Newstead Energy Feasibility Study

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Acknowledgement to members of the Newstead Community for their assistance

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EXECUTIVE SUMMARY

The magnitude of the task

Our modelling suggests that the usage for the district is in the order of 1.6MW of electricity per annum. We have modelled this usage over a 15 year period.

To *generate* the equivalent energy from renewable sources Newstead would require a 200kW capacity power station operating at 90% efficiency (ie a geothermal plant), or a 570kW power station operating at 32% efficiency (ie a wind farm) or a 1.12MW power station operating at 16% efficiency (ie a solar park). Indicative pricing for each of these projects range from $800,000 to $6,700,000.

If viewed from the perspective of buying Greenpower over the project life of 15 years, the total cost is expressed as $1,32m.

If the equivalent emissions from current use were to be offset through the purchase of Offsets over the project life, then this would cost $756,240 on current day estimates. As a direct comparison, sequestration through local projects is estimated to cost $920,640.

When scenario modelling is undertaken, and assumptions are made about the uptake of various energy efficiency and generation interventions, the task looks more manageable, but not easy.

Approaches that can be taken

We do not believe that there will be one single approach taken. The task outlined above can be broken down into a number of approaches. There will be a combination of reduction in use, substitution of generation from renewable sources and sequestration.

Some answers to GHG abatement are very simple and obvious. Subject to householders satisfying themselves that the general conclusion outlined in this report is appropriate to their circumstances; energy audits, retrofitting, solar hot water and household PV should be taken up at household level. This would make a substantial contribution without resorting to a generation project.

GreenPower represents a different approach. Unlike the aforementioned measures that have an investment return, GreenPower represents an ongoing commitment to buy a solution at market rates. Unlike solar hot water and PV, there is no notion of an asset being purchased or any hedge against future price rises being obtained. Aside from purchasing GreenPower on a customer-by-customer basis, we have flagged the notion of forming a buying group that may deliver a better value proposition, and not just for green energy.

Generation at a medium or larger scale represents a challenging proposition but delivers high rewards if successful. Generation potential is constrained due to the unsubsidised nature of these generation projects and\or existing network parameters.

Sequestration or the purchase of offsets has been treated as a residual solution in the accounting model, but should not be dismissed merely by this accounting treatment.

Newstead's natural advantages appear to centre upon goodwill with high community spirit. From a generation perspective, geothermal appears to be the most interesting, but at the same time is the least developed. Sequestration with woodlot harvesting will be an integral part of the solution in the absence of a generation project delivering a complete solution.

Some other ideas were examined, including household wind, micro-grids, behind the meter solutions and biomass. They were briefly evaluated but little work expended due to either poor resource or lack of critical mass.

Carbon Accounting Model

At first glance modelling a transition to zero emissions from stationary energy consumption is a simple concept, but in reality it is not so simple.

The initial problem is building a robust model to account for emissions and to account for the benefit of any intervention or action undertaken. This is a difficult process due to the risks in *double counting* and dealing with the concept of *additionality*. It has the capacity to be "de-motivating" to a community unless an equivalent "attribution" model[1] can be run in parallel. We have made comments on this approach and understand the Newstead community wants to pursue a model where action undertaken is recorded rather than modelling an outcome based on where the environmental credit is accounted.

Putting these issues to one side, the model has been built to cater for either the strict carbon accounting principles or the attribution approach and it provides a framework for options to be considered and evaluated. Various scenarios have been modelled that involve following a number of initiatives in combination.

Broad conclusions

- The task is manageable but not inconsequential
- Household sector initiatives can contribute to the solution and make financial sense, providing a better financial return than generation projects, based on current market parameters
- Further works are required to evaluate various generation projects. Positioning of such projects and their agreements around the sale of power are critical to their financial viability. Subsidisation as a policy trial for government may be an option whilst we operate in a marketplace where there is little or no recognition for the benefits of generation at distribution level
- Further work is required to develop a sequestration project augmented by a community woodlot
- All these initiatives are likely to become more attractive if power prices rise higher than our estimates over the project period

Having scoped the nature of the problem and the various models towards achieving an answer, it must be stated that a journey towards eliminating emissions from stationary energy is a complex but not unsurmountable proposition.

[1] a model where an action taken, even if the accounting benefit cannot be claimed, can at least be attributed back to its source.

PART A- INTRODUCTION & BACKGROUND

1. Project Vision

The project vision is to determine the feasibility of the Newstead community[2] transitioning (over fifteen years) to zero net emissions from its principle stationary energy source of grid connected electricity. If deemed feasible, the model developed could be used to assist others transition to a zero net emissions outcome from their stationary energy needs.

2. Mission

To develop a set of Carbon Management Principles to measure the existing energy usage, explore the viability of methods to reduce energy use, to explore the viability of substituting generation with generation from renewable sources, and finally to sequest or offset emissions that cannot otherwise be avoided.

3. Scope and Disclaimer

This feasibility study is not (at this point in time) a Greenhouse Gas abatement project in its own right but draws on the:-

- GHG Protocol - Project Accounting Principles,
- Sustainability Victoria's draft guidelines for *Calculating Greenhouse Gas Abatement*, and
- Victorian Environment Protection Authority ("EPA") *Carbon Management Principles*.

The study relates purely to stationary energy in the form of grid connected electricity and does not address emissions from transport or agriculture.

The report encompasses a broad spectrum of issues in addressing climate change. In many areas considerable work has been done by others and we have drawn on their experience and provided the relevant references. We have avoided attempting to reinvent the wheel where quality analysis has been undertaken by others.

In most areas further work is required to move from feasibility to implementation.

This report does not constitute financial advice to acquire a financial product, nor is it consumer advice to acquire goods and services. Members of the Newstead community should obtain independent advice to ensure that any intervention they undertake is appropriate to their own needs and circumstances.

This study is not to be referred to or used by any party in any statement or application without prior written approval from Crockford McCartney Pty Ltd.

This study has been undertaken from anecdotal evidence and research and whilst it is prepared in good faith, Crockford McCartney Pty Ltd, SRA, CVGA or Sustainability Victoria takes no responsibility to any person with regard to the report including any errors or omissions.

[2] The two hundred households centred in or around the town of Newstead

4. Stakeholders

4.1 ***Newstead Community*** as represented by Newstead 2021 and Renewable Newstead.

Newstead 2021 has been established to support the development of a vibrant, informed and sustainable community in our town and surrounds. The group comprises interested members of the local community who are actively and collaboratively working towards this goal. The purpose of the group is to:-

- To support the discussion and implementation of ideas and projects that benefit the Newstead community
- To seek and communicate relevant information about issues concerning our community
- To support actions that improve the social, cultural, economic and environmental well being of the Newstead community
- To promote two way dialogue with Local Government
- To actively seek resources that can contribute to our goal

Renewable Newstead aims to convert Newstead to 100% renewable energy by 2015[3]. The project has grown out of a collaboration between Newstead 2021 and Central Victorian Solar City to work together to achieve this purpose. The stated goals are to reduce the amount of energy the town consumes, and source all energy we do use from renewable sources which might include a locally-based income-generating power source.

Newstead Community is the Primary Stakeholder.

4.2 Sustainable Regional Australia Pty Ltd ("SRA")

SRA is a private company majority owned by the Central Victoria Greenhouse Alliance[4], the region's earliest climate change action group. It has a high level of representation from fourteen local governments in the Central Victorian region. SRA was established to undertake the lead proponent role for the Central Victoria Solar City and other commercial opportunities that may present.

4.3 Central Victoria Solar City ("CVSC")

The Central Victoria Solar City[5] research trial is part of the Australian Government's Solar Cities program. It encourages locals to test the effectiveness of different energy efficiency and renewable energy products and services in reducing energy use and reliance on non-renewable energy. The Central Victoria Solar City project is funded by the Australian Government through the Department of the Climate Change and Energy Efficiency, the Central Victoria Solar City Consortium[6], Sustainability Victoria and the Sustainability Fund.

SRA and CVSC are the project sponsors and the funded client.

[3] This target is well in advance of the timelines modelled in this study

[4] www.cvga.org.au

[5] www.centralvictoriasolarcity.com.au

[6] Bendigo Bank, CVGA, Origin Energy, Sustainable Regional Australia and Powercor

4.4 Sustainability Victoria[7]

Sustainability Victoria was established under the Sustainability Victoria Act 2005 (Act No. 65/2005). Sustainability Victoria's purpose is to show the way to using our resources more efficiently and reducing our everyday environmental impacts. Publicly available material on SV's website states "To achieve our vision we must engage with and provide value to all Victorians. We work across all industry sectors, as well as with schools, State and local governments, community groups and individuals to promote and encourage environmental sustainability"

Sustainability Victoria is a key funding supporter of the project.

5. Newstead demographic analysis

5.1 Profile [8]

Newstead is an inner regional town located 130km north-west from Melbourne on the Loddon River. Newstead has a small but passionate population.

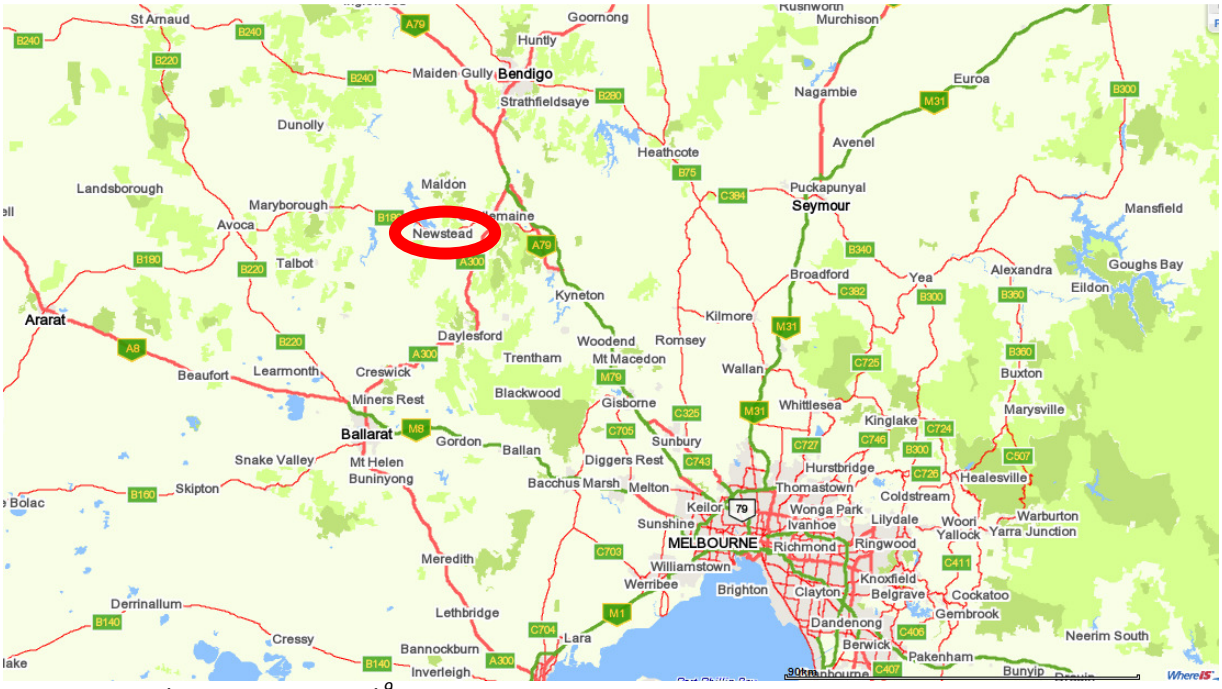

Fig 1.1 map showing Newstead [9]

This profile of Newstead has been drafted using information from the June 2006 Australian Bureau of Statistics Census, unless otherwise noted. Much of the information has been further drawn from analysis available from the Mount Alexander Shire, incorporating data for small areas. References to the Newstead district also include Newstead's surrounding hinterland. References to the broader Newstead region include neighbouring towns, such as Maldon and Harcourt.

