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Issue 107 Apr-Jun 2009  
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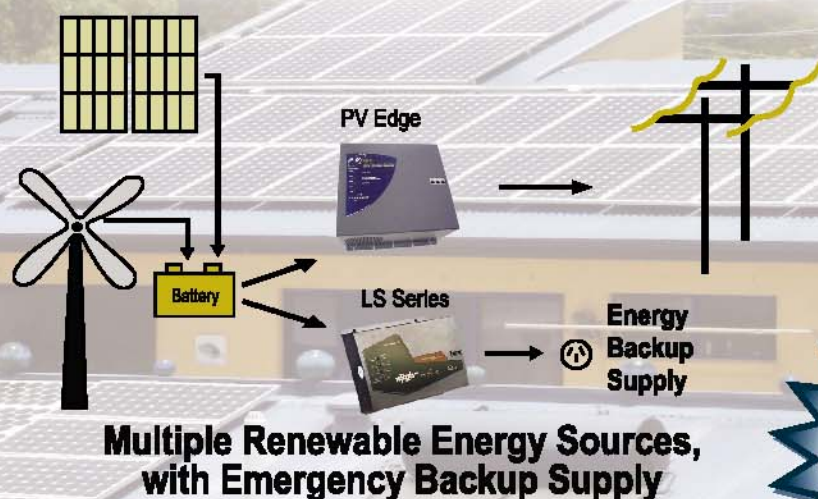
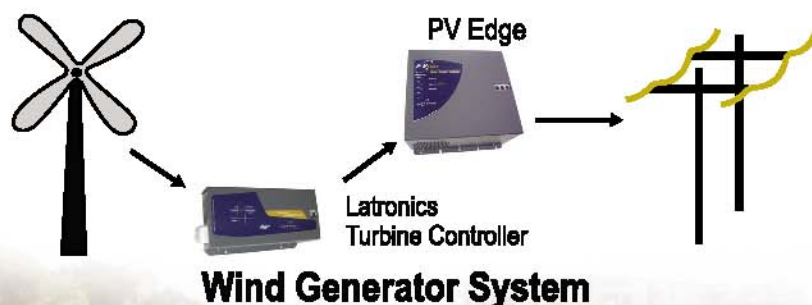
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Cover photo by  
Jacinda Brown in the  
Northern Territory.



A colour printer that uses no coloured inks, or ink cartridges!  
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## From the Editor



### About ReNew

*ReNew* has been published by the Alternative Technology Association, a non-profit organisation that promotes energy saving and conservation to households, since 1981. *ReNew* features renewable technologies such as wind power, solar power and alternative modes of transport. *ReNew* includes practical examples of water conservation or reuse, recycling materials or ways to achieve energy efficiency at home. *ReNew* provides practical information for people who already use sustainable processes and demonstrates real-life applications for those who would like to.

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Contributions are welcome, guidelines available on the web at [www.ata.org.au](http://www.ata.org.au) or on request.

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**Next advertising deadlines: Booking 24 April 2009. Advertising copy due 1 May 2009. Next editorial copy deadline: 24 April 2009.**

## Improvements for next time

**WE'RE LEAVING** a topsy turvy old summer behind at the moment with plenty of questions regarding how we live in this harsh climate.

While you might pick up this issue in the cooler months of autumn or in the midst of the tropical dry season, the season that's just passed will be back, and depending where you live it might be wetter or drier than ever next time. We've all got to work towards living in this climate a bit better with clever retrofits of existing dwellings and better energy efficiency.

The economic slowdown has some unexpected perks regarding the latter. Next summer it'll be ok to ask 'have you got insulation?' when visiting a neighbour or friend, because the federal government is currently offering up to \$1600 of free insulation per household. And if you know anyone who's a landlord, don't forget to ask if they've taken advantage of the increased rebate for insulation in rental properties. At the very least tell them that *ReNew* is interested in their experience. More details on page 16.

It's refreshing to see financial uncertainty spark more spending on energy efficiency. Around one tenth (\$4 billion) of Australia's \$42 billion stimulus package is dedicated to sustainable measures. It's not a lot considering economist Nicholas Stern recommends 20% of global stimulus packages should be dedicated to green measures, but it's certainly welcome. The federal government has also allocated over \$20 billion to building projects such as new defence force accommodation, public housing and libraries, science labs and much-needed refurbishments to schools.

There's obviously a sense of urgency in approving plans and rolling out construction projects, but let's hope that the initiatives that don't fit under the umbrella of 'sustainable', actually have green elements too, such as passive heating and cooling, materials with low embodied energy, low-toxin paints and finishes, and renewable energy generation. Otherwise we'll look at them ten years down the track and wish they were never built.

Enjoy this issue of *ReNew*—it's been a good one to put together. The inspired sheds on page 46 are a highlight.

**Jacinta Cleary**

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### Terms and Conditions

- (1) The competition is open to anyone in Australia who subscribes to *ReNew* or *Sanctuary* or joins the Alternative Technology Association (ATA) during the competition period, including existing subscribers and ATA members who renew their subscription or membership during the competition period.
- (2) The prize is not redeemable for cash. Price includes GST.
- (3) Edwards Solar Hot Water reserves the right to change specifications without notice.
- (4) Paid ATA staff, members of the ATA executive committee, Edwards staff, Edwards dealers and members of their immediate families are ineligible to enter.
- (5) The competition runs from 24 February 2009 to 5pm on 21 August 2009, and subscriptions/memberships must be paid by this time and date.
- (6) The competition will be drawn at 10.30am on 24 August 2009 at the Alternative Technology Association, Level 1, 39 Little Collins St, Melbourne VIC 3000.
- (7) The winner will be contacted by phone and will be notified in writing. The winner's name will be announced in *ReNew* 109 and *Sanctuary* 9, released in September and November 2009 respectively.
- (8) The competition is open to individuals only. Corporate entities, collectives and organisations are ineligible.
- (9) To enter, subscribe or join the ATA using the subscription form in *ReNew* issue 107 or 108 (or a copy of it), or the form in *Sanctuary* 7 or 8, visit our website ([www.ata.org.au](http://www.ata.org.au)), or call the ATA on (03) 9639 1500 to pay by credit card.
- (10) The competition is only open to Australian entries and includes delivery and installation within 200 kilometres of Australian capital cities. Edwards Solar Hot Water will cover standard install costs in other locations.
- (11) Edwards Solar Hot Water reserves the right to change the brand/model of the system depending on the water conditions.
- (12) The solar hot water system must be installed on the winner's primary place of residence. If the winner does not own an eligible property, then they may transfer the prize to the person of their choosing who has an eligible property.
- (13) Prize includes the supply and installation of a top of the range Edwards family sized stainless steel solar hot water system as well as a Clipsal cent-a-meter, total value \$7029.
- (14) The winner agrees to assign any REC's (Renewable Energy Certificates) generated on this system to Rheem Australia.

The *ReNew*/Edwards Solar Hot Water subscriber competition is proudly sponsored by Edwards Solar Hot Water, ph:1300 765 277, [www.edwards.com.au](http://www.edwards.com.au)



## Up front

### 140,000 LED streetlights for LA

California's green credentials continue to improve with the announcement that Los Angeles will retrofit 140,000 streetlights with LED bulbs. It's estimated that the new bulbs will reduce carbon emissions by 40,500 tonnes and save \$10 million every year. The project will begin in July and take five years to complete.

On hand to celebrate the announcement was former President Bill Clinton. "If every major city followed your lead, we could eliminate two and a half coal-fired power plants," he said. "This is like taking 6000 cars off the road."

### Lighting just a call away

Street lighting has a lot of disadvantages—it creates skyglow, it wastes a great deal of energy and it costs councils lots of money.

Several towns in Germany have looked at addressing these issues by modifying streetlights to remain off until they are needed.

They don't have motion sensors, but instead respond to mobile phone calls. If you want light, you call your local street light pole and it switches on for 15 minutes.

The town of Morgenröthe-Rautenkranz installed these lights over 18 months ago. For the first two weeks after the lights were installed they tended to stay on most of the night while residents tried out the new system, but

now the lights stay off until they are needed. This has resulted in considerable energy savings for the town, with running costs falling by €4000 per year.

Other towns using similar systems include Groß Pankow, Döblitz and Dörentrup, which uses a more complex system designed by Dial4Light (see [www.dial4light.de](http://www.dial4light.de)). Lemgo and Rahden also use the Dial4Light system and some towns such as Rahden are even charging for the service—1 hour of light will cost the caller €3.50.

### Bring in the negotiator

CSIRO's Intelligent Energy team has developed a new 'smart' fridge that negotiates with other fridges to determine when best to consume electricity. Yes, that's right; it is a fridge that negotiates.

The fridge maintains its average temperature while regulating the amount of power it draws from renewable energy sources, such as solar panels or wind turbines.

"The fridges are designed to talk to each other, negotiating when it's a good time to consume electricity and when it's better not to," says Sam West, CSIRO engineer.

For example, supply of electricity from a renewable source can be unexpectedly interrupted, leading to increased demand on the electricity grid. The new smart fridge recognises that this is not a good time to consume energy. It can also tell when there is surplus electricity and reduces the fridge

temperature to a few degrees lower than necessary, creating a thermal energy store that keeps the fridge contents cold at night.

### Solar stoves

The solar cooking-craze has taken off in rural Vietnam where villages have been switched on to using solar stoves to boil water.

Dutch NGO, Solar Serve, has collaborated with the Da Nang People's Committee to provide solar stoves to Binh Ky 2 village. About 100 of the village's 300 households have made the change to solar cooking. Villager Nguyen Thi Anh Minh admitted that it took a while for villagers to be convinced about the merits of this idea, but the change has been both economical and simple, saving her US\$17 per month.

"After lighting the firewood, I was all wet with sweat," she said. "But now I only need to pull the cooker into the sunlight and wait for few minutes to cook."

Those who have made the switch have seen their gas usage cut by half and, crucially, villagers have stopped felling trees for firewood.

### Television recycling plant

In *ReNew 101* we featured an article about E-Cycle Recovery, a company that has been tackling Australia's alarming flow of electronic waste. E-Cycle Recovery recycles electrical items that are usually disposed of in landfill or



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## Up front

shipped overseas to become somebody else's problem.

Now E-Cycle Recovery has set up a new company, CRT Recycling, that will recycle CRT televisions and monitors. CRT glass is the main source of lead in municipal waste streams, and Australia is lagging behind the rest of the developed world in regulating its disposal. Every year, 1.5 million CRT televisions and monitors go into landfill in Australia.

It looks as though CRT Recycling will be particularly busy in 2009-2010, as analogue televisions are set to be phased out by the demand for digital technology.

"This service is going to allow Australia to catch up with the rest of the world," said Michelle Morton, founder of E-Cycle Recovery. "It has the capacity to divert large amounts of hazardous materials into a product that is in high demand for glass to glass recycling applications; it should no longer be acceptable for landfill to be an available option."

### Universal mobile phone chargers

If you (like the rest of us) have ever wondered why all mobile phones do not have the same charger, this news is for you. The European Commission is preparing to force all mobile phone manufacturers to use one standard charger. Their aim is to reduce the amount of e-waste generated by people switching chargers every time they switch phones.

The EC is rapidly losing patience with the mobile phone industry, which it says has had ample opportunity to develop a solution to the problem.

In the past, industry representatives have given mixed responses to the proposal. However, the push for change gained momentum in February at the Mobile World Congress in Barcelona when industry body GMSA pledged that by 2012 the majority of mobile phones shipped around the world will use universal chargers.



### Wind turbines for Antarctica

Wind energy has taken another big leap forward with the news that Princess Elisabeth Station in Antarctica has become the first polar base to be powered entirely by renewable energy. The research station, set up by the Belgian government, has eight wind turbines that are coping with the most extreme weather conditions on Earth. They will be operating in temperatures of  $-60^{\circ}\text{C}$ , average wind speeds of 85km/h and winter gusts of up to 360km/h.

The 6kW wind turbines provide 230V electricity and have been supplied by Proven Energy, a Scottish based manufacturer with a track record that includes installations in Slovenia and Japan.

Construction of Princess Elisabeth Station was completed in February and the new base will provide a unique opportunity for scientists to research climate change.

### Phantom solar

Household rebates for solar electricity are set to change again with the Solar Credits Scheme due to start in July. This replaces the Solar Homes and Communities Plan, which placed a means test on eligibility for the rebate last year.

While some will be happy to know the means test is gone as of July 1, the new scheme still has some issues.

Under the Solar Credits Scheme, homes and businesses that install solar panels will be awarded with five times the amount of Renewable Energy Certificates (RECs) for every megawatt-hour of clean energy their system produces, up to a maximum of \$7500. These additional RECs will become part of the Renewable Energy Target of 20% renewable energy by 2020, yet they are for clean energy that was never generated.

"By handing out phantom RECs, the government is putting homeowners in the difficult and perverse position of either forgoing any financial support to install solar or increasing the amount of dirty electricity in Australia," says Alternative Technology Association Energy Advocate Damien Moyse.

"Under this phantom credits scheme, installing a solar panel will actually mean less power will come from renewable sources."

### Feed-in tariff pioneers

The ACT commenced Australia's first gross feed-in tariff for solar electricity generation on March 1. Under the gross model, all electricity generated produces revenue for the homeowner. Other states have proposed a net feed-in tariff,



which only pays for the electricity not used, which is great if you're never at home.

Until the end of June next year the amount paid will be 50.05 cents per kWh generated for systems up to 10kW. For systems between 10kW and 30kW a rate of 40.04 cents per kilowatt-hour will be paid. The price paid back is set each year.

The scheme is available to all ACT electricity customers (except non-educational government agencies) with solar capacity no greater capacity than 30kW. All schools and educational institutions can access the scheme. Renters need to get the homeowner's permission before installing solar panels, but aside from that hurdle, they're eligible too.

### Solar prize winner

The winner of the latest *ReNew*/ATA subscriber and member prize was drawn in late February. Greg Chard of Archerfield in Queensland won a \$14,000 grid-connect solar power system from Earth Utility. A big thanks to Earth Utility for their support.

That's not it for the prizes though with a new one launched this issue. All new and renewing ATA members and *ReNew* subscribers who sign up before 21 August now go into the draw to win an Edwards stainless steel solar hot water system, plus a Clipsal cent-a-meter and installation. Good luck!

**Upfront compiled by David Sparkes**



### Big PV in the USA

For anyone who thinks the future of photovoltaics isn't thin film technologies they should take a look at what's happening around the world.

First Solar has been supplying thin film solar panels for large array installations for some years now and they have numerous installations under their belt.

The projects include rooftop arrays in Europe and the US, in sizes into the multi-megawatt class such as the 2.5MW array in Ramstein, Germany. They also install on-ground arrays including the 10 megawatt array near Boulder City, Nevada, which is the largest thin film solar PV plant in North America. Amazingly, this array, some of which is pictured above, was constructed in less than six months.

[www.firstsolar.com](http://www.firstsolar.com)

### NREL sets thin film record

Researchers at the US Department of Energy's National Renewable Energy Laboratory (NREL) have moved a lot closer to creating a thin-film solar cell that can compete with the efficiency of the more common silicon-based solar cell. The copper indium gallium diselenide (CIGS) thin-film solar cell recently reached 19.9% efficiency in testing at the lab, setting a new world record.

Multicrystalline silicon-based solar cells have shown efficiencies as high as 20.3%. Researchers were able to set this new thin-film record because of improvements in the quality of the material applied during the manufacturing process, which boosts the power output from the cell according to NREL.

[RenewableEnergyWorld.com](http://RenewableEnergyWorld.com)



**ATA undertaking research into sustainable solutions for your home for over 25 years**

### Safe use of greywater

ATA has been conducting research on safe greywater use in the garden including which soaps and shampoos to use and the long-term effects of greywater on soils.

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# Letters

## From Collyn Rivers regarding ReNew 106

My letter (pg 14/16 *ReNew* 106) stressed that packaged solar systems produce 20-30% less power than generally claimed. *ReNew* (unexpectedly) added a comment that partly explained *why* such product does this, but tacitly implying this somehow *justifies* the shortfall.

I argue that a product claiming quantified attributes must deliver those attributes. One does not expect a '1000 ml' bottle of Scotch to contain 700-800mL—and then be solaced by Drinkers Monthly advising 'it's because bottles shrink when filled'. As my article 'Double Standards' (in this issue, page 61) explains, solar modules and systems short-deliver by not dissimilar amounts.

*ReNew*'s comment in effect noted: 'Collyn's right about systems producing less than claimed, but we need to explain to him that the 13-15 volts etc required to charge 12 volt batteries causes losses'. I appreciate the intent—but I knew that 65 years ago.

Marketing for solar modules invariably quotes the product's voltage and output (in watts) e.g., '12 volt, 100 watts' but not that the latter is unachievable in real life.

As my article 'Double Standards' in this issue (and my latest book, *Solar Success*) explains, power mismatch is just one of various discrepancies that sepa-

rate solar marketing and solar reality. Power loss through heat is another. But it's mostly about rating methods.

With respect to a much appreciated magazine, *ReNew*'s response simply parroted industry attempts to justify *why* product is promoted as delivering output the industry itself accepts it doesn't. I respectfully suggest the first part of *ReNew*'s response could be perceived as being from industry PR—not from a reliable and respected independent publication seeking to inform.

In effect the industry says: 'We *know* our advertised 1000mL bottle only contains 700mL or so (of 'battery' Scotch), and 800mL or so (of 'grid-connect' Scotch). We do this for reasons you peasants are not likely to understand. If you really need to know, it's all in our technical literature—and readily understandable—as long as you can read Sanskrit.'

Let me say it again please—preferably without comment.

Solar systems promoted as developing (say) 1kW do not produce 1kW. If they have battery backup they produce about 700 watts. If they are grid-connect they produce a bit over 800 watts. No amount of industry or editorial spin can explain this away.

**Collyn Rivers**

Successful Solar Books  
Broome WA

## More on battery lifespans

Re Evelynne Wagon's battery question in *ReNew* 106, I would like to add a comment to Lance's offering on batteries.

I lived with battery systems for some years, I had a renewable energy business for 12 years and then taught renewables at Swinburne TAFE for six years.

I installed a 48 volt system using the BP 2P batteries like the ones Evelynne has. I had trouble with the BP regulator. It was not adjusted and the batteries were always flat, until I got an electronics engineer in to set it up properly. I was not impressed at this from BP, it was a very expensive regulator. The batteries lasted

for 13 years after that. I would suggest you check your regulator.

I would also add a few things to what Lance said:

Yes, depth of discharge is important, but I suspect more important is the rate of discharge and recharge. I saw many people put small battery banks onto systems and they lasted only a few months. Ten percent of capacity is the maximum discharge I would encourage. A 1000 ampere-hour battery means a maximum discharge rate of 100 amps—preferably less. Your batteries appear to be of large capacity, so hopefully this is not an issue.

The recharging of the batteries at too high a rate can also kill them. Again I'd suggest a 10% maximum when they are down in charge, but as they approach full charge (say 85%) the rate must decrease. Lance alluded to this by saying not to give too much of an equalizing charge.

If batteries are left discharged for long (as can occur in winter) this also has an adverse effect. One cell will fall over first, and then slowly others will follow. This is exactly what has happened for you and is totally normal. Once one or two go it is not worth mucking round with the bank any more. They need to be replaced.

I had good success with traction batteries, used for fork lift trucks.

**Andrew Blair**  
Healesville VIC

## Solar hot water

I have just read your issue 106 and would contribute the following:

Regarding solar water heating, I have evaluated and used solar water heating about 25 years ago and whilst applauding the benefits most exposed by advertisers it was clear that two issues needed addressing.

The first was wasted booster energy. I was a pioneer in using instant heating to add energy on demand. This proved to dramatically reduce booster energy input cost. The prototype used at that time was a three-phase powered instant

### Write to us!

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heater that was temperature controlled at the output. The operating temperature was set to 65°C and therefore energy was only added if the solar system temperature dropped below that value.

My prototype never got to the production stage in that it was conceived that a gas instant heater configuration would be better and additionally three-phase power to households was being discouraged. Today the temperature controlled gas instant heater is readily available.

Next is the excessive solar temperatures or wasted solar energy.

It is very common here in Western Australia to have much more hot water than required during summer, generating excessive temperatures with low consumption or whilst absent on holidays. Some people resort to blinds to intercept the solar energy.

The article written by Chris Mills on using solar hot water well may be fine for those on a very low budget, but switching the booster according to weather or time of day is not practical for most. Better solutions are:

- The instantaneous booster for those with more funds.
- For lower budgets, the addition of a simple timer set to switch on the booster for a period at the end of the day when solar energy input is low and the cycle completing before the evening showers etc. Typically, initiating a 1.5hr heating timeslot prior to the expected use, heating will terminate either via the storage thermostat or the time limit. This method is a simplified top up mechanism prior to demand that leaves the storage tank depleted to gather solar energy next day. If high hot water consumption is in the early morning the timer can be set accordingly and may additionally benefit from the use of 'off peak' power.

Additional saving is available by setting the in-tank solar booster thermostat to a lower temperature e.g. 60°C.

**David Chambers**  
davmax@aapt.net.au

## Simple SHW savings

An idea perhaps someone could explore, it could be already done, I don't know.

In our house most of the hot water is used in the evening with showers etc. Solar hot water systems with an electric booster, having used the heat collected during the day, spend half the night heating the water up again, just in time for the sun to come up. I haven't got around to setting it up yet but if you put the booster element on a timer, say coming on at 3pm and going off at 7pm, if you hadn't collected enough heat through the day the element would come on to give you a nice warm shower. Then if the next day is a hot one, the element doesn't come on again until the day after that.

**Terry Brown**  
twoshedsb@bigpond.com

## Rebates and RECs

It was astounding that we could have a solar panel rebate scheme where good people honestly believed they were doing good for the environment by putting them on their roof, and they were given \$8000 of taxpayers money because it supposedly was, and it wasn't because the deal in most cases included them selling their RECs to allow polluters to produce as much extra CO<sub>2</sub> as the solar panels saved.

So how much more astounding and outright disgraceful it is that that scheme is replaced with one that results in polluters being able to produce five times as much extra CO<sub>2</sub> as the panels save—you reduce CO<sub>2</sub> emissions by a tonne and a half each year and they get RECs that enable them to produce an extra seven and a half tonnes—and no one criticises that.

Clearly the mainstream green movement is more interested in preserving the image of things like solar power than actually saving the planet.

**Gordon Drennan**  
Burton SA

## Paint makes a difference!

Thanks for your recent article in *ReNew 106* on insulation. It can be an ever so important and yet invisible part of retrofitting or designing a residential house or commercial building to make it more comfortable and energy efficient.

I wanted to say that I am a bit surprised that the subject of paint was not brought up as a way of improving the insulation properties to a dwelling.

If I may refer to my experience with paint when wanting to make an improvement to the heat transfer rate of my concrete tiled, brick/timber veneered 30-year-old Brisbane bungalow. The biggest heat transfer, apart from through the windows during the summer, was coming through the roof. Six inch fibreglass batts were already in the ceiling when I bought the house in 2000.

Measuring the inside temperature of the house and comparing it to that outside in the shade, it worked out that there was a 4°C difference with the windows shut at about 10 in the morning. This was maintained until about noon when it gradually reduced to zero at about 1pm. In order to economically address this heating problem without lifting the roof, after some deliberation, I decided to get the roof painted with an 'off white' colour paint called 'Insultec'. It was claimed that with this product, my heat transfer rate would be even more reduced.

Sure enough, the 4°C difference that I measured originally had increased to over 8°C. The time lag for the heat to transfer through the ceiling was extended enough so that I could open up the windows to capture the mid-afternoon south or north-easterly breezes to cool the house down again.

I have been very happy with the performance and believe that some paints in the market may qualify as another solution for insulating a building.

**Otto Lechner**  
ottol@gil.com.au



# Letters

## Remote power sockets

*ReNew 105* made numerous suggestions for switching off electrical items at the wall so as to avoid the power usage in standby mode. I think you could have mentioned the remote control sockets which can be bought in Dick Smith Electronics and elsewhere (made by Jackson). They're ideal for sockets that are hard to get to and are not very expensive. They are RF (radio frequency) so don't need line-of-sight like an infra-red device. I have one controlling the power board that has my TV, video hifi etc plugged into it. One remote can control five sockets. I bought two sockets but haven't found a use for the second yet! Aldi recently sold a package of several. Perfect for a solar system, where standby power may be draining your batteries needlessly.

Another idea is electronic seven-day timers. Set them to switch off the power at times or days you know the items won't be used, such as nighttime for TV and home theatre systems or computers. It won't save as much power, but if the power board isn't reachable it's better than nothing. The power draw of these devices (timer or remote control switch) is presumably very low. Electronic timers can be as little as \$10 each.

An issue that annoys me is my solar heat pump hot water system. During winter I regularly hear it switch on at night, which is well below zero where I live. They are far more efficient at higher ambient temperatures, so I wonder about getting a timer wired in that stops it coming on at night so it will only come on later in the day when the ambient temperature is higher. (A thermostat would work well too, but is more complex and also would prevent it coming on at all on a cold day.)

I doubt this will have much effect on the temperature of the water when I want it in the morning for a shower. The heat pump's tank is much larger than the electric storage system I replaced (which is a drawback, as it means I'm heating far more water than I need—I didn't think of that when purchasing



## Simple solar panel mounting

I would like to share my low-tech solution to the problem of fixing two 85 watt PV panels to the roof of my carport. I bought two 1200 x 2000mm sheets of galvanised wire mesh (for \$28 each) and had the supplier bend them to a 45 degree angle (to compensate for a 10 degree fall of the roof in the 'wrong' direction) and then tack-weld the rest of the sheet across the back. The total damage was \$121. Contrast this with the almost \$700 I was quoted for a few proprietary aluminium profiles and fasteners! Tomorrow I'm going to affix the panels, and fasten the lot to the roof.

**LM Huesch**

[lutz.huesch@gmail.com](mailto:lutz.huesch@gmail.com)

it). Unfortunately this is a job for an electrician, so has been added to 'the list'. I presume a central heating timer device will do the job.

**Peter Marshall**

Captains Flat NSW

## Grid connect issues

Six years ago we purchased a grid-interactive solar system (cost \$22,000 minus a \$7000 rebate, hence it cost \$15,000).

My electricity supplier provided the five 300 watt panels and the 2500 watt inverter, and their contractor installed the system.

Eleven months ago the inverter part of the system failed. The contractor was unable to detect the fault. After a delay the inverter was sent to South Australia where the technicians trained to work on this type of inverter decided it was not repairable. Note the inverter manual quoted a 12 month guarantee and a 20 year life span.

Negotiations continued with me calling my electricity supplier weekly. It

took 11 months and \$2500 of my own money to pay for a new inverter in the end. Their contractor took \$500 off the price because I think he felt sorry for me. The inverter is a 1500 watt model, 1000 watt less than my original inverter.

The only compensation for 11 months of non-production of power back into the grid was an average of previous years' generation deducted from my power bill.

The warning I would like to give to others is to check the written guarantee and don't rely on large companies to do the right thing.

**Adrian Thomas**

Glenlyon

## Eco Kettle in Australia

Page 80 of *ReNew 105* stated an Australian vendor of the Eco Kettle was unknown. In fact, Neco sells them, see their website at [www.neco.com.au](http://www.neco.com.au)

**David Cooper**

[davemarg@internode.on.net](mailto:davemarg@internode.on.net)



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# Insulating renters

Write to *ReNew* and tell us what you did to insulate your rental house.

**AFTER A LONG** hot summer, which is slowly turning towards the cool days of winter, many tenants are simply dreaming of the day they live in an insulated house. Insulation decreases the need for artificial cooling or heating and thereby cuts power bills and greenhouse gas emissions. It could also mean a better night's sleep under a roof that's had some buffer from the sun all day.

Negotiating non-essential changes to a rental property can be a hard task though, so much so that some tenants just don't bother trying. Sustainable improvements are at the bottom of the list for some landlords compared to urgent matters such as a leaky roof. Asking for

these changes via a real estate agent can also be tricky for those who don't know their landlord.

Even the government is backing insulation these days with more financial incentives as part of its plans to stimulate the economy. The Energy Efficient Homes package announced in January offers up to \$1600 worth of free insulation in owner-occupied properties and a rebate up to \$1600 for homeowners who install solar hot water. But did you know that up to \$1000 is available to landlords who install insulation in a rental property?

This \$1000 rebate is available now and replaces the \$500 federal rebate for insulation in rental houses. Uptake in the past has been low.

With a higher rebate available to landlords, will this give the rebate the fillip it needs and encourage more people to install insulation in rental homes?

In an attempt to open the lines of communication between landlords and tenants, we want renters to send us their anecdotes on how they went about getting insulation installed. Write to *Re-*



*New* magazine and tell us how you successfully negotiated with your landlord to get insulation installed at home. Did you write a letter, offer to cover extra expenses ... what worked for you? What problems did you encounter on the way and how were they fixed? Or if you are a landlord tell us what made you take the step to insulate your rental property. Did your tenants twist your arm, or was it entirely voluntary?

