Wimmera Investment Plan

Executive Summary

Developing a project for the Wimmera Southern Mallee was part of the Regional Bioenergy Project. A reference group recommended that the Wimmera project should be a study on using waste, either grain waste or municipal green/wood waste, to heat the Horsham Aquatic Centre.

This plan covers five areas: Purpose, Cost, Risks, Finance and Options.
The purpose is to demonstrate the effectiveness of bioenergy. The cost is estimated to be between $250,000 and $300,000 with an annual net savings will be around $78,629 per year and a simple payback of a minimum of 3.2 years. Project risks a generally low except for the potential of significant emissions if fuel quality standards are not maintained.

Finance would be mainly from Horsham Rural City however there may be grant funding available from the State Government. The short payback means the economic risk is low. The primary option is installation of a biomass fuelled boiler by Horsham Rural City however there is another possibility of entering a heat supply agreement with a private developer. With other potential users nearby this could be also viable.

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.

Background

Developing an investment plan for the Wimmera Southern Mallee part of the Regional Bioenergy Project was identified as part of the original project planning. The scope of the plan and type of investment was not specified but was left to the Wimmera Southern Mallee Reference group to decide.

On the 17th October, 2012, a meeting of seven stakeholder representatives undertook an Investment Logic Map (ILM) process led by Jeremy Smart from Ecosphere. The meeting developed a draft ILM (see attachment 1) which identified the relevant issues facing the Wimmera. This document was reviewed and refined at a second stakeholder meeting on October 31st, 2012.

At this meeting nine stakeholder representatives identified potential pathways and solutions to the issues identified in the first meeting. They developed the final ILM and a list of potential projects (see attachments 2 to 5). The list of potential projects was then considered by both the Project Control Group and a meeting of the Project's Wimmera Southern Mallee Reference Group to identify which projects could be achieved. A decision on a final project/s was delayed until after tender for the Beaufort Hospital boiler installation had been awarded so the amount of funding available could be determined.

On the 29th of August, 2013, a meeting of the Wimmera Southern Mallee Reference Group recommended that the Wimmera project should be a study on using waste, either grain waste or municipal green/wood waste, to heat the Horsham Aquatic Centre. This heating study would be prepared by the Regional Bioenergy Project Manager, Daryl Scherger.

Investment Plan

The recommendations of the heating study (see attachment 6) form the basis of following investment plan for the Wimmera. The investment plan has five parts:

1. **Purpose**

   The purpose of this plan is to develop a bioenergy facility in the Wimmera Southern Mallee to demonstrate the effectiveness of bioenergy to the local residents and as well as to a wider community. It should support existing local enterprises and help establish new businesses and additional employment opportunities. Installing a wood waste fuelled boiler at the Horsham Aquatic Centre would achieve this purpose. The site is a public facility readily accessible by the community so the performance of the installation will be obvious. The fuel will be produces locally with local transport and local contractors would undertake any maintenance required. This will support local businesses and employment.

2. **Cost**

   The cost of the installation is set out in the heating study business plan (section 7). The estimated capital cost of the proposed installation is $250,000 to $300,000. Annual fuel and maintenance costs are estimated to be $32,040. The operating life of the system is expected to be more than 25 years so the depreciation/replacement cost would be approximately $20,000 per year. The annual reduction in the cost of natural gas as a result of the installation is expected to be $25,034. Avoided waste disposal costs due to a reduction in wood waste being deposited in landfill are expected to be $59,040 at current fee levels. An additional potential benefit is the reduction in carbon emissions as a result of fuelling the boiler with wood waste. The reduction in the cost of emissions could be up to $3,555 per year based on current carbon prices. Additional costs such as project management, promotion and signage have not been included as have any additional benefit such as the enhanced reputation of Horsham Rural City and future gas price rises.

3. **Risks**

   The risks associated with the proposed development are low but there are a small number that should be considered. These are:

   a. Safety during installation - Risk management plan will be in place and standard operating procedures will be followed.
   b. Impact on pool operations - The boiler system will be stand alone and not connected to the existing pool system until the installation is almost complete.
   c. Disruption to normal operation while the final connects are being made is expected to be minimal.
   d. Savings not achieved - Based on the experience from the Beaufort Hospital and case studies from similar installations overseas there is a high level of certainty that the savings will be achieved. The financial saving is likely to be higher after year one due to forecast increases in gas prices.
   e. Boiler emissions exceed EPA standards - A program of regular testing of stack emissions will ensure boiler fuel and operation are within specifications. Boiler ash should also be tested if not being sent to landfill.

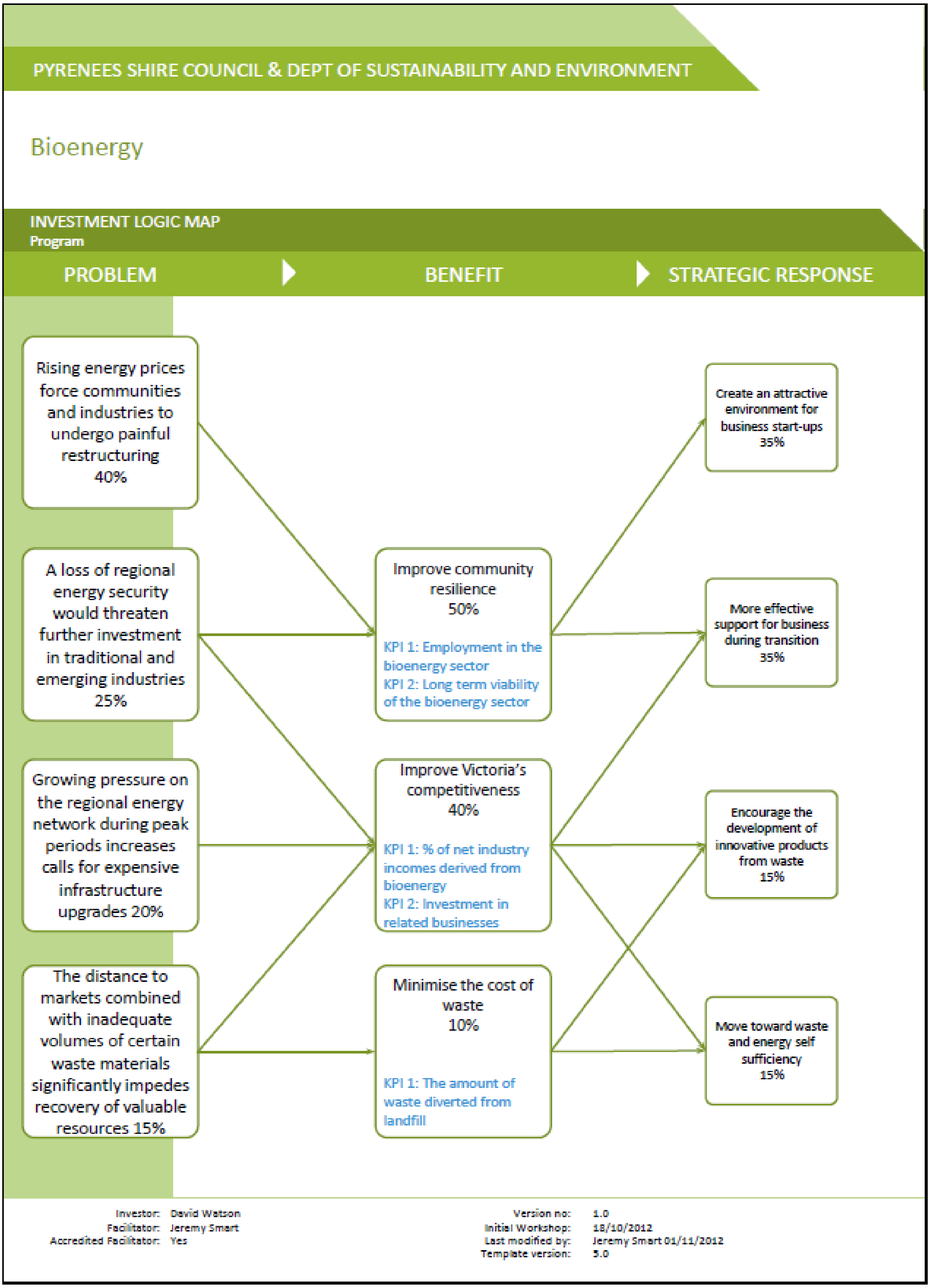
f. Failure of system installer/s to meet contractual obligations – This is managed under the normal tender process.

