygone days of simplicity and rusticity are still dominant in our society as the anti-pit-toilet-professionals-by-day overwhelmingly voted to bring back the outback dunny by night. ✲

Further information and a copy of the proceedings can be obtained from the conference website at www.lanfaxlabs.com.au

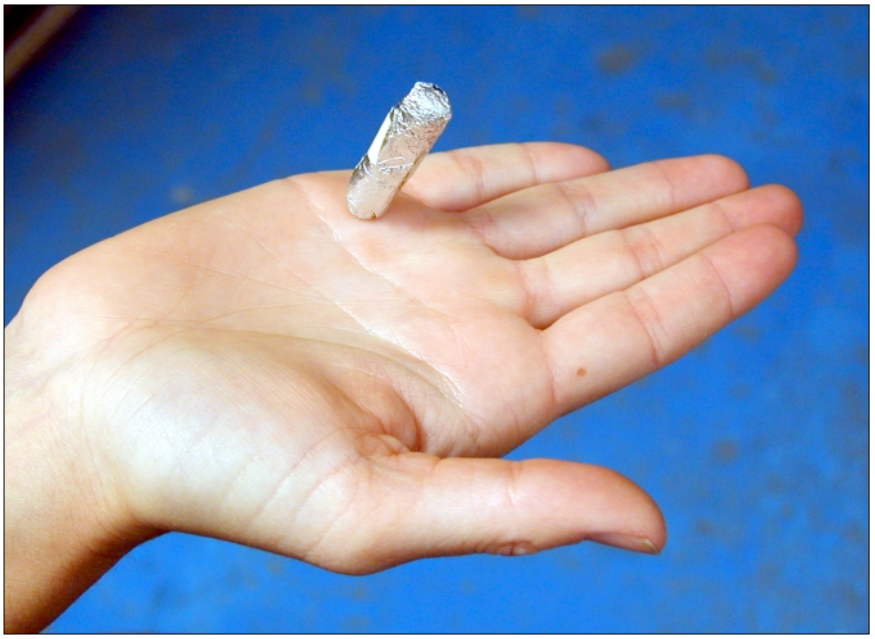
ReNew water articles index

This index covers all water-related articles and products that have appeared in *ReNew* since issue 72. The index is divided into relevant subject areas and lists the issue number followed by the page number. That is, issue 72, page 76, reads 72:76.

Noel's Treasures from Trash

To make your own Jitterbug you will need:

- A small ball bearing (bike shops have 5mm ones)
- a piece of aluminium foil about 25mm square
- a piece of dowel about the same diameter as the ball bearing and at least 150mm long
- a piece of newspaper about 150mm x 200mm
- sticky tape



Jitterbugs are so simple to make, yet they act like they have a life of their own!

Many years ago, dancing changed from the smooth, gliding style of ballroom to the jerkier, jive style of jitterbugs, so we made a toy which moved in a jerky way and called them 'jitterbugs'. The toy depended on the momentum of a heavy ball moving a lightweight tube with round ends, to make all kinds of jerky moves.

Making them

Start by wrapping the paper around the dowel so that the dowel's diameter is slightly larger than that of the ball bearing, and then tape the paper so it doesn't unwrap.

Wrap another two turns of paper round the dowel, with the edge of the paper a couple of millimetres over the end of the dowel, to make a cup so the ball bearing can sit with the top just showing, and tape this paper in place also.

Now gently—not too tightly—wrap the aluminium foil around the dowel so that the top of the foil is seven to eight millimetres above the ball bearing. Bend the foil over the ball bearing and tap it down on the ball so it becomes dome shaped. Tape the foil in the middle so it won't unwrap.

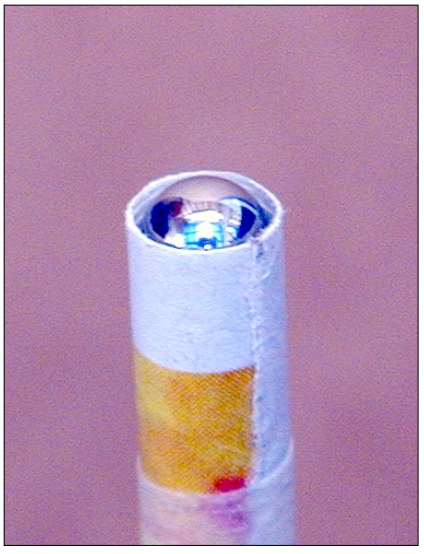
Now for the hard part! With the round end down, slide the dowel out of the foil, making sure the ball bearing stays in the foil. Very gently tap the open end of the foil to fold over a little of the foil so that the ball is contained and will not roll out when you put it on a flat surface.

Let the ball gently roll down to the end you have just closed so that you can use the ball to give the foil its final round shape.

Because the ends need to be round for the jitterbug to turn over, put the jitterbug into a cup and shake it back and forth until the ends become round. Check that the ends are not coming undone—if so, just repeat the previous step.

Once you have made your first jitterbug, test it on a flat surface like a tray or the palm of your hand. Move the surface slightly and the jitterbug should jump around, trying to flip over and even stand on end! Now all you have to do is make some more—it is more fun when you have more than one.

Happy jitterbugging!



This is the end of the dowel used to form the foil jitterbug casing. See how the ball bearing sticks out above the paper sleeve.

Why be a drop in the bucket when you can make a splash?

Make your charity $$$ and tax break really count by becoming an ATA *Supporter*

ATA has a very practical approach to achieving change. It takes the feedback it receives from people active in renewable energy, sustainable building and water conservation, and works to overcome the barriers that prevent or slow down the uptake of sustainable technologies. Some require a change in government policy, others different methods of implementation and some require ongoing education and training to make an impact.

ATA relies on the financial support of individuals to remain independent, frank and bold in its advocacy. Join the growing list of ATA *Supporters* who make ATA's advocacy and policy work possible, by making a tax-deductible donation to ATA each month.

Some of ATA's policy and advocacy efforts

ATA's work linking **energy efficiency with social equity** is an ongoing commitment that aims to cut the energy bills of our lowest income households. This not only helps the environment but improves the comfort and help relieve the financial stress of residents.

In July 2003, ATA started a two year research and promotion project focusing on **greywater systems** for domestic use. Six systems will be trialed and evaluated by ATA members in Melbourne. The information gleaned will play an important role in ATA's advocacy on a whole range of water conservation issues. ATA advocates for greater water conservation, but also for safe and effective systems, and government processes that support this.

Sustainable buildings are the exception rather than the rule in Australia. ATA is actively lobbying government for stronger energy efficiency standards, to reduce the greenhouse gas emissions associated with housing.

