City of Mount Gambier
BLUE LAKE CITY

City of Mount Gambier

Civic Centre
10 Watson Terrace
Mount Gambier SA 5290

P 08 8721 2555
F 08 8724 9791
city@mountgambier.sa.gov.au
www.mountgambier.sa.gov.au

Reference: AF12/377 SW

20 February 2014

**MEMBERS**

**NOTICE** is hereby given that the Environmental Sustainability Sub-Committee will meet in the following Meeting Room on the day, date and time as follows:

**Environmental Sustainability Sub-Committee**
*(Conference Room - Level 1):*

Tuesday, 25th February 2014 at 7:30 a.m.

An agenda for the meeting is enclosed herewith.

**Mark McSHANE**
CHIEF EXECUTIVE OFFICER

ENVIRONMENTAL SUSTAINABILITY SUB-COMMITTEE
Meeting to be held on Tuesday, 25th February 2014 at 7.30 a.m.

AGENDA

1. ENVIRONMENTAL MANAGEMENT - Renewable Energy Options Investigation - Ref. AF11/407

2. ENVIRONMENTAL MANAGEMENT - Aquatic Centre Biomass Boiler Case Study - Ref. AF11/407

3. ENVIRONMENTAL MANAGEMENT - Environmental Sustainability Sub-Committee - Reports for information - Ref. AF12/377

ENVIRONMENTAL SUSTAINABILITY SUB-COMMITTEE

Meeting to be held in the Conference Room, Operational Services Area, Level One of Civic Centre, 10 Watson Terrace, Mount Gambier, on Tuesday 25th February 2014 at 7:30 a.m.

AGENDA

PRESENT: Crs D Mutton, A Smith, B Shearing and I Von Stanke

APOLOGIES: moved the apology received from be accepted.

seconded

PRESIDING MEMBER: The Environmental Sustainability Officer invited nominations for the position of Presiding Member for this Sub-Committee.

nominated as Presiding Member.

There being no further nominations was nominated Presiding Member for this Sub-Committee.

COUNCIL OFFICERS: Daryl Sexton, Director - Operational Services
Aaron Izzard, Environmental Sustainability Officer
Tracy Tzioutziouklaris, Strategic Project Officer
Team Leader - Administration (Operational Services), Sally Wilson

COUNCIL MEMBERS AS OBSERVERS:

**WE ACKNOWLEDGE THE BOANDIK PEOPLES AS THE TRADITIONAL CUSTODIANS OF THE LAND WHERE WE MEET TODAY. WE RESPECT THEIR SPIRITUAL RELATIONSHIP WITH THE LAND AND RECOGNISE THE DEEP FEELINGS OF ATTACHMENT OUR INDIGENOUS PEOPLES HAVE WITH THIS LAND.**

MINUTES: moved that the minutes of the previous meeting held on Tuesday, 17th December 2013 be taken as read and confirmed.

seconded

QUESTIONS: (a) With Notice - nil submitted.
(b) Without Notice -

**1. ENVIRONMENTAL MANAGEMENT - Renewable Energy Options Investigation - Ref. AF11/407**

*Goal:* *Environment*
*Strategic Objective:* *(i) Systematically build Council as an environmentally sustainable organisation*

The Environmental Sustainability Officer reported:

(a) One of the Environmental Sustainability Programs tasks is to conduct a Renewable Energy Options Investigation. The purpose of the report is to investigate various renewable energy options in a holistic sense, and outline Council's options with regards to utilising renewable energy for all or part of its electricity use. The intended outcomes of the investigation include:

- Financial savings on energy costs;
- Insulate Council from further rises in energy costs;
- Gradually increase Council's utilisation of renewable energy;
- Move Council towards true sustainability in line with the Natural Step Framework.

This investigation is now complete and report attached to this agenda;

(b) at the 20th May 2008 Council meeting, Council formally adopted the Natural Step Framework (TNS). The TNS system conditions indicate that Council should reduce, and eventually eliminate, its contribution of substances into the environment that do not break down quicker than they are contributed. This includes greenhouse gases. The majority of Council's electricity comes from power plants that burn either coal or gas, generating greenhouse gas emissions;

(c) when considering utilising renewable energy the first step is to improve energy efficiency, to reduce reliance on electricity. Energy use should be reduced as much as reasonably practicable, then the balance provided by renewable energy. In 2011 Council had energy audits done on most components of its major buildings, with the largest omission being a technical analysis of the Civic Centre HVAC systems. A number of the actions highlighted in the 2011 audits are still outstanding.