4. **Finance**
The installation would be financed by Horsham Rural City either by external borrowing or internal resources. There is scope for the proposal to attract funds from the State Government through grants such as the Sustainability Victoria Timber Recycling Fund or more general grant funding from the Department of Planning and Community Development or the Department of Business and Innovation. The Timber Recycling Fund would be applicable and offers one to one funding up to $150,000. With a predicted payback time of less than five years, funding the project through borrowing is a real option.

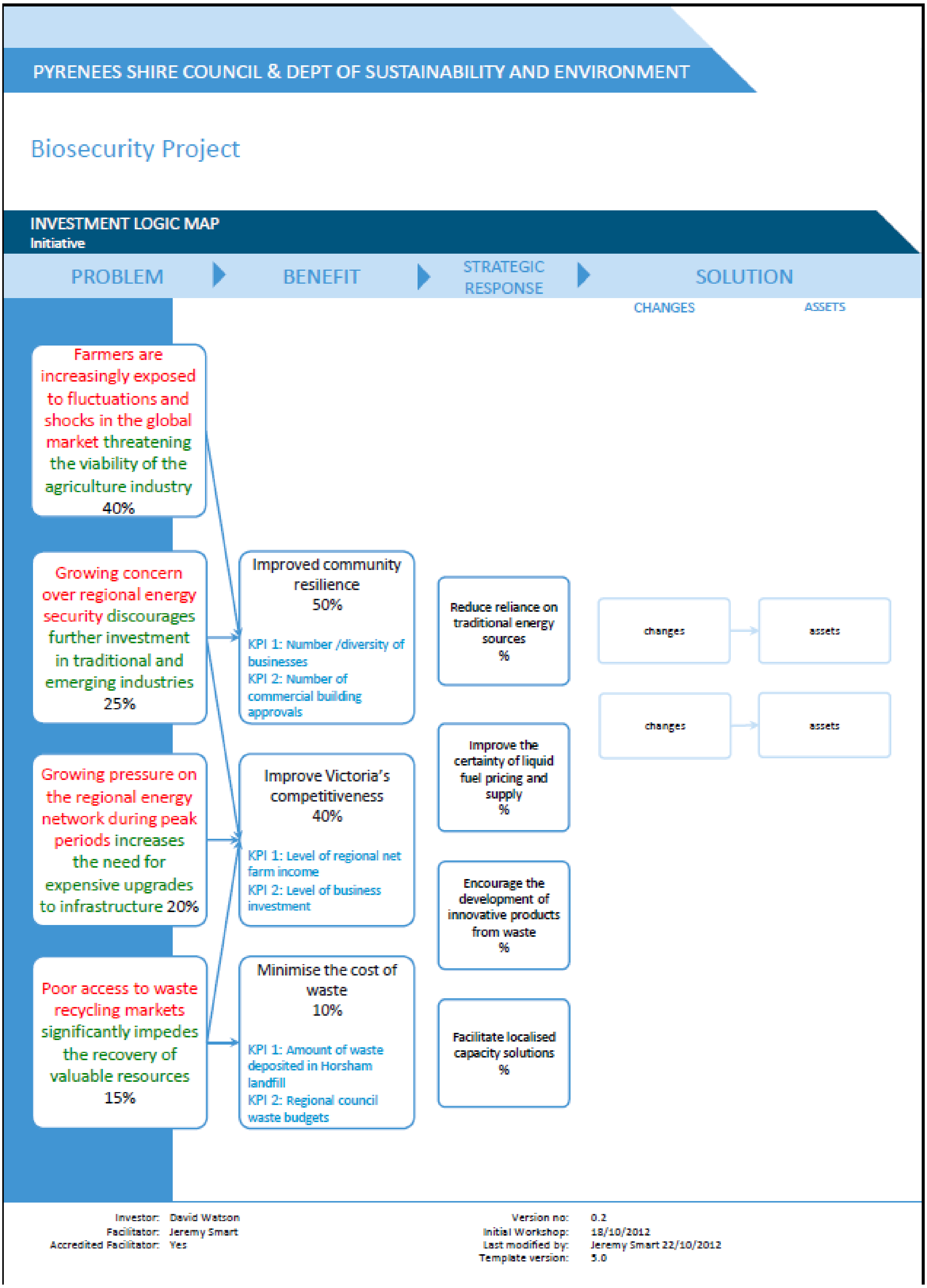
5. **Options**
Alternate ways to achieve the outcomes established in this plan are limited but one possibility is for the Horsham Rural City to tender the supply of heat for the aquatic centre. A private business would install, operate and maintain the boiler system and sell the heat produced to council. There are a number of potential customers in the vicinity, including a large motel adjoining the site, so there may be economies of scale which would allow a business to supply heat at a lower cost than council. It would also limit councils risk exposure and simplify the operation of the aquatic centre.

Recommendation
That Horsham Rural City Council adopt this plan and take steps to procure the necessary funds to install the wood waste fired boiler system as described in the attached heating study.

