Heating the Heij Home – How did life get so complicated?

By Elizabeth Heij (Lot 63)[1]

One of the most daunting things about trying to establish a more sustainable and environmentally friendly lifestyle is the sheer complexity of all the issues that need to be resolved. Everything, it seems, is connected to everything else – across all the old boundaries that used to separate different parts of our lives. Even "apples" and "oranges" cannot be dealt with separately any more. The debate over how to use energy and how to heat our homes is a case in point.

When I first tuned into the debate, I came in through a discussion of the relative ***environmental*** merits of wood versus gas as a fuel for home heating in winter, and from the decision-making perspective of an independent individual. If you draw a line around this very limited argument, you can build a range of for-and-against arguments that, on balance, appear to favour purpose-grown plantation wood and high-efficiency combustion heaters over the longer term:

- Wood is a renewable, greenhouse-neutral fuel, whereas gas, although cleaner than coal, is still a non-renewable fossil fuel that adds greenhouse gases like CO2 to the atmosphere.
- Burning wood means we are living on our current solar "income"; burning gas is just spending our "capital assets."
- Plantation timber grown for fuel on previously cleared land is environmentally positive, as deep-rooted trees help lower water tables and reduce salinity. Drilling for gas generally causes environmental damage, especially in sensitive coastal and underwater areas.
- Plantation timber can be used to recycle the nutrients in sewage effluent. Burning gas recycles nothing.
- Burning timber generates more particulate pollution (smoke) than gas, but both add a range of compounds to the air in addition to CO2. Human sensitivities to these vary – some individuals are more sensitive to wood smoke, and some to gas exhausts (particularly from poorly flued or unflued heaters). Smoke from wood fires can be minimised (though not eliminated) with fully enclosed combustion heaters, designed for re-combustion of flue gases and burning suitable types of appropriately matured dry wood. Emissions from gas fires can be minimised by using flues that take the gases out at high level, well away from neighbours' homes (i.e., no flued horizontally out through a wall).
- There is the potential for wood to be grown in many dispersed local areas to minimise transport costs and distribution infrastructure (although thought needs to be given to planting species whose wood can be made suitable for efficient combustion). Most gas is drilled in a few remote regions of Australia, or beyond our coastline, and requires massive pipelines and other infrastructure for supply. Building and maintenance of these infrastructures represent big sunk energy costs.
- The huge infrastructures needed for supply make gas more vulnerable to maintenance problems, accidents and sabotage.
- Gas users can be held hostage to big utility companies if prices rise in response to supply and demand fluctuations over which consumers have no control (and we are just starting to hear "rumblings" about the price rises we can expect when gas services are fully privatised). In contrast, there is much more potential for switching among local supplier of wood in response to price or supply problems.
- There are increasing incentives for the planting of trees in Australia (e.g., in response to both dryland salinity and global warming). Plantation timber for fuel is likely to become more available – gas will inevitably be a declining resource.
- Australia's domestic gas consumers are actually part of a global market – and the global price for gas will inevitably rise – a lot. Australia will not sell its gas cheap to citizens at home if it cam make more export dollars by selling abroad. Australia already has a huge contract to supply liquefied natural gas (LNG) from the Timor Sea to China, where there is now a strong move away from dirty coal to feed a monstrous, growing industrial sector – and this first big contract is just the "tip of the iceberg". Another factor pointing in the same direction is the impending move of big

[1] Article written for the Village Newsletter after a discussion at the 2002 AGM designed to air polarised views on suitability of wood-fired heating and cooking for the village. At the meeting it became clear that the large majority of community members were against wood fires for health and comfort reasons – thus impacting on the plans of those who were, at the time, considering this heating / cooking option.

fleets of road transport trucks and buses from diesel to LNG as a fuel. If we think we can maintain our current access to cheap domestic gas supplies, we are in for a nasty shock!

So do we all run out and buy high-efficiency wood heaters? Uh-huh – not so fast! As has been pointed out by a number of villagers at our recent General Meeting, we have an "apples-and-oranges" situation here. Debating the relative environmental and economic merits of wood versus gas is an "apples-with-apples" discussion. The real argument, however, pits the "apples" of environmental health against the "oranges" of human health – a much more difficult discussion altogether:

- Wood smoke contains small quantities of a range of toxic, irritant, allergenic and carcinogenic chemical along with many minute sooty particles. It also has a distinct and persistent odour. While some people enjoy the aroma of small amounts of wood smoke, others find it unpleasant, irritating or downright sickening – especially if they suffer from asthma or other allergies. A perennial problem with wood fires is that while owners of the heater get all the heating benefits and little of the pollution, any close neighbours get none of the benefits and a lot of the pollution problems!
- Over time, wood smoke emerging from a chimney, particularly in still weather, can deposit its various toxic chemical compounds on adjacent areas of roof. If the roof is to be used for collection of rainwater for domestic use, some of these compounds are likely to finish up tainting the water supply. Whether or not their concentration could become high enough to cause adverse effects is uncertain. Whether or not neighbouring roofs and water supplies will be at risk is also unknown. It will obviously depend on the efficiency of the heater and its fuel, how intensively it is used, the amount of smoke emitted, and the average direction and intensity of prevailing winds. Our Village location is comparatively windy and, while this might tend to clear smoke away from its origin quickly, it would also spread the smell more widely.

So now what do we do to heat our home? It is starting to look like a trade-off between the health of the global environment and the health and comfort of our Village neighbours. Do we have a greater responsibility to the life-support systems of the planet or to the health and comfort of a few human beings living close around us? By now, we are in a real dilemma because we happen to believe we have big responsibilities to both.

