Making sure your home is not an energy sink 3

In this final instalment of his three-part series illuminating energy savings around the home, **Peter Seligman** provides more insights into heating, carbon offsets and alternative energy sources.

This time, we'll look at space heating. In Melbourne you need it, if you don't want to be the bad guy who goes around telling everybody to put on jumpers instead of heating the house. Our house is heated by gas, and occasionally by a wood fire. Space heating, as you can imagine, is one of the big energy users and also a big CO_2 producer.

In the pre-green 'business as usual' scenario, the central heating accounted for about one-quarter of our home's CO_2 production. We were using around 55 000 MJ (megajoules) per year.

Gas is sold in MJ, electricity in kWh (kilowatt-hours). Both MJ and kWh are units of energy. You can convert MJ to tonnes of CO_2 produced by dividing MJ by 16 000. Our central heating unit was producing (55 000/16 000) 3.4 tonnes of CO_2 a year. It was an older type with a pilot light which, I discovered, was using more gas than the cooktop! We replaced the unit with a 5-star model with electronic ignition. At the same time we added insulation to the ceiling. The combined effect is that we are now using about 39 000 MJ per year – a saving of 1 tonne of CO_2 per year.

After the various energy modifications we made (Figure 1), we are producing about one-quarter of the CO_2 that we produced under the 'business as usual' scenario. Overall, the result is quite satisfying.

Of course our 'journey' wasn't cheap, but it was only a fraction of the price of a 4WD, and will last a lot longer. Here's another way of looking at it. If you decided to buy a large 4WD to replace a normal-sized car, your CO_2 production would increase from about 4 tonnes to 6 tonnes a year. For a fraction of the 4WD's cost, you could reduce your emissions around the house from 14 to 3 tonnes per year – a saving of 11 tonnes! Where are your priorities?

What is the energy or environmental cost of energy-saving measures themselves? For example, how can you calculate the environmental or energy cost of a compact fluorescent lamp (CFL) with its many different components and materials?

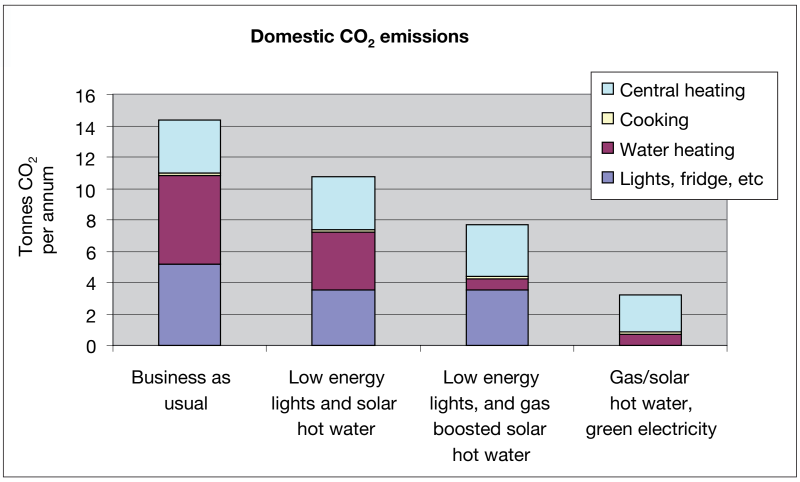

Figure 1: Domestic CO_2 emissions after various energy modifications around the Seligman household.

As far as energy is concerned, if a CFL costs $5, it can only have used $5 worth of energy at an absolute maximum. Otherwise it couldn't be sold for that price. A CFL has the potential to save around 80 watts for 5000 hours, which is 400 kWh. That electricity would cost about $50. So the CFL could save up to 10 times the maximum possible energy cost of its production. So energy wise, it must be worth it.

Carbon offsets

Carbon offset schemes do good, to make up for doing bad. Planting trees is a great example of such schemes. If nothing else, the trees should increase the rainfall and habitat for wildlife – and that's good.

However, you should know that one tree extracts about 60 kg of CO_2 a year from the atmosphere. An average household with average energy use will be putting about 14 tonnes of CO_2 into the atmosphere a year. The car accounts for another 4 tonnes and each overseas trip another 4. Let's say 20 tonnes a year for the purpose of this discussion.

What is 20 tonnes of CO_2 in tree equivalents? At 60 kg per tree that works out to 20/0.06 = 333. Please plant them! Or use an organisation that will plant and maintain the trees on your behalf – Greenfleet, for example, will plant 17 trees for $40.