[7] www.sustainability.vic.gov.au

[8] Profile developed by Purcell Communications

[9] www.whereis.com

Newstead's age profile is roughly aligned to the regional Victorian average, with somewhat less adults in the 18 to 64 age group (55.4% for Newstead compared to 59.1% for regional Victoria) and somewhat more who are aged 65 and over (18.8% for Newstead compared to 15.9% for regional Victoria) (See Appendix 1.1).[10]

Over 40% of those in the Newstead district hold a post-school education qualification, less than the national average of 53.0%, but higher than the 35.5% average for regional Victoria. [11]

33.6% of the district's residents report that they undertake voluntary work for their community, much higher than the average of 24.0% of regional Victorians and 20.0% nationwide. [12] There are over 40 community organisations in Newstead.[13]

5.2 Households

Newstead's 486 residents live in 217 local households. The vast majority of these households, almost 80%, reside in detached houses, and 23.0% of those in the district lived alone. Close to 60% live in the same house they lived in five years ago. [14]

A significantly higher proportion than average of Newstead locals own their own home outright (46.8% compared to a regional Victorian average of 38.8%), whilst 28.6% are paying off a mortgage and 19.1% rent their home, lower than the regional Victorian average of 22.4%. (See Appendix 1.2)[15] Average loan repayments and rental costs are lower than elsewhere (see Appendix 1.2) [16], but there are more households earning a lower income; and less earning a higher income, than when compared to the regional Victorian average (see Appendix 1.2). [17]

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[10] Mount Alexander Shire Council *Snapshot Summary Profile for Newstead* available from http://profile.id.com.au/Default.aspx?id=334

[11] Mount Alexander Shire Council *Community profile for Rural West – Newstead* available from http://profile.id.com.au/Default.aspx?id=334

[12] Mount Alexander Shire Council *Community profile for Rural West – Newstead* available from http://profile.id.com.au/Default.aspx?id=334

[13] Taken from listing of Newstead's community organisations available at http://newstead.vic.au/organisation

[14] Mount Alexander Shire Council *Snapshot Summary Profile for Newstead* available from http://profile.id.com.au/Default.aspx?id=334

[15] Mount Alexander Shire Council *Snapshot Summary Profile for Newstead* available from http://profile.id.com.au/Default.aspx?id=334

[16] Mount Alexander Shire Council *Community profile for Rural West – Newstead* available from http://profile.id.com.au/Default.aspx?id=334

[17] Mount Alexander Shire Council *Snapshot Summary Profile for Newstead* available from http://profile.id.com.au/Default.aspx?id=334

These figures support statistics for the broader Newstead region indicating over 20% of residents receive a Centrelink benefit as part of their main income, (including Aged Pension; Disability Support Pension; Newstart; and Parenting Payment recipients).[18]

5.3 Employment

Unemployment in the Newstead region is estimated at 5.2% as at June 2009, about level with the Victorian and national average. [19] Main industries by employment are manufacturing (12.5%); agriculture, forestry and fishing (11.8%); and healthcare and social assistance (11.8%). There are slightly more than average Newstead residents employed in agriculture, forestry and fishing (compared to the regional Victorian average of 9.1% and the national average of 10.0%), and less than average employed in retail trade (compared to the regional Victorian average of 12.2% and the national average of 11.0%) (See Appendix 1.3). [20]

5.4 Transport

Less Newstead district residents ride a bike or walk to work than elsewhere in regional Victoria, but more work from home (11.9% compared to 7.3%). 63.5% of residents travel to work by driving their own car. [21]

This is consistent with the high car ownership per household in the Newstead district, with less households owning no car (3.1%) or one car (28.2%), than two cars (39.9%) or three or more cars (25.1%) (See Appendix 1.5). [22]

6. Household Energy Use

6.1 Introduction

In Victoria, households accounted for just over a third of Victoria's greenhouse emissions not attributable to transport as at 2004.[23] Average household energy use is estimated to be 6,840

[18] *Australian Bureau of Statistics Mount Alexander Shire (balance) SLA (Region code 235105434)* available from www.abs.gov.au

[19] Mount Alexander Shire Council *Community profile for Rural West – Newstead* available from http://profile.id.com.au/Default.aspx?id=334

[20] Mount Alexander Shire Council *Community profile for Rural West – Newstead* available from http://profile.id.com.au/Default.aspx?id=334

[21] Mount Alexander Shire Council *Community profile for Rural West – Newstead* available from http://profile.id.com.au/Default.aspx?id=334

[22] Mount Alexander Shire Council *Community profile for Rural West – Newstead* available from http://profile.id.com.au/Default.aspx?id=334

[23] Source: Energy in Australia 2005, ABARE

kWh/year .[24] This equates to almost 12 tonnes of greenhouse gas produced each year from energy used in the home. [25]

Australian Bureau of Statistics figures indicate that virtually every household in Australia (99.9%) uses electricity as their main source of energy. [26] Many households also use gas energy (61%), with Victoria having the highest rate of access to natural gas in Australia, largely through mains gas in cities and towns (although not Newstead). [27] [28]

6.2 Growth in consumption

A key challenge for Victoria is the significant growth in the demand for energy. Our energy consumption has increased by 25% since 1990.[29] Current demand is growing by an average of 1.6% per year. At this rate demand for energy will increase by 50% by 2029-30.[30] Using more household appliances, and leaving more of them on a standby setting are the main drivers of this growth.

6.3 Price changes

Energy prices continue to rise, making expenditure on energy a larger proportion of household budgets[31]. These increases are partly attributable to uncertainty faced by energy companies regarding future investment in either carbon intensive or low emissions energy production and the implications a carbon tax and emissions trading scheme will have on their business. Anecdotal evidence from NSW indicate that energy bills will rise by over $300 pa or 17%.[32]

6.4 Heating, cooling and water

Heating and cooling accounted for most of the energy consumed in households (in 2006-07, almost 40%).[33] In Victoria in 2005, 78% of all households used room heating; with gas (33%) and electricity (32%) almost equally preferred. A small proportion of households used wood heating (12%).[34]

Additionally, 25% of energy consumption was used in Victoria for water heating, with 51% of households using electricity as their major energy source for household hot water systems.[35]

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[24] *Energy Use in the Australian Residential Sector Report*, Dept of Climate Change, 2008

[25] Sustainability Victoria http://www.sustainability.vic.gov.au/www/html/1819-energy-use-in-victoria.asp

[26] 4102.0 Australian Social Trends June 2010
http://www.abs.gov.au/AUSSTATS/abs@.nsf/Lookup/4102.0Main+Features20Jun+2010

[27] 4102.0 Australian Social Trends June 2010
http://www.abs.gov.au/AUSSTATS/abs@.nsf/Lookup/4102.0Main+Features20Jun+2010

[28] Victorian Government Department of Primary Industries 2010, *Energy Industries*,
http://new.dpi.vic.gov.au/energy/about-energy/energy-industries

[29] 4102.0 Australian Social Trends June 2010
http://www.abs.gov.au/AUSSTATS/abs@.nsf/Lookup/4102.0Main+Features20Jun+2010

[30] Sustainability Victoria http://www.sustainability.vic.gov.au/www/html/1819-energy-use-in-victoria.asp

[31] The assumption being that energy prices rise at a rate greater than CPI

[32] Daily Telegraph 13 April 2011

[33] 4102.0 Australian Social Trends June 2010
http://www.abs.gov.au/AUSSTATS/abs@.nsf/Lookup/4102.0Main+Features20Jun+2010

[34] 4602.2 - Household Water, Energy Use and Conservation, Victoria, Oct 2009 ABS.gov.au

In this study, the obvious carve-outs from stationary energy use are bottled gas and wood for household stoves and heaters. Further work may be undertaken to quantify the effect of these forms of energy use but they are not the subject of this report. Wood "represents a large but uncertain element of household energy use. Unlike gas and electricity its consumption is not metered, and much of it is self gathered rather than purchased from commercial suppliers. The Australian Bureau of Agricultural and Resource Economics (ABARE) estimates that wood represents about 23% of household delivered energy use, and a recent study by the International Energy Agency concluded that 23% of Australian households used wood as their main heating fuel (IEA 1997).[36]" Bottled gas statistics may become clear over time as CVSC undertakes home energy assessments and audits.

6.5 Household appliances

Of household appliances, refrigerators and freezers were the largest contributors to household energy use, consuming 34% of all energy used by household appliances.[37]

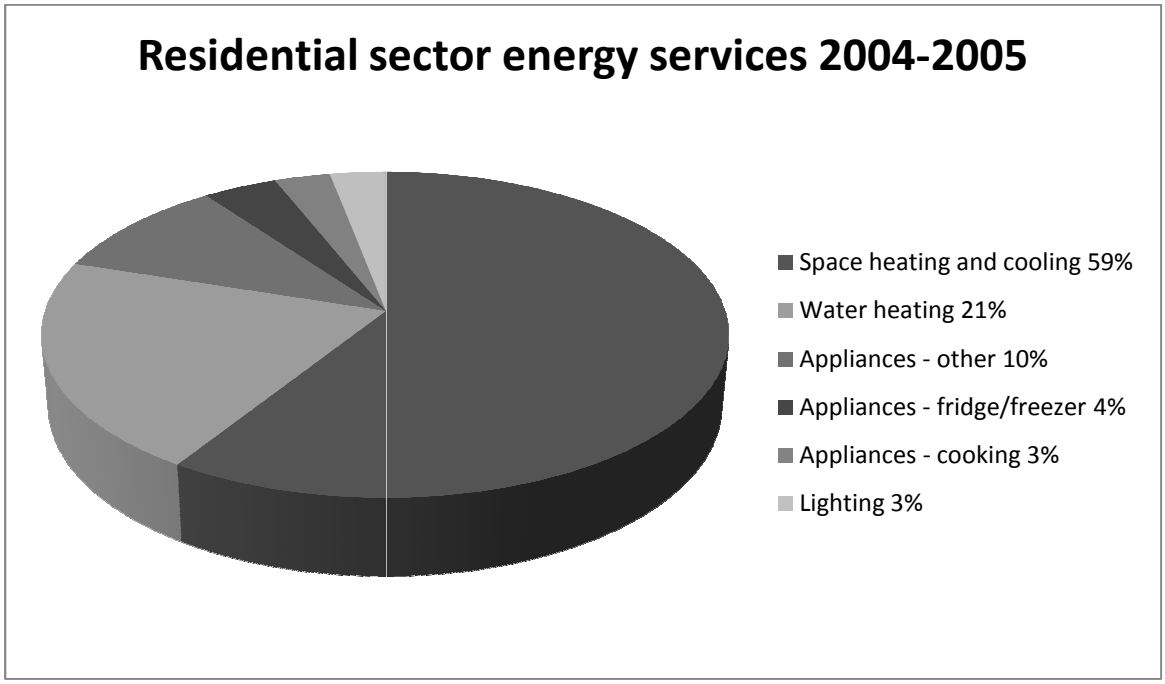


Fig 2 Breakdown of household energy use[38]

6.6 Household energy use and the environment

[35] 4602.2 - Household Water, Energy Use and Conservation, Victoria, Oct 2009 ABS.gov.au

[36] 4102.0 Australian Social Trends June 2010
http://www.abs.gov.au/AUSSTATS/abs@.nsf/Lookup/4102.0Main+Features20Jun+2010

[37] Sustainability Victoria http://www.sustainability.vic.gov.au/www/html/1819-energy-use-in-victoria.asp

[38] 4102.0 Australian Social Trends June 2010
http://www.abs.gov.au/AUSSTATS/abs@.nsf/Lookup/4102.0Main+Features20Jun+2010

Use of solar energy increased from 5% in 2002 to 8% in 2008, but it was still the least common source of energy used by households.[39] Solar energy in Australia is primarily used to heat water and was used for this purpose by 4% of all households in 2005. [40]

Environmental factors have become an increasing concern for households when considering their household energy use and choosing their appliances. Between 2002 and 2008, the most common element considered by household in choosing white goods changed from cost to energy efficiency. The use of energy saving lights by households also increased between 2005 and 2008 from 33% to 59%.[41]

6.7 Income effects

High income households in Victoria tend to have more environmentally sustainable sources of energy and water than lower income households, but are also more likely to have and use energy intensive appliances than low income households.

Most high income Victorian households have insulation (80%) and almost a third have a rain water tank (31%). Solar energy use (7.4%) was much higher than in low income households (1.8%).

7. Geographical and climate analysis

7.1 Climate effects

Newstead's climate has an important influence over both energy consumption (with relatively higher heating costs[42]) and local options for the production of greenhouse gas reducing energy alternatives.

Sunlight hours in Newstead are lower than elsewhere in mainland Australia (although better than Melbourne). This does not rule out the production of solar power, but suggests that energy yields from photovoltaic cells would be lower than in other areas of Australia.

Average Daily Sunshine Hours[43]
Australian Cities Compared

Month	Brisbane, Queensland	Sydney, New South Wales	Canberra, ACT	Melbourne, Victoria	Adelaide, South Australia	Perth, Western Australia
Jan.	8	8	9	8	10	11
Feb.	7	7	8	8	9	10

[39] 4602.2 - Household Water, Energy Use and Conservation, Victoria, Oct 2009 ABS.gov.au

[40] 4102.0 Australian Social Trends June 2010
http://www.abs.gov.au/AUSSTATS/abs@.nsf/Lookup/4102.0Main+Features20Jun+2010

[41] Australian Bureau of Statistics *Household Water, Energy Use and Conservation* (cat. no. 4602.2).

