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WIN
a solar PV system from Tindo Solar!

*Australian residents only
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Cover image: Rob Lacey Photography. This cool-climate build is Meg Warren and Fraser Rowe’s second sustainable building project with Ovens and King Builders. They aimed to use newer technologies in the hope that these will become commonplace in the future. There are always challenges in going beyond the norm, but the rewards are in a high-performance, lovely (award-winning!) home. Page 48.
Who needs fossil fuels?
From sunshine to wheel spin

Energy will flow from the sun, the brakes and even the shock absorbers in the SolarX solar car. Clint Steele describes the power train in part 2 of our series on the car’s design.

The main function of a solar car is, not surprisingly, to convert solar energy to torque at the driving wheels so that the car can travel at speeds that make it a practical driving option.

Power flow
The biggest difference in a solar car’s power system, compared to a conventional car, is in the flow of energy and the recapture of that energy. In a standard petrol car, the power flow is pretty much one way: fuel → engine → transmission.

In this solar car, however, there’s an additional flow, with power reclaimed via regenerative braking. This is common to most electric vehicles.

There’s also one more power flow in the SolarX. In most cars (electric or non-electric), energy is lost in the suspension system as it dampens the car vibrations. Shock absorbers can reach up to 180°C as they dispel this energy as heat. This sounds high, but the actual amount of energy is usually not enough to warrant the effort of regenerative shock absorbers. This is not the case here—the power used by the car is so small that the suspension units will make a significant difference. Thus, the team working on the suspension are also developing a regenerative shock absorber.

Power management
In a standard car, the power is delivered as needed: fuel is delivered to the engine or the current is drawn from the batteries when required.

However, the sun is an energy source that can’t be controlled in such a way. If the batteries are fully charged and the vehicle is at a speed that needs a relatively small amount of power, any excess energy falling on the solar cells is lost. And, in fact, this extra energy needs to be managed, to avoid damaging the batteries. This is another unusual aspect of managing the energy flow in this solar car.

Figure 1 shows the major components and the layout of the power system that ultimately converts sunshine to tractive effort. The subsystems are discussed below.

Energy storage
Most electric vehicles on the market today rely on lithium battery technology. For the SolarX car, the design team is investigating a hybrid energy storage system consisting of traditional lithium ion batteries coupled with supercapacitors.

Supercapacitors have superior power density, much higher than that of chemical batteries, which means they can be lighter for the same peak output power capacity.

A series of high-power car stops and starts will cycle a battery enough to shorten its life. By using supercapacitors to take these peaks, the life of the battery can be extended considerably. This is not a concern in solar car racing, which is the pedigree of this car, but it is in road cars.

One of the challenges of this project will be managing the flow of electricity to each of the batteries and capacitors as desired.

Regenerative shock absorbers
Relying on the laws of electromagnetics, the suspension system uses a design akin to a linear generator. Permanent magnets provide the damping force, instead of a fluid (which simply gets hot and wastes energy). Tuning the parameters of the directly driven electromagnetic motor is key in achieving the power output.

Based on results from scale prototypes, the final design is expected to produce between 40 and 60 watts of harvestable energy.

PV panels
The solar panels to be used will share many features with the panels used on current solar racing cars. They use Sunpower silicon cells that are more than 22% efficient, higher than the 14% to 18% efficiency of the solar cells you find in most house power systems.

The car will have 5m² of cells, which gives a potential 1kW+ continuous power supply on a sunny, cloudless day. The current Solaris race car is able to achieve 155km/h with only 5.5kW of power, so this 1kW can make a significant contribution to the overall power required to operate the car.

The regenerative shockers are basically linear generators. As the magnets oscillate with vertical wheel movement, they generate current in the coil though the change in magnetic flux. The optimum configuration of the magnets and coil to increase efficiency is the key to making it successful, and this is still under consideration.
Sourcing green products
Why process matters

There are ways to stop the ‘too-hard’ feelings when choosing green building materials, writes Elizabeth Wheeler.