Email your tips and anecdotes of no more than 300 words to [renew@ata.org.au](mailto:renew@ata.org.au). We'll publish a selection in future issues of *ReNew* in a bid to find out what works for landlord and tenant when insulating rental properties. Share your insulation story so that others can see how it's done! ✱

## Energy Efficient Homes package

- Free ceiling insulation worth up to \$1,600 to all Australian home owner-occupiers of currently uninsulated homes; or
- A \$1,600 rebate on the costs of installing solar hot water systems at owner-occupied homes
- A rebate for landlords on the costs of insulating their rental properties (up to \$1000 available).

## New guide for renters!

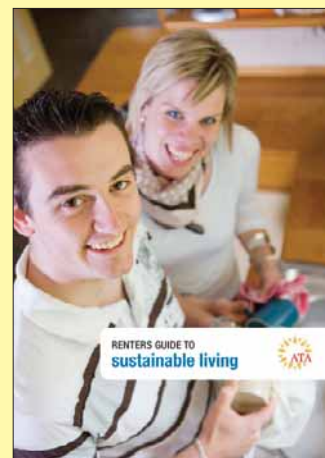
Even renters can make changes to their home to make it more comfortable, save money and reduce their environmental impact. The *Renters Guide to Sustainable Living*, published by the Alternative Technology Association, shows how it's done. The 16 page booklet is a free resource for anyone looking to lighten their carbon footprint as a tenant.

The booklet also has handy information about how to negotiate changes with a landlord, rebates available as well as eligible tax deductions. There are tips for the whole

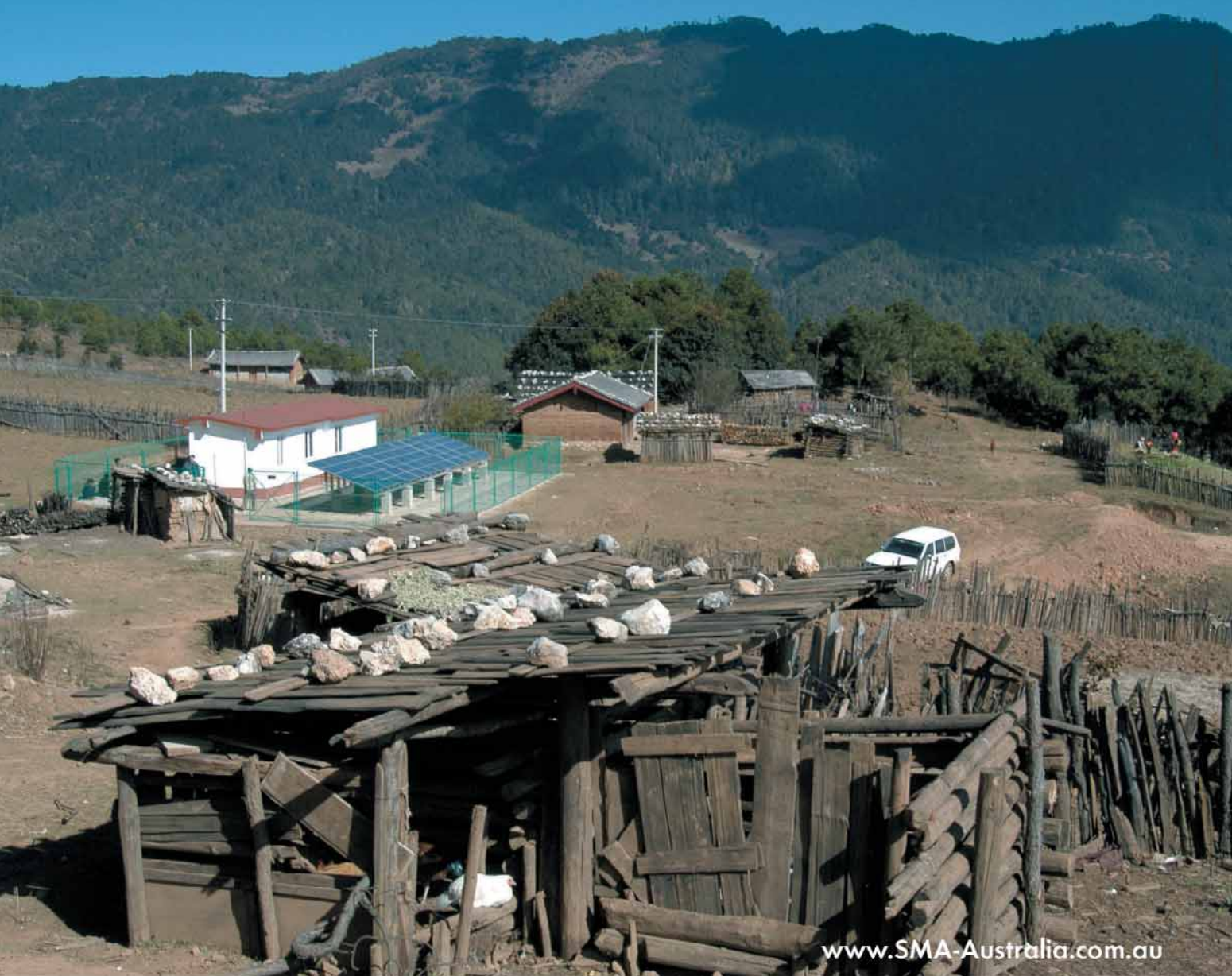
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The guide was funded by the Department of Environment, Water, Heritage and the Arts Green Loans Program.







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The Future of Solar Technology





# Making the most of our water

Simon Sykes explains how his multiple water gathering and recycling systems keep his gardens, stock and house supplied with water all year.

**W**e live on a small rural block (40 acres) just outside Canberra. We have no mains water supply so have to provide our own water and sewage treatment. Needless to say, we have to make the most of the water we've got. Rainwater is collected from the roof of our house and shed (about 450m<sup>2</sup> in total) and stored in a large concrete tank for household use. We also have two small dams that we hope to harvest water from one day and a council-approved aerobic system for sewage treatment.

To make the most of our water we implemented three water systems around the house: one for potable water, one for reclaimed water and a third, using the dam water, for stock watering and irrigation. This is the story of the evolution of these three systems with all of the work done by us.

## Potable water

The potable water system captures rainwater from the roof of the house and shed in a 90,000 litre concrete tank. This is the minimum tank size required by council regulations. Water is supplied to the house by a small pressure pump next to the concrete tank.

Not long after we moved in we experienced a number of very inconvenient power outages and decided we needed a water supply that did not require electricity to operate. The hill above the house is high enough to place a header tank, so we installed a 22,000 litre poly tank there for potable water, enough to meet household requirements for a couple of months. The added advantage of this set-up is that if something goes wrong with one tank, we can rely on



Photo: Cait Greenup

the other tanks until the problem is fixed.

Initially we used the pressure pump to supply the house from the concrete tank. A check valve in the piping allows the pressure pump to operate normally without overflowing the header tank and also allows the header tank to supply water when the pressure pump is not operating. However, after reading a story in *ReNew* about the electricity used by pressure pumps each time they start just to fill a glass of water, we turned the pressure pump off and now normally operate from the gravity supply. The pressure pump only gets turned on once every couple of months to fill the header tank.

## Reclaimed water

With the only source of water for our house and garden being rainwater, water reuse was an important consideration in our house design. We considered separating and recycling the household

greywater, however, while reading the Department of Health accreditation certificate for the Aerated Water Treatment System (AWTS) proposed by our builder, we discovered that the water discharged from an AWTS can be applied safely on most plants. The discharge from an AWTS can't be applied to parts of plants intended for human consumption, such as leaf and root vegetables, but it can be applied to the root zone of fruit trees. All the water from the house could be reused just by storing the treated water from the AWTS and distributing it to the appropriate gardens.

Our AWTS treats the combined grey and blackwater from our house. It is a buried concrete tank with four internal chambers and uses chlorine tablets to sterilise the treated water before it is discharged above the ground through four 'rose' sprinklers. This is a common style of water treatment system and cost approximately \$5000 in 2002.

In anticipation of being able to store the treated water, we asked the AWTS manufacturer to install a 'hi-lift' discharge pump that could be used to pump the water to the highest point on our property.

To store the reclaimed water and act as a header tank for the reclaimed water system, we installed a 5000 litre poly tank on top of the hill. Excess reclaimed water is discharged through the original rose sprinklers into a stock paddock.

The water in the header tank is circulated using a submersible 12 volt pump and a length of flexible pipe with the end held approximately 100mm above the surface of the water by an old plastic milk container. The surface disturbance ensures the water remains oxygenated so there is no buildup of anaerobic bacteria and the associated smells. The pump is powered by a 10 watt photovoltaic module on top of the tank and a mini-maximiser from the Alternative Technology Association. Due to the tank's distance

from the house this proved much cheaper than running an electric cable to the tank. It was also our first foray into using photovoltaic technology. We now consider solar for any permanent low-power system that is a significant distance from the house, such as the light in the small shed.

The original circulation pump was a cheap bilge pump for a boat, which cost \$35. Unfortunately this lasted only 18 months before the bearings wore out. A search for a longer life pump identified a brushless magnetically coupled pump with an expected life of 50,000 hours (March Pumps model 893-09). While the new pump was 10 times the cost of the bilge pump, it is likely to last for 20 or more years.

The design of an AWTS has to be registered with the NSW Department of Health and council approval is needed to store treated water for reuse. A couple of forms, \$55 and a small amount of processing time saw the proposed de-

sign approved by the local council who consulted the Department of Health in the process.

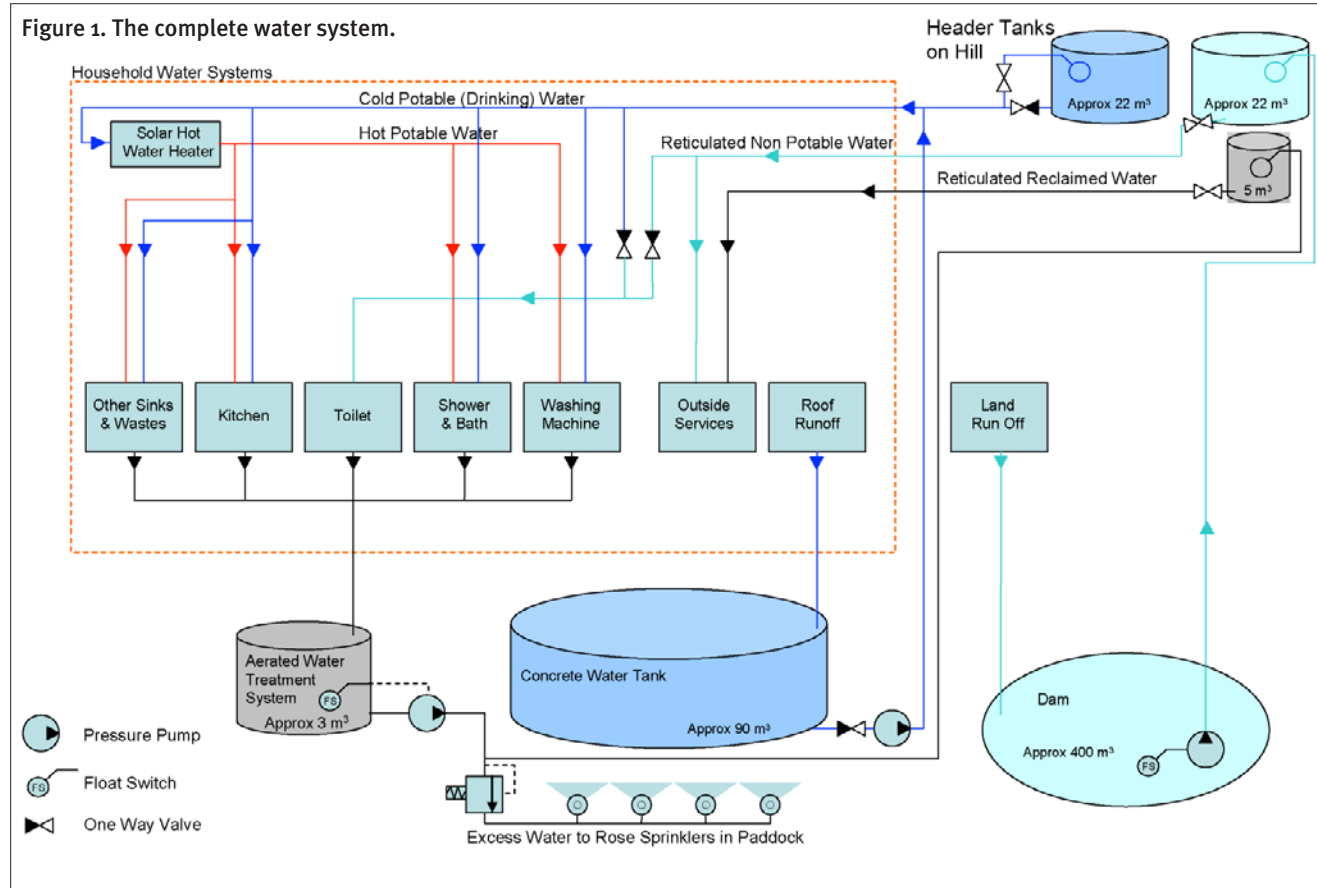
The header tank receives 2000 to 3000 litres of water per week—more than enough for our current gardens. We use low-phosphorus detergents in the washing machine and dishwasher and have used the reclaimed water on our fruit trees, native trees and shrubs over long periods with no detrimental effect.

One drawback with the current system is that we have to defer reclaimed water to a stock paddock in winter when the garden requirement is very low. This would also be a problem on a small property if there was insufficient ground to absorb the water. We are considering installing a larger reclaimed water tank to store this water from winter for use in summer.

## Dam water

The third water system will eventually

Figure 1. The complete water system.





use water harvested from a dam for gardens and stock watering. Another 22,000 litre header tank is located on the hill to supply this system. However, the current drought has not seen the water level in the dams rise to a point where water could be harvested. We currently fill this tank from the concrete potable water tank.

## Plumbing

One of the things that makes projects like these easy to complete is poly pipe. Poly pipe can be cut with a sharp knife or a fine tooth hacksaw. Compression fittings used to terminate the pipes can be tightened by hand. Lots of teflon tape and a couple of small plumbers wrenches are all that is required to make fittings.

Unfortunately there is usually a lot of digging required with plumbing. For the larger jobs we have hired a trench digger but even this type of machine does not cut through rocks so sometimes the old fashioned method involving a crow bar and shovel is required. You just have to get used to the idea of expending lots of energy digging holes to bury valuable things. Dogs seem to enjoy it.

Separate distribution systems are used for the three types of water. Potable water is only supplied to the inside of the house. Reclaimed water is supplied to an orchard with 25 fruit trees and to ornamental gardens and all the taps are labelled to warn people not to



Header tanks on the hill provide plenty of water pressure.

drink the reclaimed water. Dam water is supplied to all gardens (including vegetable and herb gardens) and is also available for stock watering.

## Irrigation systems

Our latest projects have involved installing automatic irrigation systems. All permanent plants that need regular watering have timer-operated drip systems. Drippers operate quite successfully in low pressure systems like ours, being only susceptible to clogging with foreign matter. Strainers are recommended to minimise this. We use a combination of battery-operated tap-connected timers and integrated solenoid valves. The battery-operated timers need to be protected from frost.

## Water usage

We have been living here for nearly seven years and supply the house, a modest vegetable garden, the orchard and an ornamental garden with rainwater from the roofs.

It was only during the 2006/2007 summer when the rainfall was less than half of the long-term average that we had to buy in water. During this period we traded in our old top-loading washing machine for a new front-loading model. The water usage in the house has dropped noticeably since, although with less water used there is also less to reclaim for gardens. At this time we were also looking after a dozen cows for some friends, which we now understand drink a lot of water. \*

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# Soaps, shampoos and soil

Hard soap is out and bodywash is in when it comes to greywater in the garden. A report about the impact of bathroom products on soil shows why.

**G**reywater use has become so widespread in many parts of Australia that it is now more a case of who isn't using greywater to keep their gardens alive. This is great news for water conservation efforts. Greywater use is not an exact science, though, and successful greywater irrigation depends on a number of factors including soil type, plant type and ultimately which chemicals and elements make up your greywater.

Typically, laundry and bathroom water are the most common and safest waste waters to use depending on which products you are using. Thanks to Robert Patterson of Lanfax Laboratories ([www.lanfaxlabs.com.au](http://www.lanfaxlabs.com.au)) and his independent study of laundry detergents we have a better idea of which laundry products are safe for greywater irrigation (see report in *ReNew* 98). This data has been a valuable resource over the years for people using laundry water to irrigate their gardens, yet there has been a need for similar studies for bathroom products.

With this in mind, the Alternative Technology Association, in conjunction with Associate Professor Barry Meehan and RMIT University's Environmental Science Department, set about filling this information gap. The plan was to analyse typical ingredients in a number of bathroom products and assess the potential impact on soils.

## Choosing products to test

The Alternative Technology Association (ATA) conducted a member survey last year about the types of bathroom products used in households.

The survey identified the most popular products in four categories: sham-

poos, conditioners, solid soaps and bodywashes. Within these categories a further distinction was made according to whether the product was mainstream, generic or 'eco friendly'.

All of the 44 products tested in this study were brands identified by ATA members who were watering their gardens with bathroom greywater. Product samples used in this study were provided by the ATA.

## Testing

Simulated shower greywater solutions were prepared for each product. The solutions were subject to chemical analysis (pH, electrical conductivity, sodium, potassium and phosphorous) and used to test their effects on soil stability. For the soil test, solutions of 0.5g of product in 200mL of tap water were used: this concentration was considered to be the worst case scenario and represented the higher concentrations of products that could be discharged during use. A more dilute solution was used in the chemical testing.

Soil stability tests were conducted on

three different soil types to see the impact that each product might have on soil structure in particular, to determine whether the soils would disperse or slake when in contact with bathroom greywater. Soils containing high proportions of sodium tend to readily disperse when in contact with water. Dispersion affects drainage and causes erosion and crusting.

The three soils were light, medium and heavy textured soils typical of many parts of Melbourne. Soil types included a loamy-sand, a clay-loam and a heavy clay soil. Simulated bathroom greywater solutions, plus a plain tap water control were applied to petri dishes containing small soil aggregates (approx 2 to 5mm) and the effects recorded over a 72 hour period.

The test solutions were photographed and observed at various time intervals after the greywater solution and water control was applied.

## Results

The greywater solutions and plain water had very little impact on the medi-



um and heavy textured soils except when solid soaps were used. The light-textured sandy soil showed slight dispersion after 24 hours with many of the products except with the mainstream body washes and all of the conditioners. One of the organic body washes caused slight dispersion of the medium textured soil after 30 minutes. With the exception of one mainstream hard soap, all of the hard soaps caused extensive dispersion after 24 hours.

## The right products

Previous studies show that using the right products is critical when irrigating with greywater. This study reinforces that point. It also highlights that the effect of greywater on soil will vary greatly depending on the type and health of the soil. Physical tests showed clearly that most hard soaps produced greywater that is likely to damage soil structure due to generally high levels of sodium. This was particularly evident in heavy textured soils and soils with weak structure.

In contrast the majority of body washes had low sodium content and showed minimal dispersion, making this the pre-



Photo: www.rubishtreeyear.co.nz

ferred soap to use. Equally, most of the shampoos and conditioners had minimal dispersion, except where high levels of sodium were present. When choosing shampoos and conditioners choose products with low to no sodium levels.

Considerably more research needs to be undertaken on a much larger range of products. This enables informed advice on a range of product types and the receiving soils, particularly looking into the long-term accumulation of salts

and some trace elements such as zinc and boron. \*

**A full copy of the report can be downloaded from [www.ata.org.au](http://www.ata.org.au)**

**The Alternative Technology Association would like to thank Associate Professor Barry Meehan and RMIT University's Environmental Science Department. This is Adam Maxey's swansong project at the ATA. Adam has been the ATA's Water Policy Manager for over two years.**

## Bathroom products and your soil—observations

- Most of the hard soaps tested produced high pH greywater which over time could be damaging to plants and soil.
- The sodium level of all the hard soap products is very high and poses a 'sodium hazard' to clay soils over time. This is supported by the soil stability results which showed that most of the hard soaps caused extensive dispersion of all the soils tested, eventually leading to poor drainage and possible water logging
- Body washes appeared to pose no long-term problems associated with soil pH. They showed less dispersion than tap water after a 24-hour period. This could be due to the presence of surfactants, similar to those in 'wetting agents'.

- The sodium level of most of the body washes was relatively low indicating that these products should be used in preference to hard soaps, with the products with lower sodium content being preferred.
- Most of the conditioners produced low pH greywater. As these products are used in conjunction with shampoos with slightly higher overall pH, using these products would be unlikely to alter soil pH.
- The sodium level of most shampoos and conditioners was low, although the long-term effects of some shampoos would need to be investigated further. Low sodium content greywater can still cause long-term problems if the levels of other cations such as calcium and magnesium are low. This also applies

to the body washes.

- The levels of potassium in most products appear to provide a source of potassic fertiliser and not pose any long-term problems associated with nutrient build up.
- The level of zinc in one of the hard soaps could pose long-term problems of zinc accumulation in the receiving soil. Avoid products containing zinc.
- Most of the products tested produced greywater with low phosphorus levels, although one mainstream shampoo with extremely high phosphorus levels could potentially pose long-term problems to plant health.
- There was no indication that products listed as eco-friendly were more suitable for greywater irrigation systems than mainstream products.



# Sealand: A nation powered by wind turbines

One small nation, two wind turbines, and all the electricity they need. Cat O'Donovan reports on the world's first 100% renewable nation.

One nation is excelling above all others in the race to reduce emissions. Whilst other countries struggle to produce more of their electricity from renewable sources, the Principality of Sealand is nautical miles ahead of the pack.

'But I've never heard of Sealand!' I hear you exclaim. It's not surprising really, considering the entire population of the concrete island could fit on a small bus. How did such a peculiar principality come into being?

## A new state is born

The story begins in 1942, during World War 2, when numerous military bases were constructed in the North Sea. British troops were shipped to these isolated outposts to serve as a first line of defence against German air raids. After World War 2, the offshore bases became redundant and their military inhabitants returned home to England.

One of these abandoned bases was HM Fort Roughs, a steel and concrete construction seven miles off the east coast of the UK. Until 1987, the UK's jurisdiction extended only three miles from shore, meaning that Roughs was technically in international waters between the UK and continental Europe.

The military would later regret overlooking this technicality. The placement of Fort Roughs outside UK jurisdiction was a military blunder that reached the headlines in 1967. Former English major Paddy Roy Bates moved his family to the derelict fort and declared himself Prince of a brand new independent state,



Photo: [www.portaldascuriosidades.com/forum/index.php?topic=50052.0](http://www.portaldascuriosidades.com/forum/index.php?topic=50052.0)

**Self-sufficient: the Principality of Sealand runs entirely on wind power.**

later named the Principality of Sealand.

## Electricity generation

A principality surrounded by sea needs its own source of electricity. For several decades, a diesel-powered generator powered the domestic needs of Sealand's 15 to 20 semi-permanent residents.

But when a fire ripped through the fort in 2006 the generator was badly damaged. Instead of buying a replacement, Prince Roy saw this as an opportunity to take a step towards a more environmentally

friendly Sealand. He began to explore alternative sources of electrical power.

Roy turned to the company Church and East for guidance. "Wind is something that Sealand is not short of," explains Tina Harrington, director of Church and East who were responsible for finding and installing Sealand's turbines. But it was not simply a case of picking one up from the nearest retailer.

Micro-wind turbines, designed for small-scale domestic use are not designed for the open sea. The conditions

in Sealand are harsh, with winds often exceeding Storm Force 12, moving over 32 metres per second.

## FuturEnergy

“Initially, we expected to be told that wind turbines were not designed for the wind conditions of the North Sea and that they were for domestic land-based use only,” says Tina. “But FuturEnergy showed a real interest in the project and committed themselves fully to the creation of the perfect wind turbine for our situation.”

Peter Osborne, founder of FuturEnergy, was frustrated at the low performance of micro-turbines that were already on the market. He set himself the challenge of building a high performance small-scale wind turbine that the general public could afford. After the success of FuturEnergy’s 1kW turbines, work is now underway on a series of more powerful turbines.

## Sealand’s turbines

Sealand’s two wind turbines have been generating Sealand’s electricity for over 18 months. The 1kW upwind micro-turbines are mounted on five metre tall masts, towering approximately 29 metres above sea level. With a rotor diameter of 1.8m, each turbine has five blades, at a 25 degree pitch. They are designed to withstand wind gusts of up to 50 metres per second.

The turbine’s start-up wind speed is 2.5 metres per second, with a cut-in wind

**This turbine is designed to withstand wind gusts of up to 50 metres per second.**



speed of 3.2 metres per second. Its rated wind speed is 12.5 metres per second.

The installation did not work straight away. The ferocity of the gusts generated unexpectedly high levels of power, and the turbines needed to be upgraded. After a few modifications, the turbines are now operating at well over their 1kW capacity.

“The turbines provide the sole form of power to our community, relegating the diesel generators to a standby emergency role only, with no diesel purchased for over 12 months,” says Tina.

FuturEnergy’s micro-wind turbine has also been installed on an Arctic ex-

ploration vessel, withstanding temperatures as low as -34°C.

## A wind-powered nation

Sealand’s wind generated electricity is used for lighting, business equipment and domestic appliances. The population’s heating is still produced by wood burning stoves, and bottled gas is still used for cooking.

Nevertheless, Sealand, a state with its own national anthem, flag, currency, and constitution, has become the first state in the world to generate all its electricity from renewable resources. What more could a nation want? \*



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# The great meter reading fiasco

Got grid-connected solar and receiving incorrect bills from your electricity retailer? You're not alone. Matthew Dunk shares his story: the message is persistence pays off.

**T**his week I went onto the roof to read the inverter; it is a week that marks one year of grid-connected solar power. Coincidentally, it is a week that also marks another milestone: our first *accurate* power bill since installing the system.

I guess that every person who installs a grid-connected PV system can hardly wait for that first power bill. Probably, like us, they have no idea what exactly to expect—anything from dreams of a bill so much in credit that the system will pay itself off in a year, to a mild dread that they have missed something critical and the total saving will be less than ten cents.

What I am sure about, though, is that none of them would expect the bill to be higher than usual.

Last March I opened the mailbox and saw what we'd been eagerly waiting for: our first power bill since the installation. Here it was, the first pay-off for our sacrifices. There had been no big holiday and a leaner than usual Christmas—all in anticipation of a lower power bill and the pleasant sense of *doing* something about global warming; something more than just changing the light globes and unplugging recalcitrant appliances.

## This doesn't look right

I opened the bill and went straight to the total. I read it again. That's not right, is it? I turned it over and read the next page, looking for the supporting figures. There were multiple rates for the time of year, pro rata based on the number of billing days plus a couple of new entries: the feed-in figures and two more lines, with more numbers the same as



Photo: Matthew Dunk

the feed-in figures. Actually, there were numbers everywhere and for the first time in my life I was unable to read my electricity bill. But I could read the total, and it had gone up.

In desperation, I looked at the daily-use figure and saw that we had actually used *more* than usual for this time of year. Okay, that was unexpected, but we had endured a 16-day heatwave and, after three days, I had given up and plugged in our little window-mounted air-conditioner. It must have used a lot more power than expected! Imagine what the bill would have been like if we didn't have the solar panels! A little disappointed, we redoubled our efforts at saving power around the house and paid the bill on the due date.

In June, the next bill arrived. I opened it and, again, the total was higher than the same time last year, again with pages of totally indecipherable numbers and the feed-in numbers appearing twice. There had been no heatwave during that

bill and the air-conditioner was back in the shed collecting dust. Something was not right with the bill, I was sure of it now. This time I decided to find out what all the figures meant.

I called our electricity retailer and pushed the numbers for billing: "Hello, I would just like someone to explain my power bill to me before I pay it."

They said that someone would call to discuss it within four weeks and suggested that I might like to pay my bill now to avoid a late payment fee.

The due date was more than four weeks away, so I decided to take a chance and wait to see if someone would call me.

No one called.

I paid the bill on the due date, but I was not happy about it. Reading it carefully, it looked as if, under one line on the bill, we were being credited for the power we had generated, and then, under another line, being billed right back for it.

Power bills can be hard to read. There is always a rate change in the billing

period; sometimes it's a winter-summer rate change, other times it's a rate increase. Then there are different rates based on the quantity used: the first number of kilowatt-hours at rate A, the next at rate B. Looking at the bill, the mysterious extra amount seemed to be adding itself to rate B (the higher rate) and pushing the bill higher than usual by negating the buyback amount that (at the time) was significantly less than the low rate. All these double-ups meant the bill figures ran to something like 20 lines of numbers.