[42] *Energy Use in the Australian Residential Sector Report*, Dept of Climate Change, 2008

[43] www.livingin-australia.com/sunshine-hours-australia

Mar.	7	7	8	6	8	9
Apr.	7	7	7	5	6	7
May.	7	6	6	4	5	6
Jun.	7	6	5	3	4	5
Jul.	7	7	5	4	4	5
Aug.	8	8	6	4	5	5
Sep.	8	8	8	5	6	7
Oct.	8	8	8	6	7	9
Nov.	8	8	9	7	8	10
Dec.	8	8	9	7	9	11

Mapping of Newstead's wind levels shows that Newstead also has no significant natural wind power production capabilities[44]. Newstead's wind levels are below average for the region at between 5-6 m sec at 65 m above ground compared to 7-8 m sec in surrounding areas, meaning that wind turbines are unlikely to enjoy any advantage as a feasible economically friendly energy alternative.

7.2 Hydro power

Whilst Newstead is close to a number of water sources, there are no consistently free flowing, high volume bodies of water that would be conducive to the consideration of hydro power.

7.3 Biomass

Newstead's refuse is not disposed of locally, but collected from households and transferred to a facility in a neighbouring town[45]. This limits the potential for biomass energy production from waste. There does not appear to be any other obvious source of biomass fuel in the district.

7.4 Geothermal resource

To our knowledge, there is no significant material published about the potential for utilising deep drilling to access geothermal resource, although test drilling has taken place around the area. This would suggest that Geothermal remains "on the table" as a resource for Newstead.

7.5 Land for sequestration or development of a bio-fuel supply

Anecdotal evidence would suggest that the traditional agriculture base of Newstead is being challenged when viewed as a longer term sustainable industry. This would suggest that land may be freed up for sequestration or fuel production.

[44] Interactive Wind Map – Sustainability Victoria

[45] Mount Alexander Shire Council www.mountalexander.vic.gov.au

7.6 Implications for Newstead

At first glance, Newstead's climate and geographical features are generally not conducive to local installation of many common options considered as environmentally friendly large scale energy alternatives. Less common or obvious alternatives may have merit in Newstead.

PART B – FRAMEWORK & MODELS

1. Evaluation Framework for Feasibility Study

As outlined elsewhere in this study, there will be a Carbon Management Plan developed. The stakeholders have agreed that there should be three key evaluation criteria applied when reviewing the feasibility of the plans adopted.

- *Economic* – each action or step in the Carbon management Plan needs to be evaluated for its cost per kWh of electricity, its Return on Investment ("ROI") or Internal Rate of Return ("IRR") based on discounted cash flows from investment. Each intervention has been costed in both its raw and its subsidised form if any level of subsidisation exists in the marketplace.

- *Social* – Even with financial and environmental outcomes aligned, if the social goodwill or so called "Social Capital" is not sufficient to support the project, then feasibility will be prejudiced, possibly to the point of failure. The social feasibility of the project has been determined using SRA and its commercial relationship with University of Ballarat through their work on the CVSC.

- *Environment* – the impact of each intervention needs to be appraised for its consequent effect on the level of Greenhouse Gas ("GHG") emitted for each kWh of electricity produced, although for many of the initiatives this is largely a case of extrapolating the amount of grid connected electricity avoided or replaced at an agreed conversion factor to GHG tailored to the Victorian context where the vast majority of power generated is from GHG intensive brown coal. For sequestration and offset products generally, the products are appraised or stated relative to the tonnes of GHG abated.

2. The *Carbon Accounting* model

2.1 Outline of the Carbon management plan

It is acknowledged at the outset that it is possible for the Newstead community to proceed without a formal plan, to make no public claims about its progress and just get on and "do good things"! To do so would be a form of progress without any form of map, and without understanding which of their actions are the most effective. Furthermore, it would be advancing but not knowing the outcome from their actions.

This approach does not produce the desired result for all stakeholders and this report contemplates a mechanism based on meeting the industry best practice reporting and monitoring standards. This may produce various uncomfortable outcomes and a Newstead scorecard or so-called "attribution model" may need to be developed alongside the industry best practice model, in order that the progress can be monitored in a way that builds social capital and goodwill.

To ensure integrity of approach to the project outcomes, we have developed a set of Carbon Management Principles tailored to the vision and mission of this project. There are many protocols and approaches to claims around carbon neutrality and we needed to develop a robust framework for this study.

We have relied heavily on the framework developed by the EPA in Victoria and the guidelines developed by Sustainability Victoria for calculating Greenhouse Gas Abatements. The Principles,

Policies and Concepts enunciated in the GHG Protocol for Project Accounting have been addressed where it is possible to do so.

The broad outline of the model is as follows:-

- Establishing the **baseline** – Defining the GHG Emissions boundary ...What are you emitting? The current understanding is that the studied region consumes 1.6 MW pa. This equates to the 200 households in Newstead using power at the national average level of consumption adjusted for actual audit findings in Newstead....with the balance of being industry, public lighting and infrastructure. Put another way, at current GreenPower retail rates it is a $1.32m issue over 15 years.[46]

- What do you want to achieve ie a **target**? .....Net zero emissions from stationery energy consumed

- **Avoid and Reduce**... Can you avoid generating emissions? Reducing energy use through behaviour change and or retrofit of housing stock

- **Switch**...Can you switch energy sources so they are less greenhouse intensive? Replacing or substitution of energy consumed through generation at point of consumption or remote to the point of consumption

- **Sequester** ... what options are available to sequest emissions?

- **Offset** ... can you offset your residual GHG emissions?

The model references conversion of stationary energy in the form of grid-connected electricity to GHG emissions (CO2 equivalent) through use of the National Greenhouse Accounts Factors, July 2010 update. We have used Scope 2 and Scope 3 emissions factors in line with the methodology adopted by the EPA for its voluntary reporting of GHG emissions. This methodology is defendable as it accounts for the cost of moving the electricity from the point of production to the point of consumption.

2.2 Remote or local solutions

There is a conceptual issue for the community to address. The Carbon Accounting Model can handle solutions that are imported into the region from projects outside Newstead, including projects outside Newstead owned by Newstead investors. The carbon accounting model can also deal with solutions developed at Newstead that are exported to other regions and claimed in their carbon model accounting.

For reasons associated with double counting referred to in the following section, there may be difficult or de-motivating social outcomes from different approaches.

2.3 Double Counting

Double counting of benefits is an issue raised constantly when claims are made about GHG abatement. The risk of double counting emerges when an environmental credit (initially attached to

[46] Of a $657k issue if using offsets purchased at $20 per tonne

a solution) is traded separately for value, thereby leaving the actual solution in place, but the credit capable of being applied elsewhere.

To avoid such claims, and to account correctly, the environmental credit should be surrendered alongside any claim for the associated action being part of a GHG abatement exercise. This approach cannot however be mandated across the Newstead community.

Examples of the problem include:-

- With a household system of PV or Solar Hot Water, commercial reality and market pricing would suggest that the price in the marketplace normally assumes assignment of the environmental credit to the product seller for on-sale or other application in the marketplace. Where that environmental credit surfaces.....in whose carbon accounting model.... is an issue. Could you assume that many residents of Newstead would not want their purchase of a Solar Hot Water system counted in Newstead's model? We think not. Would they be prepared to pay a higher price to retain the environmental credit for surrender as part of the Newstead carbon accounting model. Again we think not.
- If a wind-farm was constructed from funds raised from the Newstead community, and the wind-farm was located in Newstead, is this part of the Newstead journey to zero emissions or does the value sit where the power is consumed? ie if the power is on-sold as part of a broader portfolio of Greenpower, the Greenpower consumer elsewhere in Victoria rightly claims the benefit as part of their journey towards a lower carbon footprint? Is there a risk it is double counted if Newstead investors also claim the benefit?

2.4. Additionality

Finally, where any proposed intervention would have occurred as a response to a change in business as usual circumstances, it should not be counted as it fails the additionality test.

There are problems associated with benefits being claimed when they are events that would have occurred in the ordinary course of business. Of particular relevance in the current political climate is the effect that a regulatory shift like a carbon tax or a "cap and trade system" might have.

This becomes a difficult issue to monitor as an element of subjectivity enters into the treatment of data.

2.5. Template

Aside from the short narrative about each of the interventions outlined in Parts C and D of this report, we have developed a template to apply a common analysis across each of the interventions.

Template for evaluation of each intervention

Item	
Item description	
Cost	
Subsidisation levels	

Economic benefit	
Environmental benefit	
Remote or at source solution	
NPV of item over 15 years discounted at 6%	
IRR	
Degree of social capital required (low medium or high) and associated reasoning	
Risk of double counting	
Existing examples	
Misc comments	
Additionality issues (if any)	

2.6 Assumptions embedded in the model

Assumption	Value	Rationale
Inflation rate	3%	This is in line with the upper end of the targeted long term projected inflation range monitored by the Reserve Bank of Australia
Discount rate for modelling the current value of future cash flows	5.55%	equivalent to the current 10 year bond rate
Time Frame	15 Years	approximating the useful economic life of most interventions and approximating the lifecycle of establishing sequestration projects to maturity
GHG produced through generating electricity in Victoria (kg per kWh)	1.37	National Greenhouse Accounts published figure for Victoria
Average household rate of consumption (kWh pa)	6,840	Department of Climate Change – residential sector figures
Adjustment for Newstead having no reticulated gas supply (%)	0	Evidence from CVSC household energy audit data suggests that Newstead household consumption is less than the national average, thereby negating any need for an uplift factor
Rate of energy price increases (%)	7.5%	4.5% above inflation over the forecast period, acknowledging that current press speculation would

suggest increases of 30% over 6 years, off a recent history of 40% over 3 years. Also acknowledging the one off increase resulting from the imposition of a carbon tax[47]

2.7 Impact of this carbon accounting model on Newstead

What starts as a noble conquest and seemingly a simple ledger keeping exercise quickly becomes more complicated as a robust model is developed. To tell people that they can't count certain benefits because it would be "double counting" or fail the *additionality* test is potentially de-motivating.

At a higher level and unrelated to the carbon accounting model, there is considerable discussion around the need for the solution to be locally based or whether any solution can be remote to Newstead, albeit sponsored by Newstead, to enhance its economic return.

Our preliminary advice from the community is that any solution should ideally be positioned in or around Newstead and "buying or exporting" solutions is not the preferred outcome.

A possible approach could be to keep a simple ledger alongside the formal project accounting model and divide the carbon accounting exercise as follows:-

- Actions or interventions that produce a benefit but there is no capture in any other model and capture can be made in the Newstead project under its formal Project Accounting Model
- Actions where interventions that produce a benefit are sourced at Newstead but are exported to be claimed in someone else's model *ie SHW where the RECS are sold*
- Actions where interventions that produce a benefit are "bought" into Newstead *ie Greenpower*

We have referred to this model as an "attribution" model. It is an attempt to capture all the activities that build social capital in the township, in spite of the fact that the solution is exported. It may also help understand how much of Newstead's solution is imported, home grown (and kept at home) or exported!

[47] Press reports suggest doubling in six years – using the Rule of 72 this means that it is a compound growth rate of 12%

PART C - POSSIBLE APPROACHES FOR REDUCING CONSUMPTION

1. Energy audit, education and behaviour change

Through education and auditing of a household it is possible to reduce energy consumed. It is often argued that reduction in consumption is the most beneficial intervention as it reduces consumption outright.

Central Victorian Solar City is working with Renewable Newstead to roll out a block of 200 household audits. The data from the audits will form part of the nation-wide bank of data emerging from the Solar Cities program. Of specific interest to Newstead will be any signs of trends or patterns around energy use, whether such use is above or below the state or national average and what level of savings are achieved in the period following the audit.

Many papers are published about the theoretical savings from education and behaviour change. Sometimes the boundary between energy auditing programs and retrofitting are not entirely clear. Claims are made for gains around 20% from improvement in energy use practices[48]. Early indications from programs linked to CVSC are closer to 10%. We have therefore adopted 8.7% as our modelling target as this is the closest verifiable data set available to us.

2. Retrofit

The intent of retrofit is to expend capital or undertake works generally in such a form that the housing infrastructure uses less power. In a sense it is an asset intervention more than a behavioural intervention.

More recently, this concept has been extended to include retrofitting the appliances within the house[49] on the assumption that the new appliances are more energy efficient.

For the sake of modelling it is impossible to assume that "one size fits all" in the retrofit marketplace. As an example, one property may need insulation whereas another may already have insulation and needs external shading.

CVSC has a retrofit option as part of its suite of household initiatives.

Examples of retrofit include:-

- Insulation of walls and roof-space
- Double glazing
- Shading (either external aspects of the house or with Drapes and curtains)
- Draught-stopping
- Replacing appliances with more energy efficient versions, thereby creating Victorian Energy Efficiency Credits ("VEECs")

[48] VEET scheme

[49] GreenPower www.greenpower.gov.au

We are instructed that the Newstead community has the potential to tap into the skills and volunteer capacity of the *Men's Shed* initiative in order to obtain basic retrofit skills.