ATA continues to fight the introduction of a **biodiesel excise tax**.

Contact the ATA if you would like to get involved with this campaign or any of the above.

Sign up on page 83

Practical info? Be a Member

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

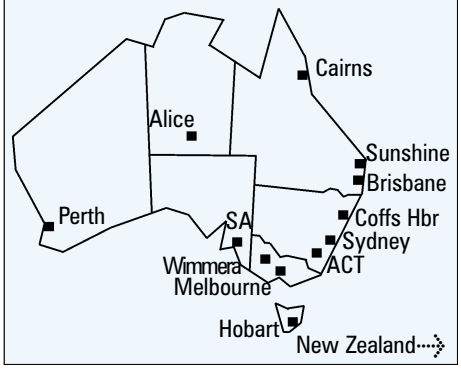
- *ReNew* magazine each quarter
- Advice by email or phone
- *The Sun* newsletter and email bulletins with events and info
- Discounted entry to seminars and open houses
- Discounts on products (below)
- Chance to network with other members at your local branch.

Discounts for members

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

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

ATA branches



ATA shop by mail

Books, booklets and CD ROMs

Renewable energy and energy efficiency in detail

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

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

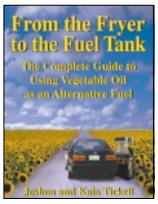
Vegetable oil for fuel

From the Fryer to the Fuel Tank

Author: Joshua Tickell

Price: $34.95, Paperback, 160pp

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

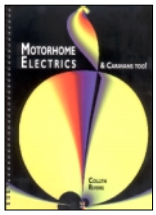


Motorhome Electrics & Caravans too!

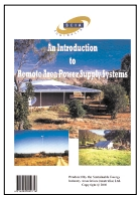
Author: Collyn Rivers

Price $42.50, A4 ringbound paperback, 102pp

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



For remote properties



Remote Area Power Supply Systems: An Introduction

Price: $33.00

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

Windpower Workshop

Author: Hugh Piggott

Price $30.80, Paperback, 160pp

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

Make yours the ideal home

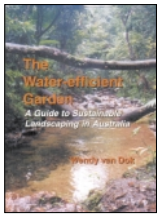
The Water-efficient Garden

Author: Wendy van Dok

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

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

Item code: WEG

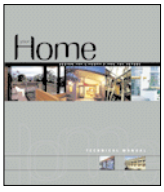


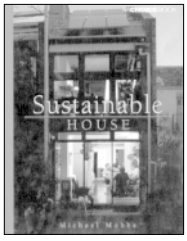
Your Home Technical Manual

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

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

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





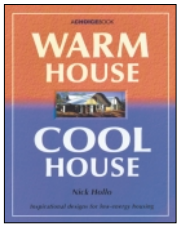
Sustainable House

Author: Michael Mobbs

Price: $38.50, Paperback, 188pp

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

Item code: SHB



Warm House, Cool House

Author: Nick Hollo

Price: $33.00, Paperback, 172pp

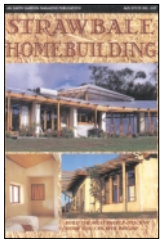
An easy-to-read introduction to the principles of energy-efficient housing design. Covers a broad range of topics and contains an abundance of drawings, plans and photographs. *Item code: WHCH*

Strawbale Homebuilding

Price: $19.95, Paperback, 156 pp

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

Item Code: SBH

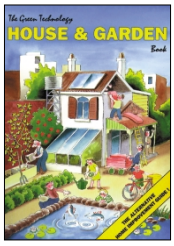


The Green Technology House and Garden Book

Price: $11.00, Paperback

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

Item code: GTH&G



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

Solar hot water

ATA Booklets series: Solar Hot Water

Price $7.90 each (inc postage)

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

Solar electricity

ATA Booklets series: Solar Electricity

Price $7.90 each (inc postage)

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

Be a fashion guru!

ATA T-shirts

Price: $15.00 plus $5 postage

Sizes: S, M, L, XL

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

Note: You must state size when ordering!

Save water this summer

Greywater Diverter

Price: $33.00 plus $8 postage

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

Item code: DIVERTER

Renewables on CD ROM

ReNewROM

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

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

Item code: RENEWROM

Kits, LEDs and energy efficient lighting

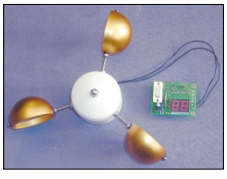
Freelight keyring solar torch

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

Weather monitoring kits

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

The anemometer and pre-built datalogger kit from Fascinating Electronics/James Jarvis lets you measure wind speed and log the data without a PC. Download the data only when you need to—the datalogger stores up to 32k samples, and also displays windspeed on an LED display. Anemometer requires assembly but datalogger is pre-assembled and ready to log. Note: does not record wind direction. Price: $250 ($240 for ATA members)



Aluminium 4 LED torch

New

This machined anodised aluminium torch uses 3 AA-cell batteries to drive four 5mm LEDs. Never be stuck with a blown bulb again! The torch is water resistant and very robust. What's more, a set of alkaline batteries should give at least 24 hours of usable light. Price: $20 ($18 for ATA members).

LED halogen replacement globes

We now have a new supplier of globes that are designed to fit standard halogen downlight fittings. These 5mm LED lamps have 21 narrow angle (25 degrees) LEDs and are suitable for highlighting, task lighting and general illumination. They will run from either AC or DC and so can be plugged straight into existing halogen fittings. Note that the rounded shape of the 5mm bulbs might prevent them being usable in some fittings. Price: $25 ($22.50 for ATA members). For wide-angle LED halogens, see our kits overleaf.

New

12 volt, 1 amp switchmode plugpack

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

Item code: SMPLUGPACK

Blaster 3D torch

This is a machined anodised aluminium torch that uses 3 D-cell batteries to drive a 1 watt Luxeon star. Never be stuck with a blown bulb again! The Blaster is waterproof and almost unbreakable. What's more, a set of alkaline batteries should give at least 24 hours of usable light. This torch should last a lifetime! Price: $110 ($100 for ATA members).

Aluminium 9 LED torch

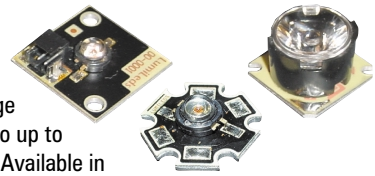
This is a machined anodised aluminium torch that uses 3 D-cell batteries to drive nine 5mm LEDs. Never be stuck with a blown bulb again! The torch is water resistant and very robust (we have drop tested it onto concrete!). What's more, a set of alkaline batteries should give at least 48 hours of usable light. Price: $45 ($40 for ATA members).