## Taking it further

Two weeks after paying the bill I was still waiting on a call from our retailer. I received an email from the Alternative Technology Association (ATA); it was a survey, asking people to share their experiences of the photovoltaic buy-back scheme. I filled out the survey and included a remark about the confusion with my power bill. The ATA contacted me straight away and told me to get in touch with my local energy industry ombudsman (in South Australia EIOSA) and explain my case. The ATA had heard of similar cases and said there was probably a mistake with the bill.

Following their advice I contacted EIOSA by phone and after hearing me out they said they would contact the retailer for me. After the mandatory 20 working days, I had not been contacted by my electricity retailer, so I called them. I was put through to the person who was handling my 'case'. She told me the matter had been investigated, the bill found to be correct and the matter closed. I asked her to help me read the bill and she reiterated that the bill was correct and that if I had further concerns I would have to contact EIOSA.

I was told by EIOSA that I could request another reading of the meter to clarify things. They made the request to the retailer on my behalf. Another 20 working days passed and I was contacted again, this time by EIOSA. They told

me that the retailer had organised a new meter reading, that the reading was correct and that the extra amount was for off-peak use. There was no supporting documentation for any of this from the retailer, just statements of 'fact'.

I must admit at this point I was tempted to give in. Everyone was telling me the bill was correct, although nobody was willing to discuss the actual figures on the bill.

I was fairly sure I could see what was wrong: the retailer was putting the numbers from the feed-in meter into a non-existent off-peak meter register. I took a different approach: I rang ETSA, South Australia's primary electricity retailer, and asked them to explain how to read the meter. (Here's a tip: don't ring ETSA and tell them you are in a protracted dispute with your retailer about a power bill. You can imagine them ducking for cover on hearing that. Try this instead: call ETSA and tell them how thrilled you are with your new meter and you'd just love to know how it works so that you can see how much power you are generating.)

ETSA were terrific and after five minutes of instruction I knew all there was to know about reading the meter. And, no, there was no off-peak service on the meter—they could tell me that from the programming code it was displaying.

I went back to EIOSA to request another meter reading but this time I asked that I be present for the reading. EIOSA made the request to the retailer and another 20 working days elapsed without contact. By now it was September and I contacted EIOSA to tell them that the mandated time had passed without a response. Within two days ETSA called. They would read the meter the following morning. I took the morning off work and I stood beside the meter reader as he read it. He agreed there was no off-peak service on the meter. He also showed me the records of previous readings, and there was no record of an additional reading. He was

emphatic: if the meter had been read, even for a re-reading, it was recorded in that particular record system.

## Try another retailer

At this point I decided to change my electricity and gas to a new retailer. I can certainly understand and forgive a mistake; I find it harder to forgive poor customer service and follow-up and I simply cannot tolerate what appears to have been a blatant lie about the extra reading.

Now that I could see what was wrong, I just had to convey that to the EIOSA. I put it all in writing, scanned all of the bills, recalculated the amounts (no small job) and put everything in the hands of the EIOSA. It was now mid-September and all I could do was sit back and see what happened next.

As it turned out, not much happened at all.

Another incorrect bill was received from the original retailer in September, which I scanned and sent on to EIOSA.

In early October, there was one email from EIOSA saying they were still working on the matter.

Then, late in October, there was a flurry of activity. It started with a call from my original retailer. This was going to be interesting. It was someone from their customer service team. "Is this about the bill?" I asked. No. They were calling me to find out why I had changed retailers.

I made the reasons pretty clear.

Another bill arrived from my original retailer, this one different from the previous ones: it had no covering letter or explanation; just a new amount, greater than the previous bills and overlapping the period of the new retailer. I scanned it and sent it to EIOSA.

The first bill from my new electricity retailer arrived. It had *exactly* the same billing problem as the original retailer, with the feed-in amount entered as an off-peak usage. I scanned it and sent it to EIOSA. (I was getting quite good at scanning and emailing bills by now.)

Finally, at the end of October, I was



contacted by EIOSA. They were pleased to inform me that my original retailer had agreed that the bills were incorrect and they had waived all outstanding amounts owing as a gesture of goodwill. ETSA were also sending me a cheque as a kind of goodwill gesture for their part in the matter. My new retailer would also be sending me an amended bill for the correct amount.

This was terrific news, and it was nice to share it with the ATA in particular. It turns out to have been a slightly premature celebration. Another month went by and then, in early December, the mail arrived; there were three letters in one day, all relating to my electricity service.

Letter one was from my original retailer explaining that they had investigated my billing query, that they agreed with my assessment and that they were waiving all outstanding amounts (about \$160) as a gesture of goodwill. I was tempted to send them a bill for my work on the matter, based on my standard

hourly rate and see how far that gesture of goodwill really extended.

Letter two was a bill from my original retailer. It ran to about four pages of apparently random numbers each negating the other, except for the final item, which was a total of \$1.47 and was listed as 'sundry charges'. The total of the bill was \$1.47.

Letter three was from my new retailer stating that *they* had noted and fixed a problem in my billing and here was my new bill. This bill, however, had a completely new set of meter readings on it, totally different from the previous set, although at least they were all in the correct places.

### Finally fixed

Back to EIOSA I went. It took a further week or two, but I got confirmation that the \$1.47 could be ignored and that the readings on the second bill from the new retailer were actually correct. (There had been a bit of a mix-up with

the readings on the first bill from the new retailer.) So, finally, here I am with my cheque for \$50 from ETSA, a pleasant note from my new retailer telling me that my power bill is in credit, and, most importantly, a lesson learned: persistence pays!

It took a year to sort it all out. I don't know how many times I doubted myself and was ready to give in. Throughout, the support and advice from Brad Shone at the ATA was invaluable. Brad regularly sent me encouraging emails with articles on the various retailers getting it wrong and having to refund their clients—a kind of modern day battle cry to rally the weary. The EIOSA were helpful, in their way, hearing me out and advising on the next step, but don't expect them to do all the work: you still have to work it out for yourself and be prepared to stick to your guns.

A final tip: when all else fails, remember what Kermit says: 'It isn't easy being green.' Perhaps he knew something! \*

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# The geothermal farmhouse

This pioneering house renovation features a geothermal heat pump, keeping it warm in winter and cool in summer, writes Donald Payne.



The sustainable renovation of this farmhouse includes a direct exchange geothermal heat pump that exchanges heat up to 30 metres below the surface.

**A**fter completing my PhD thesis on plasma and astro physics I sought an activity far from computer screens. The renovation of a farmhouse that has been in the family for decades fitted the bill.

The farm house is just out of Point Lonsdale and Queenscliff on Victoria's Bellarine Peninsula and is now aptly called the Highfields Sustainability Centre. It is perched on a hill on the 80 hectare cattle property, overlooking the heads of Port Phillip Bay, and has been in Dad's side of the family for over 70 years.

In 1936 the

small cottage was converted into a wooden house. In 1967 my grandmother brick-veneered and extended this small house. In 2007 we renovated the house and extended it further by adding a 15-square room to the south end. The new room is presently a glorified living area, with the original house becoming a dormitory section, but is de-

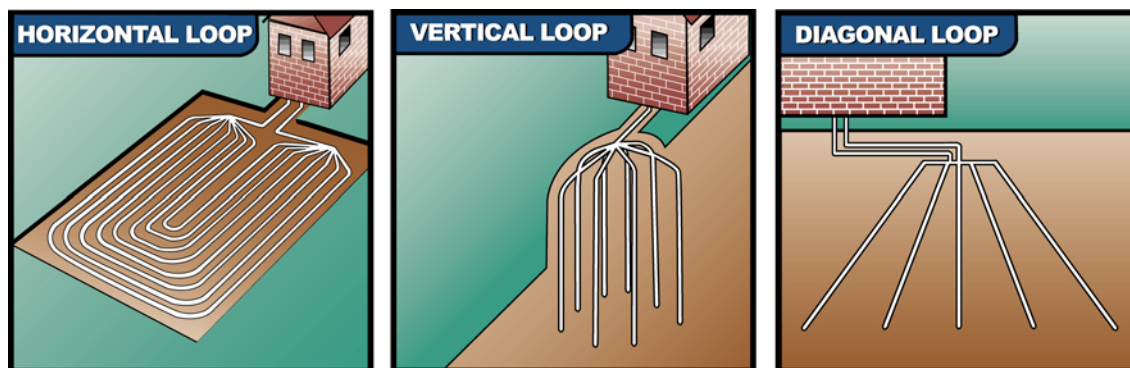
signed with the potential to be used as a function centre. Our vision is for it to be an example of sustainable living for all Australians.

The key innovation of this project is the direct exchange geothermal heat pump for heating and cooling. We installed solar water heating on the old, renovated part of the house prior to realising that geothermal heat pumps can heat water.

Ultimately we aim to have a net zero footprint by incorporating a wind turbine and photovoltaic panels.

## Sustainable renovation

During the renovation and extension care was taken to use sustainable materials. The whole house has been painted with low-lead and low-VOC, bio-friendly paints. Furthermore, an anaerobic septic system, which produces class B water, has been installed. The extension has insulation in the roof, walls and floor and appropriate features for at least a 5-star energy rating—especially with two 22,300 litre water tanks collecting rainwater from the roof of the whole house. A valve was installed



Horizontal pit, vertical and diagonal loop configurations for direct exchange geothermal heat pumps. This project used a diagonal configuration because of the smaller footprint required at the surface. The other configurations are just as viable.

that can divert rainwater to indoor use if needed.

## Geothermal heat pump

I had heard about geothermal heat pumps over five years ago through a colleague in the Department of Mechanical and Manufacturing Engineering at the University of Melbourne. As a physicist, the idea makes simple sense: when it's hot outside, it's cool underground and when it's freezing outside, it's relatively warm underground. It's 12 to 20°C all year round below the frost line, just a metre or two below the surface. Thermodynamics doesn't get much simpler!

When seeking geothermal heat pumps in Australia, initially through my colleague, I found that there were surprisingly few available. The only system I could get quoted on was a water-loop geothermal heat pump which would have involved several hundred metres of trenching or a few 100 metre deep, 150mm wide holes in which polyethylene pipes circulating water/glycol would be inserted.

Looking further, I found a builder and a refrigeration engineer who were bringing a direct exchange geothermal heat pump into Australia which only requires drilling 30 metre deep, 70mm wide holes. Copper loops circulating refrigerant are inserted into these holes and grouted with a thermally conductive grout. The efficiency is enhanced by the refrigerant undergoing a phase change (liquid/gas) under the ground and thus directly transferring the latent heat of vaporisation to/from the ground. The Highfields Sustainability Centre would be the demonstration project for this technology in Australia.

Geothermal heat pumps are used to air condition over a million homes in the US, saving up to 70% of the energy of standard resistance-element heaters. An average house (20 square) requires four 30 metre holes giving 14 kW heating/cooling output. The drilling adds about ten thousand dollars to the cost



**Top:** The diagonal loop configuration used at the homestead. **Bottom:** The installation at the homestead—drilling for heat not oil.

above and beyond conventional air conditioning, but pays for itself in five to ten years depending on usage. Studies of a 4000 house geothermal heat pump installation in Fort Polk, Louisiana, US indicate that energy savings can be 6400kWh per year. For comparison, a 1kW set of photovoltaic panels costs \$10,000 to \$15,000 and saves 1500 to 2000 kWh per year.

## Our installation

The drilling was done in September 2007

and the *Bellarine Echo* and *Geelong Advertiser* were swiftly down to cover it; passers-by thought we were prospecting for oil! The drilling took a couple of weeks to complete. EnergyCore, the company undertaking the project, were just learning drilling techniques then—if it were done now it might only take a couple of days. Some ironstone gave the augers trouble during the drilling but several drill bits and copper loops later they had all the holes complete. The extension was being built at the same time and the



compressor and internal duct work were installed and commissioned just in time for the opening in December 2007. Inside the farmhouse the system looks and acts just like any other air conditioning and heating: there is a thermostat where you set a desired temperature and the system responds to reach this.

## Geothermal action

Since this project I have become actively involved with the Australian Geothermal Energy Group (AGEG), formed to represent both hot-rock geothermal and direct-use geothermal, including geothermal heat pumps. We presented a position paper to Federal Energy Minister Martin Ferguson in February last year, making a strong case for geothermal heat pumps to be included in RECs and rebates. This was followed by a submission to the COAG review on the expanded Mandatory Renewable Energy Target (MRET) and there has been growing interest from both sides of par-



After the renovation: the left side is heated and cooled by direct geoechange.

liament. Geothermal heat pumps could greatly assist Australia in reaching the new clean energy target of 60,000GWh/yr (20% of current energy consumption) by 2020. \*

Dr Donald Payne now works in policy liaison for EnergyCore, the company that carried out this project. At the time of completion in 2007 his main involvement was as a homeowner.

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# Household paint buyers guide

**Paint options leaving you with a headache? Daniel Wurm from GreenPainters explains the options available when it comes to environmentally-friendly paints.**

**I**n some ways painting is a very sustainable thing to do. After all, it preserves and protects buildings and assets from the damaging effects of rain, UV radiation and corrosion. The problem is that some house paints are an environmental hazard, even if they do help building materials last longer.

Regular paints release low level toxic fumes, causing health problems such as headaches and breathing irritation. Painted surfaces can continue 'off gassing' fumes for months after painting. Considering the fact that the average Australian spends over 90% of their time indoors and that indoor air has 1000 times the pollutants of outdoor air, it becomes apparent that attention needs to be paid to the negative contribution of paint to indoor air quality.

There's also the environmental impact. Many Volatile Organic Compounds (VOCs) react in the atmosphere to form ozone. Ozone compounds in the lower atmosphere are smog-producing and as they rise to the upper atmosphere they react again to form greenhouse gases. Building coatings are responsible for 9% of all VOC emissions, so reducing the VOC amount in paints is one way to reduce ozone formation.

The good news is that there are alternatives. This buyers guide aims to show you some ways to brighten your home without damaging your health or that of the planet. There are low VOC products for the same cost as regular paints, or to lower exposure to synthetic chemical off-gassing, invest in paints that include only natural ingredients.



## Painting change

It wasn't until the 1990s that serious consideration was given to the effects paints were having on human health and the environment, although there had been serious concerns prior to this regarding lead content in paint. Solvents, monomers, softening agents and biocides were only some of the components of paints that could cause serious ecological and toxicological effects during their production, manufacture, application, use and ultimate disposal. Painter's Syndrome was identified as a genuine illness that was affecting professional applicators.

Research showed that exposure to chemicals in paints was causing respiratory illness, increased risk of liver and lung cancer and reproductive disorders. Consumers in the European Union started to demand paints made using naturally occurring materials. Legislation in the European Union began to strict-

ly regulate paint ingredients and European manufacturers developed new technologies that drastically cut the levels of VOCs and other toxic chemicals in paints.

## Plant-based paints

Today, plant-based paints account for 9% of all paint sales in Europe. Manufacturers, based mainly in Germany, have found ways of replacing petrochemical binders and solvents with plant-derived ingredients. These paints do not form a plastic film but remain a breathable and waterproof layer on the substrate. This means a house can regulate its moisture content which is a bonus—walls are less prone to mould if they can breathe. This property also leads to less blistering and peeling and less mould means better air quality. Plant-based paints are also anti-static, meaning less dust.

Yet the biggest advantage of plant-based paints is the fact they largely con-

tain renewable resources and, because the ingredients are biodegradable, almost all waste products can be composted. They thereby have the lowest environmental impact of modern paints.

Ingredients in plant-based paints are printed on the label or on a technical datasheet so the user can establish whether allergic reactions are a risk. The ingredients can include linseed and citrus oils and these natural VOCs may cause reactions such as watery eyes or respiratory problems in people sensitive to these substances. They also contain plant resins, finely ground minerals and earth pigments.

## Drying and cleaning

These paints are simply not as scrubbable as synthetic paints. Do not attack a wall covered in plant-based paint with a scrubbing brush.

Plant-based paints take longer to dry because they don't have the petroleum content to speed up the drying process. They dry by taking in oxygen from the air. Have patience.

## Mineral-based paints

Mineral-based paints such as lime or clay paints bond with the substrate, which means they become a sacrificial surface. They gradually wear away until it is time to recoat. However, they generally do not crack, peel or blister and can offer outstanding durability for exterior masonry surfaces.

## Timber finishes

A typical conventional option for timber might be to coat it in something containing polyurethane as a base, to provide a hard, glossy finish. Alternatives are natural wood oils, stains and varnishes.

### Wood oils

Wood oils work by penetrating deep into the timber and soaking the timber in oil molecules that repel water. The oily molecules do not form a film and

eventually wear off, so regular maintenance is necessary. This is achieved by simply cleaning with a pH-balanced cleaner and applying another coat, usually on an annual basis.

### Stains

Stains stain the timber to a desired colour, often highlighting the grain and enhancing the natural beauty of the wood. They do not form a coating and are usually overcoated with a longer-lasting oil or varnish.

### Varnishes

Varnishes work by forming a water-repellant barrier. They often contain UV-resistant substances, as UV rays from sunlight damage the timber's cells, creating the familiar greying of exposed timber. Molecules in the varnish link up when exposed to air to form a con-

tinuous film. This enables them to have high sheen levels and greater water-resistance compared to wood oils, and less maintenance. However, unlike oils, when maintenance is undertaken the entire surface must be sanded.

## Heat reflective paints

Paint additives are now available that may significantly improve a building's insulation properties by up to 40%, thereby leading to reduced energy costs and wastage. These products should be considered for their ability to lower greenhouse gas emissions. They contain tiny microspheres—hollow ceramic balls which stop conduction of heat through the paint membrane. On internal surfaces they reduce heat loss, and on external surfaces they reflect heat. They do not affect the paint's adhesion,

## A brief history of paint

Over the centuries many substances have been applied to timber, masonry and steel to beautify and protect them. Bitumen, plant oils and mined minerals were the basis for many of these early coatings, with linseed oil, turpentine gum and water often used as solvents.

In the 1930s, the invention of petro-chemical derived plastics led to an explosion of new synthetic substances, produced by chemically altering naturally occurring minerals such as crude oil. It became possible to manufacture coatings that had high resistance to abrasion, high gloss levels and cured to a hard, tough surface. These oil-based coatings contained high amounts of lead, but by 1965 it became apparent that lead in paint was a health hazard and it was progressively phased out of paints. Today, paints rarely contain more than .01% lead content.

The 1960s also saw the development of water-borne coating technology and a new generation of paint became available. Latex water-borne paints were more flexible than oil-based coatings, easier to use, less prone to fading or yellowing and were less hazardous to the applicator and the environment. Hailed as the future of paints, latex paints used acrylic plastics suspended in water, which, once dry, formed a film over the substrate. However, the use of water as a solvent required the use of biocides in the solution to prevent mould and bacterial growth. These biocides have since been discovered to cause the formation of formaldehyde, a proven carcinogen.

Paint manufacturers began to add other chemicals to improve the performance of their coatings. Common ingredients included glycol ethers, acetone and ammonia. Consumers came to expect that their wall coatings should be shiny, flexible, non-fading, UV-resistant, available in any colour imaginable and completely scrubbable. Manufacturers convinced consumers that their surroundings should be coloured to the whims and moods of fashion and the coatings industry experienced an explosion of growth.



useful service life or colour, and are inexpensively applied to maximise the energy efficiency of buildings.

Other heat-reflective paints use special pigments that reflect infrared solar radiation. Because only invisible infrared wavelengths are reflected, the paints improve the energy efficiency of a building, irrespective of how dark the colour is. This property helps the paint membrane maintain a lower temperature, which leads to a longer service life.

Because many of these pigmented heat-reflective paints use regular paint chemistry, rather than natural paint bases, we have not included them in the tables.

## Exterior paints and durability

Considerations for exterior paints should include durability (fade resistance, colour fastness, UV resistance), reflectivity of solar radiation, mould resistance, and manufacturing process. There's often some debate about whether it is more important to have durable, long-wearing paints, or paints that are made from renewable materials but which might not last the test of time. Most people fall on the side of durability—after all, it's the home or building that will be damaged, and that's not so sustainable.

The durability of paints is tested by using Australian Standard 1580. Use paints that at least meet this standard. Durability can be measured using tests for abrasion resistance, UV resistance (for exterior paints), washability, fade

resistance, colour retention and resistance to saliva, mild acids and sweat. Plant-based paints are not recommended for commercial applications as they offer inferior abrasion resistance and scrubability. Yet, plant and mineral based paints will not blister or peel and offer higher resistance to mould growth.

## Sustainable manufacture

The production of one tonne of solvent-based paint results in 10 to 30 tonnes of toxic sludge. Even water-borne acrylics can be toxic to the environment, with water commonly used to wash tools after their application. It requires the dilution of 40 million parts to one to render its introduction to the sewer system harmless. Waste-water recycling systems are now available that allow the solids to be taken out of suspension and separated for disposal.

The majority of paint manufacture continues to be petroleum derived water-borne acrylics. Due to the push for Green Star rated buildings, major manufacturers have been forced to lower the level of VOCs in some new products. The Green Building Council of Australia (GBCA) requires that paint used on its Green Star rated buildings meet maximum VOC levels. These levels are based on international models and are also used by several eco-label programs.

Most major manufacturers have wall-paints that meet these guidelines. However, the tints that are used to colour the paints often still contain high levels of VOCs, so colours that require larger amounts of tint will raise the VOC level over the GBCA benchmark. In addition, the glossy water-borne enamels commonly used on timber and steel often contain VOC levels in excess of the GBCA guidelines. Therefore, relatively few manufacturers produce entire paint ranges that have consistently low VOC levels. A plant-based paint will have a more natural tint, perhaps using natural

mineral pigments, for example.

## Making choices

Just because a paint is classed as low-VOC does not mean it is environmentally preferable. It is important to consider the entire manufacturing process of a product and its environmental impact.

Consumers and specifiers should opt for products which have been independently certified by recognised eco-labelling programs. European products often carry the EU Flower ecolabel, Blue Angel ecolabel or Nordic Swan ecolabel. Manufacturers here in Australia are able to have their products certified by Good Environmental Choice Australia. The GECA program conducts a comprehensive life cycle based assessment of product compliance to voluntary environmental declaration standards and is a member of the Global Ecolabelling Network. Low-VOC paints with the GECA label have excellent durability, comparable to conventional paints.

Paints or products that carry the Energy Star symbol have been independently certified by the Energy Star program as significantly increasing the reflectance of solar radiation by the painted surface. Energy Star certified products can aid a building to reflect unwanted solar energy by up to 50%, reduce its temperature and thereby lower the costs of cooling. Using these products may also help your home achieve Green Star credits.

Using greener paints in sustainable buildings doesn't have to add significant cost to the project. Ultra-low VOC paints are comparable in price with premium paints and plant or mineral based paints only cost fractionally more. As demand for natural paint rises, the cost of sourcing the materials will fall. Furthermore, as the price of oil increases, natural paints will become increasingly competitive with petrochemical-based coatings.

**Continued page 38**

## Paint tips

- Use natural paints in nurseries and bedrooms of allergy sufferers.
- Always have good ventilation when using paints, even natural paints.
- When using regular paints, adding colour pigments to a low emission light-coloured paint base usually increases the emissions—check with your paint supplier or the manufacturer.

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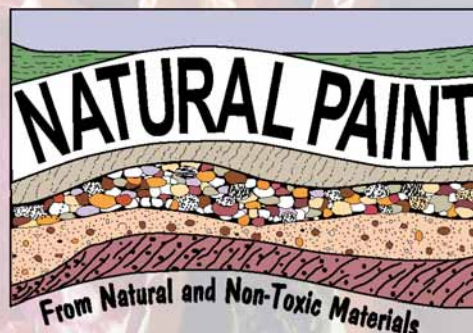
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## About GreenPainters

GreenPainters was formed in response to the increased demand for environmentally friendly painting solutions and has been operating since 2007. As a non-profit organisation it is working with Sustainability Victoria and Master Painters Association Victoria to help specifiers, applicators and consumers make eco-responsible choices with paint product selection. Certified GreenPainters use environmentally friendly products and strategies to minimise the impact of paint on the environment and the health of individuals.

**For more information on green paints, retail outlets, product VOC levels and Certified GreenPainters visit the website [www.greenpainters.com.au](http://www.greenpainters.com.au)**

**Daniel Wurm is managing director of GreenPainters Ltd.**

**Buyers guide table prepared by ReNew staff.**

## Home-made paint recipes

### Milk paint recipe #1

- 1 litre skim milk (room temperature)
- 30gm of hydrated lime by weight (do not use quick lime)
- 450 to 1100gm of chalk may also be added as a filler.

Stir together milk and lime to form a smooth paste. Add colour pigment of your choice and apply with a natural bristle brush. Allow first coat to dry sufficiently before applying another. Finish off with an oil finish if desired.

### Milk paint recipe #2

- 4 litres skim milk
- 2 cups builders lime (do not use quick lime)
- 1 litre linseed oil (the boiled type)
- ½ cup of salt
- Dye (colour)—add in as needed

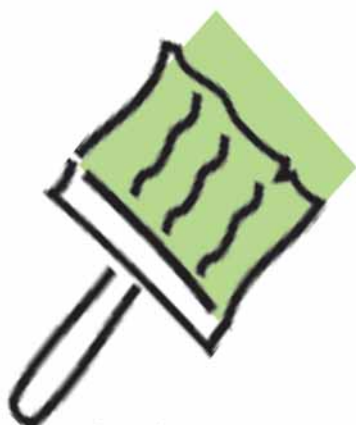
Mix all ingredients together and strain through a cheesecloth. Use within a day or two.

### Washing up

Use water and a little soap. Unlike commercial synthetic paints, the residue can safely be poured onto the garden, though be careful not to tip too much lime on one area.