For modelling purposes we have assumed an average cost per household of $1500 with an associated benefit of 10% reduction in energy use.

PART D – SUBSTITUTING GENERATION FROM RENEWABLE SOURCES

1. GreenPower™

1.1 Introduction

GreenPower accredits renewable energy products generated from sources that produce no greenhouse gas emissions. Energy retailers purchase the renewable energy and sell the benefits onto customers.

Eligible renewable resources include[50]:

- solar power
- wind
- biomass (landfill gas, municipal solid waste, agricultural wastes, energy crops, wood wastes)
- hydro-electric power (small-scale or on existing dams)
- geothermal energy
- wave and tidal power.

1.2 Government accreditation

The government arranges independent audits of the GreenPower program to ensure that energy retailers are investing in renewable energy. Accredited GreenPower products carry an accreditation label that is supported and managed by governments throughout Australia (Fig 1.2).

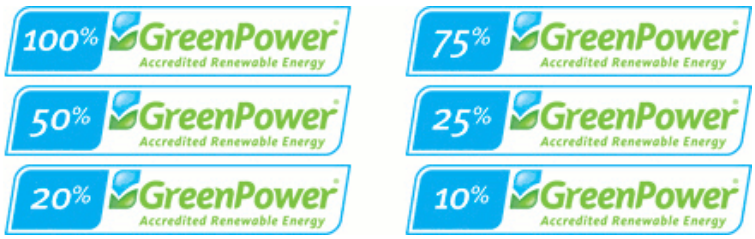


Fig 1.2 GreenPower accreditation labels.

The GreenPower accreditation labels reflect the proportion of a business or household's power consumption that is purchased on their behalf by an energy retailer in the form of renewable energy. Businesses and households can choose this proportion, with a larger proportion reflected in a higher energy cost.

1.3 Pricing for consumers

GreenPower accredited product	*Estimated additional cost per kWh*	*Estimated additional cost per week*
25% GreenPower	1.04¢	$1.00
50% GreenPower	2.75¢	$2.65

[50] Origin Energy http://www.originenergy.com.au/1142/Green-energy-FAQs

100% GreenPower (wind)	5.5¢	$5.29

Fig 1.3 Estimated additional cost of GreenPower for an average household[51] (based on a customer consuming 6,840 kWh of electricity per annum)[52].

1.4 Consumer takeup

GreenPower is available from energy providers in all states and territories and more than 900 000 Australian households and businesses offset their electricity consumption through GreenPower.

In 2008, the total energy supply to households through GreenPower was enough to power a year of household electricity use for almost 45,000 homes. [53]

GreenPower advocates argue that GreenPower not only reduces current greenhouse gas emissions but increases the overall demand for renewable energy, helping to further economies of scale and improve the long run competitiveness of renewable sources.

GreenPower switching case study: the Stewart family

Maria Stewart lives with her family in an average house in Newstead and after learning more about their impact on the environment, the Stewarts decide to switch to GreenPower to help reduce their greenhouse gas emissions.

Maria investigates the cost with her electricity retailer, and finds that switching to 100% GreenPower would cost her family an additional $275 per year. The Stewart family's electricity bills are currently $1460 per year, so switching to 100% GreenPower would raise their bills to $1735, an increase of under 20% or less than $70 per bill cycle.

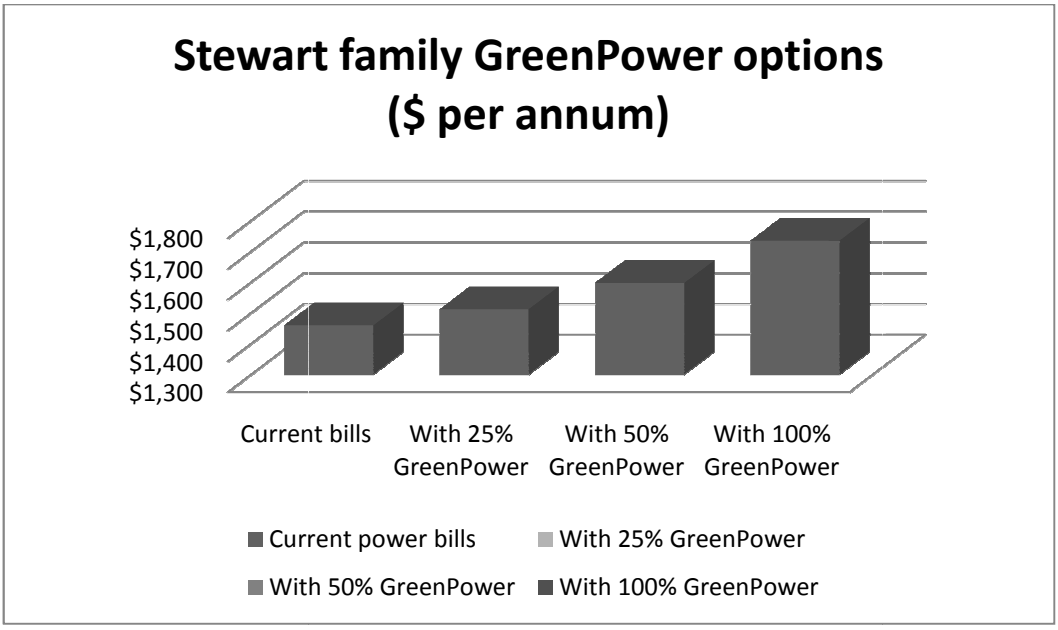
[54]

[51] *Energy Use in the Australian Residential Sector Report*, Dept of Climate Change, 2008 quoted by Origin Energy http://www.originenergy.com.au/1142/Green-energy-FAQs

[52] ABS Australian Social Trends March 2009, *Are households using renewable energy?*, available from http://www.abs.gov.au/AUSSTATS/abs@.nsf/Lookup/4102.0Main+Features80March%202009

[53] Average bill figures taken from Victorian Essential Services Commission *Retail Energy Performance Report 2010* available from http://www.esc.vic.gov.au/public/Whats+New/Whats+New.htm

[54] Joshua Gans 17 January 2007 *Some questions about GreenPower* http://economics.com.au/?p=593


Stewart family GreenPower options
($ per annum)
$1,800
$1,700
$1,600
$1,500
$1,400
$1,300
Current bills
With 25% GreenPower
With 50% GreenPower
With 100% GreenPower
Current power bills
With 25% GreenPower
With 50% GreenPower
With 100% GreenPower

1.5 Ongoing debate

Energy retailers are already required to source some of their energy from renewable sources. It is argued that consumers purchasing GreenPower may displace renewable energy already sourced by retailers, paying extra for renewable energy that would be sourced anyway.[55]

GreenPower renewable energy purchases are fed by energy retailers into the electricity grid. As a result, national greenhouse gas emissions are reduced – not individual household or business emissions.[56] Consumers who choose GreenPower may be disadvantaged in a carbon trading scheme because their energy supply still comes from the grid. It has been argued that with a carbon trading scheme, these consumers would end up cross-subsidising the same emissions they have paid through GreenPower to have reduced. [57]

Additionally, a number of retailers have been investigated by the Australian Competition and Consumer Commission for selling to customer's renewable energy which they never actually purchased, potentially undermining consumer confidence in GreenPower's accreditation process.[58]

1.6 Implications for Newstead

GreenPower offers a viable alternative for Newstead households and businesses. With zero net greenhouse gas emissions, switching to GreenPower presents a simple, straightforward solution for a quick, large scale reduction in Newstead's emissions.

The purchase of GreenPower is also a recurring cost, involving no need for the purchase of any physical assets as a method of greenhouse gas reduction.

However, by purchasing no asset, Newstead residents would be fully exposed to likely energy price increases in the future. The purchase of an asset, whilst involving an up-front outlay, can lessen the impact of future energy price rises. For example, the purchase of PV panels may be initially expensive compared to adopting GreenPower, but if energy prices continue to rise dramatically, over time the savings afforded by the solar energy cells may outweigh the cost.

There is also an anomaly in relation to possible double counting of the emissions saved though the purchase of GreenPower. As referred to earlier, the establishment of a renewable energy producing asset where the output is on-sold to a retailer and then to a customer (for example, a wind farm), does not reduce emissions for the area where the asset is located, but rather for the whole grid. Specifically, it is likely to be allocated as a renewable energy source to those who then purchase GreenPower from the grid.

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[55] GreenPower www.greenpower.gov.au

[56] See, for example, Prof Barry Brook of The Environment Institute, University of Adelaide, 26 August 2008, *Brave New Climate* http://bravenewclimate.com/2008/08/26/make-the-switch-to-greenpower-and-make-virtually-no-difference-to-your-carbon-emissions/

[57] Matthew Murphy and Ruth Williams 26 January 2010 *Sydney Morning Herald* "Separating the eco conscious from the cowboys" available from http://www.smh.com.au/environment/separating-the-eco-conscious-from-the-cowboys-20100125-mujq.html

[58] Note that the RECS multiplier is due to be revised downwards from 1 July 2011

This means that if Newstead invests in a renewable energy asset with the intention of selling output to the grid, the energy generated by that asset will not reflect community use of renewable energy. It will be sold across the grid as GreenPower. To obtain a benefit for the Newstead model (and to avoid breaching the double counting test), local residents would also be required to purchase the output as GreenPower.

2. Household Solar Power

Household Solar systems generate electricity and through an Inverter provide AC power to the household.

Household based systems are available through Origin Solar as part of the Central Victorian Solar City. For the sake of analysis we have used the headline Origin rate from the website stating that a 1.5kW system is available at $3,999[59][60].

This figure is determined after the application of the Solar Credits scheme. As a worked example, there would be 26 solar credits generated, times 3, times $35 per credit, totalling $2,730. This is the current level of subsidisation and is outlined on the Origin website. The predicted output is 1971kWh pa based on material provided by the Clean Energy Council. A 1.5kW system is currently the financial "sweet-spot" for household systems and has been used in the project modelling.

A 1.5kW system is predicted to generate just under 30% of the households energy needs. Importantly however, some of the production is expected to be exported as many households would be at work whilst the maximum generation is achieved. This should achieve an extra level of financial benefit under the Victorian Premium (or Transitional) Feed-in Tariff legislation. For the modelling we have assume 15% would be exported.

From an economic analysis it is important to note that purchasing a system involves the acquisition of an asset at a fixed capital cost and therefore the future energy generated is hedged against rising energy prices. Stated differently, the higher that energy prices rise, the better the financial return through purchase of a system.

The subsidisation embedded in the cost is the Solar Credits RECs multiplier scheme. It is assumed that the vendor of the system takes these elements of subsidisation. Therefore a risk of double counting arises if the Newstead community claims the benefit through its carbon accounting model and other parties to the transaction claim a benefit elsewhere as the RECs are surrendered. To be pure in its approach, the environmental benefits created as a result of the transaction should be retained and surrendered in support of Renewable Newstead.

3. Household Solar Hot Water

Solar Hot Water systems use energy from the sun to heat water helping to reduce a householder's energy bills.

[59] It is acknowledged that bulk buying and other schemes may be capable of delivering greater economic efficiency than a single retail transaction

[60] Australian Greenhouse Office

The value of switching to Solar Hot Water is determined by the amount of electricity consumption avoided through moving away from storage-based electricity powered hot water systems. In undertaking the analysis, a percentage of household energy use attributed to heating hot water in the traditional electricity storage tank must be determined. We have used a figure of 21% based principally on the analysis outlined in Part A of this report.

To determine the cost of this initiative, we have applied the headline rate of Origin Solar Hot Water available on the CVSC trials. We have assumed that the form of system used is storage tank with bottled gas instant booster.

The subsidisation embedded in the cost is assumed to be the Victorian based Point of Sale rebate scheme and the RECs. It is assumed that the vendor of the system takes these elements of subsidisation. Therefore a risk of double counting arises if the Newstead community claims the benefit through its carbon accounting model and other stakeholders claim a benefit elsewhere as the RECs are surrendered. To be pure in its approach, the environmental benefits created as a result of the transaction should be retained and surrendered in support of Renewable Newstead.

4. Medium Scale Solar Power

Central Victorian Solar City constructed solar parks in Ballarat and Bendigo. Much of the knowledge from that exercise is used in undertaking the modelling for the Newstead study.

Like all solutions that are remote from the point of consumption, they are grid connected and a Power Purchase Agreement is required in order to sell the output. The sale of the energy is usually accompanied by the attaching environmental credits. It is likely that the output would be used in satisfaction of either MRET, VRET or Greenpower transactions. Again the issue of double counting arises. The anomaly is that unless the consumers locally acquire the power and the associated environmental credits, the benefit is exported. To do otherwise would be to double count. Construction alone of such a facility could only be counted under the *attribution* model discussed earlier.

5. Household Wind

There has been publicity around the invention by Bendigo based inventor, Antony Interlandi of a household based 1 kW vertical axis wind turbine that is reported to be capable of generating in excess of 60% of a household's electricity needs. Grocon have purchased the patent and an example installation has been undertaken at the Pixel Building in Carlton.