Attachment 1



Attachment 2



Attachment 3

PYRENEES SHIRE COUNCIL & DEPT OF SUSTAINABILITY AND ENVIRONMENT

Bioenergy

BENEFIT MANAGEMENT PLAN
Part 1: Benefit Map

BENEFIT	INVESTMENT KPI	MEASURE	BASELINE	TARGET
Improve community resilience 50%	Increase employment in the bioenergy sector 50%	Number of people employed in the sector	Baseline Date of first report	Target Date of last report
	Increase the long term viability of the bioenergy sector 50%	The length of time the industry requires government support	Baseline Date of first report	Target Date of last report
Improve Victoria's competitiveness 40%	Increase the % of net industry incomes derived from bioenergy 50%	% of industry incomes derived from bioenergy	Baseline Date of first report	Target Date of last report
	Increase investment in related businesses 50%	Number of new related businesses established	Baseline Date of first report	Target Date of last report
Minimise the cost of waste 10%	Increase diversion of waste from landfill 100%	Diversion rates	Baseline Date of first report	Target Date of last report

RESPONSIBILITY FOR DELIVERING THE BENEFITS		
David Watson	Position	31/10/2012

Investor: David Watson
Facilitator: Jeremy Smart
Accredited Facilitator: Yes

Version no: 0.1
Initial Workshop: 31/10/2012
Last modified by: Jeremy Smart 31/10/2012
Template version: 5.0

Attachment 4

Bioenergy

Investor:	David Watson
Facilitator:	Jeremy Smart
Initial Workshop:	31/10/2012
Version No.:	0.1
Last Modified by:	Jeremy Smart 31/10/2012

	Strategic options	
	Option 1	**Option 2**
Strategic Interventions		
Create an attractive environment for business start-ups	**35%**	**35%**
More effective support for business during transition	**35%**	**15%**
Encourage the development of innovative products from waste	**15%**	
Move toward waste and energy self sufficiency	**15%**	**50%**
Total	**100%**	**100%**

NOTES

1 The range of strategic interventions that could respond to the identified problem and deliver the KPIs for the expected benefits are listed in the left-hand column.
2 Against the listed strategic interventions a spread of strategic options are structured to provide genuine alternative strategic responses to the problem.
3 Strategic options should be titled to reflect the underlying strategy.
4 The shaded boxes indicate which interventions are used in each option and the percentage (%) indicates the relative importance of each specific intervention within the option.
5 This is a balance of two factors: the importance of the intervention in delivering the KPIs and the likely effort/cost involved.

			Strategic options	
			Option 1	**Option 2**
Benefits				
Percentage of full benefit to be delivered			**100%**	**76%**
Benefit 1	Improve community resilience	50%	5	3
Benefit 2	Improve Victoria's competitiveness	40%	5	5
Benefit 3	Minimise the cost of waste	10%	5	3
Cost				
Investment cost (Range)			Lower	Higher
Operational costs if significant (Range)			Lower	Higher
Time				
(Range)			Faster	Slower
Risks			Likelihood/Consequence	
Delays in achieving legislative change			eg. Low/High	
Lack of adequate alternatives				

Lack of markets for new products		
Lack of social acceptance of fuel over food		
Inadequate economies of scale for waste inputs		
Successful business opportunities		
Dis-benefits	Likelihood/Consequence	
Potentially crowd out other businesses including food production	eg. Medium/Low	
Ranking		
1-2	**1**	**2**

Overall Assessment:

add assessment

Recommendation:

add recommendation

Notes:

a Benefits - rank (0-None, 1-Low, 5-High).
The value the investment will provide to the organisation or its customers. Benefits are the of successfully responding to the identified problem.
A benefit is supported by one or more key performance indicators (KPIs).

b KPI - rank (0-None, 1-Low, 5-High)

c Dis-benefits - Negative impacts that are likely to occur as a direct consequence of implementing this option

d Risk - the most significant things that might result in the failure of this option to deliver the expected benefits.

e Timeframe - From funding date to delivery of benefits.

f Cost - range of total estimated expenditure (TEI). It should be sufficiently reliable to provide an order of magnitude of the option.

g Cost (Operational) - impacts of operational cost should be identified (if significant) as these may substantially differ between options.

h Ranking - Considering all factors, which options are the preferred response to the problem.

i Overall Assessment - why was the preferred option chosen? Any other assessment observations?

j Recommendation - How should this investment proceed...or not?

Attachment 5

Projects	Benefits (Score out of 5)						Strategic Fit	Timing	Costs	Primary Risks	Risk Status	Overall Assessment
	Improve Community Resilience		Improve Victoria's Competitiveness		Minimise the cost of waste							
	25%	25%	20%	20%	10%							
	Increase employment in the bioenergy sector	Increase the long term viability of the bioenergy sector	Increase the % of net incomes derived from bioenergy	Increase investment in related businesses	Increase diversion of waste from landfill	Overall Score (Out of 100)	Very High / High / Medium / Low	Short / Medium / Long	Range		High / Medium / Low	Score
Grain waste pellets for fuel	2	5	3	4	0	63	High	Short	$0-0.5m	Lack of appropriate supply	Low	
Straw to diesel	3	5	5	5	0	80	High	Long	$10m+	Unproven technology	High	
Establish resource hub	2	3	0	4	5	51	High	Long	$0.2-20m	Poor level of business interest	Medium	
Hospital boiler	1	5	3	4	0	58	Medium	Medium	$0.2-0.3m	Inadequate supply of chips	Low	
Biodiesel from canola (demonstration project)	1	4	2	2	0	41	Very High	Short	$0.05m	n/a		
Investment prospectus for bioenergy	1	5	4	4	4	70	Very High	Short	$0.2-0.3m	Fail to target the right audience or the audience is not ready	Medium	

Attachment 6

BIOMASS HEATING STUDY

by

Daryl Scherger

April 2014

Table of Contents

Executive Summary

The bioenergy project, *Building Community Resilience and Adaptation to Climate Change through Distributed Bioenergy*, is a major pilot study across the Central Highlands and Wimmera Southern Mallee local government regions. Funded through the Victorian Adaptation and Sustainability Partnership, the project aimed to showcase commercial scale bioenergy production across the region.

A major part of the project involved installing a bioenergy demonstration plant at the Beaufort hospital. Other actions included undertaking a feasibility study for a Wimmera Southern Mallee bioenergy unit. The Wimmera Southern Mallee Project Reference Group recommended the Wimmera Southern Mallee project should be a feasibility study on using locally sourced grain waste to heat the Horsham Aquatic Centre. Using wood waste diverted from landfill was also considered as an alternate fuel.

Heating consultants, Invertech P/L, were engaged to determine the size of biomass boiler required. They recommended a 200kW wood chip fired boiler with a turn down capability to 65kW and a 7,000 litre buffer tank. Three estimates were obtained from boiler suppliers with $250,000 being the lowest.

Based on an average 0.67 cents per MJ price for natural gas, the annual natural gas cost in the 2011/12 Financial Year for the 7,140,242 MJ used was $ 48,074.35. In comparison, a 200kW bioenergy unit is estimated to consume of 480 tonnes of shredded wood waste per year and at $48 per tonne, this gives an annual cost of $23,040. Waste grain would require 444 tonnes at around $100 per tonne or $44,393 per annum.

At current natural gas prices, the $250,000 cost of installing a biomass boiler system would give a simple payback of 14 years however the retail price for gas is expected to double by 2016 and this will have a significant impact on the energy costs for the centre. If this occurs then the payback period for a 200kW biomass boiler unit is approximately 3.4 years.