New

Nightstar kinetic torch

This amazing torch uses no batteries and no incandescent globes, yet will provide light when you want it with total reliability. The Nightstar uses a high power rare-earth magnet passing through a wire coil to provide the electricity to charge a super capacitor that drives the white LED lamp. Around 30 to 60 seconds of gentle shaking gives 5 minutes of full light and a steadily reducing level for another 15 minutes. Price: $70 ($65 for ATA members).

1 watt and 5 watt Luxeon LEDs



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

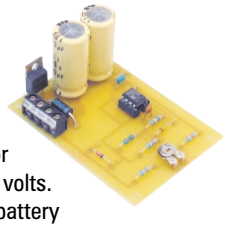
Luxeon optical collimators and reflector

New 25mm optic with holder. This optic solves the problem of how to attach the optics to the LEDs! $12 each.
The chrome reflector is not designed for the Luxeon LEDs, but fits nicely over them to give a semi-directional output. $0.50 each.

Simple 1 amp rectifier kit

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

Mini-maximiser kit

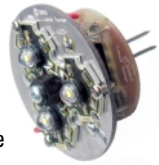


Our popular mini-maximiser kit will handle pumps up to 6 amps. The kit allows you to build the unit for use on either 12 or 24 volts. Note: not suitable for battery charging use! Price: $35 ($30 for ATA members). *Item code: MINIMAX*

30 amp speed controller kit

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

LED halogen conversion kit



This kit uses three of the 1 watt Luxeon Star LEDs, and includes a rectifier and constant current circuit to drive the LEDs at the correct current. Note that the light output won't be equivalent to a 50 watt halogen lamp, but then, the kit only uses 4 watts! Also note that you may need to replace your halogen transformers, as they often need a minimum load of 20 watts. $22.00 each without LEDs, or $70 including three white Luxeon Stars ($65 for members)
Item code: LEDHALKIT.
We now have a Superflux LED version of this kit which takes up to 18 Superflux LEDs of your choice.
Also available is our new general-purpose bulb kit. This kit takes up to 45 Superflux LEDs to build a 12 volt DC light bulb that can be made to fit any standard screw or bayonet socket of your choice. See our webshop for details of these kits.

Constant current circuit kit

This short form kit allows you to build a simple constant current circuit for driving LEDs from almost any DC voltage. It is available in four sizes, 20mA, 50mA (for the Superflux LEDs), 300mA (for the 1 watt Luxeon LEDs) and 650mA (for the 5 watt Luxeon LEDs). Please specify which current rating you need when ordering.
RRP: $8
Item code: CCBOARDxxx where xxx is the current rating in mA (020, 050, 300 or 650).

Superflux LEDs

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

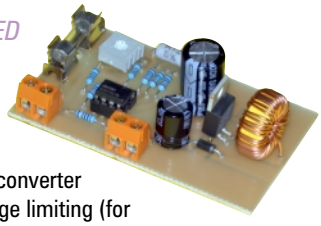
Chinese Superflux LEDs

These are a cheaper Asian-sourced Superflux LED. They are the same size and shape as the Lumileds Superflux LEDs, and of similar brightness, but not as expensive. In fact, we think these are the best LED value in Australia, although they probably won't last as long as the Lumileds LEDs, they should be great for most uses.

Maxi-maximiser kit

A larger version of the mini-maximiser which is available in 12 and 20 amp versions. The kit allows you to build the unit for use on either 12 or 24 volts. You must specify current rating when ordering. Note: not suitable for battery charging use!
Price: 12 amp: $70 ($65 for ATA members), 20 amp: $120 ($110 for ATA members)
Item code: MAXIMAX

Switchmode LED driver kit



This kit allows you to build a simple switch-mode DC to DC converter with either voltage limiting (for powering small DC appliances from up to 30 volts DC) or current limiting (for driving LEDs directly from up to 30 volts DC). The voltage or current is fully adjustable, allowing the one design to be used for a huge number of appliances or LED types, including the 1 watt and 5 watt Luxeon LEDs. Efficiency is typically over 70% on most input voltages. Kit includes circuit board, all components and instructions, and fuses in the following ratings: 50mA, 315mA, 500mA and 800mA. No case is provided. RRP: $27 ($22 for ATA members).
Item code: SWITCHMODE.

Expand your *ReNew* collection

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

Issues available are: *Soft Technology* issues 41, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55 and 56. *ReNew* issues 57, 58, 61, 62, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 80, 81, 82, 83, 84 and 85.

ATA order form

To assist our administrative section, please do not staple cheques/money orders to your order form.

Name Date of birth:

Address

State P/C

Phone (BH) (AH)

Fax/Email: (MOB)

Join me up as an ATA Member

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

- ❒ Individual membership Aust/NZ $55
- ❒ Concession (proof of entitlement required) ... $40
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- ❒ Individual rest of world membership $68
- ❒ Business/Government $150
- ❒ *Gift membership/subscription ..... $_____

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

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Total (NB. All prices in $AUD. Prices subject to change)		$

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

EACH MONTH, I would like to donate

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Send to

ATA, PO Box 2919, Fitzroy VIC 3065, fax:(03) 9419 2441

Note: Please allow up to 21 days for delivery.

86/04

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 2919,**
Fitzroy VIC 3065,
Ph:(03) 9419 2440
Fax:(03) 94192441
Email: lance@ata.org.au
www.ata.org.au

Fridge ventilation

I am building a new passive solar home from brick veneer. Someone has told me I should, if possible, put an external vent to the bottom of the fridge (through the concrete slab) and one going up into the ceiling space to improve the fridge's efficiency. Is this true? If so, what are the critical things to get right?

Joy Coulson, Warrnambool VIC

Fridges are heat pumps. They transfer heat from the inside to the outside. This is how it works. A fridge transfers heat by the use of a refrigerant which is compressed on the outside of the fridge (giving off heat) and is allowed to expand inside the fridge (cooling the inside). The heat that is produced is given off by that black grill at the back of the fridge. The easier it is to get rid of that heat the more efficient the fridge will be.

Good air movement at the back of a fridge would improve efficiency so a vent as suggested could be a good idea. However, you could achieve some of these improvements by just making sure the fridge is not boxed in by cabinets as is often the case with modern kitchens.

Another consideration is what the vents would do to the thermal performance of the kitchen. In winter when you are trying to keep the house warm a vent behind the fridge drawing cold air into the room may not be something you want. Likewise, a vent above the fridge drawing warm air out may not be a good result.