(d) the second step is to reduce reliance on fossil-fuelled electricity. Council currently purchases 20% green power. Council paid $8,016 in 2012-2013 for green power. If Council wishes to increase its percentage of green power then under the current contract with the supplier it would cost an extra 50% for every 10% increase in green power. For example, if Council chose to purchase 40% green power then it would cost approximately $16,000 per year. If Council wished to purchase 100% green power it would cost five times the amount that Council currently pays, hence it would cost approximately $40,000 per year. Green power rates tend to rise in the same manner as conventional electricity, and there is no payback period;

(e) the main alternative to purchasing green power is for Council to install its own renewable energy systems - solar, wind or biomass. The benefits of this approach include a payback period and long term financial savings, as well as publicly demonstrating to the community that Council supports and utilises renewable energy;

(f) the most likely Council site for solar is the Library. Due to the pattern of use and the configuration of the roof, almost all of the electricity generated would be utilised in the facility. It is a high profile site, and the most highly patronised community facility. A display screen could be incorporated with the installation, which would display current and historical electricity generation and usage, providing a community education component;

(g) a solar system on the Library could cost from $8,900 for a small 5 kW system, up to $105,000 for a larger 60 kW system. The payback period depends on the capital costs and size of the system, but could be as low as 7 years. In terms of financing the capital costs there are two options. One is outright purchase, the other is a lease arrangement. With the lease arrangement there is no upfront capital cost, the system in leased for 5-10 years and then owned by Council, essentially a kind of lease-to-own arrangement. This arrangement could deliver a net financial savings as quickly as year two after installation, with no expensive capital outlay;

(h) regarding generating electricity from wind, a wind turbine may not be appropriate in amongst buildings, due to turbulence issues, but may be suitable to be placed on reserves with adequate clearance. Council has a number of reserves where a small wind turbine could be situated with minimal disturbance. Council could investigate whether it

would be financially viable to install a wind turbine on one of Council's reserves. TAFE SA could be invited to be involved in this investigation;

(i) when current hot water systems reach their end of life and are required to be replaced, renewable alternatives should be investigated - including solar, heat pump, or biomass systems.

moved it be recommended:

(a) The report be received;

(b) commencing in the 2014-2015 financial year, Council endeavour to establish an annual budget item of $50,000 for energy efficiency and renewable energy measures. These funds should be used for actions focused on delivering the greatest financial savings, in the shortest time period. Energy efficiency measures should be considered first;

(c) the outstanding actions from the 2011 energy audits be completed, and a technical audit of the HVAC systems of the Civic Centre be undertaken. These actions are to be funded from the budget item referred to in recommendation (b);

(d) subject to an allocation in the 2014/2015 adopted Budget, Council release a tender for the installation of a solar power system on the roof of the Library;

(e) when current hot water systems reach their end of life and are required to be replaced, renewable alternatives are to be investigated;

(f) investigate whether it would be financially viable to install a wind turbine on one of Council's reserves, and invite TAFE SA to be involved in this investigation.

seconded

**2. ENVIRONMENTAL MANAGEMENT - Aquatic Centre Biomass Boiler Case Study - Ref. AF11/407**

*Goal:* *Environment*
*Strategic Objective:* *(i) Systematically build Council as an environmentally sustainable organisation*

The Environmental Sustainability Officer reported:

(a) In September 2013 Council's contractors installed a new biomass boiler at the Mount Gambier Aquatic Centre. Council has been a leader amongst local government in terms of utilising renewable energy to generate heat. The biomass boiler at the Aquatic Centre utilises biomass to create heat, which in turn heats the water for the pools. Utilising biomass to heat the pools not only supports local industry and is carbon neutral, it also has significantly cheaper operating costs than a gas boiler;

(b) there has been significant interest in the project from other local governments and other organisations. In order to showcase the project a case study has been written about the Mount Gambier Aquatic Centre biomass boiler installation (attached to this agenda). This case study can be put on the City of Mount Gambier website and promoted to interested parties.