By using wood waste council would also avoid $59,040 in landfill charges. If the increased gas prices and avoided landfill costs are combined then the payback period could be less than 2 years.

<u>Comments</u> Given the low cost and availability of wood waste, this report recommends wood waste is used as the primary fuel with grain waste considered as a backup fuel. The estimated costs exclude maintenance costs of the biomass boiler and retaining the natural gas boilers as a back-up. Maintenance costs will apply annually for both fuel types.

 Shredded wood waste	 Grain waste

1 Background

In December 2010, a collective of nine councils and eleven partners successfully sought funding through the Sustainability Accord for a regional bioenergy project across the Wimmera Southern Mallee and Central Highlands regions. Pyrenees Shire was lead Council.

The project aims are to investigate and establish a bioenergy demonstration system using sawmill waste at the Beaufort Hospital. A further study will investigate feasibility of a Wimmera Southern Mallee bioenergy installation.

At a meeting of the Wimmera Southern Mallee Project Reference Group, held on the 29th August 2013, it was resolved that the Wimmera Southern Mallee project shall be a feasibility study on using locally sourced grain waste to heat the Horsham Aquatic Centre.

Aerial view of the Horsham Aquatic Centre

2 Biomass Heating Study Purpose and Objectives

The Regional Bioenergy Project Manager, Daryl Scherger, will undertake the study and work closely with the Wimmera Southern Mallee Project Reference Group to achieve the listed study objectives.

Study Objectives:

- Produce a report and business case for the installation of a biomass heating system at the Horsham Aquatic Centre
- Identify likely additional benefits to the community from the proposed heating system
- Report the study findings to project stakeholders and the wider community

3 Deliverables

The deliverables from the study were to produce a document covering the deliverables as listed below and report the results as indicated:

3.1 Combustion Systems:

- Obtain a report from a suitably qualified consultant on the output capacity required to meet the current and expected future heating demand of the aquatic centre.
- Investigate appropriately sized and proven thermal biomass heating systems
- Determine the size and construction of the boiler house and fuel store
- Obtain quotes on suitable boiler systems, boiler house and fuel storage.
- Identify all boiler system installation, and commissioning costs as well as product warranty
- Identify operating, maintenance and replacement costs for the system.

3.2 Fuel Supply

- Investigate the availability and price of the grain waste fuel
- Identify fuel supply, delivery and storage options/issues including costs
- Consult with researchers and DEPI to identify likely benefits to the farming community from utilizing grain waste

3.3 Regulatory Processes and Operational Issues

- EPA (noise, smoke, smell)
- Planning Scheme
- Building Code
- OH&S
- Other legislation relevant to the project
- Fuel supply agreement and delivery process
- Ash removal and disposal.

3.4 Business Case:

- As part of the study a business case will be developed for the installation

3.5 Report Findings - Presented to stakeholders:

- Horsham Rural City Council and Other Wimmera southern Mallee municipalities
- The Wimmera Mallee Project Reference Group
- The Regional Bioenergy Project Control Group
- Other community groups (WDA, WMSA, WFG, BCG, etc.)
- Placed on the Pyrenees Shire website
- Articles submitted to local papers.

The study will be completed prior to the Regional Project Forum in April 2014.

4 Methodology

The study methodology involved:

- Review of published information from a variety of sources.
- Obtain estimates and quotes from recognised suppliers
- Consulting with researchers, government department staff, industry, producers and technology installers.

A number of reports and a database of key contacts were provided by Horsham Rural City to assist with research. Telephone and email consultation provided a key source of information. Internet searches provided supplementary information.

Where responses were unable to be gained, gaps in information will require further investigation.

5 Key findings of the study

The following is a summary of key findings from research and consultation undertaken for the Biomass Heating Study.

5.1 Heating Demand for the Horsham Aquatic Centre

The Horsham Aquatic Centre is heated by natural gas boilers. The annual gas consumption is set out in the table below. The required output for a biomass boiler to meet the heating demand is 200kw (refer to attachment A – Invertech report)

Based on 2011/12 Financial Year Natural Gas consumption data

	Jul/Aug	Sep/Oct	Nov/Dec	Jan/Feb	Mar/Apr	May/Jun	Total
Natural Gas - MJ	1,459,666	1,224,707	836,860	779,529	1,188,391	1,651,089	**7,140,242**
Natural Gas - kWh	405,463	340,196	232,461	216,536	330,109	458,636	**1,983,401**
Gas Cost	$10,831.07	$8,160.24	$5,182.27	$5,037.83	$7,281.25	$11,581.69	**$ 48,074.35**

If wood waste or waste grain was used as an alternate heating fuel then the likely amount and cost is set out below.

	Jul/Aug	Sep/Oct	Nov/Dec	Jan/Feb	Mar/Apr	May/Jun	Total
Heat Required - kWh	405,463	340,196	232,461	216,536	330,109	458,636	**1,983,401**
Grain Required - tonnes	91	76	52	48	74	103	**444**
Grain Cost @ $100/tonne	$9,075.27	$7,614.44	$5,203.06	$4,846.61	$7,388.65	$10,265.41	**$44,393.45**
Shredded Wood Waste - tonnes	98	83	56	52	79	112	**480**
Waste Cost @ $48/tonne	$4,704.00	$3,984.00	$2,688.00	$2,496.00	$3,792.00	$5,376.00	**$23,040.00**

Boiler Options	kW Output	Purpose - Heating	Purpose - Hot Water	Estimated Costings*
Option 1 Living Energy NZ – Binder Step Grate Boiler	200kW	Yes	Yes	$xxx,xxx - supply & install
Option 2 Step TRUTNOV – solid grate boiler – supply with local plumber to install	190kW	Yes	Yes	$240,000 - supply & install
Option 3 HDG Boiler – supply with local plumber to install	200kW	Yes	Yes	$250,000 - supply & install
Options 1, 2 & 3 Annual maintenance				$9,000

*Excludes GST

Option 1: Living Energy is an established NZ bioenergy company using Austrian built boilers. Installation costs would need to be firmed up and itemized for this option.

Option 2: Step TRUTNOV is a Czech boiler company prepared to export to Australia. Installation would need to be done by a local plumber.

Option 3: HDG is a German boiler manufacturer with an agent in New Zealand. Price is based on a current published price list and Beaufort Hospital costs.

Annual Maintenance: Estimated to be double the Beaufort boiler fee.

Comments It should be noted that all costings supplied for this report are preliminary estimates. For each of the options, additional costs including a concrete base for the unit, housing/shedding, perimeter fencing, entrance points, signage, biomass/fuel supplies and regular freight/delivery may not have been included.

Bioenergy unit installation and maintenance
A local heating engineer would assist with the unit's installation and then provide a local 24/7 call-out service. Normal hourly rates would apply.
Critical spare parts would need to be stored onsite or with the local service agent. Other items could be flown from Europe in around four to five days.