6. Biomass

Biomass is the name given to any recent organic matter that has been derived from plants as a result of the photosynthetic conversion process. Biomass energy is derived from plant and animal material, such as wood from forests, residues from agricultural and forestry processes, and industrial, human or animal wastes.

The energy value of biomass from plant matter originally comes from solar energy through the process known as photosynthesis. The chemical energy that is stored in plants and animals (that eat plants or other animals), or in the wastes that they produce, is called bioenergy. During conversion processes such as combustion (burning), biomass releases the energy stored in its carbohydrates.

Biomass can be used directly for electricity generation, steam for industrial uses, heating, cooking or indirectly by converting it into a liquid or gaseous fuel (eg ethanol from sugar crops or biogas from

animal waste). An example of biomass used for renewable energy generation in Australia is the use of sugar cane waste, or bagasse, for electricity production in sugar mills[61].

No significant effort has been spent during this study on generation from biomass as the current fuel resource would be considered sub-optimal. As background, readers are referred to the study conducted for the Central Highlands Region in 2009.[62]

7. Large Scale Wind

Wind farms are considered one of the more viable economic propositions that utilise renewable energy. There are many in Victoria that exist based on current commercial settings around MRET and VRET.

For the sake of comparison we have used the Community wind-farm example in the adjoining shire of Hepburn as a starting point for evaluation in the Newstead context. It has been used principally due to its size, its community-based investment characteristics and the fact that it is an actual investment, not just an idea.

The stated economics[63] for the 4 Mw project are:-

- Capital or debt required is $13,000,000
- Output is estimated at 33,424 kWh per day (or 1,783 average households under our modelling or 3 times the Newstead study region's total consumption)

Unfortunately Newstead does not enjoy a particular advantage in access to wind and would not seemingly enjoy the same economic value as the Leonards Hill site. Our modelling has reduced the stated Hepburn example by 10% but detailed study would be required to model the actual difference.

The community investment model may be of value in modelling solutions, but early research would suggest that the capital should be applied at a point of superior economic return than in Newstead. This is an example of the aforementioned *remote* versus *at source* dilemma.

This suggests that an opportunity to explore a community based investment model for an installation out of the region would be sensible. It may be that such a scheme could piggyback on an existing proposal, thereby avoiding much of the time consuming journey along the knowledge curve.

8. Geothermal

Geothermal power uses heat from the earth to produce power. Bodies of water are accessed and the steam used to drive a generator, or dry rocks have water pumped down to produce the same result. Power from geothermal resources is generally included in the definition of renewable energy generators.

[61] Publicly reported statements from executives associated with the project

[62] SED Consulting – Central Highlands Bioenergy Scoping Study and Biomass audit

To date there are limited examples of geothermal power generation in Australia.

Geothermal power is reported to be highly scalable. A large geothermal plant can power entire cities while a smaller power plant can supply a rural village.

The Newstead community through its *Renewable Newstead* project has met with representatives from AGL Energy Limited who hold geothermal exploration permits in the region. AGL have undertaken a preliminary drilling program and are further exploring the region of geothermal prospectivity.

It is too early to appraise the cost of an actual power generator for Newstead. For the purposes of this study and to determine if such an approach is appropriate or feasible for the community to support, a preliminary cost[1] needs to be determined relative to the rate of production envisaged. The modelling could then be applied alongside the wind farm and solar park examples. Early enquiries by Renewable Newstead suggest the technology costs are comparable.

The reasoning behind pursuing the geothermal possibility relates principally to its high efficiency factor[2]. If the cost per installed unit of capacity is mooted to be similar or slightly higher than a wind farm, and wind farms in Australia are around 30% efficient, then geothermal production at reported rates closer to 90% constitutes an approach worth pursuing.

Feasibility of a geothermal power project including determination of whether there is geothermal prospectivity in the region would need to be demonstrated before an approach could be made by the community to facilitate the investment by corporate investor.

Similar to wind farms and solar parks, however, the power generated would need to be acquired as a retail customer (presumably from AGL) by the members of the Newstead community in order to claim a benefit under the project accounting model being developed.

9. Comparison of generation techniques

Rate of return is highest at the currently subsidised form for household PV and SHW.

Other larger scale projects must stand alone based on their cost per installed unit of capacity and efficiency factor. In this regard:-

- Wind Farms are attractive with an efficiency factor of 32% on a cost per kW of installed capacity of $3,250
- Solar Parks are not so attractive in an unsubsidised form, with an efficiency factor of 16% on a cost per kW of $6,000[64]

[1] Capital costs tend to be high. In total, electrical plant construction and well drilling cost about 2-5 million € per MW of electrical capacity, while the levelised energy cost is 0.04-0.10 € per kWh. Enhanced geothermal systems tend to be on the high side of these ranges, with capital costs above $4 million per MW and levelized costs above $0.054 per kW·h in 2007: wiki

[2] Factor of likely production against rated total production capability

[64] Information provided by Central Victoria Solar City

- Geo thermal plants may be more attractive as they are assumed to have a high efficiency factor, closer to 90% with similar capital cost to wind projects.

A general observation is that the market price of all output from remote generation solutions is constrained by existing market pricing principles and bears out study conclusion about embedded generation at distribution level, referred to later in this report.

PART E – SEQUESTRATION & OFFSETS

1. Sequestration generally

A key component of carbon management can be to reduce atmospheric GHG concentrations through natural or artificial GHG sequestration.[65] The EPA Discussion paper on draft carbon management principles provides a useful analysis to consider in its section titled Natural Carbon Sequestration...

> *Naturally occurring carbon is present in forests and vegetation, soils and the ocean. If a tree is destroyed, carbon dioxide is released into the atmosphere as it burns or decays and as soil is disturbed. However, growing a tree absorbs carbon as it undergoes photosynthesis, storing it in both its mass and in the surrounding soil..... The process of naturally storing carbon is often referred to as bio-sequestration. The most common form is tree planting..... Investing in bio-sequestration or forestry projects undertaken by others as carbon offsets is more common.....farming communities and enterprises are more likely to have opportunity to directly participate in reforestation projects..... Forest sinks can help reduce GHG emissions and can also provide additional revenue streams and natural resource management benefits, including salinity mitigation, enhanced biodiversity and improved water or soil quality..... A robust approach to reducing GHG emissions requires bio-sequestration projects to be carefully managed controlled and monitored in accordance with strict standards. It is not as simple as just planting trees"*

The Newstead community have expressed a desire to understand the contribution that sequestration could make in their journey towards carbon abatement. In addition, they have floated the concept of having a mixture of planting and harvesting to support a community woodlot[66] given the lack of reticulated gas for heating. Co-generation fuelled by biomass[67] could also emerge as a possibility.

These outcomes can be pursued provided the harvesting and the replanting was appropriately scoped, modelled and reported. The key concept is to be measurable and verifiable, and this is why the community should not just "go and plant some trees" in isolation. It is not that the tree planting would fail to effectively sequester CO2, it is that the claim for abatement under the Carbon Management Plan being constructed could not be made in line with government regulations.

2. Sequestration in the Newstead context

It is important to understand that different geographic areas have different soil types, suitability for tree species, planting rates and rainfall. In addition, fire risk and land availability must be addressed. A detailed study would be required for the Newstead project. In the interim, a report at this level can only use "rule of thumb" measures to scope the potential as part of a broader feasibility study that encompasses energy efficiency and generation. We cannot adequately determine tonnes per hectare at this stage.

[65] EPA Discussion Paper

[66] Need to determine expected yield in m3/year

[67] Biomass to energy

Work around sequestration has been undertaken by CVGA and others over recent years. The most relevant material appears to be the study titled *Growing Trees for Carbon and Conservation in North Central Victoria*[68]. This study occurred prior to the introduction of the National Carbon Offset Standard and advice obtained would suggest that the tools currently used for modelling have advanced substantially since 2005.

The National Carbon Offset Standard is effective as a voluntary standard from 1 July 2010[69]. The Carbon Credits (Carbon Farming Initiative) was introduced in 2011.[70]

The methodology can be summarised as follows:-

- Requiring methodology to be approved,
- Recognised Offset Entity
- Project Approval
- Reporting
- Crediting
- Termination or transfer of projects and
- compliance

It is beyond the scope of this paper to provide a definitive pathway and costing for registration of domestic offsets under this newly introduced standard, but early indications and lessons from the NSW scheme would suggest that the Newstead proposal would need to:-

- Establish a body capable of navigating through the forestry issues and Carbon Offset Standards/CFI legislation applicable to such a scheme, or join an aggregator, or use an agent
- Source land that was used as grazing land prior to 1990 (ie non-forest)
- Have legal agreements to demonstrate long term access to the land (usually 100 years)
- Determine a regime for management of the project
- Have adequate resources in relation to managing hazards and risks
- Be able to model and measure carbon stock changes
- Have a methodology and regime for the measuring, monitoring and reporting of the project
- Be prepared to quit the credits created in pursuit of the journey towards zero net emissions

Our clear recommendation is that the community fund an updated study. One of the co-authors of the aforementioned study has a business in Castlemaine[71] and could assist if appropriately instructed and funded.

Aside from the detailed analysis of the framework and its application in Newstead, the obvious question still remains, how many trees over what period need to be planted in and around the

[68] Study undertaken by Ben Keogh, Paul Dettman and Craig Clifton (March 2005) with support from Australian Greenhouse Office, CVGA, NCCMA, SKM, the Victorian Government and Greenhouse Balanced

[69] Demand side criteria

[70] Supply side criteria

[71] Ben Keogh – Australian Carbon Traders (www.australiancarbontraders)

Newstead area to achieve the GHG abatement that will be needed as part of the overall solution alongside reduction in energy use and generation from renewable sources?

There are many "rule of thumb" figures quoted and it takes some effort to reconcile their application to the Newstead context. There are figures quoted for CO2e sequestered for mature trees as against seedlings grown, there is the problem in estimating sequestration rates as trees mature from seedlings and there is the projected sequestration rates and planting rates per hectare for individual regions.

For example and to illustrate the divergence in outcomes using rule of thumb measures:-

- Ergon Energy Greenpower marketing material describes its customer base saving 58,000 tonnes of GHG each year which is the equivalent of planting 235,000 new trees every year (one tree equals approximately 0.25 tonnes of CO2)
- The US EPA quotes a seedling grown over ten years as sequesting 0.039 metric tonnes of CO2
- Work undertaken for the CVGA suggests that a hectare of planting at 1000 stems per ha would yield 12.5 tonnes per hectare
- 65-75% of benefit occurs in the 1st 30 years of a project
- Anecdotal evidence for dry land areas like Newstead suggest that the species around Newstead would produce 3 tonne per year over 15 years

As stated earlier, and with all the necessary disclaimers about the possible errors in using "rule of thumb" appraisal techniques, we have settled on the following parameters for our modelling, but confirm that further work must be undertaken to give certainty around this approach:-

- 1000 trees should be planted per hectare providing an average sequestration rate between 3.4 tonnes and 12.5 tonnes of CO2e per hectare per year
- The cost per tree is assumed to be $3.50[72]
- The figure used for modelling purposes is 0.125 tonnes per tree over 15 years

Using these parameters, the cost of sequestration locally is marginally more than purchasing offsets from forest projects in the marketplace, reflecting perhaps the result you would expect from dry-land sequestration.

Our modelling attempts to use an "Emissions Abatement Balance" methodology over 15 years, rather than "Real Time Offsetting" or "Forward Loading offsets".

Finally, and so as to be clear, the sequestration concepts and many of the offset products should not be viewed as mutually exclusive, the Newstead community could achieve the same outcome through:-

- purchase of offsets that are based on other sequestration projects
- invest in other projects
- undertake their own project, or
- form a group of landowners that may join or extend an existing offset project.

[72] Carbon Neutral (www.carbonneutral.com.au) quoted rate for WA

They could also explore:-

- Improved forest management
- Avoided deforestation
- Soil carbon

3. Native Vegetation around Newstead

Although not technically part of any current or proposed sequestration project, it is interesting to note the native vegetation data for the 10km radius of Newstead.[73]

Of the total area of the district (31,400 ha), 17804 ha or 56% have native vegetation cover. Recent research[74] suggests that there has been approximately 2% increase in the area with new tree cover (from revegetation and natural regeneration) on private land over the last ten years. Calculated at 2% of the mapped 11727 ha of native vegetation on private land this represents as addition of 234 ha to the native vegetation resource on private land from 2000 to 2010[75]

This illustrates the glaring differenced between robust registered carbon accounting based sequestration projects and an attribution model. Native vegetation (and presumably its associated carbon abatement) is expanding independent of registered projects that can be traded for value.

4. Carbon Offset

4.1 Introduction

Carbon offsets work to reduce greenhouse gas emissions by using another mechanism to reduce greenhouse gases elsewhere. Credits for carbon offsets can be gained through purchase from an offset scheme provider or through new projects developed.