moved it be recommended:

(a) The report be received;

(b) Council approve of the publishing of the Mount Gambier Aquatic Centre Biomass Boiler Case Study to the City of Mount Gambier website and promoted.

seconded

**3. ENVIRONMENTAL MANAGEMENT - Environmental Sustainability Sub-Committee - Reports for information - Ref. AF12/377**

*Goal:* *Environment*
*Strategic Objective:* *(i) Systematically build Council as an environmentally sustainable organisation*

The Environmental Sustainability Officer reported the following for information:

(a) Workshop: Identify Common Weed Species and Native Plants

The City of Mount Gambier is partnering with Nature Glenelg Trust (NGT) for the delivery of a workshop being run by Neville Bonney. The workshop is an Introduction to Identifying the Ferals of the Bush in the South East of SA. Participants will able to view specimens and be shown the botanical differences. What is a Native Plant, What is not. A useful workshop for those interested in Native Seed collection, Local and State Government employees who carry out weed control programs, Native Plant Identification, or those just wanting to learn more about the health of our Natural Bushland. Details of the workshop are below:

Identify Common Weed Species and Native Plants

Date: Saturday the 22nd of March
Time: 9:00am to 12:30pm
Where: NGT Community Nursery, Vansittart Park, Mount Gambier

RSVP by 19th March to:

Ken Baker, NGT Community Nursery Co-ordinator, ken.baker@natureglenelg.org.au, 0437 597 685

(b) Environmental Sustainability Program 2014 - Project Progress

The current table outlining projects for 2014 is attached to the agenda for Members information.

moved it be recommended:

(a) The report be received;

(b) items (a) to (b) as above be received and noted for information.

seconded

**MOTIONS WITHOUT NOTICE**

The meeting closed at a.m.

20 February 2014
AF12/377
SW

# Renewable Energy Options Investigation

*Aaron Izzard, Environmental Sustainability Officer, City of Mount Gambier*

*February 2014*

## Purpose

The purpose of this report is to investigate various renewable energy options in a holistic sense, and outline Council's options with regards to utilising renewable energy for all or part of its electricity use.

## Intended Outcomes

- Financial savings on energy costs;
- Insulate Council from further rises in energy costs;
- Gradually increase Council's utilisation of renewable energy;
- Move Council towards true sustainability in line with the Natural Step Framework.

## Natural Step Framework

At the 20 May 2008 Council meeting, Council formally adopted the Natural Step Framework (TNS), to be used as a planning tool to enable Council to integrate environmental and social considerations into strategic decisions as well as daily operations. The TNS system conditions indicate that Council should reduce, and eventually eliminate, its contribution of substances into the environment that do not break down quicker than they are contributed. This includes greenhouse gases. The majority of Council's electricity comes from power plants that burn either coal or gas, generating greenhouse gas emissions.

Renewable energy does not generate any emissions, or is at least carbon neutral – as is the case with sustainable biomass options. If Council is going to move towards true sustainability in line with the Natural Step Framework, then it must gradually increase its utilisation of renewable energy.

## Renewable Energy Options

The most feasible renewable energy options for Council include:

- Purchase green power;
- Install solar power;
- Install wind power;
- Install bioenergy (from organic materials);
- Combination of the above.

**Amount of Electricity**

Over the last three financial years Council has had the following total electricity use:

- 2010-2011 1,182,999 kWh
- 2011-2012 1,254,454 kWh
- 2012-2013 1,381,155 kWh

Council should strive to reduce the overall amount of electricity it uses as much as is reasonable, then gradually increase the proportion of renewable energy.

*Current costs*

Council paid $494,179 in 2012-2013 for its electricity.

*Expected future costs*

Electricity costs are expected to rise in coming years at a greater rate than CPI, approximately 5-8% per annum. From 2011/12 to 2012/13, regulated prices in South Australia rose nominally by 13 per cent[1]. Some organisations have experienced much higher increases.

If Council installs its own renewable energy systems then it will be insulated from these rising costs, to the extent of the proportion of its total electricity use that is generated from its renewable energy systems.