The warranty period for the boiler unit is normally one year on mechanical parts and three years on boiler components.

5.2 Regulatory and planning processes

Environmental Protection Agency (EPA)
The Development Assessments Unit at EPA advised no regulations apply for a bioenergy unit with a capacity less than 1 megawatt. This is in accordance with the Environment Protection (Scheduled Premises and Exemptions) Regulations 2007 under A08 (Waste to Energy) category.

Planning Scheme & Building Code
The Manager of Planning at the Department of Planning & Community Development (DPCD) Ballarat advised that are there unlikely to be any DPCD triggers for this bioenergy project. The following clauses within the Horsham Rural City Planning Scheme could trigger the need for a planning permit to be obtained for the project:-

Clause 52.10 USES WITH ADVERSE AMENITY POTENTIAL
Purpose - To define those types of industries and warehouses which if not appropriately designed and located may cause offence or unacceptable risk to the neighbourhood.

Comments The bioenergy unit is ancillary to the primary use of the hospital.

Definition - Table to Clause 52.10

Type or production, use or storage (purpose)	Threshold distance (metres)	Notes
Recycling and Resource Recovery		
Advance resource recovery technology facility		Note 1
Combustion, treatment or bio-reaction of waste to produce energy		Note 1

Note 1 of the table: The threshold distance is variable, dependent on the processes to be used and the materials to be processed or stored.

Comments No threshold distance is applied.

Clause 52.07 LOADING AND UNLOADING OF VEHICLES
Purpose - To set aside land for loading and unloading of commercial vehicles to prevent loss of amenity and adverse effect on traffic flow and road safety.

Requirements to be met - No building or works may be constructed for the manufacture, servicing, storage or sale of goods or materials unless:

- Space is provided on the land for loading and unloading vehicles as specified in the table.

Clause 36.01 PUBLIC USE ZONE
Purpose - To recognise public land use for public utility and community services and facilities.
To provide for associated uses that is consistent with the intent of the public land reservation or purpose.

36.01-3 Application requirements - An application for a permit by a person other than the relevant public land manager must be accompanied by the written consent of the public land manager, indicating that the public land manager consents generally or conditionally either:

- To the application for permit being made.
- To the application for permit being made and to the proposed use or development.

36.01-6 Table of public land use

Shown on the planning scheme map	Purpose of public land use
PUZ6	Local government
PUZ7	Other public use

Building code
Horsham Rural City Council estimated costs of planning permits for the project. It is usually the Cost of Works (Building) plus the use fee of $502.

Cost Of Works (COW)

Under $10,000	$102
$10,001-250,000	$604
$250,001-500,000	$707
$500,000-1,000,000	$815

Depending on the cost of works, whatever is the higher fee the lower fee is then halved (eg if the shed is $10,000 the cost is $502 plus half of Cost Of Works (COW) $51 but if the shed is $200,000 the cost is $604 plus half of the use fee $251).

Comments Additionally, advertising for the project (if required) usually involves newspaper advertisements for two weeks in Wimmera Mail Times. If required, letters to surrounding neighbours would be an additional cost.

Australian & New Zealand standards
The requirements for the operation of boilers, including unattended, limited attendance and fully attended are covered by AS 2593-2004: Boilers – Safety management and supervision systems standards.
Comments The scope of these standards refers to 'Boilers having a power output within the capacity specified in Table 1 for the boiler type and category'. The cost to purchase these standards to ascertain the boiler's output for its type and category is approximately $170.

Occupational Health & Safety (OH&S)
A monitorable Occupational Health & Safety (OH&S) Management Plan is required to ensure the projected OH&S outcomes will be achieved. An environmental monitoring program should also be instigated to demonstrate commitment to responsible environmental management of the project.

Comments Details of OH&S issues to be included in the OH&S Management Plan can be detailed once the decision is made on a particular bioenergy unit. A check will need to be undertaken to confirm whether utility providers and/or emergency services need to be notified of the bioenergy unit. Further OH&S information needs to be sought regarding supervision processes for boiler units.

Other legislation relevant to the project
Once details of bioenergy units have been decided upon, further background checks should be performed to ascertain whether any other legislation may be relevant to the project.

5.3 Biomass (fuel) types, storage, supply and transport
The proposed multi fuel step grate boiler is capable of successfully burning a range of fuel types from highly processed wood pellets to unprocessed grain waste. The merits of available fuel types are set out below.

Available Fuels

Type	Price	Energy density	Comments
Pellets	3 – 4 times more expensive than woodchips - $400 to $500/tonne	High	Small fuel store required
Woodchips	Lower cost fuel but with higher transport costs - $100 to $150/tonne	Moderate	Larger fuel store required
Grain Waste	Locally available with low transport costs - $100/tonne	Relatively high	Smaller fuel store required
Wood Waste	Lowest cost fuel and locally available - $40 to $60/tonne	Moderate	Large fuel store required

Wood waste is readily available and the lowest cost fuel. Around 2,000 tonnes is received at the Horsham Transfer Station annually and currently this is all sent to the Dooen Landfill. There is currently little demand for wood waste so its use as bioenergy would benefit council's waste program. To produce boiler fuel, the wood material is air dried, shredded to less than 50mm then magnetically screened to remove any metal. All wood and timber received at the transfer station must be checked to ensure no painted or treated timber is diverted for boiler fuel. This is important to ensure an acceptable fuel with low levels of contamination.

Grain waste is cereal grain that is damaged and or contaminated making it unsuitable for most markets. There are potentially hundreds of tonnes of this material available in the Wimmera which currently is left in the paddock or sent to landfill by grain processors. The waste contains a large amount of weed seed so its removal would benefit future crops and providing a market would provide additional income to both farmers and processors.

Potential local fuel sources

Company	Business type	Location	Comments
Horsham Rural City	Transfer station	Horsham	Shredded wood waste source
J K Milling	Grain Processor	Horsham	Possible source of grain waste
Australian Milling Group	Grain Processor	Horsham	Possible source of grain waste
Blue Lake Milling	Grain Processor	Dimboola	Possible source of grain waste
Wimmera Grain Co	Grain Processor	Rupanyup	Possible source of grain waste

Comments Note that there will still be necessary costs for fuel and maintenance of the existing natural gas boilers as they will remain as a back-up and emergency fuel source. Biomass costings will depend upon local suppliers and relative ease for transportation. Further investigation is required into assessing regular availability of biomass from local suppliers. A biomass moisture content of 20 to 30 per cent is optimal. Grain is usually harvested and stored at below 15 %. Wood waste generally air dries to below 20% but may rise above 30% if stored in the open over winter. Further investigations need to be undertaken to determine if undercover storage facilities are needed for processed wood waste.

The consumption of biomass will vary according to seasonal requirements. The peak biomass usage will occur during winter, estimated at up to 56 tonnes per month. During summer months, consumption is estimated at 20 to 30 tonnes per month. As a guide, 1 tonne of wood waste will require approximately 4 cubic metres of storage space. Grain requires 1.5 cubic metres of storage per tonne. Transport costs for biomass are estimated at $20 to $30 per tonne.