WHEN I talk with people about the process of building or renovating a house, what they speak about most is the stress of making hundreds of decisions. Even something relatively simple has ramifications for a whole lot of other decisions. A mere choice of hand basin, for example, affects taps, benchtops, cabinetry and plumbing.

Especially for people trying to minimise their environmental impact, the number and complexity of decisions can sometimes feel completely overwhelming. Paradoxically, while there are more environmentally sensitive products available than ever before, the potential for greenwash means that consumers often lack confidence that a building product is as environmentally sensitive as the manufacturer claims.

Since our build, I have continued to be involved in the building industry, and people often ask me for advice. What I have noticed is that those who seem a bit ‘at sea’ are often unclear about the extent to which they want their home to represent their ecological and social justice values, how to obtain and understand information, and how to make decisions. In my experience, these are the people who often throw up their hands in despair and declare sustainable building ‘just too hard’.

The importance of process
Ultimately, I think people are more likely to feel confident about the building materials and products they choose when they are comfortable with the process they used to decide upon them. For this reason, I always encourage people to spend some time thinking about their values and priorities, and to work out how they will approach decision making. I also think it is helpful to keep one’s own choices as a consumer in perspective.

In terms of our process, while our house is notable for its lower-than-usual environmental impact, both aesthetics and affordability still played very significant roles in our decision making. We didn’t want to go further into debt than we could afford, and we felt that we would regret aesthetic compromises on a daily basis. We very much wanted a home we would love.

However, we also wanted a house we could feel proud of. So in addition to looks and affordability, we sought products and materials that were:

- least likely to pose a risk to occupants, workers and the environment (in production, use or at the end of their use)
- locally sourced
- low in embodied energy and embodied water
- made with or utilised recycled or reclaimed materials
- low maintenance, durable and long-lasting
- produced ethically (for example using unionised or at the very least reasonably well-paid labour).

For her family’s high-performance home, Elizabeth chose to take responsibility for sourcing paints, light fittings, tapware, benchtops, carpets and bathroom and kitchen fittings. The process used far more brain cells than she would ever have thought possible and took her to parts of Melbourne she hopes never to visit again.
Enter the eco-city
Change on a staggering scale

Peter Reefman takes us on a tour of China’s changing landscape, where the next 300 cities will be built eco-cities.

OVER the past 30 years, China has grown from an insular country with a predominantly rural population of 1.1 billion to a country with over 1.3 billion people living mainly in cities. In that same time, the proportion of people living below the international poverty line has dropped from 85% to 15%.

This rapid urbanisation and increase in wealth is unprecedented throughout the world. However, the price China and the world have paid is an equally unparalleled increase in pollution and environmental degradation. China has seen toxic pollutants rise to dangerous levels and an explosion in greenhouse gas emissions that is undoubtedly contributing to climate change.

China’s surge has occurred at a time when the world as a whole is reaching pollution and resource limits, along with the ever-growing realisation that human-caused climate change will disrupt the planet’s climate in ways that civilisation may not be able to cope with. In short, like the whole world, China desperately needs to find a way to greatly reduce toxic pollution and greenhouse gas levels, and create healthy places for people to live and prosper.

Enter the eco-city
The threat of climate change has seen pilot environmental settlements, dubbed eco-cities, get built right across the world. Well—in Australia the settlements are more accurately called eco-villages, as they typically house up to just 1000 people. Examples include the Currumbin eco-village in Queensland, the Beyond Today project in South Australia and the Cape Paterson eco-village in Victoria.

In China, however, where the scale of everything is staggering, the many pilot projects are certainly eco-cities, places where large numbers of people (hundreds of thousands in many cases) can spend their lives in clean, sustainable built environments.

There are currently no global or Chinese standards for eco-cities to be accredited under, but there are some common goals. As a starter, they’re intended to be places where people can live, go to school, work, shop, play sport, see arts etc; in short, everything that a normal city enables people to do.

Because there are no accreditations to achieve, eco-cities vary in their sustainability specifications and aspirations. But a good eco-city should address many key criteria. These encompass the use of green energy, energy efficiency, sustainable transport, biodiversity protection, waste minimisation and reuse, sustainable use of water (potable and natural systems), zero-pollution industries, local organically grown food, healthy lifestyles and social inclusion.