**Buyers guide tables on page 40-41. →**

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Company	Brand/product	Type of finish	Materials used	Application methods	Suitable for use on	Indoor/outdoor	Price per can	Price per litre	Guarantee	Comments
Amma Earth Products - Volvox ph:(02) 4782 9009 amma@7mail.com www.amma.net.au	Volvox/Clay Décor	Matte, marble, sandy, depending how it's applied	Clay, water, pigments, binder	Like any other paint. (Roller, spray, brush etc.)	Interior walls and ceilings, exterior	Indoor/outdoor	5L = \$120	Approx \$3/m²	Quality of the product is guaranteed, not the application	All our products contain non-hazardous chemical ingredients and are completely VOC free. EU EcoLabel license no. UK/7/1.
	Volvox/proAqua Transparent Wood Finish	Stained finish	Water, pigments, binder	Can be applied like any other wood stain	Interior/exterior furniture		2.5L = \$164	Approx \$4.83/m²		
	Volvox/proAqua Enamel	Matte smooth finish	Water, pigments, filling material, binder	Reduce 1st coat with 5-10% water and apply evenly and sparingly, this is a very fast drying paint so you should work fast	Doors, frames, furniture, skirting boards and other woods		2.5L = \$210	Approx \$5.27/m²		
	Volvox/Timber Deck Care	Stained finish	Oils, lead-free driers, pigments	Oil broom, floor applicator or a soft paint brush.	Timber decks		2.5L = \$100	Approx \$3.36/m²		All our products contain non-hazardous chemical ingredients and are completely VOC free.
	Volvox/Hard Oil Wax Finish	Mattes/shiny finish	Oils, waxes	Must be spread with a trowel then buffed in	Interior floors	Indoor	2.5L = \$206	Approx \$1.68/m²		
	Volvox/Wax Finish	Shiny protective finish	Carnauba wax, alcohol ester and water	Apply with a damp cloth or mop, water down the wax finish for further coverage but a thinner coat	Surfaces finished with clay paints, wood oils, wood finishes and anything else you wish to add a protective layer to		1L = \$26	-		
Bauwerk ph:(08) 9433 1008 info@bauwerk.com.au www.bauwerk.com.au	Mineral	Fully permeable soft chalky appearance	Minerals	Brush, spray and roller	Most internal and external wall surfaces, especially suited to masonry finishes	Interior/exterior	Average price: 1 litre \$31 4 litre \$98 10 litre \$165 20 litre \$300	Average \$13-\$15	Perform as well as any good quality paint. Australia's highest rating for environment friendly paint for all its paint products, including the colouring system.	GECA certified, carbon neutral, wall paints only.
Bio Products Australia ph:1800 809 448 info@bioproducts.com.au www.bioproducts.com.au	Bio Wall Paint and Bio Wall Primer incl. water-based pigments	Matt	Based on natural and non-toxic ingredients	Brush, spray and roller	Interior masonry surfaces	Interior	10 litres white \$153.30	\$15.33	Less than 1 gram per litre VOC	Very good hiding power and tested for scrubbing.
	Bio Enamel Lacquer water based	Gloss or satin	An oil based product		Wooden and masonry surfaces		5 litres \$149	\$29.80		-
	BIO Oil finishes		Natural oils		Timber surfaces		Different prices for different products		Oils have a very natural looking finish	Bio oils are for interior or exterior use.
	BIO Varnishes		Natural oils, resins and solvents		Wooden surfaces					Bio varnishes provide a natural look to your timber.
	Bio Thinner	-	Lemon oil and parafin oil	For thinning and cleaning of surfaces	-	-	4 litres \$58.25	\$14.56	-	The healthy alternative to mineral turpentine and gum turpentine.
	Bio Enamel Lacquer solvent based	Gloss or satin	Natural oils and resins	Brush, spray and roller	Wooden and masonry surfaces	Interior/exterior	4 litres \$146.20	\$36.54	-	A very durable finish for high traffic areas.
	BIO Antique Wax	Matt	Natural waxes and solvents	Cloth or brush	Antique furniture	Interior	1 litre \$30.50	\$30.50	-	-
	Bio Timber Care Polish	Matt	Natural waxes, essential oils, water		Timber surfaces, furniture, floorboards		1 litre \$29.45	\$29.45	-	A natural maintenance product which compliments the varnishes.
Livos Australia ph:(03) 9779 3405 info@livos.com.au www.livos.com.au	Ardvos Universal Wood Oil #266	Transparent satin	Linseed oil base with natural resins and waxes. A full ingredient listing is on each product and web site	Brush, sponge/lambswool applicator, spray, dip or cloth	For interior timbers, furniture and floors as well as OSB-boards.	Indoor	Ranges from \$8.00 to \$489.00 current RRP	\$48/L. First coat 17m²/L, 2nd coat 42m²/L, 3rd coat 106m²/L.	The product is warranted to be free of manufacturing defects whilst in the can.	Penetrating oil. Excess to be wiped off, easy to rejuvenate.
	Kunos Natural Oil Sealer #244	Transparent, high gloss.		Brush, solvent-resistant applicator, spray, dip, cloth, or machine applications	For solid interior timbers, such as furniture, windowsills and floors and for OSB boards.	Indoor	Ranges from \$8.00 to \$685.00 current RRP	\$68/L. First coat 22m²/L, 2nd coat 88m²/L, 3rd coat 295m²/L.		Comes in 7 colours and clear. A glossier appearance can be achieved by buffing in between coats with a polishing pad. Excess oil to be removed. Easy to rejuvenate.
	Meldos Natural Resin Hardening Oil #264	Matt - satin	Linseed oil, stand oil, natural resin ester, orange oil. A full ingredient listing is on each product and web site	Brush (undiluted), spray, roll, dip (dilute with minimum 20% SVALOS No. 222).	Interior coniferous (pine) woods such as furniture, floors and porous stone.	Indoor	Ranges from \$8.00 to \$476.00 current RRP	\$47/L. First coat 17m²/L, 2nd coat 33m²/L, 3rd coat 84m²/L.		5% Vindo Natural Oil Paint # 629 may be added to tint the oil for concrete treatments.
	Kaldet Wood Stain #270		Linseed oil, stand oil, natural resin ester, iron oxide and mineral pigments, micronized wax, orange oil. A full ingredient listing is on each product and web site.	Brush (undiluted), spray or dip (may be diluted with Svallos #222)	Interior and exterior (some shades) wood surfaces. Suitable for OSB and MDF-boards.	Indoor/Outdoor	Ranges from \$8.00 to \$537.00 current RRP	\$53/L. First coat 15-30m²/L.	The product is warranted to be free of manufacturing defects whilst in the can.	Available in 14 colour shades.
	Alis Decking Oil #579		Linseed oil, tung oil, stand oil, orange oil, Isoaliphates. A full ingredient listing is on each product and web site.	By brush or roller.	Deckings, fences, claddings and furniture.	Outdoor Only	Ranges from \$8.00 to \$661.00 current RRP	\$66/L. Average 30m²/L per coat hardwoods. Softwoods 24m²/L.		Produces a water repellent, open pored and fast drying finish. Easy to rejuvenate.
	Dubron Wall and Ceiling Paint #400		Water, chalk, titan dioxide, natural resins, talcum, kaolin, proteins, orange oil. A full ingredient listing is on each product and web site.	Apply with roller, brush, or airless spraying device	For plaster, concrete, masonry, brick, oatmeal wallpaper, gypsum board, as well as water based painted surfaces.	Indoor	Ranges from \$32 to \$211.00 current RRP	\$21-\$23/L. Average 9m²/L.		Washable, low tendency to drip or splash, very good water vapour permeability. Solvent free. Priming Required.
	Dubron Wall and Ceiling Paint #414	Matt	Water, chalk, talcum, natural resins, zinc oxide, bentone, beeswax, methyl cellulose, beeswax soap. A full ingredient listing is on each product and web site.	Apply with a brush, lambskin roller or airless spraying gun	For plaster, cement, brick, oatmeal wallpaper, gypsum board and smooth, painted surfaces.	Indoor	Ranges from \$32 to \$211.00 current RRP	\$21-\$23/L. Average 6m²/L.	The product is warranted to be free of manufacturing defects whilst in the can.	No Priming required. Wipeable, easy to use, very breathable, anti static. Solvent free.
	URA Pigment Paste #410		Water, iron oxide and mineral pigments, beeswax soap, linseed oil, stand oil, dammar resin, natural resin ester, orange oil. A full ingredient listing is on each product and web site.	For tinting all LIVOS-Wall & Ceiling Paints and Natural Texture Render	As per paint mixed with.	Indoor	Ranges from \$10 to \$237.00 current RRP	\$47/L. Average 6m²/L. Undiluted.		Available in 17 colours. Non fading, mixable to any ratio creating a larger colour pallet. Less than 3% VOC.
	Vindo Natural Gloss Oil Paint #629	Gloss	Linseed oil-stand oil-natural resin ester, mineral pigments, isoaliphates, orange oil, soy lecithin and citron oil. A full ingredient listing is on each product and web site.	Sparingly by brush, spray, or roller application	For application on wood and metal.	Indoor/Outdoor	Ranges from \$10 to \$422 current RRP	\$84/L. Average 15-30m²/L. Undiluted.		Weather resistant, elastic, good coverage and highly economical. May be used to tint Meldos # 264 for concrete treatments.
	Canto Satin Oil Paint #625	Satin	Natural resin ester, chalk, talcum, diatomaceous earth, orange oil. A full ingredient listing is on each product and web site.	Apply sparingly with brush, roller, or spraying device	For interior timber and metal.	Indoor	Ranges from \$10 to \$435 current RRP	\$87/L. Average 10-16m²/L. Undiluted.	The product is warranted to be free of manufacturing defects whilst in the can.	A highly elastic natural resin coating varnish. Good coverage quality, high yield, very economical.
Murobond Coatings ph:1800 199 299 info@murobond.com.au www.murobond.com.au	Natural Paint	Flat ceiling and wall finish 4	Fresh milk, casein, egg white, vinegar, calcium carbonate, titanium dioxide, talc, marble powder, borax, linseed oil, methylcellulose, glycerine, sodiumsilicate, alum, essential oils (thyme, pine-tree, mint).	Brush or roller	Bare porous substrates and previously painted surfaces.	Indoor	4L around \$78 (inc gst)	1L around \$32 (inc gst)	-	Murobond Natural Paint has a soft natural finish available in a wide range of earthy colours.

Company	Brand/product	Type of finish	Materials used	Application methods	Suitable for use on	Indoor/outdoor	Price per can	Price per litre	Guarantee	Comments
Natural Paint P/L ph:(02) 65845699 info@naturalpaint.com.au www.naturalpaint.com.au	Casein marble paint	Smooth	Marble powder, chalk, casein, talcum, porcelain clay, borax	Roller, brush, rag etc.	Plaster, gyprock, wallpaper etc. Also bathrooms	Indoor	\$82.80 for 5kg, covers 35m²	-	Non toxic	Mix with water on site.
	Casein primer	Clear	Casein, silicic acid, soda	Roller, brush, spray, rag	Plaster, gyprock, wallpaper, mudbrick, spray render etc	Indoor, outdoor under cover only	\$29.85 for 250g, covers up to 60m²	-	Non toxic	Mix with clean cold water, a vegan product.
	Earth pigments	Smooth	Earth minerals (depending on colour)	Mix into water or oil based paints or oils	All surfaces that can be painted	Indoor and outdoor	\$23.30 for 100g \$43.45 for 1kg	-	Safe to be used in face paints	Colourfast, in powder form.
	Calimine paint	Smooth	Chalk, marble, porcelain clay, methylcellulose	Roller, facade brush, airless spraying	Mainly ceilings, can be removed by washing off	Indoor	\$52.90 for 5kg covers 40m²	-	Can be removed by washing off, non toxic	A vegan product, mix into water.
	Casein lime paint	Smooth to rough	Lime hydrate, marble powder, chalk, casein, porcelain clay	Roller, brush, spray, spatula	Lime plaster renders	Indoor	\$113.40 for 10kg, covers approx. 50m²	-	-	-
	Marble fibre render	Rough textured	Marble powder, chalk, casein, porcelain clay, borax, talcum	Roller, brush, trowel	All areas, especially feature walls	Indoor	\$150.45 for 10kg, per 10-25m²	-	Non toxic	Mix into water.
	Stuccolustro	Smooth to gloss	Lime hydrate, marble powder, clay, mineral pigments, sinterwater	Brush, trowel, hot trowel	Feature walls, splash backs etc	Indoor	POA	-	Non toxic	-
	Tadelakt white	Smooth to gloss	Hydraulic lime, quartz sands, marble powder, clay ashes	Spatula, compressed by hand with special stone	Entire bathrooms, showers, fountains, splashbacks, pools etc.	Indoor and outdoor	POA	-	Non toxic	Highly architectural, high gloss finish originated in Morocco.
	Hard oil	Clear	Stand oils, balsamic turpentine, calcium, pine & others	Brush, roller, spray, rag	Timber, cork, concrete, rock, stone, bench tops etc	Indoor only	POA	\$57.50	Non toxic, nil solvents	Can be tinted with NP pigments.
	Stand oil paint	Many colours	Natural oils, balsamic turpentine, zinc white, lead-free drying agent	Brush, roller, rag	All surfaces suitable for oil based paint	Indoor and outdoor	POA	\$89.60 for 1ltr \$67.20 for 0.75ltr	Mild natural toxins	Standard colours or can be tinted to choice.
Pure silicate paint	Semi smooth	Quartz sand,potash	Brush, roller	Lime or cement lime renders, natural or artificial stone	Indoor and outdoor	POA, \$5.00/m²	-	Non toxic	-	
Peerless JAL P/L ph:1800 800 248 sales@peerlessjal.com www.peerless.com.au	Hydrothane Sport	Gloss	Water-borne polyurethane	Brush, roller, mop	Wooden floors	Indoor	POA	-	-	Contains no harmful thinners or solvents.
	Hydrothane Ultra									
Porters Paints ph:1800 656 664 enquiries@porters.com.au www.porterspains.com.au	Boncote Cement Paint	Cement-based paint	-	Brush	Unpainted bricks, cement render, bagging, off-form concrete, all sound exterior unpainted masonry surfaces, Boncote and other absorbent building stones.	Outdoor	POA	POA	10 years	Zero VOC; durable; weatherproofs; colours; protects.
	Porter's Chalkboard Paint	Chalkboard paint	-	Brush, roller	Plasterboard, plaster, wood, masonry and most paintable surfaces, including previously coated chalkboard surfaces.	Indoor/outdoor			7 years	Fun range of bright colours; low odour; excellent coverage.
	Porter's Clearcote	Low-lustre	-	Brush, roller, spray	Interior and exterior floor areas including timber decking and concrete, timber furniture and any exterior timber surface.				-	Zero VOCs; low lustre; fast drying; no odours; UV stability; water-based. Suitable for use over Porter's Wood Wash and Porter's Concrete Wash.
	Porter's Interior Distemper	Creamy matt finish	-	Brush	Gyprock, plasterboard, set plaster, cement render, bagging and all masonry surfaces.	Indoor			-	Traditional finish; handmade.
	Porter's Duchess Satin	Pearlescent finish	-	Brush, spray	Gyprock, plasterboard, wood, MDF, masonry, brickwork and set plaster	Indoor			7 years	Pearlescent finish; wide colour selection; fast-drying.
	Porter's Lime Wash	Lime-based coating	-	Brush	Unpainted bricks, cement render, bagging, besser block, mud brick, off-form concrete, exterior unpainted masonry surfaces, concrete blockwork, previously painted masonry surfaces, Granosite and James Hardie architectural columns, Hebel block and AAC.	Outdoor			7 years	Natural pigments; traditional finish; handmade;soft, weathered look.
	Porter's Liquid Iron and Instant Rust	Metallic finish with rusted effect	-	Brush, spray	Wood, plastic, masonry, MDF and most paintable interior and exterior surfaces.	Indoor/outdoor			7 years	Authentic rusted iron effect; fast-acting; dirt-resistant; 7-year guarantee.
	Porter's Low Sheen Acrylic	Low-lustre acrylic	-	Brush, roller, spray	Plasterboard, plaster, wood, masonry and most paintable surfaces. Can also be applied to previously painted surfaces.	Indoor/outdoor			15 years	Zero VOCs; self-priming; no odours; dirt resistant 15-year guarantee.
	Porter's Milk Paint	Traditional flat finish	-	Brush	Painted and unpainted timber surfaces, lining boards, furniture, plaster and masonry.	Indoor				Zero VOCs; natural paint; no odours; traditional recipe.
	Porter's Stone Paint (Fine)	Flat, textured finish	-	Brush, roller	Unpainted or previously painted wood, masonry, off-form concrete, brickwork, fibrous cement cladding, pre-fabricated GRC columns, weatherboards, Hebel block, mud brick, autoclaved aerated concrete, tilt-up slab construction, plasterboard and set plaster.	Indoor/outdoor			7 years	Dead flat finish; 7-year guarantee; finely textured finish; ideal over previously painted surfaces.
	Porter's Stone Paint (coarse)	Flat, textured finish	-	Brush		Indoor/outdoor			7 years	Dead flat; textured finish; ideal for previously painted surfaces.
Porter's Toughcote	Rich, matt finish	-	Brush, roller, spray	Previously painted or unpainted bricks, cement render, bagging, off-form concrete, fibrous cement boards and timber.	Indoor/outdoor	15 years	Low-odour; superior coverage; weather and water-resistant.			
Rockcote ph:1300 736 668 sales@rockcote.com.au www.rockcote.com.au	Rockcote are a GECA certified and Asthma Foundation certified manufacturer. However, they failed to supply data for the guide.									
Wattyl Group ph: 132 101 www.wattyl.com.au	Wattyl Interior Design i.d	Luxury Low Sheen	Odour-less APE-free acrylic polymer, titanium dioxide, crystalline silica-free minerals, water	Brush, Roller or Spray	Walls and ceilings	Indoor	\$58.90	\$14.73	The only major manufacturer to be GECA certified	VOC less than 1 gram per litre untinted or when tinted with Wattyl Ecotint.
		Silky Satin								
		Contemporary Matt			Ceilings		\$45.90	\$11.48		
		Ceiling White			Surface preparation		\$56.90	\$14.23		
	Wattyl Aqua Trim	Gloss	Crosslinking APE-free acrylic enamel resin, titanium dioxide, propylene glycol, water	Brush, Roller or Spray	Trim and woodwork	Indoor/outdoor	\$61.90	\$15.48		VOC less than 50 grams per litre untinted or when tinted with Wattyl Ecotint.
		Silky Satin	Crosslinking APE-free acrylic enamel resin, titanium dioxide, crystalline silica-free minerals, propylene glycol, water							
	Wattyl Aqua Prep	Primer Sealer Undercoat	Ultra adhesion acrylic resin, titanium dioxide, minerals, propylene glycol, water		Surface preparation		\$57.90	\$14.48		VOC less than 20 grams per litre.
	Wattyl Ecotint - 12 different colour tinters	Colourants to produce tinted colours in Wattyl finishes	Lead-free coloured pigments: different for each colourant. Iron oxides, titanium dioxide and synthetic pigments. APE-free inert carrier, water	Mixed into paint finish, usually in retail store	Wattyl architectural and decorative paints		Used by retail stockists	Used by retail stockists		VOC less than 1 gram per litre.



# EVs popping up everywhere!

With the recent economic downturn, you might have thought car companies would be putting their electric vehicle programs on hold. Not so it seems, with several more companies announcing new EVs for the near future.

## Get an Aussie EV

The only commercially available EV in Australia as yet, the Electron (formerly the Blade Runner), is a Hyundai Getz converted to electric power by Blade Electric Vehicles in Castlemaine, Victoria.

The Electron is available as a complete vehicle for \$39,500 (using converted ex-lease vehicles), or you can have your own Getz retrofitted for \$29,990.

Blade Electric Vehicles has recently announced that it will be selling the Electron in New Zealand, with a contract to supply 200 of the vehicles. The first vehicle was shipped in November 2008. It's a small start to what could become a booming industry, if all goes well.

The Electron features a 16kWh lithium iron phosphate battery pack with a rated life of around eight years. Range is rated at around 120km.

[www.bev.com.au](http://www.bev.com.au)



## Will Mitsubishi be the first?

We reported on the i-MiEV previously, and now it seems that Mitsubishi Australia has plans for the little EV. They will be bringing two i-MiEVs into Australia this February—one for display purposes, the other for test drives by potential customers. While this is officially a feasibility study, Mitsubishi's Australian president and CEO, Robert McEniry, states that the chances of the i-MiEV arriving in local dealerships by 2010 are 'very high'.

The i-MiEV has a 47kW motor and a range of up to 160km per charge. Price hasn't been set but it is rumoured to be as low as \$30,000.

[www.mitsubishi-motors.com/special/ev](http://www.mitsubishi-motors.com/special/ev)

## Another EV available in Oz—maybe

At the Detroit Motor Show in January, Toyota unveiled a prototype of a small electric vehicle based on their IQ urban commuter vehicle. The FT-EV is still a concept at present, but Toyota has confirmed it plans to produce an urban commuter EV by 2012.

Aimed at the lower cost end of the market, the expected price is in the US\$20,000 range.

Whether it makes it to Australia, or how much it will cost, is anyone's guess—that all depends on what happens to the Australian dollar in the interim.

<http://pressroom.toyota.com/pr/tms/toyota/maintain-pace-broaden-scope.aspx>



## Fisker Karma

The Fisker Karma sports car uses Fisker Automotive's plug-in hybrid technology called Q DRIVE.

The vehicle features a 0-100km/h time of 5.8 seconds and a top speed of 200km/h. Of course, it uses AC drive technology and has regenerative braking. Battery-only range is 80km.

The driver can select between two modes of driving. The first mode is 'Stealth Drive', which is the quiet economy mode, and 'Sport Drive', which will access the full power of the vehicle.

Other features include a solar roof to help keep the car interior cool when it is parked in the sun. It also has 22 inch wheels and uses LED taillights. There is even an 'EcoChic' series that is completely animal product free (leather has a very high environmental cost) for the more ethical buyer.

[www.fiskerautomotive.com](http://www.fiskerautomotive.com)



## Is it a bird? Is it a plane?

The Aptera is like no other car available on the market. It was designed to be the most efficient car available, with the most aerodynamic body and lowest energy use per kilometre.

It is made from composite materials and aluminium and weighs around half what a normal car does, while still maintaining high levels of crash protection.

It will initially be available in California, with pricing in the US\$30,000 to \$40,000 range. Availability in other US states is to follow. Unfortunately, we are unlikely to ever see anything like it here in Australia, at least from any of the major car companies.

[www.aptera.com](http://www.aptera.com)



## Extended range EVs

Chrysler recently released details on a trio of potential new electric vehicles. There's a sports car called the Circuit, a minivan (peoplemover) and a Jeep.

All of these vehicles would use the same drive system, making them what is becoming known as an extended range EV. This is similar to the GM Volt's system, where there is a reasonable sized battery bank that gives 60km range or so and a backup generator if you need to go further.

It seems that Chrysler has not yet decided which of these vehicles it will produce, if any, but it is good to see companies starting to look at cars other than sports cars and mini/micro cars for their electric vehicle programs.

[www.chryslerllc.com/en/innovation/envi](http://www.chryslerllc.com/en/innovation/envi)



## Volt is still online

Despite GM being on the verge of bankruptcy in December 2008, it appears the Chevrolet Volt is still on track for a 2010 launch. GM has now decided on a battery system, which was the main perceived barrier to meeting their deadline. The batteries use cells from LG Chem and the packs themselves will be assembled in the US.

GM has released new images of the Volt (see photo), which has changed a bit since its original designs. What's even more interesting

though is that there are rumours that GM has plans to take the drive system of the Volt, called the Voltec, to other upcoming vehicles, including a Cadillac.

[www.chevrolet.com/electriccar](http://www.chevrolet.com/electriccar)



## A serious EV from China

We reported in *ReNew 105* that Chinese company BYD was about to release an electric vehicle. Well, things have moved forward, with BYD announcing that the vehicle will be a crossover style vehicle called the e6.

The e6 is a five seater capable of travelling up to 400km on a single charge. It features dual motors—a 160kW front motor and a 40kW rear motor. Total combined torque is a scary 550Nm, giving this two tonne vehicle a 0-100km/h time of around eight seconds and a top speed of over 160km/h.

The e6 will use BYD's own lithium iron phosphate batteries, which can be quick charged to 50% capacity in 10 minutes, while a full charge from a home power point will take eight hours. These figures seem a little optimistic. An eight hour charge on a 10 amp power point would provide, at most, around 16kWh of charge to the batteries. At a rated energy consumption of 18kWh/100km, there's no way the vehicle could be fully charged overnight unless it was on a 40 amp circuit! Regardless, if this vehicle is even remotely as good as the specifications, it should be a huge hit. The e6 is expected to go into production within two years.

[www.byd.com](http://www.byd.com)



## Still thinking, just!

The Th!nk comes with a choice of two battery pack types—sodium or lithium based. It has a range of up to 180km on the sodium battery and a top speed of 100km/h. Safety features include ABS brakes, airbags and seatbelt pretensioners.



From an eco standpoint, the Th!nk does pretty well. The dashboard can be completely recycled. The fabric, body, supports, air ducts, adhesives and fixings are designed using the same recyclable materials. The plastic body and other plastic panels are unpainted, reducing both energy consumption and toxins, while also making the panels easier to recycle. The batteries are returned to the supplier at the end of their useable life.

The Think Global company has recently hit financial problems, as have many car makers, however, they have recently received financial help from the Norwegian Government to allow them to restructure. Think has been bankrupt twice before and survived. Here's hoping they can finally reorganise themselves into a viable electric car company.

[www.think.no](http://www.think.no)

## A Joule of an EV

Most EVs are being designed by US, European and Japanese companies, so it's good to see one from what many now consider a developing country—South Africa.

The Joule, from Optimal Energy, is a six seat vehicle designed to UN-ECE safety standards and includes all modern safety features such as side impact protection, ABS and airbags. It will use lithium ion batteries and have a range of up to 400km. However, it has been designed to use a range of battery options for flexibility. Interestingly, customers won't buy the car with batteries. Instead, the batteries will be leased to them from Optimal Energy.

Other features of the Joule include regenerative braking, a maximum speed of 135km/h, and a choice of two drive options: an asynchronous permanent magnet motor driving the front wheels through a gearbox, or asynchronous permanent magnet wheel motors.

The Joule is expected to be available in the latter half of 2010. It will initially be available in South Africa, with global export to follow in an unspecified later timeframe. This great little car begs the question; if they can do this in South Africa, why can't we do it here in Australia?

[www.optimalenergy.co.za](http://www.optimalenergy.co.za)



# NEW!

A totally comprehensive guide to every aspect of solar electrical systems – from small cabins to big properties.

It shows you how to make huge savings in energy needs and consequent system costs.

As with all of Collyn's books, the subject is thoroughly researched and presented in an easily understood, down-to-earth manner.

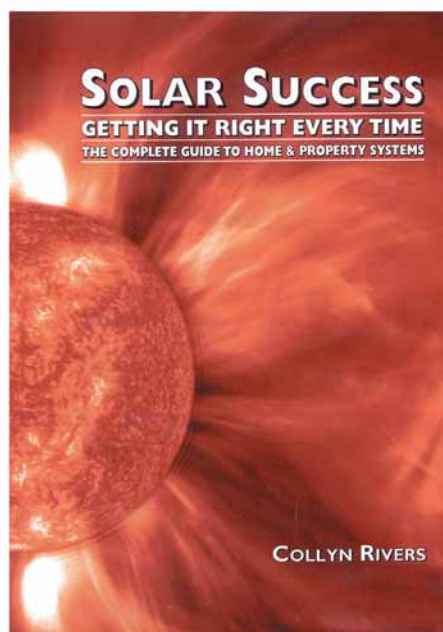
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## INVESTORS NEEDED – renewable energy

### Leading Australian technology seeking investment

- Aerogenesis is commercialising a 5kW wind turbine which is set to be the world's leading small wind turbine.
- The turbine's cost of power is expected to be 40% cheaper than competing turbines, and 50% cheaper than PV.
- The technology has been under development for 15 years (in collaboration with a premier research institution), and the turbine is now 12 months from commercial sales.
- The turbine has a global market, and is suitable for both on-grid and off-grid applications.
- The Australian Government has awarded a grant of \$450k to Aerogenesis, to demonstrate the turbine in Australia and China.
- The company's latest demonstration unit is commissioned and available for inspection in Newcastle.
- Since placement of our advert in the last edition of Renew, Aerogenesis has been awarded \$750k by the NSW Climate Change Fund to develop Australia's first two urban windfarms (<http://www.environment.nsw.gov.au/grants/ccfred1.htm>)
- Aerogenesis is now seeking to raise \$500k in aggregate from 1 or 2 investors, to part-match these government grants, and for general commercialisation purposes.
- If you have a passion for renewable energy and are in a position to help us bring this technology to market, we encourage you to contact us.

**For an Investor Summary document, please call  
Warren Kalinko on 0413 357 473.**

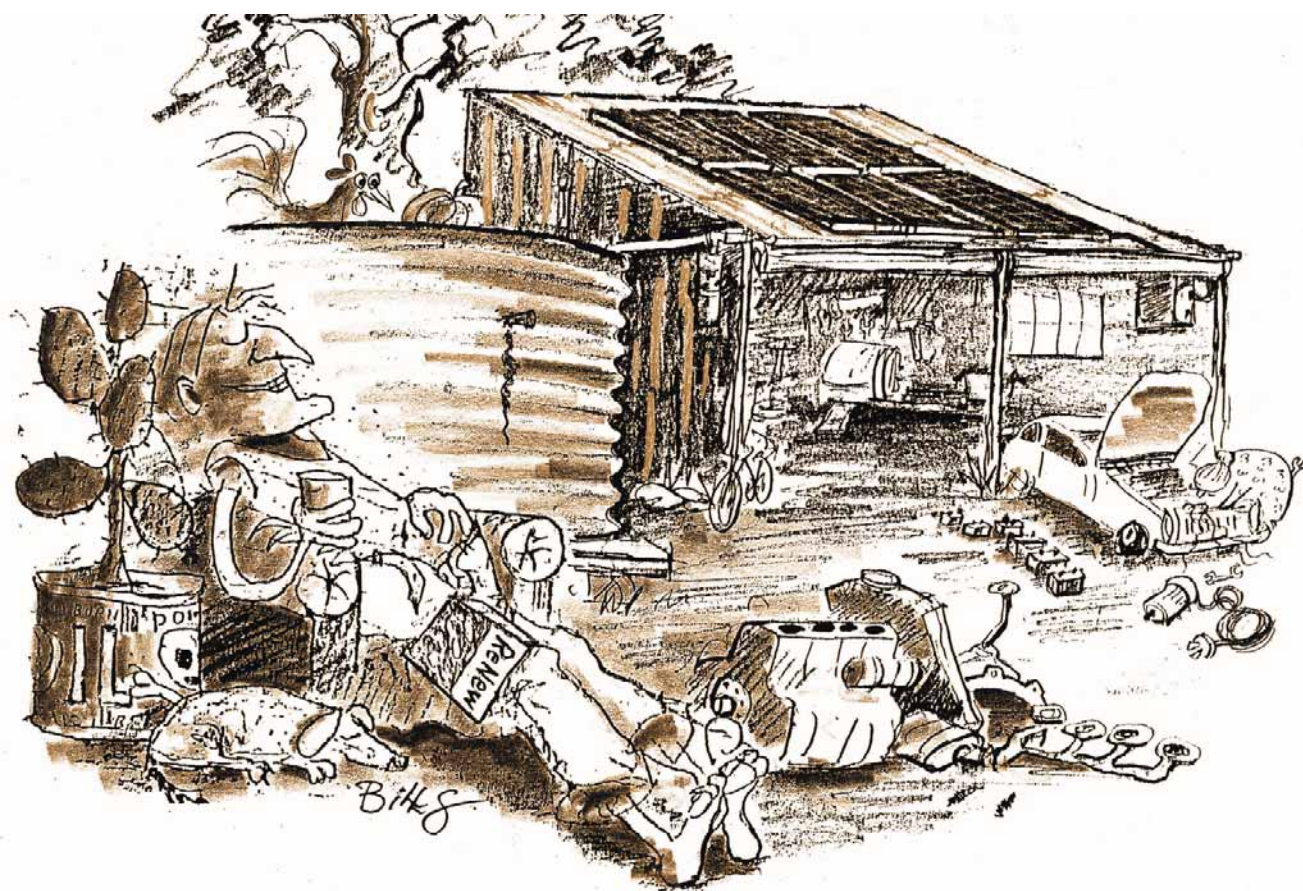


(As required by the Corporations Act 2001, only open to Professional and Sophisticated Investors).