Risk management matrix

Likelihood	Impact		
	Minor	Moderate	Major
Very Likely	Medium	High	Extreme
Likely	Low	Medium	High
Unlikely	Low	Low	Medium

Risk	Likelihood	Consequence	Risk rating	Evaluation/Action	Residual Risk	Date Reviewed
Wood waste unavailable due to other demands	Unlikely	Major	Medium	Ensure boiler system is also able to operate on grain or wood/straw pellets and retain natural gas system as back up.	Low	
Bioenergy unit meeting Australian Standards	Very Likely	Major	High	Review with supplier	Low	
Planning issues in relation to location of unit and storage facility	Likely	Moderate	Medium	Further liaison required with the Planning Dept Horsham Rural City once further details regarding the unit and storage facility are available	Low	
Possible objection/s during planning scheme permit process costing additional time & resources	Likely	Moderate	Medium	Ensure system is well publicised including community benefits prior to lodging planning application.	Low	
Biomass supply chain contract security. Risk of suppliers securing better pricing for purposes other than bioenergy (eg feed grain, garden industry).	Likely	Major	High	Council would be the main supplier of wood waste fuel so supply is secure	Low	
Boiler emissions exceed EPA standards	Unlikely	Major	Medium	Regular testing of stack emissions and ash to ensure fuel and boiler operation within spec.	Low	
Yet to determine biomass storage options for wood waste to ensure moisture content requirements	Unlikely	Moderate	Medium	Use covers on stockpiles to keep material dry	Low	
Meeting of OH&S requirements	Likely	Moderate	Medium	Establish OH&S management plan, with safe operating procedures	Low	
Need to engage support local businesses through steps of this project	Likely	Major	High	Identify opportunities for local business dealings for the project eg installation, maintenance & biomass supply	Low	
Need to engage the general public to support the project	Likely	Major	High	Clear communication strategy needed to educate local community about benefits of the bioenergy project. Regular information bulletin updates, media releases and community engagement sessions required	Low	
Lack of budget funding to install boiler system as proposed	Very Likely	Major	Extreme	Possibly seek additional funding from Regional Development Victoria or other sources	Medium	

6 Conclusions

Bioenergy unit option estimates

Bioenergy unit details	Approximate cost*
Option 1 Living Energy NZ – Binder Step Grate Boiler (supply & install)	$xxx,xxx to $xxx,xxx
Option 2 Step TRUTNOV – solid grate boiler – supply with local plumber to install	$215,000 to $240,000
Option 3 HDG Boiler – supply with local plumber to install	$220,000 to $250,000
Options 1, 2 & 3 Annual maintenance costs	$9,000
Options 1, 2 & 3 Additional costs – Project management, concrete base for the unit, perimeter fencing, housing/shedding, entrance points, insurance, signage, fuel & freight costs	TBA

*Excl. GST

Based on an average 0.67 cents per MJ price for Natural Gas, the annual natural gas cost in 2011/12 Financial Year for 7,140,242 MJ of usage was $ 48,074.35. In comparison, the 200kW bioenergy unit with an estimated consumption of 444 tonnes of grain waste per year, at a cost of $100.00 per tonne would have an annual fuel cost of $44,400. Using 480 tonnes of wood waste per year at $48 per tonne would give an annual fuel cost of $23,040. An annual saving of over $25,034 per year on natural gas.

At current natural gas prices the payback for the installation of a biomass boiler system is 14 years which is difficult to justify, however the retail price for gas is expected to double by 2016 and this will have a significant impact on the energy costs for the centre (see Figure 1). If this occurs then the payback period for a 200kW biomass boiler unit is approximately 3.4 years.

By using wood waste, council would also avoid $59,040 in landfill charges annually. If the increased gas prices and avoided landfill costs are combined then the payback period could be less than 2 years.

Comments The estimated costs exclude maintenance costs of the biomass boiler and retaining the natural gas boilers as a back-up. Maintenance costs will apply annually for both fuel types.

7 Business Case

Horsham Aquatic Centre Bioenergy Heating Project

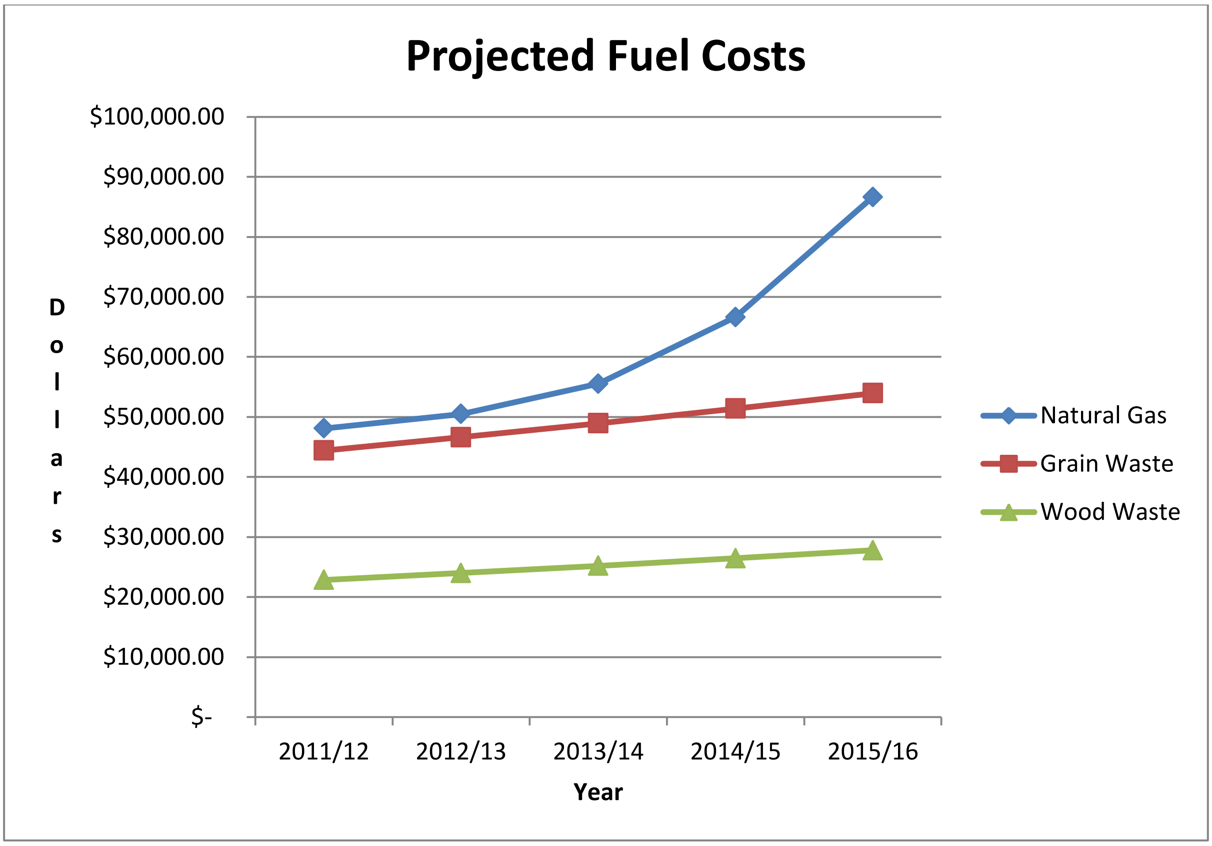
Proposal summary (Value proposition)

Horsham Rural City Council would need to invest $250,000 to install multifuel biomass boilers at the Aquatic Centre. The proposed boiler system would take over most of the heating load for the centre with the existing natural gas system retained as back up. The project is estimated to deliver a financial benefit of $25,034 per year through reduced energy costs and a further $59,040 in avoided landfill costs. In addition to reducing the energy costs for the centre, the proposed biomass system will reduce Council's greenhouse gas emissions by approximately 395 tonne per year.