**Energy Efficiency**

When considering utilising renewable energy the first step is to improve energy efficiency, to reduce reliance on electricity. Energy use should be reduced as much as reasonably practicable, then the balance provided by renewable energy. In 2011 Council had energy audits done on most components of its major buildings, with the largest omission being a technical analysis of the Civic Centre HVAC systems. A number of the actions highlighted in the 2011 audits are still outstanding.

**Current Practice with Regards to Renewable Energy**

Currently Council purchases 100% green power for the Library, and 20% green power for all other electricity accounts. This reduces Council's emissions compared to buying no green power. Council heats the pool water at the Aquatic Centre with a biomass heater, using local pine wood chips as the fuel – a carbon neutral process.

**Green Power**

[1]Australian Energy Market Commission March 2013. Electricity Price Trends Final Report – Possible future retail electricity price movements: 1 July 2012 to 30 June 2015.

GreenPower is a government accreditation program that enables an energy provider to purchase renewable energy on its customer's behalf. GreenPower is renewable energy sourced from the sun, wind, water and waste[2].

As stated above, Council currently purchases green power for part of its electricity use.

One of the major drawbacks of green power is that there is no pay back period. Green power operates in the same manner as conventional electricity, a fee is paid for the provision of electricity.

Council has informed the community that it purchases green power, but this is not as easily understood as seeing a physical solar power system or small wind turbine on a Council property. Solar power or wind systems in prominent places serve as a constant reminder that renewable energy is being generated at that site.

Council's green power is purchased through Pacific Hydro, fossil-fuelled electricity is purchased through Origin Energy.

*Current costs*

Council paid approximately $8,016 in 2012-2013 for green power. Council has been purchasing green power for 5-6 years, for an approximate accumulated cost of $36,200 on top of purchasing fossil fuelled electricity. Initially 10% green power was purchased, this was then increased to 20%.

*Expected future costs*

Green power rates tend to rise in the same manner as conventional electricity. In order to be consistent with the Natural Step Framework, Council should increase its utilisation of renewable energy. If Council chooses to utilise green power for this purpose, then it should gradually increase the percentage purchased over time.

If Council wishes to increase its percentage of green power then under the current contract with Pacific Hydro it would cost an extra 50% for every 10% increase in green power. For example, if Council chose to purchase 40% green power then it would cost approximately $16,000 per year. If Council wished to purchase 100% green power it would cost five times the amount that Council currently pays, hence it would cost approximately $40,000 per year.

**Council Installations**

The main alternative to purchasing green power is for Council to install its own renewable energy systems. This could be solar, wind or biomass systems.

Council has been a leader amongst local government in terms of utilising renewable energy to generate heat. The biomass boiler at the Aquatic Centre utilises biomass to create heat, which in turn heats the water for the pools. This system does not create electricity, but only generates heat.

Solar power or wind systems in prominent places serve as a constant reminder that renewable energy is being generated at that site, as opposed to purchasing green power. They would set a clearly visible example to the community that Council is investing in renewable energy.

[2] What is GreenPower? http://www.greenpower.gov.au/About-Us/What-Is-GreenPower/

Installing a renewable energy system to generate electricity on a Council site would involve the capital cost for purchasing and installing the equipment. There may be minor ongoing maintenance costs depending on what type of system is installed. Post installation, any electricity generated by the system which is used at the site is essentially free. So rather than paying an external provider for that electricity, Council is generating its own.

Given this, properly sized and designed renewable energy systems deliver pay back periods. That means that the savings in electricity costs eventually pay for, and then exceed, the initial capital cost of the system. Once this point is reached, the system is delivering overall net financial savings to the organisation, essentially generating electricity for free.

If Council were to install renewable energy systems on its properties it could partner with the local TAFE to collect data from these systems, and use this information to provide advice to the community about which systems are the most efficient for our region.

In order to install a renewable energy system, Council would need to negotiate with its electricity retailer, especially if any electricity was going to be fed into the electricity grid. If a system is to be connected to the electricity grid, then Council would also need to negotiate with SA Power Networks, as they are the organisation who maintains the grid.

At this point in time it is generally more cost effective to size a system to only feed the building/site on which it is located. Current feed in tariffs are not large enough to make feeding into the grid an attractive investment.

