The Regional Bioenergy Project – Lessons Learnt

Executive Summary

The Regional Bioenergy Project came out of a perceived need to establish a demonstration project for bioenergy. Project aims included installing a bioenergy system at the Beaufort hospital, and investment plan for the Wimmera, case studies and a forum to recommend future bioenergy related activity. A number of issues had to be overcome to achieve these aims including:

- No suppliers of suitable boiler systems in Australia
- No local installers or trades people familiar with bioenergy systems
- No established fuel suppliers for this type of system
- Limited knowledge on suitable technology
- A low level of understanding of bioenergy within stakeholder s and the wider community

The key lessons gained from the project are:

- Bioenergy is viable but you need to determine your energy requirement. The output of an existing gas or electric system is not applicable to a bioenergy system. Get advice from a heating engineer familiar with bioenergy.
- You need to identify what potential fuels are available locally. There are bioenergy systems available to match a wide range of fuel types. Once you know these then do some research on the types of systems available. The range of systems available in Australia is limited at present but there is a lot of information available on the internet.
- Finding an experienced installer will be difficult. Bioenergy is becoming more popular but you may have to shop around to find someone willing to undertake the installation.
- You will need to allow additional time for the planning process and consult the local community. Both council planners and the public are unfamiliar with bioenergy and you will need to provide more information than with conventional heating systems.

The project also identified supply chain opportunities in the region including farmers, local sawmills and councils. The Wimmera Investment Plan identified potentially significant savings councils could make by using wood waste for facility heating. Bioenergy can also be integrated with other land management activities such as fire prevention and weed control. Bioenergy works and is cost effective.

Background

This project came out of substantial investigation and active interest in bioenergy application led by the Central Highlands Agribusiness Forum (CHAF). At the time there were no working examples of bioenergy which made explaining the benefits of bioenergy very difficult. CHAF identified the Beaufort hospital as a suitable site for demonstrating the concept as the hospital had aging and inefficient gas boiler which it was looking to update. Staff from a number of local council worked together to develop a funding application that led to the project being funded.

Beaufort Hospital

Project aims

These were formulated at a regional workshop held in Beaufort in November.

They were:

- The Beaufort Hospital bioenergy unit operating effectively
- A Business Case developed
- Investment planning for a Wimmera Southern Mallee bioenergy facility
- A Bioenergy Forum report outlining recommendations to stimulate further bioenergy activity in the region
- An LGA Forum Report outlining recommendations for further bioenergy activity in the region
- Case studies showcasing the practical aspects of regional bioenergy delivery and opportunity are developed and communicated

I believe the project has delivered on all of these aims. The demonstration boiler unit has been installed and is operating entirely as expected. A business case for these types of installations has been written, copies of which are available. An investment plan for a Wimmera Southern Mallee installation has been written (Horsham Aquatic Centre Heating study) and the results of this forum will provide recommendations for further bioenergy activity in the region. Finally, the documentation produced by the project will be circulated to show the practical aspects of delivering bioenergy to the region.

So what did we learn?

The first lesson was the difficulty in developing bioenergy in Australia. Using bioenergy is not mainstream so there was not local information or support to draw on. At the scale we were looking, between 50kW and 1 MW, there is no locally produced equipment and no distributers of the technology. Put simply, no one is doing it!

Luckily there are distributers and installers and a developing bioenergy industry in New Zealand. We were able to tap into this resource. The New Zealand Energy Efficiency and Conservation Authority (EECA) and the Bioenergy Association of New Zealand (BANZ) are excellent sources of information on bioenergy systems and installations.

What fuel to use

For anyone thinking of installing bioenergy there are a number of things you need to consider. Firstly look at potential fuel sources. Bioenergy systems can utilize a wide range of organic material so if you or nearby industries have an organic waste they currently have to pay to dispose of then this would be a good place to start. Next look at your energy needs. Bioenergy is best at providing heat, particularly constant low grade heat such as space or water heating. It can provide both heat and power or even

heat power and cooling but this required significant capital investment. If your energy and or waste disposal costs are more than $10,000 per year then bioenergy could be applicable to your situation. If you are using LPG for heat then bioenergy is definitely worth investigating.


Beaufort Bioenergy System

Once you have decided the type of energy you need and the type of fuel you have available then finding suitable technology isn't difficult. The internet makes locating technology providers simple. For wet wastes, such as animal manure, sewerage sludge or food wastes, bio digestion is a well proven technology. For dry wastes, such as wood chips, nut shells, straw or sawdust, there are a range of combustion systems available. If you don't have access to any suitable fuels, commercially produced wood pellets are now becoming available for bioenergy applications.

Hargassner Boiler Unit

Choosing a boiler

Choose a boiler that will be able to efficiently use the fuel you have available. Some boilers can use a range of fuel types. So called multi-fuel boilers can burn grain, sawdust, wood chips, wood briquettes and pellets but pellet boilers will only burn pellets. While more expensive, a stepped grate boiler gives more flexibility with fuel types and is less prone to ash clogging.


Chip storage shed at Pyrenees Timber

The size or heat output of the boiler is an area that has been a major issue overseas and you need to consider it carefully. It's recommended you obtain advice from an independent heating engineer with experience in bioenergy when making this decision. Bioenergy heaters operate differently to conventional fossil fuel heaters so just replacing a gas heater with a biomass fuelled boiler of the same heat output will result in operating problems. Biomass heaters are designed to operate over long periods at maximum output. Biomass heaters work on a lower output over a long period with a buffer tank to smooth out heating demands. Gas boilers operate on a high output for brief but regular periods.