Safety and comfort of the public will also be ensured with the boiler system fully containerised and refuelling occurring outside opening hours.

The financial benefit is estimated as a simple payback of 3.2 years and the project will make a significant contribution to achieving Horsham Rural City's energy reduction target.

Figure 1: Projected fuel costs using current and proposed fuels



Proposal development

This proposal has been developed by the Bioenergy Project Manager as part of the Horsham Aquatic Centre Heating Study. The project was identified at a Regional Bioenergy Project Reference Group meeting held at Horsham on the 29th August, 2013 and endorsed by a subsequent Project Control Group meeting. . The development of the business case proposal involved discussions with boiler suppliers, Aquatic Centre management and staff at Horsham Rural City. The Project Manager has also sought advice from Project Reference Group and DEPI .

Technical changes required

The proposed biomass boilers will be plumbed into the existing pool heating circuit parallel to the existing gas boilers. The biomass boiler control system will be linked to the gas boiler controls to ensure the biomass boiler operates as the primary heating source. The gas boiler will only operate if the biomass system is off line and for brief period each month for maintenance purposes.

The fuel storage silo will be located at the western end of the delivery bay which will allow easy access of fuel delivery vehicles.

Cost/Benefit analysis
Costs

Item	Value	Assumptions and accuracy
Purchase of boiler system and fuel store	$120,000	Estimated prices obtained from all three potential suppliers (±10% accuracy)
Installation cost	$130,000	Estimate based on Beaufort Hospital installation (±10% accuracy)
Annual Maintenance	$9,000	Estimate based on Beaufort Hospital installation (±10% accuracy) Maintenance on gas boilers will be less than present.

Financial and other benefits

Item	Value	Assumptions and accuracy
Pool Heating Cost reduction	- $25,034/ annum*	Boiler output based on tests with wood chips. Estimate output with proposed fuels ±5% accuracy.
Avoided landfill cost for wood waste	-$59,040/annum	Current price for depositing builders waste at the Dooen Landfill is $123/tonne
Reduced carbon emission	-$3,555/annum	Estimated reduction based on Sustainability Victoria figures and current carbon price of $9/tonne
Reputation	Not included in this estimate	Horsham Rural City has publicly committed to a 20% reduction in energy use compared to 2010 levels. This project will help to ensure the target is achieved.

*Based on current gas prices. The price of natural gas is estimated to rise by 50% in the next three years. This forward value has not been included in the calculations.

Total installation costs = $250,000

Quantifiable benefits = $87,629 less annual maintenance costs (approx. $9,000/annum). Net savings will be around $78,629 per year.

Approximate simple payback on the project is 3.2 years without inclusion of co-benefits such as Horsham Rural City's' reputation and potential gas price increases.

Project risks

A risk assessment has been conducted in accordance with internal procedures. A summary of key risks and how they will be managed is described below.

Risk	Mitigation strategy
Safety during installation	Risk management plan will be in place and standard operating procedures will be followed,
Impact on pool operations	The boiler system will be stand alone and not connected to the existing pool system until the installation is almost complete. Disruption to normal operation while the final connects are being made is expected to be minimal.
Savings not achieved	Based on the experience from the Beaufort Hospital and case studies from similar installations overseas there is a high level of certainty that the savings will be achieved. The financial saving is likely to be higher after year 1 due to forecast increases in gas prices.
Boiler emissions exceed EPA standards	A program of regular testing of stack emissions will ensure boiler fuel and operation are within specifications. Boiler ash should also be tested if not being sent to landfill.

Next steps

Following project approval, Horsham Rural City will appoint a project manager to undertake the planning process, develop an installation program and prepare tender documents. They will manage project expenditure and oversee the boiler installation and commissioning.

8 References

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Sustainability Guide for Energy from Waste (EfW) Projects and Proposals, (Edition 1, 22 Dec 2003) Waste Management Association of Australia

Wimmera Bioenergy Resource Audit, Melissa Morris, Project Consultant, November 2010

Grampians Regional Waste Management Group - Regional Waste to Landfill Survey – 2008, EC Consulting, February 2009.

Attachment A - Heating load report, Invertech Consulting

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Daryl Scherger,
Bioenergy Project Manager
Pyrenees Shire Council
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Thursday, 30 January 2014

Dear Daryl,

Re: **Horsham Aquatic Centre - Supplemental Wood Fired Boiler**

Further to our site inspection and review of the pool heating requirements at the Horsham Aquatic Centre, we provide the following advice regarding the proposal to provide a wood chip fired HHW boiler to supplement the existing gas fired boilers at this site.

Existing HHW Boiler Plant & Solar Heating Plant

There are currently two (2) gas fired heating hot water (HHW) boilers at this site that serve the heating requirements of the Pool Hall, the Change Rooms and other air handling plant. The same two HHW boilers also serve the heating requirements of the 25m Pool and the Leisure Pool.

The heating hot water boilers have a combined output of 315kW + 345kW = 660kW total.

At the time of my inspection, both HHW boilers were observed to be in operation. This was surprising, as it was a warm day, and one would expect the heating loads to be carried by a single boiler.

Additional heating is provided by a solar hot water system, with around 600 m^2 of collector located on the roof. A "side stream" system is employed, where a portion of the "return-to-pool" water is drawn off, and circulated through the solar collectors, before being returned to the pool supply pipe work. A solar collector system of this size should be able to meet the pool water heating requirements for the majority of the time during the December / January / February period.

It was not clear if these systems were operating as intended. Temperature set-points and operating parameters do need to be carefully monitored if energy wastage is to be avoided. A poorly maintained system can potentially waste energy by operating the HHW boilers, only to lose heat via the solar collector array.

Proposed Wood Chip Fired HHW Boiler Plant

There is a proposal to install a wood chip fired heating hot water boiler at this facility. This report is intended to address the capacity requirements of such a wood chip fired HHW boiler.