### ***Solar***

Solar power is the most well established form of small scale renewable energy in Australia. There are one million homes around the country that have a solar system installed. Many councils across Australia have installed solar systems on their buildings, with payback periods as short as 6 years[3], after which, the electricity generated by the system is essentially free.

The solar industry has suffered from a chronic lack of certainty when it comes to legislation affecting the sector. The rules regarding feed in tariffs, service charges, grid connection and other issues have regularly changed in every state, and also at a federal level. Following the 2013 Federal election there is yet again uncertainty regarding legislation affecting the solar industry. One approach to best manage this uncertainty is to avoid connecting to the electricity grid, and only supply electricity to the site on which the system is located. Council's electricity retailer still needs to be involved, but some of the complexity is removed.

#### *Locations*

Solar systems are generally installed on north facing roofs, as these give the greatest generation rates. West facing roofs give the second best generation. Ideally there should be no shading of the system, and the angle of the roof should be as close to 37° as possible (Mount Gambier's latitude).

With regards to having an appropriate roof arrangement and high electricity usage, there are a number of Council buildings on which a solar system could be installed. Possible sites include:

- Mount Gambier Library (Electricity use approximately 350,000 kWh/pa);

[3] Sustainable Focus December 2012. Energy Efficiency & Solar Power Review – Prepared for the City of Charles Sturt.

- Civic Centre (Electricity use approximately 210,000 kWh/pa);
- Lady Nelson (Electricity use approximately 75,000 kWh/pa);
- Council Depot (Electricity use approximately 48,000 kWh/pa);
- Waste Transfer Centre (Electricity use approximately 4,800 kWh/pa);
- Aquatic Centre (Electricity use approximately 175,000 kWh/pa) – externally managed site.

Renewable energy systems could also be installed on Council owned community facilities, but these generally do not have the same occupancy rates as Council occupied sites. This would require electricity to be fed into the grid, reducing the viability of the installation.

The most likely Council sites for solar are the Library and the Civic Centre. With regards to the Library, at this point in time, only part of the site's electricity use could be supplied by solar power, not 100%. This is because there is not enough space on the roof to accommodate a system large enough to supply all its electricity needs. However, this will result in the vast majority of the generated electricity being used in the building, with only a minimal amount being fed back into the grid. It is a high profile site, and the most highly patronised community facility. A display screen could be incorporated with any installation in a public building, which would display current and historical electricity generation and usage, providing a community education component.

Regarding the Civic Centre, before any solar installation is seriously considered, an assessment of the anticipated remaining lifespan of the roofing material would need to be undertaken.

*Potential Capital Costs*

Using the Library as an example, the installation of a solar system could cost from $8,900 for a small 5 kW system, up to $105,000 for a larger 60 kW system. The payback period depends on the capital costs and size of the system, but could be as low as 7 years. The site's electricity use is primarily during daylight hours, when the solar system generates electricity, reducing the need to feed electricity into the grid.

In terms of financing the capital costs there are two options. One is outright purchase, the other is a lease arrangement. With the lease arrangement there is no upfront capital cost, the system in leased for 5-10 years and then owned by Council, essentially a kind of lease-to-own arrangement. This arrangement could deliver a net financial savings as quickly as year two, with no expensive capital outlay.

*Potential Ongoing Costs and Maintenance Requirements*

Solar systems generally do not require a great deal of maintenance and as such have minimal ongoing costs. When in proper working order solar power systems result in ongoing financial savings. A minimum tilt of 15° is recommended to ensure self cleaning by rainfall. If they get covered in dust or bird droppings they may need a clean, but this is not very often, perhaps once a year. Council could get contractors to do an annual clean (if required), or Council staff could be trained to undertake this task. If a solar system were installed then a maintenance schedule should be created.

An annual maintenance inspection could involve an inspection of all fixings and mounts to ensure that they are still secure and that there is no corrosion, a visual cable and connection inspection, all breakers and points of isolation checked for correct operation, and an electrical PV string test to ensure that the modules

are operating within range. Inverter data could also be downloaded and assessed to look at any error codes or warnings to make sure everything is in proper working order.

*Planning Requirements*

Generally planning and building approvals are not required for the installation of solar panels on a roof, with the following exceptions:

- If the solar system is installed on a frame that is raised >100mm off the roof;
- The building is in a State Heritage Place or Area.