Not all eco-cities include all of the above. In fact, very few do. But as more are planned and constructed, the knowledge gained is leading to ‘higher quality’ eco-cities with more sustainability features. This is particularly the case in China, which has the largest number of these projects.

Eco-cities in China
One of the first and most ambitious Chinese eco-cities was unfortunately the largest failure: the Dongtan eco-city on the outskirts of Shanghai. The project was plagued...
You might expect that installing a water tank would be a straightforward task, with little to consider to ensure a good quality result; but is it? Dennis Boon describes common problems and best practice.

BETWEEN 2004 and 2010, the percentage of Australian households with a rainwater tank jumped from 17% to 26%, based on 2011 Australian Bureau of Statistics (ABS) data.

During this time, Australia was in severe drought and fitting water tanks and other water conservation measures became mandatory for new houses in most Australian states. Many established houses also fitted tanks and other water saving devices in response to water restrictions and generous government rebates.

In addition, the ABS data shows that, in 2010, around 830,000 households, or nearly 3 million people, were reliant on harvested rainwater for their main source of drinking water (most of these households—about 84%—lived in areas away from the capital cities).

With so many homes using rainwater, many for drinking, rainwater quality is obviously an important issue.

Rainwater harvesting dates back thousands of years and many ancient infrastructures are still in use today. With aeons of knowledge and new technology to draw on, you might expect that installing a water tank would be a straightforward task, with little to consider to ensure a good quality result; but is it?

This article considers some of the easily rectified issues that can affect water quality and tank usefulness. It focuses on best practice and common mistakes when harvesting the water. A later article will discuss issues that can arise when using the water.

Collecting clean water
There are two main things that you want to keep out of your tank: contaminants, such as bird droppings, dust and pollution, and pests, such as mosquitoes. A well-designed system will divert away most contaminants and prevent them building up in the system, and will screen out pests.

Wet or dry systems
An important consideration when designing a system is whether to use a wet or dry downpipe system for water collection.

A dry system uses a downpipe that is diverted with a slope from the roof to the top of a tank. When it stops raining, the pipe drains dry. Having more than one dry downpipe diverted to a tank involves having any additional downpipes diverted along a wall. A wet system (also called a ‘charged’ system) uses downpipes that are plumbed underground to a tank and then up a vertical riser to the tank’s top inlet. Wet systems remain full of water up to the top of the vertical riser after it stops raining. The head pressure generated by the height difference between the higher downpipe and the top of the riser must provide an adequate flow rate during heavy rain to drain the gutter.

Water diverted by a dry system is almost always of better quality than water diverted by a wet system which retains unflushed contaminants in the pipes. However, wet systems are often used due to distance between the tank and the house, or for aesthetic reasons. The design of wet systems is discussed in more detail over the page.
Winter comfort
Not just a heater choice

There's more to consider than just the choice of heater when aiming for winter comfort. Alan Pears searches for the ideal solution.

FOR Australians living in cooler climates, use of heating to provide winter comfort consumes the biggest chunk of household energy. Winter comfort is also important for health and enjoyment. We typically invest thousands of dollars in heating technology, and effective heating is seen as an important factor in resale value.

In many other parts of Australia, winter is short and relatively mild, and many people just rug up and bear it. Indeed, I have felt colder in Queensland and Western Australia than in Melbourne because the houses and their heating equipment work so poorly!

Achieving winter comfort in a way that is affordable, effective and environmentally sound is tricky. Indeed, I find advising people on this topic to be difficult and frustrating. I still can’t find the ‘ideal’ answer. This article is an attempt to at least frame the challenge and suggest some options, while flagging some of the mistakes to avoid.

The changing context
It is increasingly important to consider year-round comfort, rather than separate heating and cooling strategies. Climate change is shifting the balance: one study has indicated that, by 2070, Melbourne will be hotter and more humid than Brisbane, and heating will be a much less significant issue. My article on cooling in ReNew 122 could be a useful complement to this article.