# Sustainable sheds competition



Above: illustration by Bill Gresham  
Right: Jacinda Brown's workshop shed

Thanks to Mark Thomson from the Institute of Backyard Studies for help judging the competition—[www.ibys.org](http://www.ibys.org)  
Thanks also to Oatley Electronics for donating the solar panel and regulator for the main prize—[www.oatleyelectronics.com](http://www.oatleyelectronics.com)

# How on earth did we judge it...

**LOOKING THROUGH THE** entries to the Sustainable Sheds competition, we realised we had a pretty fortunate view. No detail was spared when people shared their stories about building, retrofitting or working within their sheds.

With the word sustainable added to the front, this competition was asking for just a little bit more than your average shed. Some entrants might not have thought of their shed as 'sustainable', as

this way of living is often a necessity in remote areas. Water tank? Of course there's a water tank—it's essential. And solar? Well, living far away from the grid means that solar is best.

In some ways the sustainable aspect is demonstrated by what people actually do in the shed, or as shed entrant John Hermans puts it, "concentrate on things that are useful to your daily needs. Fix a push-bike rather than a jet ski, make some double-glazed windows rather than a table to hold a new mega kilowatt flat screen." For others the shed is the base for their life's work committed to environmental education or awareness raising. The shed is where it all happens.

Alas, we had to make a decision regarding the three prizes. Ranking the sheds was not easy, after all, who can say that one shed is better than another? Sheds were assessed on their sustainable construction, be it a retrofit or an outright build-it-from-scratch job, renewable energy use within the shed, the

projects carried out in the shed and whether or not the overall package was essentially...good.

These winning sheds are featured on the following pages in no particular order. They include Jacinda Brown's sheds in the Northern Territory, John Hermans' sheds in Victoria and Peter and Ben Risby Jones' shed in Queensland. We're sure you'll have your own personal favourite. These three winning entrants will each receive a solar panel, solar regulator kit plus LED lights from Oatley Electronics, as well as a copy of *Makers, Breakers & Fixers: Inside Australia's Most Resourceful Sheds* by sustainable shed judge Mark Thomson.

There were many more sheds than we could feature on these pages and we're looking forward to including them in future issues of *ReNew*. A big thanks to everyone who entered.

**Jacinta Cleary, Lance Turner and Mark Thomson—Sustainable sheds assessors.**





## Sheds

# An array of Top End sheds

**Made from salvaged materials, Jacinda Brown's sheds are made for the tropics.**

**L**ike many rural Territorians, our home *is* a shed. Actually, it's a series of sheds, serving different purposes and projects. Last year, our local member of parliament sent a letter beginning, 'There have been many rumours recently about people being thrown out of their homes because they are 'sheds' and not 'houses'...' It goes on, and includes a link to a government fact sheet, *When is a shed not a shed?* which explains the difference between a shed and a house, its intended use and the 'requirements in terms of structural, health, safety and amenity standards.' Heeding this, all our buildings fit into the shed category. Lucky we live in an area without building codes.

I live on a bush block 100km outside Darwin with George and our son Rover. We have four sheds; the kitchen shed, the workshop, the metal shed and the chook shed studio. George built them all, starting with the kitchen shed.

### Kitchen shed

We began construction of the kitchen shed in 2000 and it is now our primary dwelling place. Except for the posts, it is made with secondhand salvaged materials. The rafters and purlins are stringy-



The chook shed, named so because it is made from materials from an old battery chicken shed. Right: The metal shed.

bark bush poles and local bamboo. The roof and the few walls are made with reused corrugated iron and screws. The roof is 13 feet high, which keeps the heat down, and the lack of walls ensures plenty of ventilation. When it's cold we have a fire which we also cook on. The kitchen floor is dirt and cement, the living area concrete with rocks.

It is solar powered with our brand new 4kWh RAPS system. This runs our chest fridge and freezer, lights and a fan

for Rover to sleep comfortably with.

George is a carpenter/builder and our internal structures and furniture are beautifully hand-crafted using a variety of scavenged timbers. The concept that possessions should be beautiful, useful and durable, which Satish Kumar advocates, rings true in this shed.

### Metal shed

To save us cutting down all the trees around the kitchen shed, the metal shed

was built as a roof for the solar panels. We used new steel, but reused tin and screws. An old shipping container lives here where we house the solar components and anything else that needs to stay dry. It is also George's new mechanics and welding shed and a perfect place to get that biodiesel plant going. All the sheds get water via a solar powered bore, which pumps to a header tank and gravity feeds to different locations. All waste water feeds the gardens.



Photos: Jacinda Brown

## Sheds

### Workshop shed

The workshop shed is made completely from recycled and salvaged materials, old steel posts and trusses, bush pole rafters and old tin. It has a dirt and sawdust floor. This is where George makes all the furniture, grinds the flour by hand and fixes everything. I have diagnosed him with 'compulsory fix-it disorder', but he says it's because I always bring home broken things. I'm a compulsive scavenger! The current project is converting the hand-powered grinder to pedal power with an exercise bike a friend gave us. In this shed, George made our wood-fired 'donkey', a hot water shower made with an old gas bottle and old tap fittings welded up using a generator. It is fuelled with workshop off-cuts. Luxury!

### Chook shed

The chook shed studio doesn't house chooks, but got its name because most of the materials used to build it came from some old battery chook sheds being demolished. Steel posts and beams, seven-metre wooden rafters, concrete blocks, bolts, screws and the most beautiful old rustic tin came off these sheds. We bought enough steel to do the rafters, bearers and some posts; timber to do the joists, purlins, doors, wall and window framing; and enough tin for the roof and cladding.

The louvre galleys and glass came from



# Sheds



Above: The kitchen shed. Bottom: The workshop shed. A photo inside the workshop is on page 47.

the tip shop and an old shutter window frame from hard waste. The window sills are cyprus pine, which grew and was milled at a friend's place. The louvres and clerestory window gives ample air-flow and passive cooling. We couldn't find recycled floorboards, so these are new termite resistant cyprus pine. This shed has its own 4kWh solar power system as the sheds are too far apart to join the systems.

The chook shed is where all the tech stuff lives, protected by walls! I am an environmental photographer, focusing on the local bush. It is here that I work on educational books for children and slide shows to teach about plants, critters, biodiversity and gardening, as well as tell stories from our bush sanctuary. George better watch out for his bike grinder, as I may have to schnaffle it for my pedal-powered slide show which I plan to take to schools to educate about local environment and responsible power use. It includes a bit of physical

education and mathematics chucked in too, such as 'how many kilometres at 10 kilometres per hour do we have to ride to run a 15 minute slide show with a data projector using 300 watts?'

Before I moved here I had little building experience and knew nothing about solar power, so the things I have learnt

have been most inspiring. One thing that stands out is to keep the tools and equipment in good nick. Working efficiently is more enjoyable and there's more time for those 'gunna be' projects. No more building though, because until Rover needs one, I reckon we have enough sheds for now. ✨





# Shed-dweller extraordinaire

Come inside John Herman's shed where he's been leading the way in sustainable projects for over twenty five years.



Photo: The Weekly Times

John Hermans with waste veggie oil to power the car.

Having lived on this property for more than 25 years and built all of the structures on it, including the kilometre-long driveway with rake, hoe and axe, I am fantasising of one day having the 'perfect shed'.

In fact I have had two sheds and am currently building the one that I always planned on having. But to ignore what went on in the previous two 'less than perfect' sheds is to miss out on a lot of creativity.

The first shed that I made was attached to our living space; it was a tin shed made from very old painted iron. It took me two weeks to make and was only 6 x 4 metres in size.

We lived in it for 12 years; it provided a great saving on rent.

My second shed was the back end of the earth-covered garage. It is 11 x 10 metres with a large glass skylight over the work area. It also kept me satisfied for 12 years—but I needed more space! Although the final 'perfect shed' is going to be quite large, the construction materials have not been plundered or squandered—it is being built with renewable energy and will last for many, many generations.

My philosophy is to create to the best of one's ability, for this can lead to great satisfaction and contentment.

## Projects

Many projects have been completed in my shed and have been done for my own interest as a hobby, rather than for commercial purposes.

- Axial flow water turbine and pelton turbine for water pumping, battery charging and standby AC power generation from the river bordering our property. This has been functioning successfully for around 20 years.
- Spiral water pump and paddle wheel, built for environmental campaigner Jill Redwood to keep her water tank full without the need to use a petrol-powered pump.
- A turgo water turbine coupled to a do-

# Sheds

mestic washing machine motor (Fisher & Paykel smart drive). It has been spinning away for three years to give our household around 5kWh per day of electricity.

- Hydraulic earth brick press to build a new house and shed, with construction bits and pieces paid for by old uni mates, who are now shareholders of the press. The press has made over 60,000 bricks and has a lot of brick making in it yet.
- Rebuild of Environment East Gippsland's solar power and battery storage trailer. This is used at all annual East Gippsland Forest Forever Ecology camps.
- Modifying an old mountain bike with custom-built pack racks and regenerative power-braking for onboard battery charging. Used to ride from Queensland to Victoria last year.
- Modifying an old Pittarak Sea Kayak.

Essential for completing a Bass Strait crossing last year.

- Solar-heated outdoor bath located under an old wild cherry tree in the front yard.
- Solar concentrator box cooker and wood-fired brick pizza oven.
- Hydro-charged set of old batteries to use for direct DC welding.
- Biodiesel production plant for our new (18-year-old) touring van.
- Three months later, a straight veggie oil conversion for the same Toyota van.
- Ongoing servicing of our two aged vehicles to avoid high service costs and avoid the need for any newer vehicles.
- Solar thermal panels for the whole of our north-facing roof (15m x 3.5 metres) for both hydronic floor heating and domestic hot water. Excess summer hot water used for pool heating.
- A wind speed and direction meter

poking above our tallest tree, (30 metres) made from scrap stainless steel and brass and recorded with an old bicycle trip meter.

- The completion of an endless number of electronic projects.
- Repairs to an endless assortment of bargain-purchased defunked machinery.

**I have also have a large collection of home-made trailers, including:**

- Solar-powered family camp trailer, built from the rear drive-train of an old Suburu. Used on many family expeditions.
- Beach trailer for the transport of wind surfers, kayaks, surf skis and other water toys. Built from the rear drive-train of an old Suburu. No explanation needed.
- Trailer for the transporting of large logs, usually wind fallen, to our own property sawmill. All timber for building was sourced and milled on site.





## ***'The stuff of serious shed legend! Astonishing!'***

**Mark Thomson on discovering John Hermans' shed.**

- Fire trailer with pump and 900 litre tank. Rarely used but handy to have around.
- Modified general use trailer (boxed walls, disk brakes and tipable).
- Restored roofed trailer to cart the brick press on.
- Transportable welder trailer, powered by an old Suburu motor and gas fuelled. Owning all these trailers negates the need to own large gas-guzzling cars. Only small four cylinder vehicles are used here.

These days pretty much everything I do is either recycled, renewable or plain alternative. There is quite a list of things that have been built around the shed but have not been made in the shed that are equally interesting to the many visitors that pass through.

### **New shed plans**

The shed that I am building to replace the work area in the back of my garage is my ultimate shed. All of the building work is done by me.

It has a smooth trowled black concrete floor for easy cleaning, workability and fire safety.

There are cheap but effective 20mm polypipe coils within the floor slab, to take the chill out of the work area using solar-heated water.

The entire roof support structure is of property-sourced, round, debarked, stringybark poles. The ceiling roof comprises wind-fallen, home-milled greygum, cut to 50mm slabs.

The water-proofing membrane on top of the timber slab roof is multiple layers of 0.2mm black polyethylene concrete underlay. The 30cm of earth is

almost ready to barrow on. Working under a roof of this makeup is most pleasant in all seasons.

This structure is facing north, but is yet to have its active solar roof water heater built. The adjoining house has a finished 50m<sup>2</sup> solar collector. The systems will be interlinked.

This workshop is directly attached to a richly-endowed resource room packed to the beams with all manner of useful items gleaned from far and wide. It also adjoins a large garage, a courtyard and the house. All of these are earth-covered with local indigenous flora restoring the surface. Separating each of these building spaces is a concrete wall, which prevents the possibility of an internal fire spreading to the whole structure.

All of the internal walls are pressed-earth bricks, the clay being derived from the excavation.

All energy used on site comes from the hydro system, which keeps an old 12V battery bank 90% charged, with a Selectronics 1300W inverter giving us all the power we need. However, the saw mill, which is around 80hp, is gas-fuelled with gas from the local scrapyard. Old half-empty bottles are pulled from car wrecks, giving a lifetime supply of free gas.

This work area was (before the roof went on) turned into a skate park by my young son when it was just a slab and back wall. The building of large and small ramps, jump boxes, rails and ledges was full on and dominated the site for a few years. But it had to go and plans for a new bigger and better skate park were drawn up, submitted, and given the OK by me. Ben and his five skater boy mates set to and made their own. Nothing was left out.

Not to be left off my list is that it has a ducted vacuum system and a full stereo system—but don't all blokes sheds have these?

### **Here's what I've learnt in my shed:**

- Do not spend excessive time on inventing—it's all been done before, just copy the basic ideas.

- A bit of research before you start can save a lot of time.
- Concentrate on things that are useful to your daily needs. Fix a pushbike rather than a jet ski, make some double-glazed windows rather than a table to hold a new mega kilowatt flat screen television. This can also be expressed by saying 'spend time and money on things that save you time and money'.
- Being renewable and sustainable is easy on the mind.
- Keep putting things away—if it's not tidy, it's not efficient.
- When my anemometer reads over 20 knots there are better places to be, such as windsurfing!

Well that's my shed, but you want to come and see my garden! ✱

### **Shed competition details**

- ☐ Over 35 sheds were entered in the competition.
- ☐ Recycled materials were as common as old nails, including a lot of scrap metal from the tip or hard rubbish collections, salvaged timbers, timber found on properties, materials from demolished houses or dismantled chook sheds as well everyone's sturdy favourite—the shipping container.
- ☐ Most were in rural or semi-rural areas, yet some urban sheddies shared their stories too.
- ☐ Lots had rainwater tanks. Most country properties do as a matter of course, but the shed offers another surface to collect from. The bigger the shed the bigger the surface.
- ☐ Solar electricity was a highlight. The shed was often the place for solar panels instead of the house. RAPS solar was common with many entrants living off the grid.
- ☐ Several sheddies make their own fuel from waste vegetable oil, frequenting the local takeaway stores for supplies.
- ☐ Projects within sheds include bee-keeping, horticulture, woodworking as well as home-made wind turbines, water wheels and much more.

## Sheds

# Shipping container shed

The father and son team of Peter and Ben Risby-Jones made this sturdy shed out of shipping container off-cuts.

**T**he shed has been built on my son's 127 acre property in the hinterland of the Sunshine Coast, two hours drive north of Brisbane. I live 40 minutes away in a townhouse on the coast.

The property is heavily timbered with eucalypts and large patches of original rainforest. The hilly nature of the land made it difficult to locate a suitable site for the shed.

### The shed

Back in 2004, we decided that a shed had progressed to the top of the 'to-do' list. My son and I share a passion for projects involving the innovative use of recycled materials.

Used shipping containers seemed to provide a good starting point because of their excellent structure. They are enormously strong, come with floor and walls and are weatherproof. Containers are readily available and the price is value for what you get—\$1000 to \$3000 for six metre and 12 metre lengths depending on the condition. But it would have been a challenge trying to manoeuvre even a six metre container into the only flat land that we could find.

After further hunting, we came across a supplier who had provided three containers to a customer who had wanted containers the usual 2.4m wide but cut down to three metres in length. We were able to pick up the 2.4 metre to 2.7 metre off-cuts from these three containers for only \$200 each, giving us the equivalent of nearly an eight metre container for \$600. The added bonus was that we were able to transport them on my one tonne ute (one at a time) so we saved on not having to pay transporta-

tion costs. It made the difficult job of positioning the containers on the small sloping area much easier.

The project of building and assembly was a relatively simple and straightforward one for my son and I. We purchased heaps of 200mm x 75mm galvanised C-section from the scrap metal dealer in Brisbane to be used as stumps and bearers so that the container floor would be approximately 900mm off the ground. The container sections were bolted to this, two at one end, then a breezeway, then the final container section.

The floor of the breezeway was made from compressed 16mm fibro, obtained at the local tip. It was the dividing walls from some local public toilets (amazingly, there was no graffiti). Lengthways above the containers was bolted Z-section in varying widths so that a flat roof could be screwed down with sufficient fall. All steel was sourced at either the tip or the scrap metal dealer.

The main house is not on the grid

and is self-sufficient with RAPS solar power. The shed has been connected into this system. Tank water is the only water supply on the property and this has also been connected to the shed.

With the construction of the shed, the emphasis has been to recycle, reuse and use seconds. Windows, doors, benches, shelving, lights, cable, power points and even the fire reel and hose came from the local tip. The only exception has been nuts and bolts and roofing screws, some of which had to be purchased new.

### Projects in the shed

Around the time we were building the shed we started to convert my son's Toyota Hilux to run on waste vegetable oil (WVO). This project proved successful and what started as a few hundred litres of waste veggie oil needing to be filtered just kept growing as we converted more cars. I had purchased an 80 series Landcruiser and my son was looking for a 100



Peter and Ben (right) filling up on waste vegetable oil. Solar collector is on the right.

Photos: Ben Risby-Jones





The shed is made from shipping container offcuts with a breezeway in the middle.

series Landcruiser. The end of the shed was taken over for the filtering of WVO as we had a usable area of approx 2.4m<sup>2</sup>.

After several refinements of the process, our final design has proved extremely successful and has been operating unchanged for several years now. The processor holds 2800 litres of oil with flyscreen filtering the old chips and calamari rings out, then through denim jeans legs. The legs are cut across at the crotch, sewn closed at the cut end and then used as filter socks. The oil is then passed through a hot water solar collector with a pipe running across the top to pre-heat the oil before running through a final 10 micron paper filter.

Heat is also ducted from the top of the collector to heat the filter area (a change of a few degrees has a big impact on the flow rate of the oil).

Reused 200 litre steel drums, 1000 litre plastic cubes and a 200 litre plastic tractor spray tank are the storage containers. Swimming pool filter pumps (from the tip) transfer the oil between the storage containers. A reused service station pump is mounted on the outside of the shed so the refueling of vehicles is quick and easy.

My Landcruiser has done over 70,000km on the WVO and after a few initial teething problems has been running perfectly. With a few extra fuel tanks

added, it now carries over 400 litres of fuel, giving a good range for trips away.

The local tip has proved to be a never-ending source of projects. You just need to be resourceful and creative—when you look at the stuff thrown away, it makes you realise what a wasteful society we are. Electric mountain bikes, scooters, guitars, roller blades, fishing rods and reels and electric quad bikes are popular with the grandchildren. It is fun to watch the kids gather around after I've made a trip to the tip to see what treasures I have brought back. It is helping the young ones to realise that reusing and recycling is the way to a better future—while having fun on the way! \*



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# The story of Local Power

**Thinking of starting a solar panel bulk buying group? One community group undertook the mammoth task of getting solar power to over 100 households. Russ Holmes, Rob Farago and Helen Beazley from Local Power explain how it's done.**

In April 2008 almost 140 homes in Brisbane began generating their own renewable energy as part of Australia's largest solar photovoltaic buying collective at that time. This is the short version of the nuts and bolts story of Local Power Buying Group number one, with Buying Group number two well underway.

## The idea

In June 2007 we began to explore the idea of a buying group for solar panels in West End, Brisbane. Installing solar panels through normal retail channels is expensive, even with government rebates. If we could get the price down for households through a bulk buy, and thereby entice another 50 or so households to install panels, we would be doing something much more valuable.

We were hoping that greater adoption of photovoltaic systems in homes would both boost renewable energy generation in South East Queensland and increase our members' 'energy consumption literacy' so that they would reduce their household's energy use.

## Goals

We wanted the following specific outcomes for participants:

- Significant savings compared to going with a retailer, not just 10% off the best retail price
- Good quality installation. This meant using products and installers with a good track record.
- Participation by people who would not otherwise have installed solar pan-



Photo: Michael Davies - Wide Bay Solar

els due to the high retail price. The best retail deal at the time was around \$3700. Our aim was to provide an entry level price for a 1kW system of under \$2000.

- Participation by people who would not have installed solar panels due to the complexity of product choice and too much paperwork to obtain the rebate.
- Maximising the PV system size participants could purchase. Households could purchase a 1.5kW system through Local Power for not much more than the cost of a 1kW system from other retailers.

## A good deal

Once we started speaking to suppliers and installers we gained a sense of the costs of the various elements of the installation process. We realised we could

adopt one of three broad buying group models:

**Model 1:** Negotiate a bulk installation with a supplier or installation business who would project manage the entire installation including rebate paperwork.

**Model 2:** Negotiate a bulk installation with a supplier or installation business who would project manage the entire installation, but do the rebate paperwork ourselves.

**Model 3:** Negotiate a bulk buy of components and project manage the installation process and rebate paperwork ourselves, contracting the PV installers and electricians to install the systems.

We quickly worked out that if we were just offering a large number of customers to a supplier or installer, we



would only be given a small discount off the regular commercial price of installation. This is probably because no-one had installed such a large group in a short period of time (almost 140 within three months of rebate approval) and didn't appreciate the efficiency advantages of geographic clustering for inspections and installations.

We found we had to pull the whole process apart to achieve significant savings, leading us to pursue Model 3.

## Making the savings

Savings ended up coming from:

- Bulk buying one brand of solar panels and components from one supplier/distributor.
- Taking on tasks that would normally be done by the installer at a higher fee, in particular administration, initial house inspections, project management, logistics and delivery to the place of installation. Sounds easy when you say it like that but we've learnt a lot.
- Geographically clustering consumers to bring down installer price, mainly through the advantages of reduced travel time and enabling installers to have teams in the same area.
- Bulk selling RECs for a higher price. We did allow members to keep their RECs, but no-one did.

## Affordable but high quality

We decided to offer only four solar array sizes with a minimum number of options, partly because our business experience taught us that 'complexity kills' and increases the price. We used the following strategies to reduce barriers to purchasing at the entry level.

### Offering an under \$2000 option.

We decided on a configuration for the best entry level price we could get, without compromising quality. An option under \$2000 would enable people to participate who otherwise wouldn't be able to consider solar panels. In the end we were able to offer \$2461 for a 'stand-alone install', not including selling the

RECs, and after selling RECs our lowest price came in just under \$1500.

### 'Carrying' the rebate if required.

We charged a \$165 finance fee for those who could not wait the six weeks or so between full payment of the panels and payment of the federal government rebate. However, we did ask that people carry their own rebate if at all possible to reduce the amount of capital we needed to find.

### Cross-subsidising smaller systems.

This meant imposing a higher administration fee on the larger systems as a form of cross-subsidisation for the smaller systems.

We deliberately chose Sharp panels over cheaper Chinese panels. While this option was more expensive, we wanted to know that these panels would have the best chance of lasting the 25 years of their performance warranty.

## A rip off?

We were asking people to pay the cost of systems before installation (at least \$1500 deposit and the remainder a week before installation). We hoped that organising as a community group rather than as a business would help people make this 'leap of faith'. So we negotiated to become a program of an existing not-for-profit incorporated association that we knew well. We also decided to hold a public meeting so that people could get a sense of our honesty and competence.

However, we must admit that we

were quite staggered that people were willing to give their money to strangers. We had people that we didn't know delivering fliers on our behalf, getting local news coverage on our behalf, nominating us for a particular environmental award, and entrusting us with almost two million dollars in funds for their PV systems. We were very encouraged that trust was so high and we suspect that it came largely from people who were also involved in volunteer networks.

In our opinion, the skills and experience required to run the Model 3 Buying Group we adopted would be a technical understanding of PV solar panels and the industry, business nous, access to capital, hours to give voluntarily or at a modest wage compared to trade rates, good risk management strategies and the capacity to bear risks that couldn't be avoided or minimised.

In hindsight, it would have been much less work and possibly risk if we chose Model 2, which is probably what we would recommend to other community groups. Nowadays, with many commercial companies running community-based clustering, Model 1 is also viable to someone who can find nine other friends in their suburb wanting solar electricity. ✱

**A longer and more detailed version, including the outcome of Buying Group 2, will be available via the Local Power website in early May 2009. Go to [www.localpower.net.au](http://www.localpower.net.au)**



Photo: Michael Davies - Wide Bay Solar

# Solar hot water a click away

Everything is for sale on the internet, including renewable energy systems. Bruce Jefferey shows how he installed a solar hot water system from ebay.

**W**hen searching for the right solar hot water system some intriguing ones popped up on ebay. They seemed to have all the features I was looking for, such as a stainless steel tank, evacuated tubes and a large capacity. Even better, the price was very attractive at around \$1200 for the 300 litre unit or \$800 for a 250 litre one.

We made a few phone calls to the chosen supplier and felt comfortable because he seemed like a decent guy. After hitting 'buy now' the unit duly arrived at the nearest transport depot.

The first mistake was not to immediately open the package and check the contents. Instead it sat in my shed for two months. When I opened it two of the glass tubes were broken. The supplier said if I had notified him straight away he would have replaced them free of charge, but as so much time had elapsed he would only replace them for \$25 each. This was fair enough; I realised I couldn't make a damaged in transit claim two months after the event so I paid up. The two new tubes arrived (personally checked before signing for them).

I wanted to test a tube so I filled it with water and propped it against a tree in full September sun. Within an hour the water was up to 70°C which impressed me. It could have reached a higher temperature but the tube was not capped so it was losing heat from the top.

Installation instructions were typically hard to follow, which was quite amusing at least. The supplier's installation manual had some very good photos—using both the photos and text together gave enough information.

## Installation

The first step was to bolt the frame together and affix it to the rafters. I had to modify it for our sloping roof as the system was designed for a flat roof or ground mounting.

Once the frame was in the right position I bolted the storage tank to the frame. The smaller tank was installed on top. It only contains an adjustable float valve (the same as in toilet cisterns) to regulate the water flow into the unit.

## Plumbing connections

**Water in at the top of the tank:** As water was being supplied from our rain-water tank via a low pressure pump we used garden hose for this. Using mains pressure would involve pressure plumbing.

**Hot water out at the bottom:** Three quarter inch BSP (British Standard Pipe, which is one of several pipe sizing systems) connection is used here so a basic stop valve was installed and then the pipe size was reduced to half inch. Insulated copper pipe runs from here to inside the roof space. There are two outlet pipes. We chose the one nearest the electric boost element for faster boosting. The other one was capped.

## Electric boost unit

Some people may not need or want to use the supplied 1500 watt unit but it has to be installed, otherwise the water will drain out its hole. I wired it to a standard three pin appliance plug before installing so that it was easy to connect at a later date.

The evacuated tubes slip into place in the tank via the triple O-ring seal (using heaps of liquid soap to ease insertion and reduce the force required—they are glass

tubes after all). The bottom end of each tube is seated in the bottom of the frame.

It's not advisable to let the glass tubes sit in the sun without water in them as they may get too hot and lose the vacuum due to cracking. I installed the glass tubes at night to prevent this.

Next, I turned on the water and let the system fill. It was my lucky day as there were no leaks at all.

Inside the roof I decided to install two props to the rafters to provide more support for the heavy tank. When full, the unit weighs about 400 kilograms. There were handy internal walls to run these props to so that task was easy.

## Inside the roof

The supply pipe enters the roof, travels through a circulation pump with a flow switch to increase the pressure and then connects to the hot water taps in the house. Luckily my house was set up with the hot water plumbing from an old storage unit inside the roof, so it was very easy to connect to this. If the hot water plumbing had been under the floor it would have been more difficult and would have needed longer pipe runs, resulting in greater lag times and more heat loss in transit.

The system was up and running in late 2007 and then we had six months of excessively hot water. It works a treat on a reasonably sunny day in Melbourne. Last May we tried out the electric booster and it worked well for a month before it started to run intermittently—it would run for about 15 minutes out of every hour. We contacted the supplier and received a replacement.

We didn't push the issue at first as we were planning to boost via our Nectre wood heater. First we tried a 10 metre





Clockwise from top left: the header tank, which contains the float valve to break down the mains pressure; the evacuated tube solar hot water system installed; the circulation pump; the electric booster, which you may not need, but still have to install to plug the hole in the tank.

coil of half inch copper pipe around the flue as installed by the Nectre supplier. This gave the most woeful boost; I could not believe how bad it was. After talking to a few people we opted for the 'wetback', which is a water vessel inside the fire box plumbed out the back of the Nectre. This unit was pretty hard to install. We recommend getting it factory installed because it is a real pain to fit after the Nectre is installed.