*Note: If a system is proposed to be installed on a Council building the project should be discussed with Planning and Building Officers as early as possible, as site-specific circumstances may require planning and/or building approvals.*

*Community Owned Solar*

The City of Campbelltown, with funding from the LGA Solar Innovation Fund, has commenced a 3 phase study into the viability of a Community Owned Solar Scheme on Council owned buildings - Campbelltown Community Owned Solar Study. Basically this means that Council would provide the roof space, whilst community members provide the capital funds. Council would then agree to purchase a component of the electricity generated. This is essentially a form of local and direct green power.

***Wind***

The South East is known for its reliant wind supply. This is evidenced by the numerous commercial wind farms that operate in the area (Canunda, Lake Bonney, Kongorong etc.), as well as others that have been proposed but rejected due to concerns about proximity to residences.

Wind turbines come in a variety of sizes, including many for domestic applications. Most require uninterrupted wind flows, though some newer models are designed to deal with the turbulence of urban environments.

Wind installations need to be sited in close proximity to the electricity grid, as it is expensive to install new electrical cables over long distances.

As a relatively new industry the small-scale wind turbine industry has had issues with reliability. Some companies provide proven systems, whilst others do not deliver on their claims. Trials in Zeeland (The Netherlands) and Warwick (England) have indicated that the actual performance of most turbines is well below the performance predicted by the manufacturers, sometimes significantly so.

Trials undertaken by the local TAFE indicate that horizontal axis turbines (the conventional design) do not operate well in an urban environment due to the prevalent turbulence. A vertical axis turbine may be better suited to generate electricity even in turbulence. However, caution would need to be taken as some customers have had issues with vertical axis turbines. Wind turbines have numerous moving parts, compared to solar, which has no moving parts and is a proven technology.

If Council were to consider wind power, then it should do so only with a reputable company with a history of good performance, who have had their products independently tested.

In order to gain the greatest efficiency, a wind turbine may not be appropriate in amongst buildings, due to turbulence issues, but may be suitable to be placed on reserves with adequate clearance. Council has a number of reserves where a small wind turbine could be situated with minimal disturbance, including:

- Corriedale Park;
- Blue Lake Sports Park;
- Malseed Park;
- Hastings Cunningham Reserve.

If a small wind turbine were to be installed on a Council reserve the electricity may have to be fed into the grid. This could reduce the viability of such a project, if an adequate feed in tariff could not be secured. An alternative could be to directly feed the electricity into community facilities on the site, though given these facilities have generally low occupancy rates, feeding into the grid may still be required.

The first step when considering a wind installation is to undertake wind monitoring at the sites first to see if it would be viable. This could possibly be done in partnership with TAFE SA.

If Council were to propose the installation of a small wind turbine on one of its reserves, it should consult with the community groups and nearby residents who use the reserve. Noise pollution can be an issue if residents live in close proximity to the installation.

When considering small-scale wind here are some good general guides to consult:

- Victorian Consumer Guide to Small Wind Turbine Generation

  http://frds.dairyaustralia.com.au/wp-content/uploads/2012/01/Small_Wind_Generation1.pdf

- NSW Small Wind Turbine Consumer Guide

  http://www.environment.nsw.gov.au/resources/climatechange/0449SWCG.pdf

- The Viability of Domestic Wind Turbines for Urban Melbourne

  http://www.esc.vic.gov.au/getattachment/2c104e6c-6cc9-47f2-9e08-c50f712b64bb/ATA-Viability-of-domestic-Wind-Turbines-for-Urban.pdf

*Potential Capital Costs*

Some indicative capital costs from the NSW Small Wind Turbine Consumer Guide are outlined below:

| System size | System type | Estimated price range |
|---|---|---|
| 1kW | Horizontal axis wind turbine on a 15-20 m tilt-up pole | $20-30,000 |
| 2-3kW | Horizontal axis wind turbine on a 10-15 m monopole | $30-$40,000 |
| 5kW | Horizontal axis wind turbine on a 20-30 m tilt-up pole | $40-$60,000 |
| 10kW | Horizontal axis wind turbine system on a 20 m monopole | $65-$75,000 |
| 1-2kW | Roof mounted horizontal axis wind turbine system | $15-$25,000 |
| 5-6kW | Roof mounted vertical axis wind turbine system | $50-60,000 |