As a rule of thumb, a biomass boiler is usually less than half the output of a gas boiler for the same installation. Buffer tanks of at least 20 litres per kilowatt of boiler output should be fitted in most bioenergy heating applications. At the Beaufort Hospital the 110 kW Hargassner biomass boiler is replacing two 150kW condensing gas boilers. A 4,000 litre buffer tank was installed to smooth out demand fluctuations. A potable hot water circuit will also be installed at a later date.

For anyone thinking about using bioenergy, the UK company Euroheat has a great web site with lots of information, including prices, on various types of heaters, boilers and associated equipment.
You can access the site at: http://www.euroheat.co.uk/
For combined heat and power (CHP) situations at less than 1MW, bio digestion or gasification are currently the only practical options. This involves running a modified internal combustion engine and generator on the gases produced from either digestion of gasification. The level of technical input and

management required is significantly higher but it can be an effective option if the heat produced is also used. Cooling can also be included through an adsorption process.
Organic Rankine Cycle (ORC) systems are available for bioenergy CHP applications but they are still very expensive. Lower cost systems are currently being developed and will open up a much wider use for CHP. The primary advantages of ORC are long life and low maintenance.

For councils intending to use bioenergy, based on our experience with the Beaufort Hospital installation, I'd recommend they do the project management "in house". The technology isn't complicated and most councils would have personnel capable of project managing an installation.

The planning process can take some time so you need to get that rolling as soon as possible. Installations under 1 megawatt don't require an EPA works approval however they did raise concerns about emissions for the Beaufort installations. Boilers that meet EU standards have certified emission levels well below the current Australian standard AS 4013: 1999 for wood fuelled heaters so choosing a boiler built in Europe is advisable.

Stimulating further activity

One of the project goals was to stimulate further bioenergy activity in the region. In a small way the project has assisted in stimulating further investment in bioenergy. The wood chips used to fuel the boiler come from the Pyrenees Sawmill. Previously, the mill was selling the chipped residue from their milling operation as garden mulch at a low price, just to dispose of it. As a result of the project, the mill has introduced further processing of the chip to meet the specifications required by the hospital boiler. The wood chip now produced is of a higher standard and receives a high price. The mill is now investing in converting its drying kiln to use these fuel chips as well, further improving both the utilization of the chips and the profitability of the mill operation.

Peter Berlyn, a local landowner and contractor, is developing a system to utilize Blue Gum stumps as biochar. The stumps are removed as part of plantation rehabilitation works and were previously burnt. Peter has now teamed up with Earth Systems to turn these stumps into valuable biochar which will not only improve the efficiency of the rehabilitation operation but help supply the growing biochar market.

Wimmera Project

At the start of the project, the Wimmera Southern Mallee aims were not well developed. A Project Investment Logic Map workshop was held in Horsham in October 2012 to identify potential projects. A number were initially identified with members of the Wimmera Southern Mallee Project Reference Group recommending a Heating Study for the Horsham Aquatic Centre.

The Horsham Aquatic Centre heating study looked into using municipal wood waste as a fuel. Wood waste is a major waste management problem for councils and turning it into a heating fuel could solve both the disposal problem and reduce council's energy costs. Investigations by Highlands Regionals Waste Management Group on green waste processing methods have shown it is possible to economically process this waste into a satisfactory heating fuel and this information formed part of the aquatic centre study.

The study found that by using wood waste to heat the aquatic centre, Horsham Rural city could save over $78,000 per year and repay the capital cost of the wood boiler system in three to four years.

The expected life span of wood fired boilers is over 25 years so the financial benefit of an installation could be as much as $1.6 million over the life of the system. Horsham Rural City Council has accepted the study and will include its recommendations in their Sustainability Strategy. The strategy will be implemented as funding permits.

Other potential application

An initiative that has major potential for Victoria but has yet to be taken up is the United States Fuels for Schools program. The program was started in 2001 by the US Forest Service and now covers the states of Nevada, Utah, Idaho, Montana, Wyoming and North Dakota. It targets strategic areas of public land that pose a fire danger due to high fuel loads and, rather than burning the hazardous fuel on site, it's harvested and provided at cost to public institutions such as schools, hospitals and universities as heating fuel. The result is a reduction in the fire danger for the community without the issues involved with burning. This approach would provide long term employment for the people involved in harvesting the fuel, reduced heating costs for the institutions and a general reduction in greenhouse gas emissions.

There appears to be a sound economic argument for trialling such as the Biobaler as an alternative to burning in high risk/smoke sensitive locations. According to a 2011 US trial of the biobaler, production cost for baled biomass ranged from $38 US to $58 US per dry ton. In Australian terms, that equates to $46 to $71 per tonne. At current natural gas prices, biomass is competitive at around $80/tonne delivered but this is likely to change as we move to world parity pricing.

Biobaler harvesting woody weeds

Natural gas prices are expected to double by 2016 so biomass will become attractive at prices well over $100/tonne. At current LPG prices, biomass is competitive at under $400 per tonne.

So what was easy and what was hard? The easy part was finding information on bioenergy. The internet is a marvellous tool for finding information and there is plenty out there. The hard part is getting someone to supply you with the equipment and convincing people that it works. Hopefully this project has made that a little easier for those who follow.

Take home message

The take home message for councils and industry is that bioenergy is a real option for reducing energy and waste disposal costs.