Also, improvements in building performance means, for example, the cost of inefficient lighting or running multiple electronic devices can be higher than heating.

What do you want from your heating system?
When thinking about heating options, it's important to frame the issue as part of a bigger picture. There is a system involved that includes a building, energy sources, heating and heat distribution equipment, control systems and people, as shown in Figure 1. Such a system aims to provide services that include comfort—often when different people in the space want different conditions—and more as well.

So, what do you want from your heating (and cooling) comfort system? Some possible preferences include:
• a building that is comfortable while ‘running free’ most of the time (i.e. don’t want to have to think about heating or cooling)
• one or more spaces or whole of home can be made comfortable to suit usage
• easy to make comfortable quickly after arriving home
• night-time comfort
• quiet, with little or no air movement
• easy to use, economical and unobtrusive
• low capital cost and/or add to home value
• address special needs: elderly, disabled, allergies, etc; and deliver comfort for people with varying comfort requirements
• safety, security
• a warm focal point when relaxing on a cold night
• environmentally friendly
• low (no?) maintenance, reliable, easily/quickly fixed
• other, such as low peak demand or capacity to manage peak demand.

I’m sure you can add other requirements. A variety of different solutions might deliver some or all of the desired outcomes. But it is difficult. Nevertheless, if you recognise the services you want, you can at least evaluate options against your criteria. Too many people just jump to the conclusion that they need a certain type of heater, then regret it.

How much heating?
Firstly, you need to think about how much heating is required for your situation. This can depend on many things, including climate, your house’s Star rating, draughts and microclimates.

CLIMATE
It is important to get the building and heating right depending on climate: Melbourne is...
Mechanical ventilation with heat recovery
Fresh air without the heat loss (or gain)

Clare Parry explains what mechanical ventilation is and why we might want to use it as our homes become better sealed.

MECHANICAL ventilation is not something many Australians would be familiar with in their homes, but it is something many would have experienced in other types of buildings, such as offices and hospitals. Mechanical systems are often regarded as unnecessary for dwellings, but, as our Star ratings encourage us towards better-sealed dwellings, these systems become important. Here I hope to outline the reasons why a truly comfortable and efficient home would include mechanical ventilation with heat recovery (MVHR, also called heat recovery ventilation, or HRV systems).

Air infiltration in homes can account for a significant component of the total heating and air conditioning loads in a building (around a third to a half), and this load can be particularly significant in low-energy buildings where all other loads have been reduced.

At a time when housing sustainability is on many householders’ minds, the best way to increase energy efficiency is to take advantage of the basics of building physics by making improvements to the envelope. This involves using basic passive solar design principles in conjunction with insulation and building sealing.

One of the great things about sealing up a building is that you gain control over your internal environment—you can open the place up when you want, but when ambient conditions are not suitable the home can be closed up and the internal conditions will be more stable. Ideally, a well-designed home in most parts of Australia would not require heating or cooling at all.

However, sealing a building does mean you need to consider how the building is then ventilated.

What we refer to as ‘natural ventilation’, and what the majority of Australian homes rely on for fresh air, is a combination of open windows and imperfections in construction (gaps and holes). This method of ventilation is largely imperfect; good natural ventilation relies on natural variations in pressure and temperature, and the best designs use cross-flow and stack principles to induce air flow into and through a building.

Relying on natural ventilation to provide adequate conditions for good health, as well as comfort, is likely to be insufficient in a well-sealed home. This is because the amount of air infiltration relies on a number of factors, including the time windows are open, openable area and prevailing weather conditions. Table 1 shows typical air changes per hour (a measure of air infiltration) without ventilation as building sealing improves.

Mechanical ventilation provides a way to address this, using fans to move air into and/or around a building. A number of studies have also shown that the use of MVHR can be more efficient, in terms of reduced energy use and the resultant carbon emissions, than relying on natural ventilation. As with any system, appropriate system selection and design is key.