*Potential Ongoing Costs and Maintenance Requirements*

Some indicative economics of wind turbine systems from the NSW Small Wind Turbine Consumer Guide are outlined below:

| Turbine type | Initial balance (cost of investment) before RECs | Payback period | | Final balance at 20 years | |
|---|---|---|---|---|---|
| | | *7 m/s average wind speed* | *5 m/s average wind speed* | *7 m/s average wind speed* | *5 m/s average wind speed* |
| 3 kW horizontal axis on monopole | -$30,000 to -$40,000 | Approx 7-10 years | Approx 10-13 years | +$60,000 to +85,000 | +$20,000 to +$40,000 |
| 10 kW horizontal axis on monopole | -$60,000 to -$70,000 | Approx 6-9 years | Approx 11-14 years | +$150,000 to +250,000 | +$50,000 to +100,000 |

Similar to solar power systems, wind turbines generally require little maintenance. Servicing requirements range from once per year to once every five years, for an approximate cost of $300 to $500 plus parts.

An annual maintenance check could possibly be undertaken by TAFE SA as part of their renewable energy teaching program.

*Planning Requirements*

The erection of a wind turbine generally does not need planning or building approval, except in the following circumstances:

- The turbine has a total height of >10m above ground level if not connected to an existing structure;
- If connected to an existing structure, the turbine has a total height of >4m above the highest point of the structure.

*Note: If a system is proposed to be installed on a Council building the project should be discussed with Planning and Building Officers as early as possible, as site-specific circumstances may require planning and/or building approvals.*

**Heat – Including Hot Water**

As mentioned in the “Council Installations” section of this report, Council has been a leader amongst local government in terms of utilising renewable energy to generate heat. The biomass boiler at the Aquatic Centre utilises biomass to create heat, which in turn heats the water for the pools. This system does not create electricity, but only generates heat.

Other possible Council heat installations include replacing hot water units with solar, heat pump, or biomass versions, as they are required to be replaced.

When current hot water systems reach their end of life and are required to be replaced, renewable alternatives should be investigated.

*Note: If a system is proposed to be installed on a Council building the project should be discussed with Planning and Building Officers as early as possible, as site-specific circumstances may require planning and/or building approvals.*

**Conclusion and Recommendations**

The Natural Step Framework requires that Council reduce, and eventually eliminate, its contribution of greenhouse gases to the atmosphere. The majority of Council’s electricity comes from power plants that burn either coal or gas, generating greenhouse gas emissions. The majority of Council’s heat comes from fossil fuelled electricity or from burning gas.

The first step in this process is to reduce energy consumption as low as reasonably practicable. A number of the actions highlighted in the 2011 energy audits are still outstanding. These should be completed as the ongoing budget allows, acknowledging that they will lead to financial savings. A technical audit of the HVAC systems of the Civic Centre should be undertaken as soon as the ongoing budget allows.

Once energy consumption is reduced the next step is to utilise renewable energy to supply Council’s energy needs.

Purchasing green power is a good and convenient option, Council simply pays the tariff and the supplier organises the renewable energy. Council does not have to worry about maintenance or other issues that may arise with direct installations. However, green power does not insulate Council from further rises in electricity costs, nor does it have a pay back period.

Investing in its own renewable energy installations will protect Council from further rises in energy costs, it will also directly save Council money once the pay back period has been realised.

Council should consider ceasing purchasing green power and re-investing these funds towards energy efficiency measures and renewable energy installations.

Commencing in the 2014-2015 financial year, Council should establish an annual budget item of $50,000 for energy efficiency and renewable energy measures. These funds should be used for actions focused on delivering the greatest financial savings, in the shortest time period.

Regarding Council’s own installations, the first step should be to release a tender for the installation of a solar power system on the roof of the Library, preferably on a lease-to-own arrangement, hence avoiding the need for upfront capital costs. Purchasing a system on a lease arrangement may be able to be accommodated in the existing electricity component of the Library’s budget. The tenders should be assessed by a panel who would make a subsequent recommendation to Council. When a system is installed Council could cease purchasing green power for the site.