The heating requirements for a pool facility are quite variable throughout the year. This variability depends on the temperature set-points for the Pool Hall, and the pool water temperatures. In Winter there are significant heating requirements, while in Summer the heating requirements are quite small, especially when a solar system is correctly employed to heat the pool water.

Wood chip fired heating hot water boilers are best suited to constant load applications, or applications where the HHW boiler can operate for an extended period, before shutting down. They are not suited to rapid on/off applications.

A wood chip fired heating hot water boiler is therefore best suited to operate on a "base-load" footing, with the existing gas fired heating hot water boilers then used to "top-up" any heating requirements.

The base-load heating requirement in an Aquatic Centre is readily identified as being the Pool water heating requirement. This requirement exists in Summer and Winter. Though the amount of heating required in Summer is considerably less than that required in Winter.

The solar collector system is also best used as a "base-load" system to meet pool water heating requirements, again, with the gas fired heating hot water boilers used to "top-up" any heating requirements. The solar collector system is obviously seasonal in it's output.

So any requirement for a wood chip fired heating hot water boiler to operate in a "base-load" capacity over the Summer months is greatly diminished.

Heating Requirements

Pool water heating is required to offset a number of component heat loss mechanisms:

- Convection Losses, through the pool walls, associated piping and filtration vessels.
- Evaporation Losses to the Pool Hall air mass.
- Radiation Losses to the Pool Hall ceiling, and surrounding surfaces.
- Water Losses, requiring the addition of make-up water, and it's heating to temperature.
- Solar Heat Gains. While not a "loss", this is generally ignored in indoor pool applications.
- Pool Warm-up Requirements, usually over a set number of hours, or days.

The single largest contributor to the pool water heating load is the Pool Warm-up component. This component is normally only required on start-up, or after a period of extended shut-down, and isn't considered an every day heating requirement.

The next highest pool water heating load is that caused by evaporation losses. For an indoor pool, this heating requirement varies throughout the year, and is usually highest in Winter. Although this can depend on the type of heating and ventilation system that serves the Pool Hall. In the case of the Horsham Aquatic Centre, where a 100% outdoor air system is used, this peak heating load will occur in Winter, when the ambient air has it's lowest dew point.

An analysis of the steady state heating losses from both the 25m pool and the Leisure pool was completed. The resultant pool water heating requirement is estimated to be 173kW under Winter ambient conditions.

After applying a suitable factor of safety, a wood chip fired heating hot water boiler operating on a "base-load" footing at this Aquatic Centre should have a capacity of between 190kW and 200kW. Such a selection will allow this boiler to operate at close to full load, for the maximum period of time over the course of a year.

Installation Recommendations

The existing heating hot water flow and return headers have two spare connections. A supplementary wood chip fired HHW boiler should therefore connect to these spare connections. The pipe connections for this new circuit should utilise 65mm diameter copper type B hard drawn tube and fittings. Being 65mm diameter, all pipe fittings, and isolation valves should have flanged connections.

A new pump should be installed to serve the wood chip fired HHW boiler. This pump should match the existing pumps that serve the two existing gas fired HHW boilers, so as not to cause an imbalance in the HHW circuit. The new pump should be a Grundfos TP 50-230/4 pump, fitted with a 3kW, 1440rpm, 3ph motor. The pipe connections to this pump should include a discharge check valve, isolation valves, a Staf valve (for measuring flow rate), and a suction line strainer.

The proposed wood chip fired HHW boiler is intended to supplement the existing gas fired HHW boilers and to provide "base-load" heating. The control strategies of the existing boiler plant should therefore be amended to allow the wood chip fired HHW boiler to be initiated on the first "call-for-heating", and then be the last to be shut-down on loss of a "call-for-heating".

While thermal mass is available in the form of the pool water volumes, the temperature of this water is too low to be an effective buffer for a wood chip fired HHW boiler. The return water temperature to the boiler is best maintained in the range of 65°C to 80°C. This requirement necessitates a buffer tank to be installed to isolate the HHW boiler from the field loads, thereby maximising the HHW boiler operating efficiency, and allowing an extended boiler-run time, during periods of low heating demand.

On the basis that a 200kW HHW boiler is installed, and assuming this boiler is allowed to operate overnight, the recommended water volume for this buffer tank is 7,000 Litres.

In Summer, when solar heating of the pool water is at it's maximum, it is envisaged there will be no requirement for a HHW boiler to operate to provide "base-load" heating. Under those circumstances, the wood chip fired HHW boiler should be shut down. The control system therefore needs to recognise when the solar heating system is effectively meeting the pool water heating demands, and use ambient trend-log data and "learned heating demand characteristics" to predict when the "base-load" HHW boiler can be shut down.

<u>Recommendations</u>
The wood chip fired HHW boiler should meet the Winter-time pool water heating requirements, with all other seasonal heating requirements to be met by the existing gas fired heating hot water boilers.

The wood chip fired HHW boiler should incorporate automatic stoking and de-ash. There will then be no necessity for the boiler's fuel load to "burn-down" over night. With the wood chip fired HHW boiler maintaining output on a 24-hour basis, the size of the buffer tank can be minimised.

The wood chip fired heating hot water boiler should be installed, as described above, and include a buffer tank, so that the HHW boiler is not impacted by sudden changes in field heating demands.

The buffer tank should be connected into the existing HHW circuit, in parallel with the existing gas fired heating hot water plant, by utilising available "spare" connections to the HHW flow and return headers.

When any HHW boiler is off line, the hydraulic circuit for that HHW boiler is to be isolated, either by means of a correctly functioning check-valve, or a dedicated pilot-operated solenoid valve (Y-pattern).

Our recommendation for the wood chip fired HHW boiler capacity is 200kW (turn-down to 65kW).

Our recommendation for the associated buffer tank is for it to have a storage capacity of 7,000 litres.

Our recommendation for the HHW pump connecting the buffer tank to the flow and return headers is that it should match the existing HHW boiler pumps, as noted above.

<u>Conclusion</u>
This report addresses the proposal to install a wood chip fired HHW boiler to supplement the existing gas fired heating hot water boilers and identifies the minimum capacity for this boiler, it's associated buffer tank, and "demand-side" circulation pump.

The report also broadly identifies a number of installation requirements, but is not intended to fully document the installation works.

This is envisaged to be a separate task, which takes on board the recommendations of this report and provides a set of working tender documents.

We would, of course, be happy to provide such a design and documentation service, and can provide a fee offer for this service if requested.

Following our site visit, we remain unconvinced that the existing controls systems at this Aquatic Centre are set up to optimise pool water and pool hall temperatures, and minimise HHW boiler operation. This is borne out by our observation of both HHW boilers operating on a day when the ambient temperature was 30°C.

The environment in the pool hall was akin to that of a sauna, and this is considered unnecessarily wasteful, as it promotes higher dewpoint temperatures, which in turn leads to elevated condensation issues.

Again, we would be happy to investigate this aspect further, and make recommendations if requested.

Yours Sincerely,

Invertech Pty Ltd

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James Nugent

Attachment B - Horsham Aquatic Centre Site