MVHR systems can be quite simple, such as the Lunos e2 systems which are installed in pairs. Outgoing air heats the integrated heat recovery ceramic core, which then heats the incoming air when the flow reverses—thus enacting the heat recovery.
Mind the gap
An energy efficiency road map

David Coote is on a mission to improve the energy efficiency of his house and, in the process, provide guidance to others. Here, he looks at the (lack of) data available and one approach that does help: a draught-proofing audit.

LATE in 2012 we began a project to improve the energy efficiency of our house with the aim of improving its heating and cooling performance. Our first step was thermal imaging with and without partly depressurising the house via a blower door test (see ReNew 123, pp. 30–32). The next question was what to do about the issues identified.

It soon became obvious that an answer to that question wasn’t necessarily easily determined.

We realised, of course, that the problem wasn’t just about our home. According to the Australian Bureau of Statistics, there are nearly nine million residences in Australia. With Australian residential building energy efficiency standards being almost non-existent in the past, and still low compared to world best-practice, the overwhelming majority of these homes—including ours!—could benefit from some degree of energy efficiency retrofit.

This presents an extraordinary opportunity to reduce energy use, save money and put a substantial whack in greenhouse gas emissions—and, by making houses warmer in winter and cooler in summer, also improve community health. But how can it be realised? Is it sensible to do blower measurements and thermal camera imaging, as we did, on a large scale?

Where’s the data?
To assist us in our project, we felt a clear need for independently measured, hard data from actual Australian residential energy efficiency retrofit projects on what can be done and the associated costs and benefits. It became clear to us that what would be a good start is a nice clear guide, which:

- is issued by an impartial, reliable organisation
- is based on a large number of actual projects and post-project measurements
- includes indicative costs and energy savings from various substantial retrofit measures in Australian locales for common building types. (A guide for Melbourne conditions and older double-brick houses would be useful for us.)

Unfortunately, we couldn’t find a guide of this nature for Melbourne.

We did find material on how to build an energy-efficient house, results from some retrofit modelling which may or may not be applicable in practice and limited guidance about minimal steps such as draught-proofing doors and windows. Plus, there are various reports and papers observing that the Australian public hasn’t taken to residential energy efficiency retrofits with any enthusiasm and exploring reasons why this might be the case.

Overseas experience indicates that residential energy efficiency retrofits are an effective way to reduce energy use or, at the very least, to make poor quality housing in cold climates much more comfortable. Recognising this, a number of programs in the USA, the UK and New Zealand offer...
The key to thermal performance
Insulation buyers guide

Is your home hot in summer and freezing in winter? It probably has little or no insulation. Lance Turner takes a look at how insulation can help fix these problems.

BY reducing heat flows into and out of your home, insulation can dramatically improve comfort levels during weather extremes.

In winter, once the home has been heated to a comfortable level, it will stay that way with far less energy input than an uninsulated home would require.

The same applies in summer. A properly insulated home will take longer to heat up and if an air conditioner is used it will use less energy than one cooling an uninsulated house. Note though, that any windows with high solar heat gains need to be shaded, particularly west windows, as in hot weather, insulation can slow down the ability of the house to cool down if there are large heat gains from windows.

Heat transfer and insulation
There are three ways in which heat transfers to or from a house: conduction, radiation and convection.

Conduction means the transfer of heat through a substance, in this case the walls, floor and ceiling of the house. The type of insulation used to reduce conductive heat transfer is known as ‘bulk’ insulation.

This is the most common home insulation and may be in the form of fluffy ‘batts’ made of many materials, including polyester fibre, glass fibre and sheep’s wool. Bulk insulation may also be in the form of loose-fill material, such as treated cellulose fibre (usually made from recycled paper), which is simply pumped into the roof or wall cavities and sealed with a spray-on ‘cap’. All these materials are poor conductors of heat and so reduce the rate of heat flow, provided they are installed properly.

Radiation is a different form of heat transfer. All warm objects radiate heat in the form of infrared radiation. If this heat can be reflected back from where it has come from using reflective foil insulation, then heat loss or gain through radiation can be greatly reduced.