The vent makes more sense in summer as long as the inlet vent behind the fridge is drawing in cool air. Exhausting the hot air at ceiling level would be good in summer as long as this warm air is being replaced by cool air.

So these are suggestions. If you put in a vent shut it off in winter to reduce heat loss from the room, (as it is cooler the fridge will not be working so hard and producing so much heat anyway). In summer the vent is a good idea as long as the air being drawn in is cool. If it is coming through a concrete slab it should be fine, although you should draw the air from the cooler southern side of the house.

Mick Harris

Slow pumping

I was wondering if anyone has a design for a simple system to pump water at a very low flow rate—just a trickle feed—from a lower tank which collects rainwater, up about three metres vertically and around 20 metres away to a second, higher tank.

I would like to collect rainwater from the house roof and pump up (very slowly) to a header tank at a higher point in the yard to irrigate a small orchard.

Using a solar panel, I understand some care in the selection of the pump is important and a device to match the pump with a solar panel is usually needed.

Any ideas, or pointing me to someone who has done something similar, would be appreciated.

Philip Williams, Brisbane

There is a range of pumps that could be of use. Most of the commercially available pumps are designed to deliver flows higher than you would probably want. You could get a pump which is designed for a low flow or low head but has just enough capacity to do your job, but if anything happens to reduce the pumps capacity (for instance a bit of wear in the pump or a slight restriction in the piping) you may find that what was giving you the slow trickle you wanted no longer gives you a trickle at all.

It may be better to get a pump with a little more capacity and use a float switch to turn it on and off as water is available or required. I suggest getting hold of our Remote Pumping Buyers' Guide which was published in Re-New *issue 82. It includes a detailed list of available pumps, specifications and prices. You can order it from our website at www.ata.org.au or you may find it in your local library.*

Mick Harris

Battery specs

We are currently looking to buy new batteries for our solar system and I came across a problem. When we where reading the electrical specifications there are two tables by the name of 'Nominal Capacity', C/10 and C/100, calculated in amp-hours. What does it all mean?

I thank you in advance and hope to hear (sorry, read) from you soon, because we want to buy the batteries soon!

Theo

Because the capacity of lead-acid batteries varies depending on their discharge rate, manufacturers give capacities for several discharge rates so that you know what you are getting.

For example, a battery may have a capacity of 800 amp-hours when discharged at the C/100 rate, which means that when discharged at a rate that will completely flatten it in 100 hours (the C/100 bit), the battery will have that ca-

Notes and errata: ReNew 85

In the dog poo composting article, we stated that 90,000 tonnes of dog poo is created in the greater Melbourne area every day. This should have read 90 tonnes. This was a mistake made during *ReNew* production, not the figure provided by Melbourne Water.

In the write-up in the Products section on the solar powered waste water treatment system, we stated that the system uses 300 to 350 watt-hours per day for a five person house. This is incorrect. That figure is actually for a house of ten people.

pacity. A battery of this rating could supply 8 amps for 100 hours. However, at a higher discharge rate (over a period of 10 hours, or C/10) the capacity might only be 690 amp-hours, which means the battery will provide 69 amps for 10 hours before it is flat.

RAPS batteries are usually specified at the 100 hour rate, as independent systems have to be able to provide several days' backup, and usually are never continuously discharged at a C/10 rate.

Lance Turner

Green funerals

I'm wondering if you have any articles or recent information on 'green funerals' in Australia?

I have found out information from the UK and US but nothing local. Any contacts re: cardboard coffins, regulations, contacts would be appreciated.

Ann O'Donnell,
odonnells@dodo.com.au

Biodegradable coffins made from recycled cardboard, plant materials and natural glues can be bought over the internet for as little as $200. They are available from Australian Eco Coffins which is based in Brisbane.

If you do a search under this name you will find more information including other coffin and funeral alternatives. This should help. Keep an eye on ReNew, *we may do an article on this in the future.*

Mick Harris

We have since tried to track down Australian Eco-Coffins, and their website seems to have disappeared, as have their other contact details from the yellow pages. If anyone has contacts for this or other companies selling eco-coffins, please let us know.

Lance Turner

Lighting a house with LEDs

Having read your article on low voltage halogen lights, I now face a dilemma. My wife has set her heart on down-lights and I am trying to build a tightly insulated, energy efficient house. My wife does not like light fittings which protrude from the ceiling. I have considered LEDs and am wondering if you know of any lighting engineer who could not only help us with getting the most functional lighting system, but who is also interested in energy efficiency. Am I asking too much? We are building the house ourselves.

I would appreciate any thoughts you have.

Derek

While you could certainly do something with LEDs, it would be expensive to do a whole house. The cheapest and simplest option is to fit downlight fittings designed for standard incandescent bulbs (as opposed to halogen down-light fittings, which are very different) and fit compact fluoro lamps into them. Just make sure you get downlight fittings that are deep enough to take compact fluoros of your choice. There are some very short CFLs available. The Philips Genie units, in 5, 8 and 11 watt models, are shorter than a standard incandescent bulb, so any incandescent downlight fitting should be suitable for them. We have seen suitable fittings in places like K-mart for around $15.

Lance Turner

Going solar in Spain

My partner and I have got ourselves involved in a property programme and on the back end of it, have unexpectedly found our dream home in Andalucia, Spain. However, this dream can only be realised if we are able to be eco-friendly and energy efficient when rebuilding the house and surrounding land and able to run a holistic retreat type of business. We are very 'green' in this field, and are also working against time restrictions now that we have paid the money to release the deeds.

We really need to find out what's possible and what's not, costings and possible grants, as well as working with people that know about the issues we would face in terms of bureaucracy and any restrictions or planning permissions.

We have heard that other countries have organisations that promote renewable energy, efficiency, and conservation and wondered if there was anything similar operating in Spain?

Would you be at all able to advise us or direct us to someone who might be able to help us? Is there such a thing as an eco-friendly architect?

Esme and Jeremy,
esmerowland@hotmail.com

What an adventure. You have some homework to do. You have to get a working knowledge of the issues that will apply to your new home. Do you need electricity, water? Is sewage a problem? Start with an audit of your needs and wants with the new property.

Then you need to read up on the possibilities in those areas. Some books cover the full range. Have a look at the ATA's website www.ata.org.au, as there are a number of useful books. Also have a look at the free articles under the ReNew *heading. I would also suggest a visit to the library. Some other websites such as that of Sustainable Energy Authority Victoria are very good on building although the information has to be adapted to Spanish conditions.*

I am afraid we do not know anything about local Spanish bureaucracy, restrictions, planning system, grants, et cetera, you will need a local contact for that. In terms of a local organisation I would start with the United Nations which has lists of NGOs and other specialist organisations working in various countries.