As mentioned earlier, the Australian government has developed the *National Carbon Offset Standard*, a guiding document designed to establish parameters around the voluntary carbon offset market and reinforce confidence and integrity for buyers and sellers[76].

4.2 Evaluating carbon offsets

According to the Carbon Management Principles established by EPA Victoria, ways to avoid and reduce emissions should be examined before considering offsets, in order to optimise financial and environmental outcomes[77].

[73] 2005 figures

[74] Landscape Logic

[75] Based on satellite data

[76] Australian government National Carbon Offset Standard 2010

[77] EPA Victoria available from http://www.epa.vic.gov.au/climate-change/carbon-offsets/issues.asp

Once offsets have been chosen as a tool for reducing greenhouse gas emissions, a type of offset must be chosen, and an appropriate evaluation methodology established. A thorough understanding of how an offset operates and where the emissions savings come from is essential in this process, as are cost and location preferences. The process of evaluation should be continuous, with a constant assessment and review of the type and success of the offset projects chosen[78].

4.3 Types of carbon offsets

Forestry projects (also known as biosequestration), including plantation forestry and native plantings in reforestation areas or newly afforestation areas, are the most common type of carbon offset projects in Australia today[79]. They have a number of environmental benefits outside of carbon offsests, such as providing habitat for native flora and fauna, but require particular attention to ensure that they are permanent.

Other types of offset include methane projects; industrial gas projects; renewable energy projects; and energy efficiency projects, as well as projects involving combinations of different types of offsets[80].

4.4 Registering a carbon offset

Carbon offsets can be registered according to the Australian Government's National Carbon Offset Standard[81].

4.5 Retirement on a registry

For the benefit of a offset to be included in the carbon accounting model, it is assumed that it must be surrendered and not on-sold

4.6 Implications for Newstead

There are opportunities for Newstead residents to buy into established or new offset projects, as well as to consider establishing their own.

For modelling purposes we have used a figure of $23 per tonne for offsets. This is determined by reference to the Gillard government's carbon tax announcement and on a simple smoothed observation of the various offerings available on the carbon offsets website.

It is assumed that the Newstead community would need to source the funds to purchase offsets from a broker. This could presumably be done through:-

- Community fundraising
- Seeking philanthropic support

[78] Carbon offset guide www.carbonoffsetguide.com.au

[79] EPA Victoria available from http://www.epa.vic.gov.au/climate-change/carbon-offsets/types-of-offsets.asp

[80] EPA Victoria available from http://www.epa.vic.gov.au/climate-change/carbon-offsets/types-of-offsets.asp

[81] Australian government National Carbon Offset Standard 2010

- Undertaking some not for profit undertaking to produce a surplus that could be applied to purchasing offsets
- Relying on individual action by residents who may choose to act alone but report their action for monitoring of the Newstead Carbon management Plan
- A combination of the above

The extent to which the Newstead community needs to purchase offsets is a function of the success and penetration of all the earlier initiatives.

5. Woodlots

As part of the modelling around sequestration we have made a preliminary evaluation around the potential for a community woodlot to be established as part of any sequestration project.

Initial modelling based on creating a sustainable yield firewood supply was based on using fast growing eucalypt species (*e.nitens*) planted in 2011 with the first harvesting occurring in 15 years. Each established hectare would yield approximately 10 tonnes of firewood each year, therefore a total of 40 hectares would need to be established to provide an annual yield of approximately 400 tonnes of dry firewood. The plantation would also sequester approximately 290 tonnes of CO2 per ha.

PART F – THE MARKETPLACE AND ITS IMPACT ON FEASIBILITY

1. Pricing of Carbon in the Australian economy

1.1 Carbon tax proposal

On 24 February 2011, Prime Minister Gillard announced a new two-stage plan for establishing a carbon market in Australia. The Australian Government's proposal is for an initial carbon tax, commencing 1 July 2012, to be followed by transition to a functioning carbon market.

"A carbon price is a price on pollution. It is the cheapest and fairest way to cut pollution and build a clean energy economy. The best way to stop businesses polluting and get them to invest in clean energy is to charge them when they pollute" Prime Minister Gillard, 24 February 2011.[82]

The implementation of a carbon tax and emissions trading market will encourage investment energy efficient technologies, including research and development of new energy efficient ideas.

There will also be new opportunities for carbon abatement methods and improving land use.

1.2 Introducing a carbon tax

The proposed national carbon tax is intended to provide an incentive for the reduction of greenhouse gas emissions, particularly from businesses with very high emissions, which will initially bear the brunt of proposed changes.

The short-tem measure is designed to ensure stability and business certainty as a starting point for a shift toward a market based emissions scheme closely linked to other such markets around the world. It should bring confidence to Australian business through the transformative process and could last up to five years. [83]

1.3 Developing an emissions trading market

The design of the proposed emissions trading market is not yet confirmed, but will include a capped amount of emissions likely to be based upon a desired figure to be reached by 2020.

1.4 Economic cost

The initial price announcement has occurred and the price is $23.00. Initial speculation suggested around $26 per tonne of emissions, an amount that, once passed on by business, could cost Australian households around $300 each per year.[84] Professor Ross Garnaut, a member of the panel of experts for the Australian Government' s committee that developed the Prime Minister's

[82] Press release 24 February 2011 available at http://www.pm.gov.au/press-office/climate-change-framework-announced

[83] Press release 24 February 2011 available from http://www.pm.gov.au/press-office/climate-change-framework-announced

[84] Australian Industry Group February 2011 *Energy shock: confronting higher energy prices* available from http://www.aigroup.com.au/portal/binary/com.epicentric.contentmanagement.servlet.ContentDeliveryServlet/LIVE_CONTENT/Publications/Reports/2011/Energy_shock_confronting_higher_prices.pdf

proposal, has previously suggested a price of $20 per tonne of carbon emissions.[85] The Australian Government's Multi-party climate change committee paper on the proposed carbon market suggests that the price could be increased annually to further drive investment in technology designed to reduce greenhouse gases and ensure further reductions.[86]

The Prime Minister has said that the proposed changes will be budget neutral; meaning that all revenue generated as a result of the carbon tax measure will be returned through assistance measures, such as helping with household bills and assisting businesses to transition to producing less greenhouse gas emissions. [87]

The Prime Minister has also indicated that help adjusting to the new carbon tax and emissions trading scheme will be provided to households and communities that need it the most. [88]

1.5 Community reaction

Business across Australia has reacted cautiously to news of a new carbon tax – suggesting that further detail is needed to ensure that the proposed scheme will not negatively impact on Australia's competitiveness internationally.[89] [90] Key groups such as the Australian Chamber of Commerce & Industry; the Minerals Council of Australia and Ai Group believe that the move will impact Australia's international competitiveness and harm our local economy.[91]

Environmental groups, such as the Climate Institute, and the Australian Conservation Fund, were much more supportive of the Prime Minister's announcement.

1.6 Implication for Renewable Newstead

[85] Phillip Coorey in *The Sydney Morning Herald* 26 January 2010 "Scrap ETS and go for a carbon tax: Garnaut" available at http://www.smh.com.au/environment/scrap-ets-and-go-for-a-carbon-tax-garnaut-20100125-muk8.html

[86] Multi-party climate change committee 24 February 2011 *Proposed architecture for a carbon price mechanism* available at http://www.climatechange.gov.au/government/initiatives/multi-party-committee.aspx

[87] Press release 24 February 2011 available from http://www.pm.gov.au/press-office/climate-change-framework-announced

[88] Multi-party climate change committee 24 February 2011 *Proposed architecture for a carbon price mechanism* available at http://www.climatechange.gov.au/government/initiatives/multi-party-committee.aspx

[89] Ai Group press release 24 February 2011 *Ai Group comment on Climate Change Committee Framework* available from www.aigroup.com.au

[90] Siobhain Ryan in The Australian 25 February 2011 "Garnaut backs carbon strategy" available at http://www.theaustralian.com.au/national-affairs/climate/garnaut-backs-carbon-strategy/story-e6frg6xf-1226011612271

[91] Siobhain Ryan in The Australian 25 February 2011 "Garnaut backs carbon strategy" available at http://www.theaustralian.com.au/national-affairs/climate/garnaut-backs-carbon-strategy/story-e6frg6xf-1226011612271

The implementation of a carbon tax will increase energy prices, making environmentally friendly energy options relatively more cost effective and therefore attractive for energy firms – as well as local communities and Greenpower purchasers.

However, the Prime Minister has announced the scrapping of a number of existing environmental programs[92] to pay for natural disaster recovery effort commitments. This includes the removal of a number of government subsidies for environmentally friendly energy alternatives, such as solar power. It will increase the price of these options for households.

It is also important to note the detailed implications of the carbon tax once further information about the Australian government's policy intentions. This is particularly true for the announced assistance measures, designed to help households and businesses adjust. As a relatively low income town, Newstead could be expected to be influenced by the assistance measures, and more detail is required to ascertain the balance between the measures and the behaviour changing influence of the carbon tax measures.

As well as these factors, the additionality aspects related to the proposed carbon tax are important – as a model for behaviour change related to the carbon. The additionality relates to new projects brought about through the implementation of the tax, and not those that would have happened anyway (for example, where cost efficiencies of environmentally friendly energy production exists without a carbon tax).

Finally, the model used for comparative analysis in this report is also capable of adaption in line with any changes to prices and other outcomes dictated by the final details of the carbon tax policy – once they are released by the Australian government.

2. Regulatory issues & Electricity pricing generally

The Victorian marketplace is dominated by centralised generation and a transmission and distribution grid. The marketplace is layered into generators, transmission and distribution businesses and finally retailers.

A breakup of the Powercor region in Victoria that includes Newstead suggests that:-

Role	Explanation	Cost
Generation	the cost of generating electricity	Historically between 3.628 and 5.48[93] [say] 5 cents per kWh or 20% of the standing retail offer of 25.29 cents
Distribution & Transmission ("network" charges)	the cost to get electricity from the point of generation to the point of consumption and it covers the	Between 7-10 cents per kWh (7-9 cents in distribution 0.88 cent in transmission) say 9 cents or 35% of

[92] Prime Minister's website www.pm.gov.au

[93] AEMO

	building and maintaining of meters poles and wires	the standing retail offer of 25.29 cents[94]
Retail	the cost or arranging connection of electricity and managing accounts	Say 12 cents or 49% of the standing retail offer of 25.29 cents[95]

From a public policy perspective, these costs (particularly transmission and distribution) are largely "smoothed" across sectors of the Victorian population (similar to the cost of a postage stamp[96]).

If Newstead was (by investment, co-investment or whatever) to obtain a grid connected power station powered from renewable energy then it would sell its output into the market i.e. a retailer, the buyer would pay normal distribution costs and much of the commercial value would be eroded, albeit that the power is shifted only a matter of a small number of kilometres.

This is a simplistic conclusion as a cost must be incurred to obtain the value through security of supply which is the grid. The question remains what should that proper cost be in an embedded generation model? It is beyond the scope of this paper to provide an answer, other than to note the practical problem for embedded generators and to consider "work-arounds".

3. Implementation Issues and barriers

3.1 Embedded generation at distribution level

As flagged above and as outlined in detail by various reports[97], the embedding of generation at distribution level is perceived as a problem or barrier to uptake. Of key interest in prior modelling is the effect of improved transmission pricing arrangements which allow distributed generators to pass on cost savings from reduced use of transmission networks to customers.

Put simply, if changes were to be made to the regulatory regime, then cost savings could be passed through to distributed generators, improving their business case and "investability". Newstead would currently need the most robust business case in the absence of any other support.

3.2 Creating the transaction loop where customers can buy the output from embedded generation

Currently the commercial momentum to have tagged Greenpower offers that build the connection between generation and consumption are poorly developed. Hepburn Wind are reported to have established a Power Purchase Agreement ("PPA") with a retailer who will tag the GreenPower

[94] often quoted in public as 40%

[95] Often quoted at 15% - depends on where you allocate such things as hedging costs as between generation or retail

[96] Doesn't matter if you post a letter around the block or across the state, it is the same price

[97] Understanding the Business Case for Distributed Energy Generation in Victoria, McLennan Magasanik Associates for Sustainability Victoria (2007)

offering in the marketplace to the point of generation. Until this occurs, investors are grappling with the split issue of promoting investing to get a generator in place and then having to separately buy unidentified GreenPower as the only means of completing the transaction loop. If social goodwill was to be built, we assume the preferred model would involve generation at distribution level, capturing of the transmission savings in the price and on-sale to a customer and identified as coming from the local source. This may be a useful model to put to government for trial rather than traditional asset subsidisation alone.