The problem is that a carbon offset scheme can't go on indefinitely. If you check the CarbonSMART website (www.carbonsmart.com.au) you will see that part of the contract for people growing timber on their properties is that: 'The carbon will remain on site for at least 100 years after the final trade of that carbon'. Say you lend me $100. After a while you come back and say 'what about my $100?' I reply OK, here's $10 – just put it in the bank at 5 per cent interest and in 50 years it'll be worth $115.

A tree will remove the CO_2 *over its lifetime*. Isn't that the same as the $10 repayment?

Fossil fuel alternative – drilling in the Cooper Basin has initiated strong public interest in emission-free geothermal energy. Geodynamics

Where to from here?

While we have talked about how to reduce our energy use and offset the CO_2 we produce, if we are ever going to make serious inroads into the climate change problem, we will have to do more. What we need are serious, affordable alternatives to old-fashioned coal.

Nuclear energy is a divisive issue, because people in the environmental contingent sit on both sides of the nuclear fence. I won't go into it. The same applies to wind power.

Looked at from a purely economic viewpoint, if we are going to make inroads into the problem, we need to maximise the renewable generation capacity we get for our money. The main alternatives as we know them today are shown in Figure 2. In the cases where there are greenhouse gas emissions, the cost of CO_2 has been added at $60/tonne, to give a total effective cost.

A graph such as this is, of course, highly controversial, and various camps will claim much higher or lower costs depending on their particular bent.

Another alternative is hot rock geothermal energy, mentioned in the previous issue of *Ecos* (**139**, p. 20).

Australia's recoverable hot-rock resources are capable of satisfying current electricity consumption for more than 450 years. The Cooper Basin in South Australia alone could provide emission-free base-load electricity for 70 years. Although this new resource presents some technological challenges, they are solvable, with the help of existing oil-drilling technology.

When compared with nuclear's thorny issues of safe disposal and security against terrorism and accidents, hot rock geothermal seems a very attractive proposition.

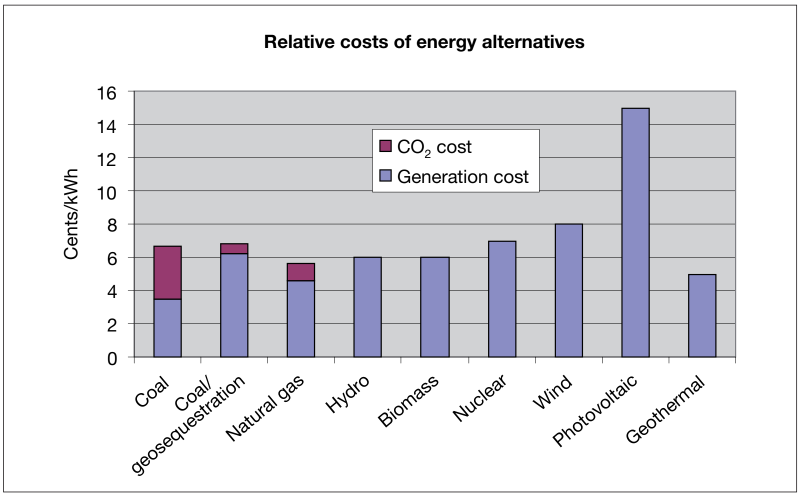

Figure 2: Relative costs of the main energy alternatives available today. The cost of CO_2 emissions has been added to coal and natural gas at $60/tonne, to give a total effective cost.

Our journey

In the first part of this series, I talked about how much energy various domestic appliances use and how we could reduce it. Some surprises included:

- A normal hot shower uses the energy equivalent of 240 light bulbs.
- Leaving a light on every night for a year uses as much energy as driving from Melbourne to Sydney.
- Electrically boosted solar water heating can be worse than gas.
- Fluorescent lights are not necessarily low energy.
- Leaving fluorescent lights on does not save energy.
- Low-voltage downlights use a lot of energy.

After giving you the bad news on the energy consumed by domestic fittings and appliances, we saw how we could do a lot better, by making the right choices and spending a bit of money. By using a combination of tactics, our household managed to get its CO_2 emissions down to one-quarter of its 'business as usual' scenario.

I hope I have alerted you to some of the misconceptions that exist about energy and its use, particularly around the home. My aim was to arm you with information – because as informed citizens, we can all do a better job!

Dr Peter Seligman, a biomedical engineer, was a key member of the team that developed the Cochlear multiple-channel cochlear implant. A focus of his work over the past 24 years has been the development and improvement of speech processors. He is a qualified electrical engineer, holds 25 patents and has been involved in the design of photovoltaic solar energy and solar heating systems.

More information:
CarbonSMART, www.carbonsmart.com.au/pdf/InformationSheet.pdf
Greenfleet, www.greenfleet.com.au