Reflective surfaces such as foil don’t just reflect, they also have low emissivity (the ability to emit radiation, or heat in this case), meaning heat that has entered the material from the non-reflective side is not emitted from the reflective side easily. This means that foils can work reducing heat flows in both directions, even if only one side of the material is reflective.

Convection heat transfer (heat transferred through the circulation of air) is often the undoing of many insulation jobs. Circulating air can pass between poorly installed insulation materials and thus transfer heat into or out of the house, vastly reducing the effectiveness of the insulation. Minimising convective heat transfer is discussed later in this article.

Bulk insulation
Bulk insulation is primarily used in ceilings, where it is usually installed directly on top of the ceiling between the ceiling joists. Increasingly it is also used inside walls and even under floors to further improve thermal performance.

Bulk insulation comes in many shapes, thicknesses and materials, all of which have their pros and cons. The most common materials are still mineral wool and glass fibre.
How low can you go?
Low-power, low-cost computing

If you need to be energy frugal, you can still have a real computer for real tasks that won’t cost the earth. Lance Turner shows you how.

OVER the years we have looked at many low-power computers in ReNew, and there are new models out on a regular basis. Many of these have considerable computing power for their size, but most cost in the realm of several hundred dollars and many are simply not available in Australia.

The needs of computer users vary widely—some need higher processing power whereas others, who do everything in a web browser, need far less. The same applies to energy consumption. If you live with a small renewable energy system, your main priority may be to minimise energy consumption.

So just what options are there for really low-energy computing? Let’s take a look at the options, and then look a bit more closely at a low-cost option with surprising power.

Phones, tablets and phablets
Mobile phones, tablets and phablets (basically big-screen phones) are everywhere, and they may be all many people ever need to get connected. They have considerable processing power, are portable and are, by design, energy sippers. But they also have numerous drawbacks that make them unsuitable for many computer users.

Trying to type anything more than a few words on a tablet’s on-screen keyboard is a real pain, at least to anyone used to using a ‘real’ keyboard. Most tablets can take some basic peripherals, such as Bluetooth keyboards, or come with optional keyboard docks that also extend battery life. These can make a tablet more like a tiny PC and can push them into the realms of usability for users who may otherwise have overlooked them as an option.

But that’s about where it ends for most tablets as they have one serious drawback—screen size. While there are some larger tablets around, most fall into the 7” to 10” screen size category, and that makes their screens all but useless for real work, such as editing documents, graphic design or similar, unless your eyes are very good! Most tablets don’t have the option of displaying output on a larger screen, although some do have an HDMI (high definition multimedia interface) output.

Some manufacturers are realising that many customers want to be able to use all that processing power in a more flexible way and so are designing phone docks that greatly expand their phones’ connectability. One example is the Samsung Galaxy Note II dock, which adds three USB, one HDMI and an audio out port to the phone while it is docked, effectively turning it into a mini desktop PC.

The other limitation is the software available. Sure there are tens of thousands of apps available for Apple and Android devices, but most are games or junk apps, written by “developers” to make a quick buck, that users download out of curiosity and then never touch again.

The biggest problem that I perceive with tablets and the main players in the tablet market is that they make their devices extremely difficult to fix and often consider their products to be disposable devices. Most tablets are simply not repairable by the average user and when the battery fails after a...
Low-cost solar heating
Experiments with DIY hydronics

Solar hydronic systems don’t have to be complex and expensive. Chris Hooley describes his simple and low-cost solar hydronic heater.

WINTERS in Melbourne used to be predictable: four months of sog from May to September. However, whether due to climate change, El Niño or simple drought, the winter of 2010 had a particular impact on me in that I kept coming home in the late afternoon to a very cold house, lit by shafts of brilliant winter sunshine. “Wouldn’t it be good,” I thought to myself, “if I could catch some of that energy and keep the house warm?”

I had a rough idea of what was available to make water hot using sunlight. Being a devoted handyman and incurable tinkerer, the seed of an idea took root and grew. My basic parameters were simple: I wanted a completely off-grid, stand-alone system that would ‘catch’ some energy in cooler months and put it to good use, without having to be plugged in or modified seasonally. Since the house already had gas central heating, the system would not need to meet all heating requirements but would rather take the edge off the cold on days when the sun happened to shine.