4. Possible short term or workaround solutions

4.1 Behind the meter and embedded network solutions

It is tempting to explore what could be achieved through avoiding distribution costs when you move generation away from the point of consumption. It is tempting to think about medium or larger scale generation if it could be positioned at the point of consumption. Unfortunately there is no major point of consumption in the Newstead community. It may have to be explored out of the district. The idea would also need to address the claiming of the benefit under the carbon accounting model, again highlighting the disconnect between taking the initiative to build energy generation and accounting for where the benefit surfaces.

The community could consider a collective investment scheme if it could raise the capital for the acquisition of the infrastructure and enter into a lease and PPA for the location of the plant and the taking of the output. This presupposes that the business case is investment positive and we have undertaken some preliminary modelling on this point.

The concept of a virtual PV Park could be modelled further. If the same capacity of a PV Park on the grid could be replicated through installations (and consumption at the point of generation) on various buildings in the town, the economic proposition could be improved. More modelling is required to establish the appropriate rental cost to be paid by the host facility, presumably reflecting the value of the energy produced and consumed. There is a precedent in Victoria for this type of arrangement in the Solar Hot Water industry.

4.2 Micro Grids or LANs

Work has been undertaken by CSIRO[98] around the development of micro grids. Commercial application seems to centre upon capturing the savings for reinvestment in some form and at this point in time does not appear to be commercially mature. We are also concerned about the scale of the task relative to both the population and landmass to be covered in the Newstead context. Members of the Newstead community are well connected to the CSIRO team and should retain a watching brief. At this point in time it does not rate highly in our analysis of feasible options

4.3 Buying Groups or demand aggregation

There appears to be a growing momentum to explore the possibility of forming buying groups. This is a commercial tool utilised by Bendigo Bank in its Telco initiatives. When customers band together and “go shopping” with their demand, then benefits can be delivered. Interval metering through the Smart Meter program should assist customer aggregation more accurately define its load profile and

[98] Intelligent Grid

usage (compared to the so-called aggregation meters used historically). Commercial pressure could be applied to source the power from a designated source, addressing the issues raised above as barriers to adoption. Newstead community could seek to engage the Bendigo Bank to scope the possibility as a community initiative in this area.

De-coupled Greenpower is now available. Promoters of decoupled GreenPower[99] argue that price savings can be obtained separate from the buying of GreenPower from a retailer. This may be a further option or an option that could be pursued alongside the buying group option.

[99] www.arkclimate.com.au

PART G - CONCLUSIONS

1. The Carbon Accounting Model and its further development

The model has been scoped and contains a preliminary outline of the steps that the Newstead community could take on its journey towards carbon neutrality on its electricity needs. Further work is required to validate the preliminary conclusions for each of the possible initiatives. In some instances it may be obtaining certainty around the take-up levels of existing proven technologies that are now commercially "mainstream". In other instances it may be firming up emerging technologies or tailoring their application to a small scale.

One long term consideration is the monitoring and reporting framework. No work has been undertaken on this aspect and it may be a case of seeking support from government.

This paper has however fleshed out a basis for Newstead to achieve its goal, and having said that, it is theoretically possible to follow the plan to reach the goal. The difficulty lies in the execution.

Some measures are relatively simple and make economic, environmental and social sense. Others are more ambitious and have a high degree of risk but high return if they can be seen through to completion.

2. Ranking of possible approaches

Initially we intended to construct a "league table" of the various solutions available to the Newstead community, but this proved not to be as relevant as initially scoped. This is due to the varying nature or characteristics of the various initiatives. Some initiatives are capable of having a complete solution; some can only achieve penetration into a sector of the marketplace. Some initiatives are based on sound economic principles; some others involve buying your way out the problem. They are difficult to validly compare.

To put some context around the results the following table is useful to compare various interventions:-

Intervention	Internal Rate of Return ("IRR")	Outlay	Net Present Value ("NPV")
Energy Audit	232%	$200	$2,005
Retrofit	15%	$1,500	$1,001
SHW (subsidised)	20%	$2,141	$2,457
SHW (Unsubsidised)	10%	$3,641	$1,035
SHW (Off Peak)	4%	$2,141	$ 818
PV Household (subsidised)	21%	$3,999	$5,033
PV Household (unsubsidised)	9%	$6,729	$1,707
PV Park (on grid)	-7%	$3,000,000	-$1,860,871

PV Park (off grid)	6%	$3,000,000	$44,692
Wind Farm	9%	$13,000,000	$2,817,941
Geothermal Plant	27%	$4,000,000	$7,078,000
Greenpower		$5,643	-$3,766

3. What does the scenario modelling tell us?

We have modelled a number of scenarios where uptake of certain initiatives is undertaken in various combinations. They are included in Appendix 3.This should give the community a sense of the magnitude of the tasks ahead, but do so in an environment where many different approaches are taken in unison.

The modelling initially tells us that the whole problem amounts to 32,880 tonnes of GHG and this can be expressed alternatively as $1.32m of GreenPower at retail marginal rates, or $756,240 of offsets at a rate of $23 per tonne, or 263,040 trees planted.

If looked at from the perspective of substituting generation (from coal based to renewable energy), the problem looked at in isolation amounts to a 200kW capacity power station at 90% efficiency, or a 0.57Mw capacity power station at 32% efficiency, or a 1.12Mw power station at 16% capacity.

The models produced in Appendix 3 are interesting as they provide a more realistic mix and match of outcomes. At a high level analysis, they prove that household initiatives, whilst effective both environmentally and financially can only go so far. The balance of the load must be borne by generation or sequestration. The models clearly show the outcomes expressed relative to the value of offsets, or the number of trees to be planted.

In Scenario 1 we see a relatively high uptake of household based initiatives with only modest uptake of Greenpower, assuming there is no local generator that inspires people to buy local greenpower. It leaves around 150 ha of trees to be planted to solve the problem.

Of the three models produced, assuming Scenario 2 is the worst in the take-up of various initiatives by residents, the load is still substantial and falls to sequestration in the form of 200 ha of trees.

Scenario 3 shows no net residual burden if local GreenPower could be produced, assuming it would have a high uptake in the community and household initiatives are popular.

4. Anomalies that would need to be addressed

- Some of the district consumption is not directly attributable to the residents and their household electricity accounts. Lobbying may be required of other users in the community, such as providers of public lighting or other infrastructure operators
- The regulatory framework is not conducive to grid-connected embedded generation at distribution level, unless it occurs at the site of consumption. Conversations should be had with policy makers to allow carve-outs for local generation in recognition of the reduction in network augmentation and infrastructure generally. To contemplate that commercial workarounds should be expected of the incumbent distributor does not make sense nor is it a sustainable long term solution.

- The hurdles associated with Carbon accounting and the anomaly that arises between the separation of the environmental credit from the production of electricity is a challenge for the lay person to analyse. A communications strategy must be developed to clearly guide the community should it proceed down the path of operating both a carbob accounting and attribution model.
- We have the anomaly that household based solutions are subsidised but medium scale opportunities such as medium scale solar remain unsubsidised. They therefore need to compete against subsidised installations as well as fit within the current regulatory framework regarding transmission and distribution costs.

5. ABS data and social research

Much of this paper is skewed towards financial analysis. The analysis must be referenced to the profile of the Newstead community and the outcomes of the social research being undertaken to adequately understand the social appetite to address the problem.

As a summary, many more than average Newstead residents own their homes outright, live in detached houses and move infrequently, meaning that investments in energy technology at a household level can be seen by most in terms of their long term returns. Those that do rent, around one fifth of households, tend to pay low levels of rent (almost all pay less than $225 per week).

Newstead residents have a lower than average household income, and a higher than average proportion of Centrelink transfer payment recipients. This perhaps limits their ability to invest in more expensive environmentally friendly energy options. However, living costs are also lower, as reflected in Newstead's housing cost figures. It is therefore difficult to draw any conclusion about the overall financial situation of Newstead residents in relation to energy investments.

Newstead's predisposition towards community spirit is a key contributor to the likely take-up of any emissions reduction project. With so many community organisations, and a willing volunteer workforce, it is likely that a community driven emissions project could achieve strong community support an effective community buy-in.

Additionally, the size of Newstead as a small town means that an emissions project could be more achievable. Less local residents in a close community means that gaining support and implementing a strongly supported project could be quicker and easier than a similar project in a much larger town.

Conversely, the small size of Newstead could also present a substantial threat to the success of an emissions project. The smaller scale of such a project means that the commitment required from local residents to gain a critical mass is much higher than in a bigger community.

6. Ways forward

We have modelled scenarios where Newstead could reach its goal of zero net emissions on its electricity usage, but to do so would involve a combination of initiatives happening contemporaneously.

It is difficult to believe that a total community-wide uptake of Greenpower could occur, or that 260 ha of trees would be planted and accredited, thereby solving the problem with one "silver bullet". What may eventuate is that residents or groups cherry-pick certain initiatives and participate in community wide projects for the balance, whilst the community leaders continue to pursue generation capability.

Having looked at the various traditional approaches such as SHW, household PV, Audit and retrofit (all solutions based at the point of consumption) and the contributions that they could make, we have to accept that they are severely capacity constrained. Residents of Newstead should take comfort from the analysis that (in their currently subsidised form) Household PV and household SHW represent valid choices. They should be pursued as they rank highly in the financial analysis.

Purchasing Greenpower, undertaking sequestration projects or purchasing Offsets may have to carry the day in the absence of generation. Putting it simply, it is difficult to believe that the goal could be achieved without a substantial contribution from a generation station (powered from renewable energy) in the district with the local residents choosing to purchase their power from this source (in the form of Greenpower) to ensure that the benefit is retained in the Newstead carbon accounting model. This exposes the financial difficulties and the difficulties around double counting in the embedded generation model under the current regulatory system in Victoria.

7. Hit List

1. Formally commence a GHG abatement project with funding to construct a model and a means of recording outcomes, including an "attribution" ledger running in parallel to leverage and reward social capital invested
2. Residents should undertake a household energy audit whilst free of charge under CVSC
3. Residents should consider acquisition of assets (such as PV SHW or retrofit) that address the GHG problem and also have a projected positive financial rate of return
4. Greenpower adoption should be promoted.....or the establishment of a buying group for retail supply generally..... consider approaching Bendigo Bank for guidance on demand aggregation
5. Chase a suitable generation project, evaluate opportunities, consider joint ventures, MOUs or other facilitation methods to advance the argument, most likely using a behind the meter strategy to create an embedded network
6. Acknowledge that competitive advantage could be in sequestration and offset provision
7. Seek funding and do further work on the issue of forestation and registration of schemes, appoint a suitably qualified consultant or contractor
8. Develop a Communications Plan and promotions strategy
9. Continue to lobby for either relief or reform around the issues of generation based at distribution level

Michael McCartney
Crockford McCartney Pty Ltd
August 2011

APPENDIX 1 - NEWSTEAD DEMOGRAPHIC PROFILE

Appendix 1.1: Newstead age structure as at June 2006 Census (usual residence data)[100]

Age group	% Newstead	% regional Victoria
Infants 0 to 4 years	4.9	6.1
Children 5 to 17 years	20.7	18.9
Adults 18 to 64 years	55.4	59.1
Mature adults 65 to 84 years	17.0	14.0
Senior citizens 85 years and over	1.8	1.9
Total persons *(487)*	100.0	100.0

Newstead's age structure is reasonably similar to that for regional Victoria. Whilst there are less infants, there are slightly more children, such that the total population under the age of 18 is about average.

The main difference between Newstead and the regional Victorian average is that there are more mature adults 65 to 84 years, and less adults 18 to 64 years.

Appendix 1.2: Newstead home ownership and costs as at June 2006 Census (enumerated data)[101] [102]

Housing tenure	% Newstead	% regional Victoria
Owned	46.8	38.8
Purchasing	28.6	32.4
Renting	19.1	22.4
Total dwellings *(220)*	100.0	100.0

[100] Mount Alexander Shire Council *Snapshot Summary Profile for Newstead* available from http://profile.id.com.au/Default.aspx?id=334

[101] Mount Alexander Shire Council *Snapshot Summary Profile for Newstead* available from http://profile.id.com.au/Default.aspx?id=334

[102] Mount Alexander Shire Council *Community profile for Rural West – Newstead* available from http://profile.id.com.au/Default.aspx?id=334

Monthly household home loan repayments	% Newstead district	% regional Victoria
$1 to $249	6.5	3.5
$250 to $399	6.4	4.2
$400 to $549	11.8	8.8
$550 to $749	15.6	11.8
$750 to $949	14.9	13.5
$950 to $1,199	12.2	15.8
$1,200 to $1,399	7.9	10.4
$1,400 to $1,599	5.1	6.7
$1,600 to $1,999	5.7	8.1
$2,000 to $2,999	5.8	6.2
$3,000 and over	0.2	2.4
Not stated	8.0	8.6
Total *(382)*	100.0	100.0

Weekly household rental payments	% Newstead district	% regional Victoria
$0 to $49	12.6	8.3
$50 to $99	4.9	15.7
$100 to $139	28.8	20.3
$140 to $179	23.3	23.2
$180 to $224	12.3	17.3
$225 to $274	0	6.5
$275 to $349	1.7	2.5
$350 to $449	0	0.8

$450 to $549	2.1	0.2
$550 and over	0	1.3
not stated	14.1	4.1
Total *(141)*	100.0	100.0

A much larger than average proportion of Newstead residents own their own home outright. Of those that are still paying off their home loans, repayments are generally lower than the regional Victorian average.