I eventually got the wetback in and fired up the Nectre, with absolutely astounding results! The water thermosyphoned from the solar hot water system storage tank through the wetback and back to the storage tank, arriving there at 95°C, which is pretty good after a 12 metre journey. So there we were, back in the hot water in the middle of winter. It felt like summer again with gallons of hot water at every tap, just what you need on a cold winter's night for that long bath.

Interestingly, even in the depths of a Melbourne winter, without boosting the

unit delivers enough hot water for a morning shower and washing up at night.

The solar hot water system has been in for over a year now and it has performed well. The electric boost element is still bad and the flow switch on the circulation pump has recently failed. Apart from these two relatively minor faults, I would recommend these units to anyone. Keep an eye on prices and enquire about the availability of spare parts before you purchase.

## System options

We have a low pressure system. The water sits directly in the glass tubes, hence there is no loss of heat in transferring it from the sun directly to the water.

If using mains pressure water there will be a drop in pressure which is only partly compensated for by the boost pump. Higher pressure pumps are available, but they have higher electricity consumption. This was a non-issue for us because we are using a water tank.

There are two systems that I know of that are designed for mains pressure; the 'U' tube and heat transfer medium.

The first has a copper pipe bent into a 'U' shape that fits inside each evacuated tube. Water flows through the copper tube from a manifold at the top.

The heat transfer system uses a single copper tube in each evacuated tube which is bonded to a manifold at the top. Inside the tube is a heat transfer liquid. When the tubes heat up the liquid rises and heats the manifold through which water travels, being heated along the way. \*

**While Bruce's ebay purchase worked out well, be cautious when purchasing renewable energy systems on the internet and do the same research as when buying from any retailer. To be eligible for government rebates of up to \$1600 a solar hot water system needs to be an approved system fitted by a licensed installer. For more information go to [www.environment.gov.au](http://www.environment.gov.au)**

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# Double standards

The output from solar panels is often lower than predicted. Collyn Rivers explains this anomaly.

Historically, many a measurement was defined by the reigning monarch's taxation needs and tax collectors' perceptions. The medieval 'virgate', a taxable area of farmed land varied from 15 to 60 acres, depending on factors including the time deemed necessary to plough it, its presumed fertility and the king's need for cash. Many measurements continued like this until standardisation became essential (in 1793) for what became the metric system.

Nowadays one can mostly draw reliable conclusions from data based on physical quantities, but there may still be need for checking. The solar industry, for example, seemingly perpetuates the 'historical' approach. I was by no means the first to comment . . .

Krauter and Hanisch's (1994) paper noted: 'Actual efficiencies of photovoltaic generators are often lower than predicted by [the industry's] Standard Operating Conditions.'

A later book on converting to renewable technology noted resultant solar input was a lot less than calculated. I also came across a doctoral thesis postulating that 'Standard Conditions' did not reflect actuality.

I found our own previously-believed 1.5 kW system generated only 1.27 kW. It was later upgraded. The supplied documentation quotes output as 80% of that noted on the RAPS rebate claim.

Check your own systems and you'll find much the same.

The industry in effect has two 'scales'. The one used for marketing, 'Standard Operating Conditions' (SOC), rates module output under laboratory conditions—using procedures/assumptions the industry admits are

non-achievable in real use. The other, Nominal Operating Cell Temperature' (NOCT) reflects reality well. Were NOCT used for marketing, variant scales would not matter. But it's not.

The technically astute rely on experience (or NOCT) and similarly astute buyers know there's a rear panel revealing the NOCT—albeit in terms mostly only electricians understand. But few system buyers understand solar technology: they are buying watts. They reasonably assume watts claimed are watts delivered (as it were).

The industry does not dispute that system outputs are less than seemingly claimed, but continues to sell using the optimistic SOC scales.

## Buying watts

Few customers now buy solar modules per se. Increasingly, they buy watts. But packaged and other systems are rated (in watts) by multiplying their modules' SOC rating by the number of modules supplied—resulting in outputs up to 30% higher than is achievable in real life—let alone delivered. Typical '1kW' systems cost \$15,000 or more, yet as little as \$12,000 worth of watts may be delivered. On big systems the dollar difference is huge.

## Why does it happen?

Many early innovators were technically knowledgeable: and some aware that measuring techniques need not directly reflect reality (provided results were repeatable and could be accurately *correlated* with reality).

The early industry thus used ratings that neither needed to, nor did correspond closely with reality. Instead, they supplied technical data (that many buy-

ers then understood) revealing the more probable output. This became 'standard industry practice'. The subsequent NOCT rating, whilst based on SOC methodology, adjusts results to reflect typical solar input and module usage. It provides acceptably realistic data. But despite the existence of NOCT, module and system rating claims are based on virtually raw SOC data.

## Most agree

In general, industry representatives rarely dispute that their product delivers less than seemingly claimed. Some argue that, because it's gone on for decades, why change now? Some that the punters don't understand watts anyway (but how many people can *define* a litre?). Others explain *why* systems cannot deliver that claimed. But explaining why you paid for 1000 watts, and only received 700-800, does not justify that practice. I suggest no parallel, but theft has been the burglary trade's 'standard industry practice' for millennia: but explaining how it works has yet to make it acceptable.

It is readily provable that, in a typical real life application, no packaged solar system comes within cooee of its typically promoted output unless on top of an equatorial mountain on a freezing cold summer day around noon and exposed only briefly to sunlight. (Some installers confirm this if queried).

## Differences explained

The first cause is power mismatch: it mostly affects systems that have battery storage.

One watt may be defined as one volt times one amp. A 120 watt solar module delivering a realistic charging/operating average of (say) 14 volts must *by*

definition, produce 8.57 amps. But measure it, or just read what it says on its back, and you'll find it typically produces 7.1 amps. Here's why:

For rating purposes the industry draws two graphs: one of volts, the other of amps. These graphs are 'overlaid' and where they peak (under SOC testing) becomes the rated output: usually 17 volts upwards. And 17 volts at 7.1 amps equals 120.7 watts.

If one has a 17 volt load all is well: the claimed 120 watts is close to obtainable, up that mountain etc. But that module may *only* deliver its rated power above 17 or so volts: below that, power tapers away. Unfortunately, 17 volt batteries are rare as fish riding unicycles.

In basic nominally 12 volt systems everything between peak power voltage and the charging or operating voltage is lost. A '12-volt' system *charges* at 14 plus volts but *delivers* at 12.0-12.7 volts. It's a silicon version of the pea under the thimble trick—now it's here, now it's not.

Explaining *why* power gets lost does not justify (for example) 1.2kW systems being sold as 1.5kW systems: but at least it reveals it's happening.

One partial remedy, Maximum Power Point Tracking (MPPT) used mostly with grid-connects but also in some stand-alone applications, juggles amps and volts to optimise watts. It typically reduces daily mismatch loss by 10-15%.

## Heat loss

Heat too causes loss.

All but amorphous-based solar modules dislike heat, typically losing about 5% output for every 10°C rise. Manufacturers admit this but vendors may claim it's not a problem since modules are rated at 25°C. But that rating is not at *ambient* temperature: it's that of the glass-covered black cells under hot sun!

The NOCT rating reveals this. It typ-



Collyn Rivers and his 3.2kW solar array in the Kimberley, Western Australia.

ically shows that, at 20°C (not 25°C) ambient and a light cooling breeze, those cells are somewhere between 47°C and 49°C and that, under such conditions, about 15% output is lost, mostly through heat.

## The issues seem clear

The fault does not lie with vendors/installers. By virtue of an unrealistic global rating system, they are locked into sales strategies that they cannot control, yet they must attempt to defend in the event of legal challenge.

The solution is obvious. To cease rating product in a way the industry *itself*

knows is unrealistic and unachievable. Simply switch to the NOCT set of scales. \*

**Collyn Rivers was founder and editor of *Electronics Today International* magazine. He was technical editor of the now defunct *The Bulletin* and also of *Australian Business*. In more recent years he has written and globally published five books, of which three are electronics and solar related. His most recent book is *Solar Success* (a complete guide to home and property systems). Visit [www.successfulsolarbooks.com](http://www.successfulsolarbooks.com) for more details.**

## Standard Operating Conditions

The SOC uses a procedure defined by ASTM E1036, corrected to Standard Reporting Conditions, also known as Standard Test Conditions. These include:

- illumination of 1kW/square metre at a spectral distribution of Air Mass 1.5 (ASTM E892).
- cell temperature of 25°C.

These are not typical operating conditions. They measure solar parameters under controlled conditions that minimise independent variables.

The energy assumption of 1000 watts/square metre is simply a handy number

that interfaces well with SI units.

## Nominal Operating Cell Temperature (NOCT)

The NOCT indicates the temperature at which a cell typically operates. It is often described as bringing SOC closer to reality. Under NOCT a typical SOC rated '120 watt' module typically produces 85-88 watts.

NOCT is based on SOC methodology but assumes:

- an ambient of 20°C
- solar irradiation of 0.8kW per square metre
- wind speed of 1 m/s.



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TECHNOLOGIES

# Low-cost electric vehicles

Paying for an electric vehicle conversion shouldn't mean you have to mortgage your home. David Rowe explains how it can be done for a lot less than you might think.

I drive an electric vehicle (EV) every day. You probably could too. You don't have to wait for the big car manufacturers to finally produce an EV, and you don't need to spend \$50,000. You could be driving an electric car for as little as \$6000. That's eight EVs on the road for the cost of one hybrid. This article describes what it's like to drive an electric vehicle every day, explains how to build a low-cost, practical EV, as well as exposes a few myths about range and charging.

## Living with an electric vehicle

Last August I took my first exciting drive in a 1991 Daihatsu Charade that I had converted to electric drive. After a bit of tinkering the EV was officially signed off in November and since then I've done about 200 electric kilometres each week. I have been to the petrol station once—to get air for the tyres!

It's fun and easy to drive. I put it in third gear and as I slowly depress the pedal the controller starts to gently whine. It accelerates well up to 60km/h, better than the original 1.3 litre petrol engine. When braking there is a purring sound from the vacuum pump that supplies braking power. I don't use the clutch to start, as the engine stops when standing still. I just use third gear from 0 to 80km/h, so it's just like driving an automatic.

The car is silent while waiting at traffic lights. I hear birds (!) and all the other engines wastefully idling around me. When driving I can hear a little transmission noise but very little from the electric motor. The car sounds very quiet to people on the street.

Driving habits change. In my EV it is



This Charade EV conversion cost just \$6000!

cheaper for me to drive into town and back (14km, 60 cents of electricity) than take public transport (\$3 train ticket). With an EV there is no guilt over very short trips, for example 1km to the supermarket when I need to carry eight shopping bags. Short trips are very inefficient and highly polluting in a petrol car.

I'm more aware of the energy I'm using in an EV, perhaps because of the metering. I get a direct reading of volts, amps and kilowatts as I drive. EVs coast forever. So if I see a red light, I take my foot off immediately and coast the last few hundred metres using no energy at all. It makes me very aware of the waste in petrol cars. Maintenance costs are low as there are very few moving parts (just brakes and tyres).

## Range and charging

The EV is a lead-acid battery conversion of a small internal combustion en-

gine (ICE) petrol car. This means the range is relatively short (40km) and it can only carry two to three people due to the weight of the batteries. Remarkably, neither of these limitations has been a problem in practice. As with many people, most of our trips are short. Despite having a family of five (two adults, three kids) most trips are for one or two people. There are plenty of opportunities to recharge during the day. I'm pleasantly surprised that the EV covers 90% of the family's driving needs with ease.

Our six cylinder petrol car is now an orphan. We rarely use it. The other day I needed it for a long distance trip and neither my wife nor I could remember when we last put petrol in it! We both prefer the EV to the ICE any day.

We have not found range to be an issue even for our simple home-converted EV and our experience is not unique. I have since spoken to several EV driv-



ers who have been happily driving electric for several years, satisfying many of their commuting and short range needs. At home I plug in the car like charging a mobile phone. It's easier than going to a petrol station and it costs only a few cents of electricity for every kilometre travelled—or it's free if you use a solar PV system. I don't see any need for special recharging infrastructure: any household power point will do. Do you sweat over recharging your mobile phone? It's about that easy.

## We need more EVs

I am passionate about getting more electric vehicles on the road. However, EVs are simply not on the map at present; government is focused on expensive and complicated hybrid technology at best. Hybrids still burn non-renewable fuel, so are at best a stop-gap measure. EVs can be powered by renewable electricity and most EV components are 100% recyclable.

Many of my friends are keen on EVs but the major objections I hear are cost, conversion time and conversion effort.

## A typical lithium conversion

This is the pricing for a typical small car EV conversion using lithium batteries:

90Ah 120V Pack .....	\$9000
Battery management system ...	\$1000
Charger .....	\$2000
Advanced DC motor .....	\$2300
Curtis controller and pot box ..	\$2500
Adaptor plate and coupler .....	\$800
Total .....	\$17,300

These prices exclude the donor car and labour, plus many other smaller items that are required to complete the conversion (such as cabling, connectors, tools, mechanical repairs). If investing this sort of money a very good condition donor car is needed (which means a reasonably expensive one). The total project cost could easily reach \$25,000. However, on completion you will have a fine EV that will seat four

people, with a range of 100km and be capable of highway speeds. For many people this is a lot of money to spend.

## Low-cost electric vehicles

To lower the costs, one approach is to build an EV targeted at 60km/h commuting, rather than try to compete head-on with the capabilities of a petrol car. Here are some suggested specifications:

Range .....	60km
Top speed .....	80km/h
Battery pack .....	72-96V
Battery technology .....	lead-acid
Conversion cost .....	\$6000

The ABS statistics for my home town of Adelaide state that 50% of all trips are less than 5km. This suggests that vast numbers of metro trips could be made by simple EVs such as mine.

The lower battery pack voltage gives adequate acceleration for metro commuting but keeps the number of batteries low to save weight and capital cost.

What about lead-acid batteries? Aren't they old technology? Too heavy, not enough range, low cycle life? For my family and 95% of people driving electric vehicles today, lead-acid technology is just fine. It's not perfect, but it gets you into an electric car for a cost that is hard to beat. For example, \$2000 for a 100Ah, 96V battery pack. It has the benefit of a wide range of suppliers, is 95% recyclable and is tried and tested technology. I see lead-acid as a viable alternative to lithium batteries—especially for low-cost EVs.

Upgrading to other battery technologies is always an option later. The bottom line is that with lead-acid you can be driving an EV today at a reasonable capital cost.

## Cost reduction ideas

At the moment each EV conversion requires custom machining to build an adaptor plate and coupler (these items connect the electric motor to the original transmission). Some ideas to reduce costs:

- Use a laser cut adaptor plate rather than machining.
- Machine shops could build stock of standard adaptor plates and couplers for common electric motor and gearbox combinations.
- Share CAD files on a web site—then converters could pull down the CAD files and send them to the local numerically controlled (NC) machine shop.

Performing conversions in modest volume (say in quantities of 10) could dramatically reduce prices of all EV components, just like group buys of PV solar systems. Discounts of up to 30% may be possible on EV components in these quantities.

Standardising on a few donor cars would allow standard components to be designed. For example, battery racks could be welded quickly and inexpensively on a jig, rather than custom fitting to each car. Engineering reports will also be much simpler and cheaper if conversions follow a similar pattern.

Current EVs contain two expensive

**The Chinese motor and adaptor plate fitted to the gearbox.**



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imported electronic components: the speed controller and charger. These items can cost around \$2000 each. Volume always drives the cost of electronics lower, so there is much potential for cost reduction in these devices. In the current economic climate there is a big demand for locally produced EV electronics, so a great opportunity exists for a local company willing to manufacture these components at a competitive price.

## The \$6000 EV

A \$6000 EV conversion is a much more attractive proposition than a \$20,000 conversion if your driving is mainly short range. Let's look at how this budget changes the EV picture:

- A rougher (cheaper) car can be used for the donor car (e.g. a 1980s Barina or Charade). A modern donor car could be used (e.g. a 10-year-old Echo for \$5000) and still have a modest all-up project cost.
- \$6000 is roughly a few years' petrol plus maintenance on an ICE vehicle, so it makes sense to the accountants and general public.
- Even if the lead-acid pack needs replacing every few years, the costs are reasonable—\$2000 over three years is \$650 per year or \$12.50 per week. That's cheap motoring compared to the cost of owning a petrol car.

When petrol again approaches \$2 a litre a \$6000 EV conversion will be even more attractive. At this cost we can get eight EVs on the road for the cost of one \$48,000 hybrid!

## Chinese kit

There are people in Australia building EVs in the \$4000 to \$8000 range already. For my next EV I am using a Chinese kit of components (available from a Queensland distributor, see end of this article for details). For around \$3000 this kit includes the electric motor, charger, speed controller, fuse, pot box, DC-DC converter and coupler. It's suitable



The Chinese kit after installation in the Charade. The end result looks neat and professional.

for cars in the Barina/Charade/Echo size range. The distributor reports a range of up to 80km using eight 12V AGM batteries (around \$2000) in his Barina. Top speed is around 85km/h—perfect for metro commuting.

It is also possible to build a low-cost EV (around \$8000) using 72V American components rather than 120-144V (price is a strong function of the voltage). Vehicles running on 72V are fine for metro driving, but a light-weight micro-car donor (Mira, Sherpa, Suzuki Alto class) should be used.

The main difference with higher voltage conversion is more power and higher speeds. Although my current EV is 120V, I have found this extra power and top speed unnecessary for 60km/h commuting.

## Fast conversions

Many EV conversions take 6 to 12 months of part-time work to complete. If EVs are to be more widespread this needs to be dramatically reduced. What would be ideal is an EV conversion business that works like current LPG conversions. Drive a car in, then a few days

later drive out an EV. Businesses like this are starting to emerge in the US. Ways to speed up conversions include:

- Standardise on just a few car models.
- Prefabricate custom components like battery racks and wiring looms.
- Bulk buy adaptor plates and couplers.
- Assemble and wire major components (e.g. controller, charger, pot box, vacuum pump, circuit breaker, front battery rack) on the bench then drop the entire assembly into the donor car.
- Purchase in quantities of 10 rather than one.
- Proper tools, a hoist, skills and experience will dramatically reduce labour. For example, my local mechanic could remove the ICE engine and mount the electric motor in a morning. It would take me several days with my tools and experience.

## Opportunities for small green business

Performing an EV conversion is not for everyone. This means that there are opportunities for small, green business to help get more EVs on the road. A price of around \$10,000 (including con-

version labour) for a small ICE car 're-cycled' as an EV would not be unreasonable for many people who want to drive electric. It is possible for small business to 'eat the big companies lunch' by servicing the latent demand for EVs.

Opportunities for business include:

- Building and stocking couplers and adaptor plates for various models so converters can buy them 'off-the-shelf'.
- Drive-in, drive-out conversion businesses.
- 'Short form' or partial conversion businesses, for example helping people with the steps in their conversion that they are uncomfortable with. Some people have the skills to perform part of the conversion themselves, especially if it saves them some money on the labour intensive parts.
- Low-cost controllers, chargers, and battery management systems with Australian service and backup. No-one likes returning their speed controller

to the US for servicing.

- EV leasing and servicing. Rather than owning an EV, people might wish to lease one for, say, \$100 per week and have it maintained for them.
- Accessories and sub-assemblies, such as efficient air-conditioning and heating units.

For a business owner with the right skill set it might be possible to put 10 metro-commuter type EVs on the road for a capital cost of \$50,000. Compared to many other businesses, this is not an expensive business to start, especially for someone with access to machine tools or a mechanics workshop.

Now is a great time to start an EV business. There is time to prepare and fine tune the business while oil prices are low. When oil prices rise again, demand for EVs will be very high. People are price sensitive right now so the low-cost EV model is extremely attractive compared to a hybrid or a US\$40,000 EV some time in the future.

I would love to see more EVs on the road. They are great to drive and can be powered from renewable energy. Converting an old petrol car into an EV saves huge amounts of embodied energy used to manufacture a new car. The 'fuel' can be made right here in Australia from solar. If EVs started to appear on every block, people would start asking the government 'why not EVs?' \*

## More info

Eugen Vajtauer is the Queensland distributor of the Chinese EV kit: [www.goombi2.mysite.com](http://www.goombi2.mysite.com)

The author's EV page: [rowetel.com/ev.html](http://rowetel.com/ev.html)

Conversion blogs that show you how to build an EV:

[www.electric-echo.com](http://www.electric-echo.com)

[www.kiwiev.com](http://www.kiwiev.com)

[www.electriccarsforeveryone.com/blog/](http://www.electriccarsforeveryone.com/blog/)

Australian Electric Vehicle Association: [www.aeva.asn.au](http://www.aeva.asn.au)



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# Rubbish-free results

Here's what happened during one couple's attempts to send nothing to landfill for twelve months.

In Issue 103 of *ReNew* we heard from Matthew Luxon, who had just embarked on a rubbish-free year. Matthew and his wife Waveney planned to send no rubbish to landfill, except for up to one council rubbish bag.

The challenge ended on February 1 and involved well and truly exercising consumer choice, composting, rehom-ing, recycling and making food and other products to avoid unnecessary packaging. They assessed every item before it entered the home, including the copy of *ReNew* we tried to post with their article in it last year. Before sending it we confirmed that the packaging and magazine were indeed recyclable, but suggested it was a great magazine for rehousing rather than composting.

As well as the obvious outcome of this household sending less rubbish to the tip, the challenge also drew a lot of media attention across New Zealand where the couple lives. Media appearances included everything from student radio, articles in major newspapers to regular appearances on prime time television program *Campbell Live*. If there was one group they wanted to engage it was the unconverted, high-rubbish producing household that just might need a demonstration of rubbish-free living on the box before they give it a go themselves.

In the end they met the challenge with plenty of room to spare in the rubbish bag. A close inspection of the bag's contents reveals it is mostly plastic. Here's some of what's in there.

1. Half a supermarket bag of paint chips from scraping and sanding our weatherboard house in preparation for a new coat of paint.
2. Approximately 50 cigarette butts

found on the property from previous residents.

3. A broken plastic peg.
4. Plastic tags from clothing labels.
5. A universal car petrol cap which was rejected at a roadworthy test.
6. Plastic wrapping from a wine bottle lid.
7. Tape from a bunch of flowers.
8. A blown incandescent light bulb.
9. Cellophane from a second bunch of flowers.
10. Two non-rechargeable batteries that accidentally came with Waveney's new bike light.
11. A cheese wrapper which initially was thought to be recyclable.
12. A hardened paint brush from painting sealant on a hearth made for a log-burner.
13. Three small souvlaki plastic bags.
14. A pie wrapper blown onto the block from the street.
15. An old plastic seedling container found half buried in the garden.
16. A plastic sleeve containing an invoice stuck onto a couriered package.
17. Wrapping from antibiotics for Jess the dog.
18. Dental floss.

Item 5, the universal car petrol cap, found a new home when Waveney was giving a talk to a group of teenagers doing an environmental course. One of them asked for it as a souvenir, stating that she also intended to use it in a piece of art. True, some of it was avoidable rubbish, or 'mistakes' as Matthew and Waveney put it, but some households put out ten times that amount of rubbish every week.

Here's some of their comments and observations during the twelve month challenge.

## One down, 51 weeks to go: Feb 08

In many ways this first week has been easier than expected. The preparations for the year were somewhat demanding, but now that we are in the swing of it, it's all good. A small challenge of the week was buying sandpaper (we're currently preparing our weatherboard house for painting) at a large hardware store. Ducking the plastic bag they wanted to put my two rolls of sandpaper in was relatively simple, but we then had to dodge the 'SOLD' plastic tape that they wanted to put on the items. Still we managed to get through unscathed and rubbishless.

## Finding new appliances: April 08

In the interests of saving our elbows from future re-constructive surgery due to continuous hand mashing of homous and pesto, we have been in the market for a blender. I mentioned this in the article I wrote for *ReNew*. A few days after it was published we received an email from a reader named Ana, offering us her very good quality blender, which was used a few times for blending and since then for gathering dust. The only problem was she lives in Melbourne, so emails were sent far and wide and our good friend Mike came back offering to transport the blender on a business trip to Christchurch from Melbourne. Consequently, we became the adoptive parents of a very sturdy and good quality blender. It's true that there are 180 blenders currently on Trademe, and also true that some of these might have been in Christchurch, however, there is something fantastic about a per-



son saying 'I have this item which I'm not using, therefore you have it and the knowledge that it is now in a more useful position is payment enough for me.'

## Financial benefits? May 08

Initially I felt that our new lifestyle was going to cause us to haemorrhage money as we started looking for alternatives for packaged products. For example, we found a metal toothpaste tube, which can be taken to the scrap metal dealer, but it costs \$7 for about half the quantity of your generic \$3 plastic tube. However, as the challenge has gone on we're finding alternatives to the alternatives such as making our own toothpaste out of baking soda and salt, which is resulting in fiscal savings.

A lot of the alternatives require an initial outlay, which is well and truly recouped over the lifetime of the product, an obvious example being rechargeable batteries. We bought Eneloop rechargeable batteries because they are like disposable batteries in that they come ready charged but can also be recharged over 1000 times through their lifespan. Similarly, we bought a bulk 20 litre container of laundry detergent as it came in a recyclable container and it is looking like it will last us at least 18 months.

These sorts of outlay initially hit hard but when costed out over their lifetime will result in savings. Interestingly our food bill has not changed in total although the receivers of our money have. Although we are not buying items like biscuits and muesli bars we are spending more on butter and other baking items so it seems to be swings and roundabouts.

## Did you know?

**You can clean out potato chip bags and reuse them to make steamed puddings in. The foil is able to withstand the heat of the water quite well. You can also use bags from cereal packets for the same purpose.**

## Rubbish-free padlock: Aug 08

I guess the 'event of the week' if anyone could call it that, was the purchase of a rubbish-free padlock. We had a combo one securing our garage and it stopped working—we suspect someone tried to break in. So the next day I raced down to The Warehouse only to find their range entirely cocooned in plastic display cases hanging neatly, one by one, off hooks. This is pretty normal and we are used to trying multiple places before getting what we need, so next I headed to Smith City, found the same thing and then unsuccessfully tried a little locksmith stand in a mall.

Then I put an ad on Freecycle ([www.freecycle.org](http://www.freecycle.org)) but before anyone could get back to me I happened to see a locksmith store which had what I wanted: a padlock in a cardboard box. It wasn't on display, he had to go out the back and dig around for it for about two minutes. What a lot of effort. Most people who hear what a palaver we go through ask why we don't just dump the unwanted packaging with the retailer—we could buy almost anything we wanted and not go to any effort to source alternatives. Yet, we hope by choosing to be rubbish-free at the point of sale, and by documenting it in our Rubbish Free Guide, we have forged a path for others to be rubbish-free consumers.

## Week 52: Jan 09

Well, as I write this there are two days of our challenge year left and a party still to have.

The way this year has gone was quite unanticipated; the way the media has been so interested and how widely people have followed our exploits. It amazes me: who would have thought rubbish would have such general appeal?



I wouldn't have guessed it, but my last rubbish-free week has been busy with making ice! We can't buy ice for our party (because of the plastic bag) so we have been making our own. I borrowed some ice trays and every five hours or so I empty all the ice cubes into large containers in the freezer and refill the trays with water. I also have a friend doing the same thing, so we should have heaps. We have also solved the serviette problem. I couldn't think how to avoid the plastic they come in until a friend suggested dipping bowls. So guests with dirty little fingers will dip them in the bowls and dry them on the hand towels provided. I like this idea—so simple. Will everyone end up with food on their face and no ice in their drinks?

## Postscript

Matthew and Waveney celebrated the end of their rubbish-free challenge with a 100% rubbish-free party at home for over 100 guests. No rubbish was created except for a piece of glad wrap from a cheese round. They say they have no plans to rush out and buy things they couldn't get when the challenge was on. Their new habits are so ingrained that very little effort will be needed to maintain them. \*

**These are edited extracts from Matthew and Waveney's very detailed blog at [www.rubbishfreeyear.co.nz](http://www.rubbishfreeyear.co.nz)**



# The national picture

**There's mixed signals from the government when it comes to tackling the economy with green solutions, writes Alan Pears.**

**THERE'S NOTHING** like an economic meltdown to change the policy landscape. On one hand, some find this is a great excuse to slow progress on climate change response while others, like President Obama (and PM Rudd to some extent) see a chance to build a new, green economy. Our prime minister sees a need to move beyond the free market model that became a bit too free, throwing us into the hands of the snake oil salesmen.

On balance, I think the meltdown will help to progress climate change response. First, a lot of old, inefficient industrial facilities around the world will close down. Second, given the obvious need to address climate change, any new investment will factor it in, driving energy efficiency and renewable energy inputs harder. So the transition may be accelerated. Share values of sustainable energy businesses are holding up better overall than those of traditional energy suppliers and resource industries. So smart investors will look much more closely at the emerging low and zero carbon industries.

At the same time, many people are confronting the financial unsustainability of their lifestyles and are voluntarily or involuntarily making big changes. At least some are also shifting their focus from 'me' to the need to work together to secure 'our' future.