With this in mind I prowled eBay and mentally drew up plans until I could stand it no more and started buying parts. The key elements consisted of an evacuated-tube array piped to a fan-forced radiator. The collector heats the water and a pump transfers the hot water to the radiator in the house. A fan forces air through the radiator and into the room, heating it.

The system would be controlled by a thermo-switch and powered by a pair of 20 W PV panels. To avoid it freezing solid overnight or boiling away in summer and to eliminate the need for seasonal draining and refilling, I resolved to fill the whole system with car radiator coolant.

The build
Having purchased via eBay a dozen evacuated glass hot water tubes from a caravan supplier in Queensland (10 for the array and two as spares), I set about building a combined stand and manifold. I fabricated this from 1” (25 mm) square tube, with a 4” (100 mm) square box section across the top, drilled to accept the tubes, to act as the manifold. Since I was aiming to catch winter sun, the whole rig was built to sit at a 45° angle, facing north. Extra space was made at one end to mount the two small PV panels. I insulated the manifold with 10 mm polystyrene, scavenged from equipment packaging at work, and coated this with cement render to provide some weather protection and deter birds from picking at the foam.

Filling of the system and thermal expansion was provided for via 6” (150 mm) of round tube welded vertically to the high end of the manifold and fitted with a plastic cap.
HAVING purchased a house in January 2013 and with autumn rapidly approaching, my partner, Mia, and I needed to find a suitable heating option to keep the Tassie winter at bay. Being a rural area, there is no shortage of firewood in the area, with prices ranging from “please take it away” to $150 a tonne. However, although wood heating can make for cheap warmth, it has a number of drawbacks.

One of those drawbacks is that the splitting, carting and storage of all that wood takes a lot of effort and time, and the thought of all that extra work seemed rather unattractive. Wood heaters are the highest maintenance form of heating.

Another issue is wood smoke. No matter how careful you are, wood heaters produce a good amount of smoke at least some time in each heating cycle. As Mia is asthmatic, that was not acceptable from our chosen heater.

Environmentally, a lot of firewood comes from native forests, especially here in Tassie, and that just wasn’t acceptable either. So what were the other choices?

Firstly, we considered reverse-cycle air conditioning. This is quiet, very low maintenance and, on Tassie’s predominantly old hydro power, would be a low-emissions option. However, we don’t like the constant air movement they produce. There was also the concern that, should we eventually take our home off the grid as planned, the heater would be too large to run on an independent power system. And even though we’re on the grid at the moment, our area has been known to have extended blackouts, and days without heating wasn’t an attractive possibility either.

We both really wanted a heater with a visible flame of some sort, so another option we considered was a methylated spirit fire. But the fuel is very expensive—even in 20L drums it’s around $4 a litre.

Methylated spirits is 90% (or more) ethanol, usually brewed from grain or other sugar sources. Environmentally, there are worse fuels, but ethanol is not the ultra-eco friendly fuel that it was once thought to be. Indeed, some studies have shown that some sources of the fuel are barely better than fossil fuels on a GHG basis due to the large amounts of diesel and other fuels used to grow the crops and ferment and distil the alcohol.

These issues led us to look at pellet heaters instead. You start the heater off with a small amount of fuel (often hardwood, but we use recycled-paper kitty litter pellets) and, once up to temperature, small wood pellets are steadily fed into the fire to keep it running. Instead of wood, some use a low-power electric element to get things rolling. Either way, they are a lot less effort than a wood heater and produce a nice fire effect and plenty of heat, with almost no smoke.

Some pellet heaters can run on other fuels, such as feed-grade wheat and corn. Such grain feeds are readily available in our area, so the idea of being able to use a number of different fuels was very attractive. Grains still have some environmental cost, but as our wheat is grown locally and straight from the silo, there is minimal transport.

We looked at Australian-made pellet heaters and discovered that they can be quite expensive. Further, most Australian suppliers only rated...