Whilst the proportion of households in the Newstead district paying $350 or more per week rental is similar to the regional Victorian average, there are far more than average households paying low or very low rent.

Note the home loan and rental payment data is for the broader Newstead district so includes a larger number of households.

Appendix 1.3: Newstead household income and Centrelink payments as at June 2006 Census (enumerated data)[103] [104]

Weekly household income (gross)	% Newstead	% regional Victoria
Less than $350	29.0	17.6
$350 to $999	34.1	33.4
$1,000 and over	24.9	37.9
Total households (217)	100.0	100.0

Centrelink payment	% Newstead region	% regional Victoria
Aged Pension	10.8	N/A
Disability Support Pension	4.7	N/A

[103] Mount Alexander Shire Council *Snapshot Summary Profile for Newstead* available from http://profile.id.com.au/Default.aspx?id=334

[104] *Australian Bureau of Statistics Mount Alexander Shire (balance) SLA (Region code 235105434)* available from www.abs.gov.au

NewStart	3.0	N/A
Parenting Payment	1.6	N/A
Total	20.1	N/A

Weekly household income for Newstead is close to the regional Victorian average at the median amount. However, household income in Newstead is skewed when compare with regional Victoria, such that a much higher proportion of households earn a low weekly income, and a much smaller proportion earn a high weekly income.

This data fits with the Centrelink payment figures for the Newstead region, as well as the age profile data, indicating that over 20% of residents earn their main weekly income from Centrelink, including the largest number who receive the Aged Pension.

Note that the household income data is for the broader Newstead district, and the Centrelink data includes the broader Newstead district as well as several neighbouring towns such as Maldon and Harcourt but excluding Castlemaine. This means the analysis is based on a larger number of households.

Appendix 1.4: Newstead district employment by industry as at June 2006 Census (enumerated data)[105]

Industry	% Newstead district	% regional Victoria
Agriculture, Forestry & Fishing	11.8	9.1
Mining	0.6	0.5
Manufacturing	12.5	11.8
Electricity, Gas, Water and Waste Services	1.2	1.3
Construction	8.1	8.2
Retail Trade	10.6	12.2
Wholesale Trade	2.2	3.4
Accommodation and Food Services	6.0	6.3
Transport, Postal and Warehousing	4.0	4.2

[105] Mount Alexander Shire Council *Snapshot Summary Profile for Newstead* available from http://profile.id.com.au/Default.aspx?id=334

Information Media and Telecommunications	2.1	1.3
Financial and Insurance Services	0.9	2.0
Rental, Hiring and Real Estate Services	0.7	1.1
Professional, Scientific and Technical Services	3.7	3.7
Administrative and Support Services	1.2	2.6
Public Administration and Safety	6.9	5.8
Education and Training	8.7	7.9
Health Care and Social Assistance	11.8	11.4
Arts and Recreation Services	1.7	1.2
Other Services	3.7	3.5
Inadequately described or Not stated	1.6	2.3
Total (1 197)	100.0	100.0

Newstead residents are employed in the greatest numbers by the manufacturing industry; the agriculture, forestry and fishing industry; and the health care and social assistance industry.

Retail trade; education and training; and construction also employ a large number of local residents.

Some of these figures may be explained through an examination of Newstead's broader environment – for example, there is little manufacturing base in Newstead, but significant opportunities in the industry close by, such as at the KR Castlemaine factory in Castlemaine.

The relatively small proportion of Newstead district residents employed in retail trade could be related to the nature of those type of jobs – often low paid and part-time and/or casual, requiring flexibility that can be difficult in an area where locals have to travel some distance for their employment.

Note the employment industry data is for the broader Newstead district so includes a larger number of residents and could be impacted by differing employment patterns across the district.

Appendix 1.5: Newstead district vehicle ownership as at June 2006 Census (enumerated data)[106]

[106] Mount Alexander Shire Council *Snapshot Summary Profile for Newstead* available from http://profile.id.com.au/Default.aspx?id=334

Vehicles per household	% Newstead district	% regional Victoria
No vehicles	3.1	6.9
1 vehicle	28.2	32.6
2 vehicles	39.9	36.6
3 vehicles or more	25.1	17.7
Not stated	3.6	6.2
Total (1 113)	100.0	100.0

A far larger proportion of Newstead district households own two or more vehicles than the regional Victorian average. Less households own no or one vehicle.

These figures reflect the lack of availability of public transport to residents, as well as the small size of Newstead meaning that travel outside of town is often necessary for access to services (such as clothes or supermarket shopping; medical care; or local Council offices).

Note the vehicle ownership data is for the broader Newstead district so includes a larger number of households.

APPENDIX 2 – EVALUATION TEMPLATES FOR EACH INTERVENTION

Item	**Household Audit**
Item description	Personalised consulting and advisory service
Cost	Usually about $200 for a slightly better than "walk through" experience
Subsidisation levels	Currently fully subsidised by Central Victoria Solar City
Economic benefit	Aspirational savings are stated at 15% but anecdotal evidence suggests 9-10% savings are achievable across a large sample size
Environmental benefit	Avoidance of consumption is the perfect outcome as it saves energy being produced, relieves strain on the network and saves customers money
Remote or at source solution	At source solution
NPV of item over 15 years (discount rate = 5.54%)	$2,005
IRR based on unsubsidised cost	232%
Degree of social capital required (low medium or high) and associated reasoning	Low – easily accessible service, common sense, currently free ... who doesn't want to save money!
Risk of double counting	Risk of double counting with Central Victoria Solar City
Existing examples	widespread
Misc comments	
Additionality issues (if any)	IS it additional to CVSC claiming benefit

Item	**Retrofit**
Item description	Application of physical alteration of the building fabric (including appliances)
Cost	Varies enormously depending on the technology employed
Subsidisation levels	Various subsidies have existed for certain elements like insulation and VEECs exist for appliance replacements
Economic benefit	Benefit exists if the funds spent produce a saving over

	time in the amount of energy consumed in the house
Environmental benefit	Reduced energy consumed means less energy produced, therefore GHG savings
Remote or at source solution	At source
NPV of item over 15 years discounted at 5.54% if cost is $1,500	$1,001
IRR	15%
Degree of social capital required (low medium or high) and associated reasoning	Low – suggest most people would want a more energy efficient house.
Risk of double counting	Risk of double counting with Central Victoria Solar City
Existing examples	State based schemes have been offered by Sustainability Victoria
Misc comments	
Additionality issues (if any)	

Item	**Greenpower**
Item description	Acquisition of renewable energy by purchase from a retailer
Cost	A recurring market- based cost
Subsidisation levels	Nil
Economic benefit	Nil
Environmental benefit	Passes obligation back to the retailer to acquire the appropriate level of energy generated from renewable sources
Remote or at source solution	Remote solution
NPV of item over 15 years (discount rate = 5.54%)	-$3,386
IRR based on unsubsidised cost	Not applicable
Degree of social capital required (low medium or high) and associated reasoning	Medium – requires householders to commit to an ongoing cost with no financial benefit
Risk of double counting	
Existing examples	widespread

Misc comments	
Additionality issues (if any)	

Item	**Household Solar Electricity**
Item description	Installation of solar panels on household roof – power generated and fed through inverter to produce AC power – is then grid connected
Cost	$2,990 with price revision due 1 July 2011
Subsidisation levels	Currently subsidised by Central Victoria Solar City and the Solar Credits scheme
Economic benefit	The acquisition of an asset that produces electricity over 20+ years – whilst it involves an initial capital outlay, it provides a hedge against rising energy prices. Currently access is available to the Victorian Premium Feed-in Tariff.
Environmental benefit	Generation from renewable sources at the point of consumption
Remote or at source solution	At source solution
NPV of item over 15 years (discount rate = 5.54%)	$6,246 based on current subsidised form
IRR based on subsidised cost	26%
Degree of social capital required (low medium or high) and associated reasoning	Low – easily accessible product – low social impact – passive technology
Risk of double counting	Risk of double counting with Central Victoria Solar City and surrender of solar credits to the retailer
Existing examples	widespread
Misc comments	
Additionality issues (if any)	

Item	**Household Solar Hot Water**
Item description	Use of solar energy to heat water for domestic use
Cost	$2,141 in currently subsidised form
Subsidisation levels	Subsidised by Victorian Government point of sale

	rebate program – approx $1,500
Economic benefit	Savings associated with domestic consumption of hot water – approx 21% savings on household energy expected
Environmental benefit	Avoidance of consumption of electricity to heat water
Remote or at source solution	At source solution
NPV of item over 15 years (discount rate = 5.54%)	$2,457
IRR based on unsubsidised cost	20% (or 4% when compared against 100% off peak rate of electricity)
Degree of social capital required (low medium or high) and associated reasoning	Low – easily understood solution
Risk of double counting	Risk of double counting with Central Victoria Solar City, Victorian rebate scheme, sale of environmental credits to the retailer
Existing examples	widespread
Misc comments	
Additionality issues (if any)	May fail additionality test

Item	**Solar Park**
Item description	Aggregation of the installation of solar panels
Cost	Currently being reviewed – estimated at between $5 and 9$ per watt, most likely $6
Subsidisation levels	Nil – no subsidisation for medium scale solar at present
Economic benefit	Nil at present
Environmental benefit	Example of embedded generation at distribution level
Remote or at source solution	Remote solution
NPV of item over 15 years (discount rate = 5.54%)	Negative – but may become positive if off-grid
IRR based on unsubsidised cost	Negative
Degree of social capital required (low medium or high) and associated reasoning	Low – people appear interested in the concept
Risk of double counting	Double counting if the power is on-sold and the

	benefit counted in another model
Existing examples	Bendigo and Ballarat
Misc comments	
Additionality issues (if any)	Nil

Item	**Wind Farm**
Item description	Installation of wind turbines that generate electricity
Cost	$13m approx
Subsidisation levels	Nil apart from MRET influences
Economic benefit	Are economically viable in today's market
Environmental benefit	Generate energy from renewable source ie wind
Remote or at source solution	Remote
NPV of item over 15 years (discount rate = 5.54%)	$2,817,941
IRR based on unsubsidised cost	9%
Degree of social capital required (low medium or high) and associated reasoning	High – large project – high cost – not always accepted in local community
Risk of double counting	Depends on where power is sold and who claims environmental credits associated with production
Existing examples	Hepburn Wind
Misc comments	
Additionality issues (if any)	

Item	**Geothermal**
Item description	Drilling to a depth to access hot rocks or water supply – can then use heat to drive generation
Cost	Unclear but assumed to be close to Wind
Subsidisation levels	Nil
Economic benefit	Assumed high efficiency factor, therefore attractive

Environmental benefit	Usually considered generation from renewable source
Remote or at source solution	Remote
NPV of item over 15 years (discount rate = 5.54%)	$7,078,000
IRR based on unsubsidised cost	27%
Degree of social capital required (low medium or high) and associated reasoning	Medium – technology not known or understood
Risk of double counting	Yes if environmental credits sold separately
Existing examples	
Misc comments	
Additionality issues (if any)	

APPENDIX 3 – SCENARIO MODELLING

Scenario 1 – No Power Station, High household activity, Low GreenPower uptake

- *High* uptake of household interventions (150 energy audits, 150 SHW, 50 PV systems, 125 retrofits)
- Low uptake of Greenpower by householders (25) or other users (10% of consumption) as no traction for adoption - no social connection to a local generator
- the balance of the path to carbon neutrality on stationery energy needs to be undertaken through high levels of sequestration or purchase of offsets (56% of the load falls to sequestration of offsets)

Scenario 2 - No Power Station, Low household activity, Low GreenPower uptake

- *Low* penetration of initiatives (100 energy audits, 25 SHW, 5 PV systems, 25 retrofits)
- Low uptake of Greenpower by householders (25) or other users (10% of consumption)
- Virtually the entire load left to sequestration or offsets (79%)

Scenario 3 – Local Power Station selling GreenPower locally and high household activity

- *High* uptake of household interventions (150 energy audits, 150 SHW, 50 PV systems, 125 retrofits)
- High uptake of Greenpower by households (175) and other users (60% of consumption) due to local generator in the district selling its power to an accommodating retailer who tailors a product for local consumption
- Balance falling to sequestration or offsets is minimal

Note: Further scenario modelling can be undertaken based on feedback from the community

APPENDIX 4 – WORK PAPERS

[See attached PDF documents]