In terms of architects, you really do need someone local, but before you go you could talk to someone here. Try one of the architects listed in the Suppliers Buyers' Guide on pages 94 to 96.

Hope this helps. Enjoy the adventure.

Mick Harris

Fridge uses too much power

We went to a solar retailer 18 months ago to update our solar system from 12 volt to 24 volt, so we could run a 240 volt refrigerator. On their assurance that what they sold us would do the job, we went out and bought a new Whirlpool two-door refrigerator, which uses 480kWh per year. We now run the generator every day on sunny days for two hours to charge the batteries and more in cloudy weather.

I am trying to convince my husband that the best way out of this mess is to cut our losses on this fridge and purchase the Vestfrost fridge. However, I must prove to him this is the better way to go rather than buying six more panels. The bottom line in all his decisions is the dollar. I was wondering if any of your readers have used the Vestfrost fridge for two years or so, and how they are finding it and its power usage, especially during winter and inclement weather.

Desperate to solve our headache and arguments!

Robyn Boness, Bega Valley

If you added a fridge to the system without adding any more generating capacity, then this problem was sure to happen. You can't add a load without producing more energy for it. A Vestfrost will use around 1kWh a day, which is less than your current fridge, and the changeover cost may be less than the difference in solar panels. Also, adding such a large extra load means the battery bank will be cycled more deeply each day. I assume the bank was large enough to allow for the extra load.

For a fridge of that energy consumption, you would need around a 500 watt array to keep up with it, maybe a bit larger to cater for the poor sunlight in winter, though the energy consumption of fridges is less in winter, providing it is situated well away from stoves and other heat-producing objects in the kitchen. This can be a major problem for fridges. If it is near a stove, or in direct line of sight of radiant heat producers like wood stoves, then it needs to be shielded or moved.

Personally, I would have spent $2000 or so on a DC fridge, they are generally lower energy consumers than even the Vestfrost, and there are no inverter losses, which always adds 10 to 15% extra to energy consumption of AC fridges. It may still be cheaper for you to buy a DC fridge and associated wiring rather than the extra panels.

It definitely sounds like the system was sized incorrectly or the fridge is using more energy than it should, maybe due to poor siting or ventilation as outlined above.

Lance Turner

A clean, fibre-free insulation alternative

AIR-CELL Insulation directly under this conventional metal roof provides R_t2.5+ installed performance.

AIR-CELL Insulation delivered both a sarking and a 4 star energy rating when installed under this tiled roof.

AIR-CELL combines both a waterproof vapour barrier and insulation.

Thermo-reflective insulation is not new to the Australian building landscape. Now available in the local market this high performance thermo-reflective product gives building designers and owner builders the opportunity to specify high performance insulation that is fibre-free, non allergenic and non asthmatic.

AIR-CELL Insulation (formerly Astro-Foil) is an insulation that combines reflective air spaces with a low emittance cellular conductional barrier to produce what is known as a "thermo reflective insulation medium".

At only 7mm thick, AIR-CELL out performs many traditional fibre-based insulations and when combined with good solar passive design, often removes the need for mechanical cooling.

Combining the technology of reflective airspaces and sealed air conductional barriers. AIR-CELL provides both a waterproof vapour barrier (sarking) and insulation barrier that rivals the thickest batts or blanket.

This assures that a minimum mandatory 4 to 5 star energy rating is achieved in most homes with just one application.

AIR-CELL Insulation is extremely easy to install in both new and existing houses. It can be applied in one application into walls, roofs, ceilings and floors. And because it has no fibres AIR-CELL won't make installers itchy, nor does it carry alarming safety warning requirements for gloves and face masks during installation.

air-cell BUILDING INSULATION

For further product details:

Product Name:	AIR-CELL Insulation
Description:	Fibre-free, thermo cellular bubble Insulation that replaces batts and sarking
Applications:	Walls, roofs, ceilings and floors
Ph:	1300 135 621
Website:	www.air-cell.com.au

RT030979

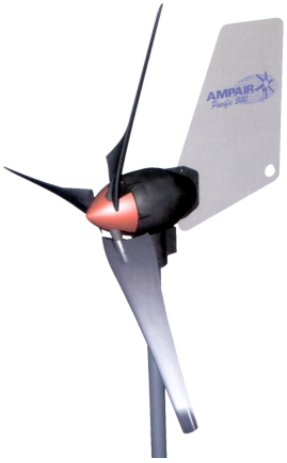
Don't be a spud, use a potato plate!

Take-away food is a huge cause of litter and unfortunately, most of the packaging is made from foam or plasticised card, which takes years or even centuries to break down. However, the Potatopak range of food trays and containers are made from potato starch. They are designed to be composted with food scraps and break down rapidly without becoming a waste problem. The starch is extracted from the water used in making potato chips, thus cleaning the water and providing a source of raw materials for this amazing food packing.

Manufactured by PotatoPak NZ Ltd, the Potatopak range comes in a variety of colors and items including bowls, plates, trays and punnets. In addition biodegradable wooden cutlery is also available.

rrp examples: NZ$3.86 for a pack of 10 large plates, NZ$1.90 for a pack of ten 12cm bowls, NZ$8.83 for the party pack, which includes four plates, trays, bowls and knife/fork/spoon sets. in assorted colours.

Manufactured by: Potatopak NZ Ltd, ph: +64 3 579 1079, fax: +64 3 579 1089, email: richard@potatoplates.com, www.potatoplates.com. Available in Australia Maryke Booth, Shop Basics Pty Ltd, ph:(02) 6280 4128, email: maryke@shopbasics.com.au, www.shopbasics.com.au



Ampair grows up!

The Ampair 100 is well known as a reliable and durable micro wind turbine. However, if you wanted more power, you had to go elsewhere—but not any more!

The Ampair 300 is the new big brother to the 100. Rated at 300 watts at 12.6m/s, it features; glass filled polypropylene blades with a diameter of 1.2 metres, die cast aluminium body (powder coated in either black or white), a cut-in speed of 3m/s and is available in either 12 or 24 volt or 3 phase AC for grid connection. The turbine also has blade pitch control and weighs 11kg.