We also believe in free choice based on principles rather than prescriptive solutions. For example, we would rather see guiding principles put in place for heating homes rather than trying to ban any particular heating mode. My suggested principle would be:

Select a *type of heating, and mode of operation*, that minimise environmental impacts and also prevent harm or nuisance to fellow Community members.

Mode of operation is important. As one of my colleagues in the Sustainability field said, very profoundly, recently, "My eco-house is in my head!" What he was talking about was the fact that although we might strive to build more eco-friendly homes, it's the way we live in them – all the conscious decisions that go into minimal-impact living – that actually delivers the greatest environmental benefits.

So how do we apply this to the question of heating our own home? The first and obvious conclusion is one also pointed out by several villagers at our general meeting – dress for the weather and use as little supplementary heating as possible. Well, John and I have just come out of a winter of doing exactly that in our present standard suburban home (admittedly uninsulated and poorly designed for energy management). We have now had the home's electric reverse-cycle heating and cooling system turned off completely for over a year, and we are still alive and kicking to show it can be done. I wouldn't say, however, that wearing multiple layers of thermal underwear, two lots of socks inside slippers, fingerless gloves when working in the office, etc., etc., has been exactly cheery and cosy!

The question we really need an answer to is this, "Will our new home – specially designed for passive heating and cooling – actually need supplementary heating?" If it doesn't, we can forget the whole debate and be very smug about having done the right thing by both planet and neighbours. But what if it does?

Wood combustion heating is very attractive aesthetically, and sounds as though it might be environmentally OK with the right heater and right wood in perfect condition, but it also seems to be ruled out by potential health risks and nuisance to neighbours. After extensive looking around Adelaide for heaters offering genuine high-efficiency combustion and secondary re-burning of waste gases, we have found only one possible brand – Lopi – fully imported from North America and very expensive.[2] Australian

[2] Found at Heatworks on Magill Road. The model that heats 230 sqm costs $2,600, the model that heats 280 sqm costs $2,999, and the flue kit costs $300-$600 extra, depending on the length needed.

and New Zealand brands are much cheaper but simply don't bother about flue gases – at least at this point in time. So what happens if the EPA or Governments tighten emission standards in urban areas, as they are very likely to do? If other models of heaters have to have supplementary devices such as catalytic converters added, how much will this cost and will it really be effective? And remembering the principle of minimal use, do we really need to spend around $3,000 for just a few weeks of winter heating each year (and that's even before we start paying regularly for wood). What about the embodied energy of all that cast iron in the heater, to say nothing of the added energy burden of transport all the way from North America? Wood, it seems, is now not stacking up so well!

Regardless of the environmental argument, conventional natural gas is not really an option for us either. Because we have invested in a full-sized, grid-connected solar PV system with battery backup, we will obviously have an all-electric home. It seems very silly to pay a gas supply charge all year round just for the privilege of minimal supplementary heating for a few weeks in winter. Also, although we are going to be to some extent "hostage" to major electricity infrastructure, we have no wish to take on the double whammy of dependence on major gas infrastructure as well. Gas doesn't stack up either!

It seems we have to think outside the square. Here's our short-term answer:

- Build the house for the most effective possible ***passive*** heating and cooling.
- Build in flexibility to fit various types of supplementary heating and cooling options if they are actually needed (e.g., roof designed to accommodate a flue above an appropriate heater position; gas pipe laid into the concrete slab floor to a position(s) accessible for heating, water heating and cooking with other gas modes (e.g., bottled gas or biogas if it becomes available); additional power points fitted where a high-efficiency electric heater-cooler might be installed.
- Live in the house through at least one complete annual cycle without any supplementary heating or cooling to see what (if anything) is really necessary. Hopefully the house will perform well enough without it if we dress appropriately for the weather.
- During the year, keep watch on new renewable-energy developments with potential for small-scale, domestic or community use (e.g., heat-bank storage systems using thermal mass or phase change materials, CHAPS (combined solar hot water and power systems), hot-rocks systems, wind turbines, solar-thermal dishes, etc) and make any relevant information available to the community.
- If the home actually needs supplementary heating and/or cooling, unless another option appears preferable at the time, consider an electric system combined either with the purchase of 100% green power from the grid (to help stimulate the "renewables" industries) or with supplementary solar PV panels or our own domestic-size wind turbine as offset.

Hopefully, the above plan will let us do the right thing for both the environment and our neighbours. As usual, life wasn't meant to be easy!

Update 2009 after living in our home for five years:

The above plan worked extremely well, allowing us to live comfortably on only passive heating and cooling for the first four years in the Village. After marking any uncomfortably hot or cold day on the calendar, we found that, for any given year, there were less than 8 days marked. We are very glad we waited before rushing into installing a heating or cooling system!

We are also glad we waited for another reason: While we were in rental accommodation during construction of our home, we found ourselves living next door to a wood combustion heater. The smell was sickening and the fumes affected my breathing at night. After that experience, we could not, in all conscience, do it to our Village neighbours! Combustion heating, we realised, while nice for the home owner, externalises its disadvantages to the neighbours!

In 2009 the increase in feed-in tariff for domestic PV electricity saw our credit with the electricity supplier top $1,200. Rather than cash out the credit and incur a tax penalty, we decided to use it to increase the "cosiness" of our home during cloudy periods of low "solar gain" in winter. We have therefore installed a ceramic J-tariff electric storage heater, and will look to regulate its use to make those cloudy winter days cosier while still continuing to live "only on the sun and the rain that fall on the roof."