We are also seeing some important lessons. For example, the US car companies have successfully manipulated governments for decades to protect them while they sold profitable fuel guzzlers. Now the global trends have caught them

out. Instead of adapting at their own pace and building new market opportunities over time, they are being dragged into the low carbon world—and they may not make it. Australia should look closely at this and ask whether our coal, resources, car and building industries can learn anything from the disastrous experience of the US car industry.

So far, the messages about Australia's response under the Rudd government are confusing. On one hand, some investment in green jobs is being proposed. On the other hand, everyone is being encouraged to consume to restart the economy, and the Carbon Pollution Reduction Scheme is offering enormous subsidies to energy intensive industries and coal power stations of around \$4 billion each year.

It is perverse to discourage carbon 'leakage' due to energy intensive industries moving offshore while at the same time driving investment in low emission and offsetting industries offshore by denying them fair treatment under the CPRS. The government seems to be so focused on oiling the squeaky wheels that it is forgetting to lubricate the new wheels on which a successful low carbon economy will depend.

In the 1970s and 1980s, the argument for supporting expansion of the resources and metals sectors was that they would provide a bridge from our declining agricultural sector until we could build a smart, internationally focused high value adding manufacturing and services economy. However, as these industries grew, they used their political power to strengthen their po-

sition—yet, even in the boom, they created only around 8% of Australia's GDP. And, by driving up the value of the Australian dollar to near parity with the US dollar, they made our export and import replacement manufacturing and services industries internationally uncompetitive. This was one of the factors that drove our manufacturing industry to Asia, making us even more dependent on the resources sector. This is not a recipe for a successful, resilient, sustainable society and economy.

The federal government is also confronting the practical and political challenges of driving climate response policy. Within each level of government, agencies are fighting among themselves to take responsibility for action, so they can either control and limit what happens, or capture the kudos for successes. And each state government, as well as the federal government, wants to be seen as a leader. In some ways it's great to see all this competition, but the downside is that a lot of time and resources are wasted, while the best solutions can be swamped by power games. It's confusing and frustrating for households and business and important outcomes are being delayed.

## Emissions trading—where to?

The elephant in the room can no longer be ignored. Community outrage and business concern about the unfair treatment of voluntary abatement under the proposed Carbon Pollution Reduction Scheme (CPRS) has ramped up. The Alternative Technology Association ran



a successful meeting last October, which played a key role in focusing media attention. Now we have a new industry association, the Voluntary Carbon Markets Association ([www.vcma.org.au](http://www.vcma.org.au)), being formed to fight for recognition of voluntary abatement. It has been interesting to note the large number of businesses who see their business strategies undermined by this policy failure. GreenPower suppliers, local councils and major businesses all see their 'carbon neutral' status and associated reputation and market positioning collapsing. And offset providers are not happy to see their livelihood threatened!

Beyond this, we have seen fascinating developments within the environment movement. Over the first weekend in February, a large meeting of environmentalists in Canberra concluded that the proposed CPRS was just too compromised to support in any way. So key environmental groups are withdrawing support. Not only is the target too weak and voluntary abatement undermined, but the generosity of the handouts to greenhouse intensive industries is just ridiculous. Professor Garnaut also expressed strong displeasure at the success of their lobbying efforts and argued there was no basis for such subsidies.

It looks as though the government decided to go with a conservative package in the hope that it would apply pressure to the Opposition to vote for it in the Senate. Now the government has a very awkward problem, as it loses com-

munity support for the whole scheme while the Opposition plays games by proposing policies that will support various abatement options, both proven and unproven. The Senate should be a very interesting place, and it looks as though inquiries and amendments, along with lots of hot air, will make for a challenging process.

The worry about all this is that we really need to act decisively and quickly. Even apart from the impact on climate change response, delay will undermine prompt abatement action and also add to risk of energy infrastructure failures.

## Decentralised versus centralised solutions

In late January, south-eastern Australia experienced record heat. The Tasmanian end of the Basslink electricity cable couldn't cope, while other power lines were threatened by fires and transmission systems in Victoria failed. At the same time, debate over hundreds of heat-related train cancellations in Melbourne flared and economists and politicians explained to the community that it just didn't make financial sense to guarantee 100% reliability under extreme conditions. Not many

people were impressed by this argument.

All this highlights again the tensions between large centralised and inter-linked systems and more diversified distributed systems. Yet again, demand side response that was available was not utilised. When will the electricity industry and its regulators take demand management and distributed generation seriously?

Soon we will have the option of smart demand side controls, some localised energy storage and distributed generation, so we can run independent of the grid for at least short periods. What will people be prepared to pay for that, especially when smart meters and time of use pricing—with \$2 per kilowatt-hour power on hot days—are introduced? \*

**Alan Pears is an engineer and educator who has worked in the energy efficiency field for over twenty years. He is Adjunct Professor at RMIT University and is co-director of environmental consultancy Sustainable Solutions.**

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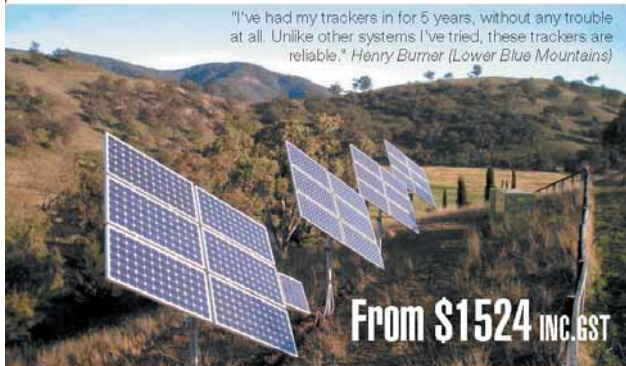
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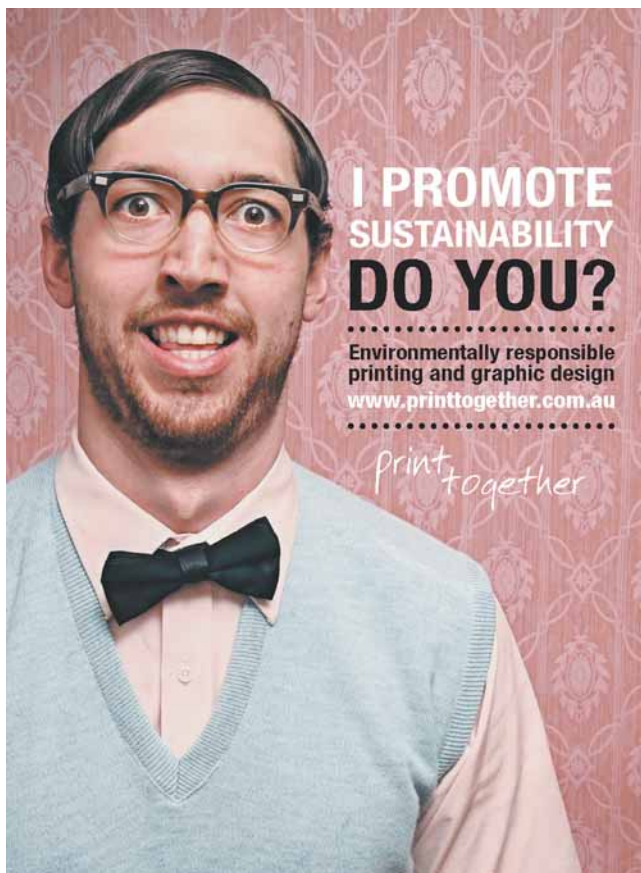
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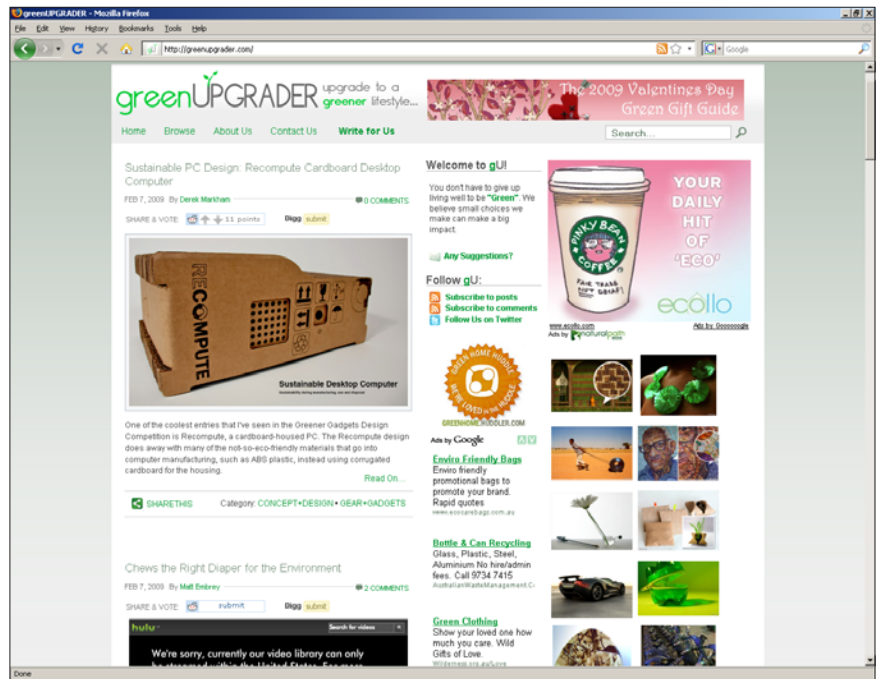


## www.greenupgrader.com

Greenupgrader is a website similar to Treehugger in that it is a blog-style collection of posts on environmental topics.

Each post excerpt (what you see in the list of posts) is usually listed with a photo and enough information to gain your interest. The posts themselves have a lot more information about the product, project or idea including extra photos and links to external websites of suppliers, or environmental foundations and organisations that might support the project as well as various other relevant sites.

You can leave comments on each post and even vote on the eco-value of the post. Of course, you can search on particular subjects and categories such as transportation, architecture, food, travel and recreation. You can also subscribe to the post feed and you can even write for the site if you don't mind not being



paid for your efforts! There's also a directory of other eco-oriented sites, although it isn't overly extensive.

So, while not the best site of its type, there's still plenty of useful and interesting information to be found here.

## www.betruegreen.com

We don't usually promote commercial websites in Browser, but betruegreen.com is different in that it

also contains a lot of free information.

While it does promote its green publications such as *true green home*—100 ideas for creating a greener home, the site also

has interesting information and links. For instance, each month there's a list of 10 tips to live a greener lifestyle. There's also an events page, where both Australian and US events are listed.

Arguably the best thing about this site, and the main reason most people will go there, is the huge links pages. There are two separate links lists—one for Australia and one for the US, so you know you'll be jumping to sites in the right country when you click.

The lists are categorised into groups such as transport, carbon offsetting companies, government sites, calculators, recycling, GreenPower suppliers, forums, environmental organisations, water and energy saving and many others.

While you may not want to spend money on their publications, we suggest you pay this site a visit if for no other reason than to visit the many other sites linked from it.



# Products

## Share your PC!

If you are setting up an office, internet cafe or any other computer cluster, you might think you need one computer per user. Not so, now that thin client computing packages are becoming available. Thin clients are small boxes that connect a monitor, keyboard and mouse (and possibly other devices) of several users back to one central PC, which has special software installed on it to allow it to drive all of the thin client terminals.

This means one PC can be used by several people at once, thus greatly reducing hardware costs as well as energy use. Combine a thin client system with a low power PC and you could provide computer services to several people for just a few tens of watts energy use each.

The company nComputing makes thin client packages from the basic L130 client right through to the X550 kits, which can provide up to 11 terminals from 1 PC. The kits include the thin client boxes, software and interface card for the PC. All you need is a PC and a monitor/mouse/keyboard combination for each user.

**RRP: POA.**

For more information contact nComputing, ph:1300 137 193, ph:(02) 9922 5420, [sales-oceania@ncomputing.com](mailto:sales-oceania@ncomputing.com), [www.ncomputing.com](http://www.ncomputing.com)



## Rechargeable solar multimeter

Every multimeter owner knows the feeling of grabbing their meter, only to find the battery is flat. A new digital multimeter from Jaycar Electronics aims to solve that problem.

The unit uses rechargeable batteries which are recharged from one of three sources: 12-36 volts DC, mains power, or the built-in solar panel.

Other features of the meter include an integrated holster, diode test and audible continuity, a Cat III 600V rating, 0.5% accuracy, true RMS measurements and a fused 10A range.

**RRP: \$109**

Available from all Jaycar Electronics stores. For more information, go to [www.jaycar.com.au](http://www.jaycar.com.au) and search on model number QM1546.

## We zink this is a great idea!

With the advent of digital photography there has been a huge upsurge in the number of colour printers being sold, particularly bubblejets. This of course means that millions of inkjet cartridges are (bought and) thrown away each year (some are recycled, but most end up in the bin).

The Zink ink-less colour printing system addresses this concern by embedding the ink inside the paper. The printer, instead of spraying dots of ink, uses thermal technology to activate the embedded ink. This eliminates the need for external ink altogether, and while you do of course have to buy the special Zink paper, most people print their photos on high gloss photo paper anyway, so you are just trading one type of expensive paper for another.

Currently, Zink paper is only available in business card size (2 x 3 inches) but Zink can supply it in any size to product manufacturers. So far only a few products are using the Zink system, including the Pogo series instant digital camera and tiny portable printer from Polaroid and the Tomy xiao TIP-521 instant camera.

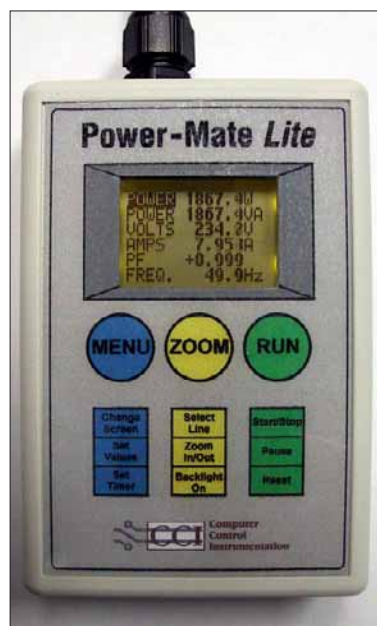
However, we suspect this is early days yet and hope to see a great many more products changing over to this system. Who knows, in a few years we might see the end of small, wasteful colour printer cartridges.

**RRP: \$199.95 for the Pogo printer.**

For more information go to [www.zink.com](http://www.zink.com). Also see [www.polaroid.com.au](http://www.polaroid.com.au) and [www.polaroid.com](http://www.polaroid.com). The Pogo printer is available from Ted's camera stores.







## Power-Mate Lite energy meter

The Power-Mate has been a very popular meter over the years but it is out of the price range of many people. The manufacturer has addressed this problem with the Power-Mate Lite.

This new meter features a new multi line backlit LCD display, intuitive three-button operation and simplified menus and non-volatile memory, so the meter resumes after a power interruption without loss of data. As well as instantaneous power, it displays energy used and the cost per hour, quarter and year, greenhouse gas production and some more technical figures such as power-factor, frequency and VA (volt-amperes). You can also start and stop (or pause ) a measurement period. The meter also has preset measurement period timer choices of 1, 8, 12, and 24 hours and 2, 5, 7, 14, and 28 days. Even better, unwanted display screens can be suppressed from view.

The Power-Mate Lite will display up to 10 amps of load, meaning it can measure all common loads in the average home or small office.

**RRP: \$99**

**Available from Alternative Technology Association, Level1, 39 Little Collins St, Melbourne VIC 3000, ph:(03) 9639 1500, email: ata@ata.org.au, www.ata.org.au**

## Thinking outside the flat (panel)

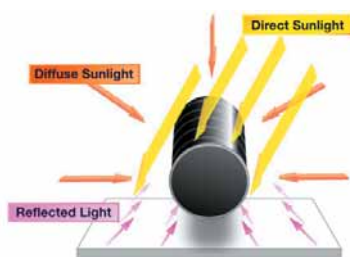
The one thing that almost all solar panels to date have had in common is that their cells are flat. Whether they be crystalline or thin film types, they all have flat cells that only work on one plane.

Solyndra has taken a different approach with their thin film copper indium gallium diselenide (CIGS) cells. The panels consist of tubular cells which are hermetically sealed each end to prevent degradation of the solar cell material. The tubes are arranged into arrays, much like evacuated tubes for solar water heaters. The cylindrical cells can take advantage of not only direct sunlight, but also diffuse and reflected light. By painting the roof white before installation, solar panel output is increased and roof cavity temperatures are decreased.

Because the Solyndra cells are not a solid panel, they have a much lower wind resistance and so can be mounted on roofs without using roof-penetrating mounting systems, thus simplifying mounting considerably. The mounting system has been certified for winds up to 208km/h. Further, because air can flow around each tube, cell running temperatures are lower than flat solar panels, according to Solyndra.

Solyndra panels are not yet available in Australia. Let's hope that an enterprising renewable energy supplier can change that in the near future!

**For more information, contact Solyndra Incorporated, 47700 Kato Rd, Fremont CA 94538, USA, ph:+1 773 360 5328, www.solyndra.com**



## Grow your own herbs

Cosset Industries makes a range of products from what's called comingled waste. This is basically mixed plastic waste and would normally end up in landfill. Instead, Cosset turns it into many useful products such as the herb garden box shown here.

The box measures 1000mm x 1000mm x 200mm and comes in a complete kit, ready to assemble. It is termite and rot resistant, needs no maintenance and will outlast wood and other materials.

Other products in the Cosset range include post and rail systems, sleepers, tree and shrub stakes, park furniture, garden edging and square and rectangular profiles.

**For more information, contact Cosset Industries on freecall: 1800 267 738, email: service@cosset.com.au, www.cosset.com.au**



# Products

## Environmentally sound umbrella

Most people don't give much thought to the humble umbrella. After all, it's just there to keep the rain off, and when you're done with it, away it goes into the cupboard. But what happens when it gets too ratty to use or gets destroyed by wind?

The average umbrella is made from metal, plastic and nylon fabric and is not very recyclable, as materials in this form are not able to be processed by the domestic recycling system. The Brelli umbrella solves this problem.

The Brelli is made from bamboo and cotton string for the frame, while the transparent cover is made from fully biodegradable plastic. Not only can the Brelli be composted, but if it does end up in landfill, it will break down in just five years according to the manufacturer.

The Brelli is available in two sizes—35 inches (89cm) and a huge 52 inch (132cm) version. It is designed to handle not only heavy downpours, but is strong enough to withstand high winds without damage.

**RRP: \$39.95 for the 35 inch model, \$59.95 for the 52 inch model.**

**Available from Neco, 101-107 Whitehorse Rd, Blackburn VIC 3130, ph:1300 882 640, [www.neco.com.au](http://www.neco.com.au)**



## LEDs coming to a street near you

They may not be common yet, but LED streetlights are definitely on the way in. There are quite a few designs appearing now, such as the range from Lightsense Australia.

These include lights from 28 to 168 watts, with light outputs from 2100 to 15,600 lumens, and the lamps are available in either cool white or warm white. The 28 watt model comes as an ES40-based bulb, while the other models are complete street-light head assemblies. There is also the SP90, a modern-looking integrated LED streetlight, and a 56 watt, 4200 lumen tunnel light.

**RRP: List prices are from \$360 for the 28 watt model through to \$1660 for the 168 watt model, plus GST.**

**Lightsense Australia Pty Ltd, 1/197 Canning Highway, South Perth WA 6151, ph:(08) 9368 2345, email: [electrical@macsmaintenance.com.au](mailto:electrical@macsmaintenance.com.au), [www.lightsense.com.au](http://www.lightsense.com.au)**

## From aircraft seat to your shoulder

Reusing materials is much better than recycling them, and Worn Again in the UK is doing just that. They take materials such as old Virgin Atlantic seat covers, car seat belts, post-Glastonbury tents and bicycle inner tubes and turn them into great things like bags and shoes.

Worn Again is working with Virgin Atlantic to meet Virgin's goal to halve the waste it sends to landfill by 2012.

The bags are all hand made in family-run and small-scale workshops in Portugal. Because they are made from recycled materials no two products are exactly the same. The bags are a limited run, with 2000 bags being made from 1000 aircraft seat covers following the refit of the economy cabins of several aircraft.

The Worn Again Virgin range includes the 'Ollie' wash bag, the 'Sherman' male messenger bag and 'Lydia' and 'Romero' ladies handbags. The bags include an 'ingredients' label which lists all the materials that make up the bags.

**Available from Worn Again, Rich Mix, Unit CO2, 35-47 Bethnal Green Road, London E1 6LA UK, ph:+44 (0)207 739 0189, email: [info@wornagain.co.uk](mailto:info@wornagain.co.uk), [www.wornagain.co.uk](http://www.wornagain.co.uk)**





## Heat only the water you need

If you can't install a solar water heater for space or solar access reasons, then you should look at using the most efficient method of heating water available. While instantaneous natural gas may seem like the best choice, your greenhouse emissions will be lower if you use 100% GreenPower and an efficient instantaneous water heater.

The Hey Presto taps from Lifesaver Systems, available in curved and straight spout models, have a built-in heating system so that water is heated directly at the point of use. This eliminates both standing tank losses and pipe losses—there's very little running of the tap needed to get hot water, saving energy and water. The water temperature can be adjusted to produce outlet temperatures ranging from 35°C to 60°C.

The taps can be fitted into any standard sink and only require a standard 10 amp power point for the electricity supply.

**RRP: \$320**

For more information, contact Lifesaver Systems Pty Ltd, Shop 2 Siganto Plaza, 142 Siganto Drive, Oxenford Qld 4210, Freecall: 1300 798 711, email: [info@saveitnow.com.au](mailto:info@saveitnow.com.au), [www.saveitnow.com.au](http://www.saveitnow.com.au)



## Cut industrial lighting energy use by more than half!

Lighting in commercial applications can be a large energy consumer. The Powerboss Eluma high bay lighting system is designed to replace conventional strip fluorescent and other gas discharge lamps to allow energy reductions of more than 50%.

Touted as an intelligent lighting system, the luminaires sense occupancy in each area of the building and/or the change in natural light and adjust the light level and hence electrical energy usage accordingly. Each luminaire uses four 55 watt Osram compact fluorescent lamps combined with a reflector material that has a 95% reflectance. This means virtually all of the light produced by the lamps makes it to the work area, rather than being absorbed by poorly designed lamp fittings, as is often the case with conventional luminaires.

For more information contact Control Supplies Pty Ltd, ph:(02) 9831 4888, [controlsupplies@bigpond.com](mailto:controlsupplies@bigpond.com), [www.controlsupplies.com.au](http://www.controlsupplies.com.au). Available in New Zealand from Pacifikstar Limited, ph: +64 9 447 1075, email: [fuel@pacifikstar.co.nz](mailto:fuel@pacifikstar.co.nz), [www.pacifikstar.co.nz](http://www.pacifikstar.co.nz). Also see the manufacturer's site at [www.somar.co.uk](http://www.somar.co.uk)



## Automatic lead-acid battery chargers

Batteries are expensive so it pays to make them last as long as possible. If your batteries regularly need a topup from the mains or a generator, then you should use an intelligent battery charger to charge them as quickly as possible without damage.

The range of smart chargers from Ozcharge includes models from 900 milliamp 6/12 volt, through to 21 amp, 12 volts. There is also a 4 amp, 24 volt model.

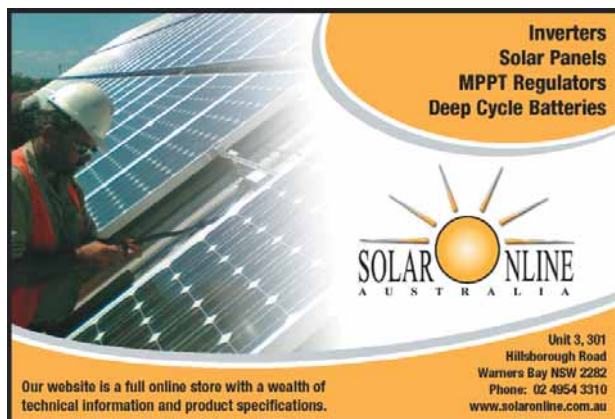
All of the chargers are microprocessor controlled and use switchmode power conversion for maximum efficiency. They suit all types of lead-acid batteries including calcium, conventional, sealed, flooded and gel cell. Another interesting feature of these chargers is that they all contain a selectable 'maintenance' function, which is basically a built-in desulphator.

The chargers all feature reverse polarity protection and come with a two-year warranty.

**RRP: from \$79 for the 6/12V 900mA model to \$259 for the 12V 21A model.**

For more information, contact Zylux Distribution Pty Ltd (OzCharge), 166 Christmas St, Fairfield VIC 3078, ph:(03) 9482 2203, email: [info@ozcharge.com.au](mailto:info@ozcharge.com.au), [www.ozcharge.com.au](http://www.ozcharge.com.au)





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 Passive solar design, fixtures, fittings and practical hints are all included. There are also stories about the experiences of owner builders in Australia and New Zealand.

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## Build Your Own Electric Vehicle 2nd Edition

By Seth Leitman and Bob Brant.

329 pages, softcover. \$54.95.

Published by McGraw Hill.

ISBN 978-0-07-154373-6

Can be purchased from Jaycar Electronics, [www.jaycar.com.au](http://www.jaycar.com.au)

THERE'S A LOT of interest in electric vehicles of late, but in Australia there are few, if any, commercially made vehicles within the range of the average buyer. In many cases the only option to own one is to build one yourself, or rather, to convert an internal combustion engined vehicle to electric.

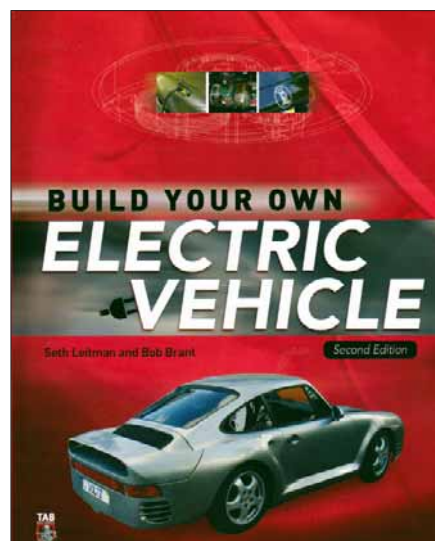
This seems like a daunting task, but provided you plan out a conversion correctly and do your homework, it needn't be difficult.

*Build Your Own Electric Vehicle* is an excellent publication to help you with this process. It gives detailed information on how EVs work, the types of batteries,

motors and controllers you can use, as well as dealing with many other issues that will crop up during a conversion. There are explanations on calculating how much power will be needed for a vehicle for a particular purpose. Plenty of formula and tables are presented to help with this task.

While it is written about the US EV conversion scene, many of the components discussed are available in Australia now, albeit at considerably higher prices than in the US.

The book is well laid out and easy to read, although a few typos and weirdly structured sentences did make it through the proofing process. However, these are easy to forgive as it is the information that the book conveys that's important. There is also a great list of sources for components in the back of the book and while they are all in the US, you can track down the Australian supplier (if there is one) easily enough.



All in all, if you are thinking of converting a car or other vehicle to electric power, then you probably should read this book. It will certainly set you on the right path and might just help you avoid some expensive mistakes.

Review by Lance Turner

## Huge power bills?

It's difficult to measure how much power many appliances use because they run intermittently.

However the Power-Mate is designed to accurately measure and record volts, amps and energy used by an electrical appliance. It can also calculate the greenhouse gas emissions.

Better still is that the Power-Mate will calculate the actual running cost of the appliance so you know exactly how much it is costing you every hour, quarter or year.



Price \$295 for the 10 amp version, \$345 for the 10 amp heavy duty. The Power-Mate is available for hire for \$30 per week (to ATA members only).

For more information please contact John on ph:(03) 9631 5413 (Tuesday and Thursday only), email: [john@ata.org.au](mailto:john@ata.org.au) or go to the ATA webshop at [shop.ata.org.au](http://shop.ata.org.au)

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If you have a project, simple or complex, electrical or mechanical, that has appeal to do-it-yourselfers and involves renewable energy or appropriate technology in some form, then send it in. Entries must describe completed working projects.

Send your ideas to: ReNew, Level 1, 39 Little Collins St, Melbourne VIC 3000, email: [renew@ata.org.au](mailto:renew@ata.org.au)  
Competition closes Friday 24 April 2009.

The winner of our previous DIY article competition is Bruce Jefferey for his ebay solar hot water article.



## Q&A

### Strawboard noise reduction

We are turning our back tin shed into a room (as our house is tiny), so being tin we obviously want it well insulated on the walls. We are using batts and plasterboard but because we have an added disadvantage of being on a very busy road we really want to decrease noise by as much as we can. When I looked up strawboard, one website said it is very good for thermal insulation as well as noise proofing. However, it is a lot dearer and we are on a very tight budget.

Do you know if strawboard is better than insulation and plasterboard for thermal, but mainly for noise reduction? If the difference is minimal we would rather spare the extra expense.