Available from Uni-Sun, 1/13 Scanlon St, (Box 2009) Solar City, Esperance, WA 6450, ph:(08) 9071 1513, fax:(08) 9071 3591, mob: 0418 934 607, email: cdarker@unisun.com.au, www.unisun.com.au

Roll away those weeds

If you are tired of pulling out weeds from your garden, then maybe there is a simple solution, Korromatt is a corrugated cardboard matt designed to suppress weeds by blocking out light. Available in both roll and pre-cut circle form, rolls are come in five, 10 and 75 metres in length, while circles are available in 20, 40 and 60cm diameters.

The circles are ideal for individual plants, and even pot plants, while the matt is ideal for larger garden beds like veggie gardens and revegetation areas. The matt is 100% organic material and is completely biodegradable. It will not cut into or damage plants, and also reduces watering by reducing evaporation rates. As an added bonus, Korromatt is impregnated with slow release fertiliser to help plant growth. Wooden matt clips designed to hold the matt in place during windy conditions are a;so available.

Available from hardware and garden stores.

Manufactured by Korromatt International Ltd, PO Box 25296, St Heliers, Auckland, New Zealand, ph:+64 9 634 6615, fax:+64 9 634 6616, email: kevin@korromatt.com, www.korromatt.com

Build it fast and strong—and insulated!

Undoubtedly one of the fastest building methods is that of insulated concrete forms. These are usually made of styrofoam blocks that you put together like giant toy blocks and then fill with concrete to make a very strong and fully insulated wall ready for render or other finishes. Using this method, a building's walls can be finished with minimal labour in a matter of days, compared to weeks or months with conventional brick buildings.

We recently received information on two very similar systems. Thermacell, which we originally looked at over 10 years ago, and another system, Zego, which has been in use in Germany for around 30 years.

The Zego blocks (pictured at right) are available in 125mm, 200mm and 250mm widths.

The Thermacell blocks (pictured at left) are available in 125mm, 166mm, 200mm and 250mm widths, as well as 166mm and 200mm lintels. There are various accessories, such as end caps, available for both blocks.

For more information, contact Zego Pty Ltd, ph:(02) 9651 2277, email: quotes@zego.com.au, www.zego.com.au, or Thermacell, ph:(03) 5977 7996, email: info@thermacell.com.au, www.thermacell.com.au

Banking on the rain

The Davey RainBank is a rainwater system controller that automatically selects between rainwater or mains water depending on the availability of stored rainwater. It can work in conjunction with an existing pressure pump, or is available as a controller only or in three different kit/pump combinations. The KRB35 kit includes the RainBank controller, pump adaptor kit and pump and is suitable to operate a single toilet and laundry at once. The KRB50 kit, including the RainBank controller, pump adaptor kit and pump unit, is suitable for up to three toilets and laundry at once. The KRB42 kit, including the RainBank/S controller, pump adaptor kit and submersible pump, is suitable to operate up to two toilets and laundry at once.

List prices: $450 for the RainBank; $780 for the KRB35 kit; $910 for the KRB50 kit; $1030 for the KRB42 kit.

Manufactured by Davey Products Pty Ltd, ph: 1300 367 866, email: sales@davey.com.au, www.davey.com.au

Grandcell gets grander

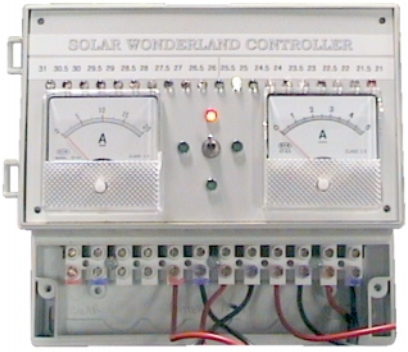
Grandcell, long known for their rechargeable alkaline batteries, have recently moved into the nickel-metal-hydride battery market with the release of their 'Digital rechargeable' range of cells. They are available in AA and AAA sizes with capacities of 1800mAh and 750mAh respectively, putting them at the higher end of the market for battery capacity.

The batteries are designed to power high-power-consumption digital devices such as digital cameras, CD walkmans and electronic games. They can be recharged up to 1000 times, saving a great deal of chemical waste (and your money!).

It is claimed that the batteries do not contain mercury or cadmium. The grandcell battery charger has also been upgraded to charge both types of grandcell batteries.

For more information contact Grandcell Batteries on freecall: 1800 423 322.

This controller is a wonder!



Most solar regulator/controllers use MOSFETs as the main switching device, and while they are a lot more reliable than they used to be, what happens when the MOSFET goes kaput? Well, if you are in a remote area, you can be stuck without a controller for weeks.

Uni-Sun believes they have the answer to this in the form of their Solar Wonderland controller. The controller uses not MOSFETs, but good old mechanical relays with quenched contacts. It features a 20-step, extended scale LED voltmeter, twin ammeters and an IP-65 rated enclosure. It will regulate two separate solar arrays (100 amps max) and has two staggered low-voltage disconnect relays for battery saving load control, making this a serious controller.

rrp: $1000 + GST

Available from Uni-Sun, 1/13 Scanlon St, (Box 2009) Solar City, Esperance, WA 6450, ph:(08) 9071 1513, fax:(08) 9071 3591, mob: 0418 934 607, email: cdarker@unisun.com.au, www.unisun.com.au

Plug and play solar

Wiring your own solar power system can seem a bit daunting for many people, but for smaller systems the task is now a whole lot easier using the SolarPRO plug'n'play kits from ICP Global Technologies.

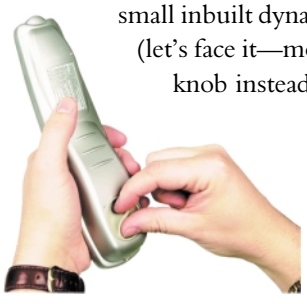
The solar panel comes ready to mount, as you would expect, but instead of a junction box, it has a plug and LED indicator on one corner. You simply mount the panel on the roof and plug in the wiring harness. The other end of the harness plugs straight into the charge controller. If you need more panels, they just connect together using the jumper wire harness. The only conventional wiring is the battery connection.

Each kit comes with solar panel, mounting hardware, wiring, connectors and charge controller. The kits are available in four sizes—30 watts, 50 watts, 75 watts and 100 watts. Kits in this size range are ideal for weekenders, boats and caravans.

For more information, contact ICP Global Technologies, PO Box 33, Cleveland QLD 4163, ph:(07) 3821 3983, fax:(07) 3821 3977, email: customers@icpglobal.com, www.icpglobal.com

Battery-free universal remote control

Despite people's desire to be more environmentally conscious, it seems every electronic device you buy has a remote control—and they all use disposable batteries.



Jaycar Electronics has a universal remote control that does not require any batteries. Instead, it uses a small inbuilt dynamo to power the remote. All you do is wind the dynamo's knob a few turns each day (let's face it—most people play with the remote when watching TV anyway, so why not just twist the knob instead!)

Controlling up to four devices, the remote control is pre-programmed for thousands including TV, DVD and VCR. The remote measures 210mm long x 55mm wide x 30mm thick.

rrp: $59.95

Available from Jaycar Electronics stores, or go to www.jaycar.com.au

LC Electronics electromagnetic field strength meter

RRP: $135. Available from Natural Paint, PO Box 287, Port Macquarie NSW 2444, ph:(02) 6584 5699, fax:(02) 6584 5799, email: office@naturalpaint.com.au, www.naturalpaint.com.au

Review by Lance Turner

There has been a lot in the media recently about the possible dangers of electromagnetic radiation, but to most people it is a matter of 'well, how can I find out if it is a problem in my home?' A field strength meter is needed to do the testing. However they are usually quite expensive to buy and not readily available to hire.

Mains frequency electromagnetic fields are thought to cause many problems, including sleep disorders (the 50Hz frequency is close to some of the natural frequencies of the human brain) and excessive field levels are even considered by some to be possible causes of cancer. Whether this is true or not, there is no doubt that the fields usually present in modern homes can be very high—and let's not forget that these fields didn't exist just 100 years ago—not long for the human physiology to adjust to such a large environmental change.

The options

Unfortunately, there aren't a great many options. You can spend $500 on a commercial field strength meter that gives you a digital readout in milligauss (up to 0.5 milligauss is considered safe for continuous exposure, though this depends on who you talk to!). While these meters are great devices, they are too expensive for most people.

However, recently Natural Paint in NSW has started supplying a German-made field strength tester that will cost you a great deal less. It is easy to use and will allow you to check for both electromagnetic and electrostatic fields.

Its use was quite obvious despite the front panel being marked in German. There is a slide switch marked off and on (well, aus and ein, actually), a x1 and x10 switch for measuring fields over two ranges, and a third switch marked W and S, which selects between electromagnet fields (W) and static fields (S).

How easy is this device to use? Very easy in fact, begin by plugging the short antenna into the top of the unit, select the x1 range switch and turn the unit on. Then, just wander around the house and see what happens. The front panel of the meter has five LEDs that light up in sequence as the fields get stronger. If only the green LED is lit then the field levels are safe, when you get to yellow they are starting to become borderline and if any of the red LEDs are lit, then reducing the field strength in that area should be a consideration.

We did a quick wander around the old ATA office and found that in most places the fields were acceptable but in a few spots, usually just one metre square or so, there were high field levels.

I also took the meter home and found similar results—most areas were fine but there were a few hotspots that were many times higher than the rest of the home.

What causes these hotspots? My guess is that the building's wiring and pipework cause fields to overlap in certain spots, reinforcing the field and causing higher than normal levels.

I also tested some appliances and computers and found most of them to be quite well shielded, except for a few older models. There were also considerable fields around electrical cabling for high-current devices like kettles and microwave ovens.

Speaking of microwaves, this meter is tuned to the common 50Hz waveforms of mains electricity and will not detect the gigahertz frequencies of microwave oven magnetrons and mobile phones. There are simple microwave field meters available for measuring these items.

Conclusion

The meter is quick and simple to use, and gives easy to understand results (good-to-bad) without having to understand the actual units of the fields you are measuring, so for anyone wanting to check their home, it is a great idea.

Thanks to Stephan Teske for translating the German instructions.

[Letters]

Continued from page 14

LG feedback

Lance Turner gave a favourable review of the LG 7kg WD-8013 front-loading washing machine in *ReNew* issue 85. I have an older 5kg LG front-loading machine and have also been very happy with it. This has a simple electromechanical controller which doesn't use power when the washing machine is not in use. Fancier models have electronic controllers which are powered on continuously.

Another 'feature' to avoid is combined washer-dryers. These use an electric element to heat air to dry clothes after they are washed. They are as energy consuming as regular dryers, but some models also waste fresh water which is used to cool the humid air exhausted from the drying chamber.

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

More on the LGs

I replaced my previous washing machine with the same LG model reviewed by Lance Turner and after six months of daily use I fully endorse his view that the WD-8013F is a superb machine.

My power supply is from a 2400 watt Latronics sinewave inverter which easily handles the LG and my 1.1hp venturi bore pump simultaneously.

Always on cold wash, 'Quick 30' and 'Rinse+' with about a dessertspoon of powder, clothes come out free of detergent and very clean. A 600rpm spin is suitable in dry air weather.

The cleaning efficiency of this machine is remarkable when compared to my previous water-guzzling washer. Rarely do I have to use the full wash cycle to remove dust and grime.

David Sims, Kalunga QLD

Battery charger ripple

The article on battery chargers in issue 85 by Jason Bond has touched on some research I have been doing over the last year regarding the charging ripple affecting battery life. The effect is not limited to below 1000Hz but is also a problem at frequencies much higher.

The problem came to my attention when investigating the performance of a generator that has 56 poles. Initially I noticed that my test batteries appeared to charge up much more quickly than they should. Using specific gravity to measure charge, I discovered that the high frequency was de-sulphating the plates. The ripple frequency was 4200Hz (1500rpm with full wave three phase rectifier).

The reason for this is that batteries have a resonant frequency. This fact is used by designers of circuits that deliberately trigger resonance to remove the sulphate. My concern was, however, on the long-term life of the batteries when operated off a supply that has ripples that trigger resonance (harmonics of the resonant frequency). Most switch-mode converters have capacitors that reduce the likelihood of this happening, however generators that have such a large number of poles usually do not.

Response from battery manufacturers to date has been to put it in the too hard basket. However, I did get a response from one of their back-room boys that had come across this in some experiments with a car alternator. Their response was to design a filter that was tuned to the battery's resonant frequency. I now use a filter when using my 56-pole generator.

In my testing I have taken batteries to destruction. The effect I have experienced is the grid breaking on the positive plate. However, loss of the active material must also happen. As the subject of resonance and harmonics is huge I better leave this as a brief introduction.

To assist my research, I would be interested in responses to this matter. Please limit size of replies to approx. 10kB.

Herb Edie,
edie1@actrix.co.nz

Oil companies responsible

Bor Ybsens letter in *ReNew* 85 states that an oil well contains around 30 times as much gas as oil and that this gas is usually wasted. Now, this statement cannot go unchallenged. I worked in the Cooper Basin long enough to realise that oil and gas companies, although often receiving bad press, are surprisingly responsible. They are accountable to state governments and required to waste as little as possible. Any pollution—excessive flaring, unnecessary gas release or oil spills—is monitored by the Environmental Protection Agency.