**Marita Wallace**

yuppah@hotmail.com

*Strawboard has a high acoustic attenuation, but whether it is better than the insulation you are proposing depends on what insulation you had planned to use. There are manufacturers of acoustic insulation that also rate it for thermal properties, so you could check those out as well. An example is [www.peaceandquiet.com.au](http://www.peaceandquiet.com.au)*

*Personally, I would use the strawboard as it is both biodegradable and quite strong for taking screws for pictures or other items that need to be attached to the wall. It also eliminates the need for plasterboard as it has a craft paper surface that you can plaster or paint directly.*

**Lance Turner**

### Smarter washing machine

Apart from being energy and water efficient, are there washing machines that

have two outlets, one for soapy water and one for cleaner rinse water? Salesmen tell me I can wait by the machine and move my outlet pipe from the drain to the garden pipe when the rinse cycle starts. This is a non-starter of an idea as nobody in my household would do that. Presumably in the 'factory default mode' these two outlets would be combined but with the option of separating them for those who wanted to and the manual would indicate how.

Also, we wash with hot (or warm) water in summer as the solar water heater has good capacity and the electric booster switch is off all summer. I assume washing machines don't have their own electric heater elements! My question is: can I plumb my washing machine so that I can put cold water into both of the hot and cold washing machine inlets in winter and thus wash with cold water only in winter? I envisage that this would just mean installing a connecting bridge (with a cock in the middle) between the hot and cold inlet pipes at the back of the washing machine. In winter I would open the bridge cock and close off the hot tap.

Thus even if someone (e.g. teenager not focused on this planet) set the washing machine control to 'hot' in winter, they would just get a cold wash. Do you see any problem with that idea?

**Bill Gresham**

bgresham@iimetro.com.au

*There might be some machines with the two outlet pipe ability but I've not seen them—there wouldn't be enough demand for such a machine yet I suspect. It would require either two separate pumps or a solenoid valve to direct the rinse water to the rinse outlet. Either way, it's extra expense that would be hard to sell, but it is a good idea and there may be enough demand for such an idea if it were marketed to the eco-conscious greywater users out there.*

*Washing machines do indeed have their own heating elements. If the incoming water isn't as hot or hotter than the temperature setting the machine is set to, the machine will heat the wa-*

*ter. Often, the machine won't continue with the cycle until the water reaches the correct temperature, so this idea may not work with your machine. It sounds like your machine doesn't have a true cold wash setting, some machines do, some don't, rather they have a 20 or 25°C setting, so they still heat the water. I have an LG front loader which has a true cold setting, it never heats water, even in the dead of winter.*

**Lance Turner**

### Gas versus electricity

Has *ReNew* ever done an analysis of relative energy usage of methods of heating water for a cuppa?

Where we've been house-sitting while owner-building, we've had occasion to use several methods. I've not taken the time to do real scientific testing minimizing the variables etc. Partly this is because my power meter only displays in 100 watt-hour increments. The house gas meter easily measures such small quantities as may be used for boiling one kettle with two cups of water.

Is it as simple as converting the gas volume used to equivalent watt-hours? What's the conversion factor/formula? In this case I needed 0.02 cubic metres of gas to heat 500mL of water to a steaming boil in a stainless steel kettle on an open gas cooktop. To heat the same amount of water at the same temperature in a plastic Kambrook Aquarius electric kettle (which has an exposed immersion heater) it took approximately 90 seconds.

Using a microwave oven was as follows: I used a 14-year-old Swedish Whirlpool AVM 350 AU rated at 800 watts full power. Using full power, there was no evidence of steam until 2.5 minutes. At that time condensation on the edge of the cups above the water indicated steaming. The ceramic cups seemed to get much hotter than when one simply adds boiling water from a kettle—I know the kettle had to get hot too.

It seemed to me that in a microwave oven water never gets to a good heat. Is this just an illusion? With the microwave, as with the electric kettle, the

### Write to us!

**We welcome questions on any subject, whether it be something you have read in *ReNew*, a problem you have experienced, or a great idea you have had. Please limit questions to 350 words.**

**Send letters to: *ReNew*, Level 1, 39 Little Collins St, Melbourne VIC 3000, [renew@ata.org.au](mailto:renew@ata.org.au)**



power meter was not sensitive enough to register consumption.

Thanks for the great mag. Sorry Penny Wong and others in the (heavily Queensland coal-rich weighted) federal government could not figure out how to significantly ameliorate Australia's part in global warming. Former General Eisenhower in his later years as US president said something to the effect: people will eventually demand peace and governments will have to get out of the way and allow it. Perhaps when that day comes we might have government regulation to effectively deal with global warming.

**Sunny Miller**

sunnymiller@hotmail.com

*According to wikipedia ([http://en.wikipedia.org/wiki/Natural\\_gas](http://en.wikipedia.org/wiki/Natural_gas)), 'The gross heat of combustion of one normal cubic metre of commercial quality natural gas is around 39 megajoules (~10.8kWh), but this can vary by several percent.' So, you are using 216 watt-hours to heat your 500mL of water.*

*Assuming the Kambrook kettle is rated at 2000 watts (a typical element size, but they can be up to 2400 watts) then the electric kettle is using 2000 x (90/3600), or 50 watt-hours.*

*Remember that microwave ovens are rated for their cooking power, but they actually draw considerably more power than this. Your 800 watt microwave may draw up to 1600 watts from the mains. Assuming this is the case, then it is using 1600 x (150/3600), or 67 watt-hours.*

*So, it appears that either method of electrical heating is far more efficient than gas heating. This would be due to several factors, the main one being that a lot of the heat contained in the gas simply flows around the sides of the kettle base and up into the air. In short, it's a heat transfer problem.*

*Interestingly, you have to be careful when heating water in a microwave oven. It can become what is known as superheated, where its temperature actually exceeds that of water's boiling point. This happens when you are using containers that are smooth, with few nucleation sites (i.e. scratches and bumps), which is where bubbles normally form. If bubbles can't form, the water temperature can exceed 100 degrees and can then erupt*

*explosively when it is disturbed, such as by removing the container from the microwave or placing a spoon in it. So, your water may indeed be reaching boiling point in the microwave, you just might not be able to tell! There is some detailed information on the superheated water problem at [www.physics.wednet.edu/~jw/superheating.html](http://www.physics.wednet.edu/~jw/superheating.html)*

**Lance Turner**

## No towbars for hybrids?

In *ReNew 106* Lance writes that a petrol hybrid is the preferred option over a diesel engine. When we were looking for a new car last year, we wanted to go for an hybrid. However when we said we wanted one with a towbar, the dealer said that hybrids can not be fitted with a towbar as this would void the warranty. We could get a towbar fitted by a local mechanic, but neither Honda nor Toyota would fit a towbar on a hybrid. The reason being that theoretically the electrical connection between the car and the trailer could upset the hybrid's electronics. So we went for a diesel car and fill up with biodiesel most of the time (which is fairly available in the Adelaide region).

**Rob Wartenhorst**

wartenhr@internode.on.net

*The drive system of a hybrid vehicle is generally separate to the 12 volt system, so it shouldn't have anything to do with the fact that the vehicle is a hybrid. It could be that the manufacturers are worried about excessive loads being placed on the hybrid drive trains by people towing heavy loads.*

*There is another possibility that is not only associated with hybrids. Many new cars have complex lighting systems nowadays, where each light fitting is networked to the rest of the vehicle on a CAN buss system. Adding a trailer to such a vehicle can upset the system as the trailer lights are usually just wired into the wiring loom at the rear of the vehicle.*

*As to why this is being done is anyone's guess—conventional automotive lighting systems had been in use for many decades before someone decided they needed to network them and make everything far too complex. After all, they are just lights*

*for god's sake, they just have to turn on and off and light up! Really, there is a serious need for simpler cars without these unnecessary technological additions, I can't help thinking most of these 'innovations' occur simply to keep some engineers and marketing guys in jobs.*

**Lance Turner**

## Finding DIY info

On [www.Earth4Energy.com](http://www.Earth4Energy.com) is an offer to a subscription to a book/video on how to build a solar cell power system for US\$200. The cost for the subscription is US\$49.97, a book is also available to build cheap wind power systems.

Can you advise if these are legitimate? Is this a scam? Is it worth purchasing and giving a go? I live in Perth and would like to go down the solar power path.

**Ron Hille**

*There is heaps of this sort of info online for free, from sites like [www.instructables.com](http://www.instructables.com), [www.makezine.com](http://www.makezine.com) etc, plus many other sites where people put their projects online. You can't easily make PV panels, you have to buy cells and assemble them into panels, which is time consuming and difficult unless you have skills working with fragile cells and soldering them together. To be honest, it really isn't worth the hassle; solar panels are steadily getting cheaper in real terms—you are better off just buying them.*

*As far as making wind turbines is concerned, there are also plenty of projects on the sites above, as well as many others. A common motor used as a wind turbine base is the smartdrive motor from Fisher & Paykel washing machines. However, recently there have been some quite cheap wind turbines arriving in Australia from China. These are most likely at least as robust as a home-made device and are worth a look. Check out the wind generators section at Jaycar Electronics, [www.jaycar.com.au](http://www.jaycar.com.au) (select the generators category). They also have solar panels.*

*When it comes to overall system information there are some great Australian-published books, including the latest Collyn Rivers book *Solar Success—Getting it Right Every Time*. See [www.caravanandmotorhomebooks.com](http://www.caravanandmotorhomebooks.com) for more information.*

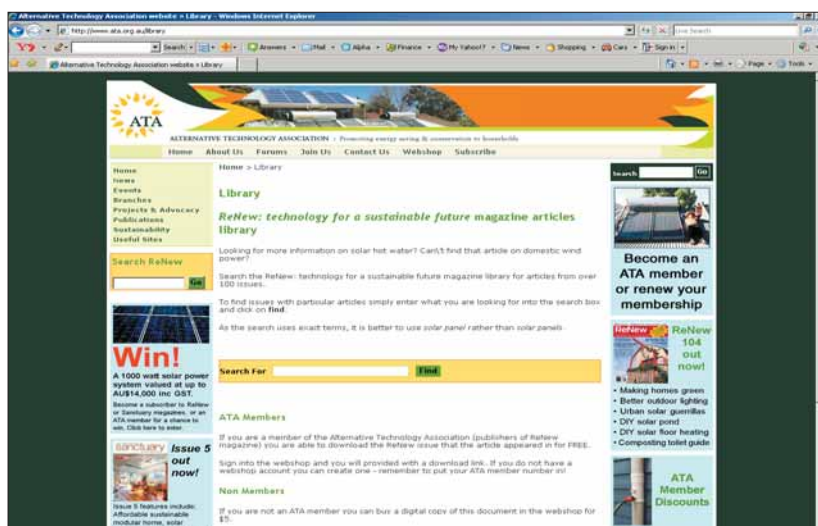
**Lance Turner**



# Practical solutions for sustainable living

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

## ATA branches





# ATA shop by mail

## Sanctuary magazine

Price: \$9.95 plus \$2.50 postage

Or subscribe 12 months (4 issues) \$36 or 24 months (8 issues) \$70

### Issue 6

Cool treatments for a hot house, chemical-free pools, 10 tips for sustainable design, solar air-conditioning, taming the sun, plus beautiful sustainable homes from across Australia.

### Issue 5

Affordable sustainable modular home, solar hydronic heating, tank bling: accessories for clean water, eco-friendly flooring options, healthy green paints for your home, plus beautiful sustainable homes from across Australia.

### Issue 4

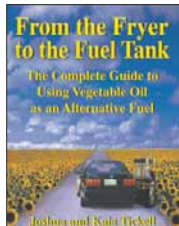
Stylish sustainable home for less than \$250,000, rainwater gardens, sustainable landscaping, the low-down on downlights, sustainable living rebates, plus 12 beautiful sustainable homes from across Australia.

### Issue 3

Buying a sustainable home checklist, design your home for green cleaning, keeping warm without costing the earth, plus 12 top eco-friendly homes from across Australia.

### Issue 1

*Sanctuary* brings together 15 of Australia's leading sustainable architects and building designers. With their cutting-edge ideas, these homes are an inspiration to anyone wanting a modern home designed for style, comfort, health and with the environment in mind.



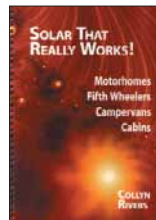
### From the Fryer to the Fuel Tank

Author: Joshua Tickell

Price: \$34.95 plus \$8 postage

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*



### Solar That Really Works!

Price: \$42.50 plus \$8 postage, 82pp

Whether for motor homes, fifth wheelers, caravans or cabins, solar energy is silent, clean and increasingly affordable. This book is a down-to-earth guide to getting it right the first time.

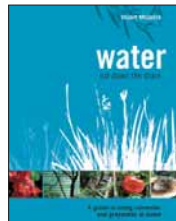
*Item code: STRW*

### Water Not Down the Drain: A guide to using rainwater and greywater at home

Author: Stuart McQuire

Price: \$29.95 plus \$8 postage

A comprehensive guide to sustainable water use around the home. Consult this book before you install rainwater tanks or a greywater system, or even if you just want to reduce your daily water use. *Item code: WNDD*

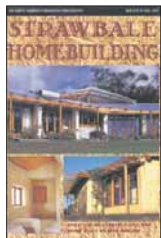


### Your Home Technical Manual

Price: \$49.50 (sorry, no member discount on this item) plus \$8 postage

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*

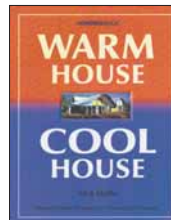


### Strawbale Homebuilding

Price: \$19.95 plus \$8 postage, 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*



### Warm House, Cool House

Author: Nick Hollo

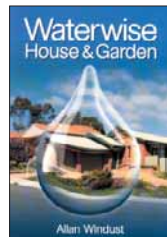
Price: \$33.00 plus \$8 postage, Paperback, 172pp

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*

### Waterwise House & Garden

Price: \$29.95 plus \$8 postage

This practical guide shows you how to conserve water in your home and garden. The book details water saving using options including rainwater tanks, greywater recycling, and creating a water-efficient garden. Included is a list of native and exotic plants that are drought tolerant. *Item code: WWHG*



### ATA Booklets series: Wind Power

Price: \$10 each plus \$2.50 postage

In this booklet you will find all the information you need to get an understanding of wind-powered electrical and water pumping systems, how to size and install them correctly, how to look after them, safety requirements and a great deal of other information.



### ATA Booklets series: Solar Hot Water

Price: \$10 each plus \$2.50 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.



### ATA Booklets series: Solar Electricity

Price: \$10 each plus \$2.50 postage

Covers all the basics you need to know when designing a solar power system. Includes panel types, batteries, controllers, inverters and many other aspects of solar energy systems.

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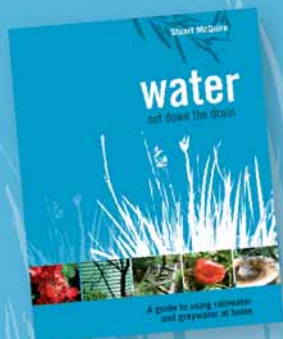
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**Smart Water Fund**



## Renewables on CD ROM

### ReNewROM

Price: \$65 plus \$2.50 postage

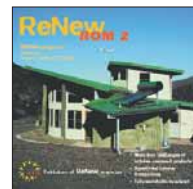
The second CD ROM of the series, covering issues 41 to 70 of *Soft Technology* and *ReNew* back issues, many of which are no longer available. This disk is fully searchable with 30 complete magazine issues in PDF format, so it can be used on PCs, Macs and Linux boxes. *Item code: RENEWROM*



### ReNewROM II

Price: \$65 plus \$2.50 postage

The third CD ROM in the series, and covers issues 71 to 89 of *ReNew* back issues, many of which are no longer available. This disk is fully searchable with 19 complete magazine issues in PDF format, so it can be used on PCs, Macs and Linux boxes. *Item code: RENEWROM2*



### ReNewROM III

Price: \$45 plus \$2.50 postage. The fourth CD ROM in the series, and covers issues 90 to 99 of *ReNew* back issues, many of which are no longer available. This disk is fully searchable with 10 complete magazine issues in PDF format, so it can be used on PCs, Macs and Linux boxes. *Item code: RENEWROM3*



## Kits, LEDs and energy-efficient devices

### Power-Mate Lite energy meter

Price: \$99

This new meter features a new multi line backlit LCD display, intuitive three-button operation, simplified menus and non-volatile memory, so the meter resumes after a power interruption without loss of data. As well as instantaneous power it displays energy used and the cost per hour, quarter and year, greenhouse gas production and some more technical figures such as power-factor, frequency and VA (volt-amperes). The meter also has preset measurement period timer choices of 1, 8, 12, and 24 hours and 2, 5, 7, 14, and 28 days. Even better, unwanted display screens can be suppressed from view.

*Item code: POWERMATE-LITE*



### LED Replacement Bulb: cool white and warm white

Price: \$34.95

This LED lamp has been designed as a direct drop-in replacement for MR16 halogen lamps. Its 5W power rating ensures a high level of brightness that is the equivalent to a 20W halogen MR16 lamp. Also, unlike the halogen equivalent that generates high levels of heat, these LED type MR16 lamps generate very little heat and are therefore safer. The body is made of aluminium for good heat dissipation, to keep the LEDs running as cool as possible. Power consumption is around 5 watts at 12 volts, either AC or DC, so can be plugged straight into most halogen sockets without changing the transformer.

Typical applications include kitchen/bathroom lighting, entertainment lighting, architectural lighting, landscape lighting, bollards, security and garden lighting, and interior commercial lighting.

Note: some electronic transformers may cause flickering due to this lamp drawing insufficient power to load the transformer adequately. Available in cool, neutral and warm white, in 38 and 60 degree beam angles. *Item code: LEDHAL\_5W/MR16\_XXYYCLR where XX is CW (cool white), NW (neutral white) or WW (warm white) and YY is the beam angle (38 or 60)*



### Non-contact thermometer

Price: \$109

This non-contact infrared thermometer can measure from -50 to 650 deg C, making it ideal for measuring the surface temperature of your solar panels or checking for thermal leaks in your home.

The unit features dual laser targeting to help get an accurate temperature reading and backlight so the temperature can be read in low light conditions. The thermometer also has adjustable emissivity from 0.10 to 1.00 so the unit can be adjusted to more accurately measure the temperature of the surface. It is supplied with a holster and battery. See our webshop for specifications. *Item code: THERMO\_INFRARED\_ED72*



### Digital lux meter

Price: \$49.95

A handy digital light meter which will measure light in three ranges, from 0.1 to 50,000 lux. The photo detector is wired on a curly cord, allowing the user to take light measurements at the optimum position. A sensor cover is included.

This meter is ideal for measuring light levels when replacing incandescent lamps with more energy-efficient alternatives, or for checking light levels on solar panels etc. *Item code: METER\_LUX\_50K*



### Power-Mate energy meter

Price: 10 amp version is \$295; 10 amp heavy duty version is \$345 and the 15 amp version is \$405

If you are looking for a professional and robust device for energy auditing or use on the workshop floor, then the Power-mate is the meter to use!

It consists of a hand-held meter which can be connected to the appliance it is measuring via a simple piggyback plug and socket set. The meter features an LED display for easy reading and high visibility at all times.

The meter can tell you a variety of measurements including: power in watts, voltage and current, with minimum, maximum and instantaneous readings. The meter can also tell you the cost of running the appliance, how much energy the appliance used in kilowatt-hours and how many kilograms of greenhouse gas emissions it produced, all in hourly, yearly, quarterly and accumulated figures. There are three versions available: the 10 amp, the 10 amp heavy duty, and the 15 amp unit (which has 15 amp plugs with the large earth pin). *Item code: POWERMATE-10A/10AHD/15A*

We also have a Power-Mate for hire (for ATA members only) for \$30 a week including express post to you.





### Low-cost energy meter Mark 2!

Price: \$69.95

Our new Power Usage Meter is an Australian-approved version of the Killawatt EZ, a very popular meter in the US, and is far better than the last one we had available. The meter will display total kilowatt-hours, voltage, watts, current, frequency, volt-amps, power factor, elapsed time, utility rate (energy cost per kilowatt-hour) and accumulated energy cost. It will also project costs, in dollars and cents, for an hour, day, week, month or year. The unit has memory backup so you can move it from place to place without losing the settings and recorded information.

Rated accuracy is  $\pm 2\%$ , but we ran one in series with one of our very accurate Power-Mate meters and it generally tracked the Power-Mate within around 1%. However, this meter is not very accurate below 10 watts due to the resolution of the internal circuitry. Item code: POWERUSAGEMETER

**ATA members now receive a flat 15% discount on ATA products, except for booklets and where noted. Ask for your discount when you order! Postage is a flat rate of \$8, regardless of the number of items, or \$2.50 for booklets/magazines/CD ROMs.**

### 6 amp maximiser kit

Price: \$45

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. When used with pumps, the maximiser can provide up to 40% more pumping per day.

Note: not suitable for battery charging use!  
Item code: MAXIMISER\_6AMP\_KIT



### 12 amp maximiser kit

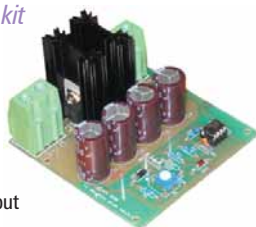
Price: \$70

This device allows you to drive pumps and other motor-driven devices directly from a solar panel or panels, without the need for batteries.

When used with pumps, the 12 amp maximiser can provide up to 40% more pumping per day.

Note: This kit is not designed for use as a battery charger, and must only be used with solar panels and motors/pumps. Maximum current: 12 amps.

Item code: MAXIMISER\_12AMP\_KIT



### 30 amp speed controller kit

Price: \$49.95

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.

Item code: SPEEDCONKIT



## Giant LED Sale!

We are having a sale of all our Luxeon and superflux LEDs. To grab a LED bargain, see our webshop at <http://shop.ata.org.au>. Note that LEDs are available as webshop purchases only!



### Dynamo multiband radio

Price: \$49.95

Housed in a sturdy rubber and plastic casing, this radio is great for any outdoor activity that requires a heavy duty radio which will withstand a lot of punishment. Features

include FM, MW, LW and SW bands and an alarm. It can be self-powered by dynamo operation or two AA batteries.

Item code: RADIO\_DYNAMO\_SW



### Constant current circuit kit

Price: \$9

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.

Item code: SIMCCKIT\_XXX where XXX is the current rating in mA (020, 050, 300 or 650)



### Simple 1 amp rectifier kit

Price \$6

This very simple kit allows you to build a rectifier for use with 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.

Item code: SIMRECTKIT\_1A

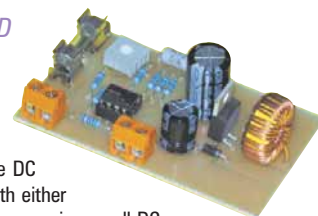


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Price: \$30

This kit allows you to build a simple switchmode 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. No case is provided.

Item code: SWITCHMODEKIT



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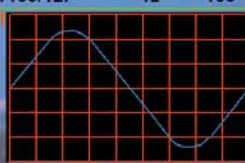
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Too good to throw out

# Recycled cardboard shelving

In the first of a new column about useful stuff made from rubbish, Anton Vikstrom shows that cardboard is strong enough to build a shelving unit.

**FINDING SOMEWHERE** to store stuff is always a challenge. So when we needed a new set of shelves we started thinking of alternative methods to make our own. We were on a budget and wanted something interesting, functional and with a small environmental footprint. After scratching our heads for a while we decided to make the shelves out of recycled cardboard. When laminated together, cardboard is easy to cut and shape and strong enough for the job. Importantly this is a cheap and recycled material.

Our shelving unit is made of cardboard laminates, which are made of seven sheets of cardboard. The combined thickness is 30 to 35mm. All the components are cut and notched and assembled using mortice and tenon joints.

The first challenge was finding large sheets of cardboard. After a trip to Ivanhoe Cycles I had in my possession about 12 bike boxes approximately 1.3x0.8m in size. These were dismantled with a box cutter and laid out to make a single massive sheet of what I would like to term

‘cardwood’. The layers were joined with diluted PVA glue and compressed using every flat and heavy object in the house. After curing, the board was marked out and cut using a Stanley knife. The shelves were also built in a similar way, but used many of the smaller off-cuts. Cutting the board was fairly difficult, requiring sharp, strong blades; a good quality box cutter is recommended.

Due to the panel layout the shelving simply notched together, forming a relatively strong structure quite quickly. We glued the shelves and used bamboo stakes to pin all the components together. At this stage the shelving was still quite rough, so an outside sheet of cardboard was applied to add a clean finish. The front surface was evened off using an electric planer.

Cardboard, while having many virtues is also very brown. While brown is a lovely colour it needed something to brighten it up. Fortunately a local op-shop had a roll of unused wallpaper in an embossed pattern which was applied to the outside and the front edges. This was a bit tricky as the wallpaper glue is fairly



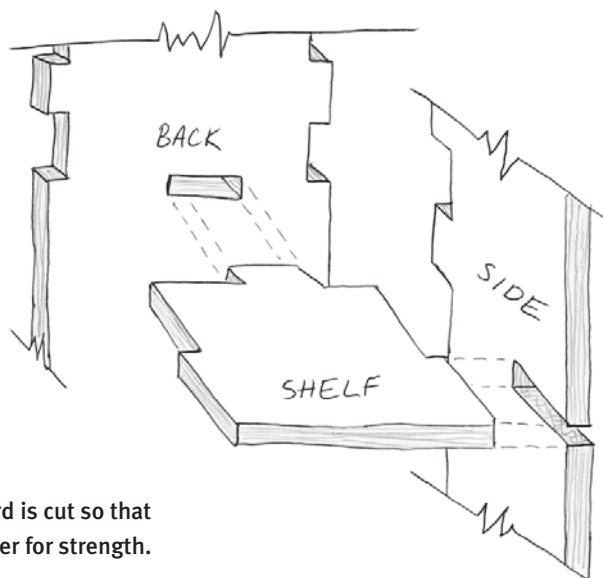
wet. A thorough read of the instructions would have revealed the need for sizing or some other form of preparation. Finally, a little trimming with the Stanley knife and the shelving unit was finished.

Overall the shelves cost us around \$30. PVA glue cost \$14, wallpaper glue \$10 and wallpaper \$6. They are attractive, customised for the space and are their very own carbon capture and storage device. Other people have also been thinking along this path and a few interesting examples are available on the web:

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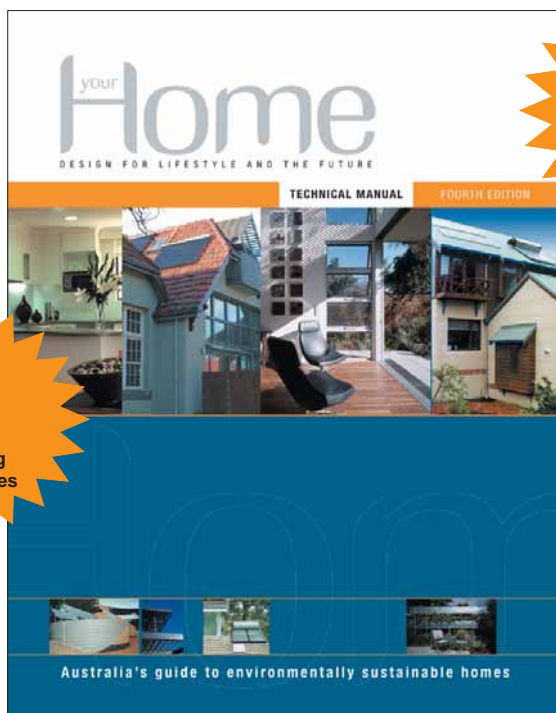


The laminated cardboard is cut so that the pieces lock together for strength.

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A white sunburst graphic with many thin lines radiating from a central point, located behind the main headline.

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# The beer that gives back.

Cascade Green is a full-flavoured, preservative free, low carb, refreshing lager made only from pure ingredients. It's also 100% carbon offset. Even this ad has been offset. Here at the Cascade Brewery we're calling it, *the beer that gives back*.

It's a beer that's part of a much bigger journey. The Cascade Brewery has been committed to reducing our carbon footprint, not just since it's become a fashionable thing to talk about, but for over a decade. In the last six years the brewery has reduced water usage by 30% per unit of production and cut greenhouse gas emissions by 16% per unit of production.

The next step seemed a natural progression. To produce a 100% carbon offset beer, Cascade Green. It's more than a good-will gesture, a well-meaning idea. It's a tangible symbol of our dedication to offering consumers a greener choice in beer. Cascade Green is officially certified by the Australian Greenhouse Friendly Program™ and has its own Emissions Monitoring Plan.

This is not the end of our journey. We know we still have a lot to do. But like Cascade Green we're 100% committed to being green, and will continue to share and update you on our progress.

Want to find out more? We invite you to sit back, take a sip of a refreshing Cascade Green and see how much a beer can truly give back at [cascadegreen.com.au](http://cascadegreen.com.au)

Enjoy  
Responsibly

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