Oil and gas companies are out to earn a dollar from anything they can pull out of the ground so wherever possible all gas associated with oil production is gathered and refined.

In free flowing oil wells there is a blanket of high pressure gas above the pool of oil so a pipe is put down into the liquid and the gas pressure drives it out. When the oil is depleted and the gas cannot be economically recovered, the well is capped off thereby trapping the gas.

Huge, wasteful gas flares make for good TV footage but they are the exception, not the rule. All flared gas must be metered and reported. Main flares are continually monitored for smoke and videotapes sent to the EPA.

The ATA cannot be expected to handle every subject outside its area of interest with expertise it should attempt to substantiate any statement made. If in doubt, leave it out.

Alan Strickland, Lynton, SA

Alan, for us to check every fact in every letter would be unrealistic—we just don't have the time. Besides, everyone is entitled to their opinions, and the last thing we want to do is start censoring letters. If a letter author gets something wrong, then readers have the opportunity to correct them in the next issue, just as you have done.

Lance Turner

Power meter concerns

I received my copy of *ReNew* issue 85 the other day—another excellent issue generally and congratulations to all involved. There was one article that I would like to express concern over however.

Dennis Stanley's article on building a real power meter for mains appliances was quite interesting but I have some serious safety concerns relating to its design and construction. Before voicing these concerns I would like to state that I am a qualified electronics engineer with over 10 years experience in developing mains powered equipment to international safety standards.

While there is a mention of connecting the meter via a safety switch, the meter should contain input over current protection such as a fuse or circuit breaker. To not do so risks fire or electic shock should the unit malfunction.

It was mentioned that the Schottky diodes D5-D7 should be capable of carrying 10A. This, plus the fact that they should be attached to an adequate heatsink, should be emphasised.

D7 and D8 will be conducting current once the mains current through the 1 ohm shunt (R11) reaches around 200mA. This is equivalent to running a 48 watt purely resistive load connected to the meter. D5 and D6 will be conducting current once the mains current through the 0.1 ohm shunt reaches around 2A. This is equivalent to running a 480 watt purely resistive load connected to the meter.

Neither of these two loads are excessive for household appliances. If these diodes are inadequately rated (which could occur if someone does not get the right type of diode from an old power supply) then they could easily fail due to excessive current. If this occurred, the entire current would pass through the shunts. These are rated at 2.5 watt for R11 and 5 watt for R12 if constructed as described in the article. These would not stand up long under any significant load and are likely to catch fire or melt down causing a possible shock hazard. The construction methods shown in the photo indicate that such a failure could conceivably create this scenario.

In addition to this the power cords going into and out of the box have no obvious cable restraint and this is not mentioned in the text. There may be a cable tie visible around one of them, I am not sure, but in any case this is not a recommended form of mains cable restraint. A clamping plastic grommet would be a better solution.

It is good to see a low-cost meter presented and it should work okay for loads that have relatively continuous input currents. For loads that contain switchmode power supplies such as found in computers and some other appliances, the accuracy is not going to be great as they often conduct current in a 'spike' on each mains cycle. My only real concerns are related to the safey of those readers who construct the design as described.

Tom Stamp, Ashburton VIC

Thank you for the comments on the design and I have to say I agree with most of them.

I did use large cable ties as cord clamps and agree that the black plastic cord clamps are more appropriate. A fuse may be an appropriate addition, however, in this circuit it would offer little protection over the recommended safety switch. This is because the fuse would need to be rated at 10 amps to accommodate the largest appliance and the meter's electronics would have behaved like a fuse by the time this current was reached. Any of your overheating concerns and subsequent failures would not be protected by a fuse as, even if the Schottky diodes went open circuit, the appliance would still be providing a ballast load, preventing the fuse from blowing.

In the article I did mention the diodes should have a heatsink for continuous operation with significant loads. However, I believe you may be over concerned about their dissipation as it's fairly minor if the meter is used as recommended. These diodes are passing the series current, not dissipating the full load. In your suggested scenario, with a 480 watt load connected each diode is passing two amps (if you neglect the shunt current). Two amps at 200mV is 400mW. 400mW is well inside the package dissipation limit for a TO247 case (18 degrees temp rise steady state). Each diode is only conducting half the time so this 400mW is shared between two diodes so it's only 200mW each. This gives a theoretical temperature rise of less than 10 degrees above ambient. To compare, consider a normal 4007 rectifier diode. They are okay for power dissipation up to 1 amp continuous and they have more than twice the forward voltage drop. They have no heatsink surface or mass at all other than their legs and the maximum power dissipation in the meter is only a few times more than this tiny package. The diodes really don't even get warm unless you are passing 10 amps through them. The diode specification is really generic though, as each diode does not have to act fast, does not see any reverse voltage greater than about 300mV and has to dissipate a maximum of 1 watt for 30 seconds. Even continuously, 1 watt dissipation is still within the package dissipation for these diodes and they would not be reaching their danger area. They would be about 50 degrees above ambient after reaching a steady state.

If the diodes did fail it is most likely they would fail short circuit. To expose the shunt to the full current, both diodes would have to fail open circuit. In this case the shunts would be overloaded and this is the entire purpose of the diodes. The alternative would be to switch the shunts, however switching the neutral to an appliance you would have to agree is likely to be a more risky proposition. The other choice I had was to dispense with the 10 watt range, but it's so useful for finding phantom loads.

It is my sincerest hope that readers do exercise appropriate caution if undertaking this project and do seek assistance if they are unsure of any of the component values.

The meter should work relatively accurately even with non sinusoidal currents and the testing we have done confirms it is accurate to about 5% over a reasonable power factor range. The loads that really trick it are non symmetric ones, like some SCR controlled rectifiers. My soldering iron doesn't register at all because it only draws power during the positive half cycle.

Dennis Stanley

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RE equipm't/components

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Solar/general

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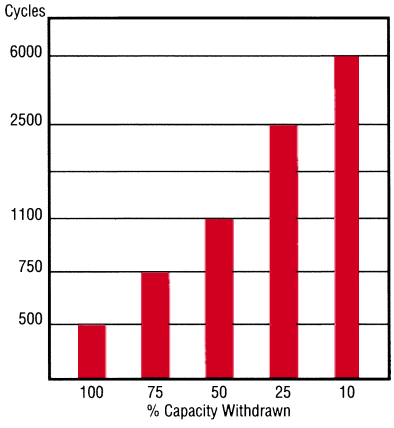

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