With regards to the Civic Centre the first steps are to complete the actions from the 2011 energy audit, and commission a technical analysis of the HVAC systems. Some additional actions may arise out of the HVAC audit. When these are complete an assessment of the anticipated remaining lifespan of the roofing material would need to be undertaken. If the expected lifespan is greater than 25 years then tenders should be released for a solar power system on the roof of the building. This must be undertaken in conjunction with Country Arts SA, as the owners of the building.

Once these two buildings are complete, attention should be focused on the Lady Nelson, Council Depot, Waste Transfer Centre and the Aquatic Centre. Again, energy efficiency first, then renewable energy installations.

To investigate the possibility of wind power Council staff should work with TAFE SA on whether it would be financially viable to install a wind turbine on one of Council's reserves, most likely Blue Lake Sports Park. This may involve installing a temporary wind monitor (anemometer) at the site.

In terms of utilising renewable energy for heat, when hot water systems are required to be replaced, renewable alternatives should be investigated.

At some point in the future Council will reach its capacity for renewable energy installations on its sites, particularly solar, unless there are dramatic improvements in efficiency, which there may be when the systems have reached the end of their useful life in 20-25 years. Once Council has reached capacity then any remaining energy balance should be supplied by purchasing green power.

If Council chooses not to install its own renewable energy systems then it should purchase 100% green power from its electricity supplier.

*Case Study*

# Mount Gambier Aquatic Centre Biomass Boiler

***February 2014***

## Background

The Mount Gambier Aquatic Centre was constructed by the Mount Gambier City Council in the 1980s as an outdoor pool facility for the local community. The Centre has three pools – an Olympic sized pool, a toddler pool and a learner pool - for a total volume of 1.38 ML (including balance tanks). The large pool is heated to 27-28$^{o}$C, the smaller learner pool is heated to 30-32$^{o}$C.

The Centre is open seven days a week for six months of the year, from the start of October to the end of March.

From the very beginning of the facility the pool water was heated by a biomass boiler, and via two heat exchangers whose combined capacity is 520 kW. The original biomass boiler ran on fresh sawdust from a local timber mill. After thirty years of dedicated service the original boiler had become unreliable and difficult to operate.

Replacement options were investigated and included a straight gas boiler, a combined solar hot water and gas option, and biomass boilers. All options were subjected to a triple bottom line assessment, which included analysing potential capital costs, operating costs, community benefits and costs, and environmental benefits and costs. The conclusion of this analysis was that whilst a biomass boiler would have a higher capital cost than a straight gas boiler, the running costs would be cheaper, which results in significantly reduced costs over a ten year period. Purchasing biomass from the local forestry industry supports local jobs, as opposed to importing gas from outside the region. The trees that the biomass is sourced from are regrown, and so the fuel source is essentially carbon neutral, as opposed to gas which is a fossil fuel that contributes to human-influenced global warming.

Following on from this analysis a tender was released for the supply of a new biomass boiler for the Aquatic Centre.

## 650 kW Binder Boiler

Living Energy were selected as the company to supply the new boiler. Their proposed solution was a boiler manufactured in Austria by Binder, rated by the manufacturer as having a theoretical maximum output of 650 kW. It is a more technologically advanced boiler than the original one at the Centre, is more responsive to changes in heat demand (which are in turn influenced by the weather), and can be monitored and settings changed remotely over the internet.

The Binder boiler has automatic ash removal, which significantly reduces the maintenance cost on the previous system, which had to have ash manually removed an average of three times per week.

The boiler only produces heat, not electricity.

## Feedstock

The boiler runs on dry woodchip, with the ideal moisture content being 20-30%. The long term source of wood chip is pine (*Pinus radiata*) sourced from the local forestry industry. In the start-up phase a variety of dry hard wood chip was tested with the new system. These were sourced from logs at a Council stockpile, resulting from trees that had been felled by maintenance activities of Council staff. The boiler ran well on this feedstock, but the feed system was regularly jammed by over-sized pieces. The contractor that was used to chip the logs did not have a screen on their operation, meaning Council staff had to manually screen the chips as they were being loaded into the bunker. This will not be an issue in the long term, as the source of pine wood chip uses a screen as part of their chipping operation.

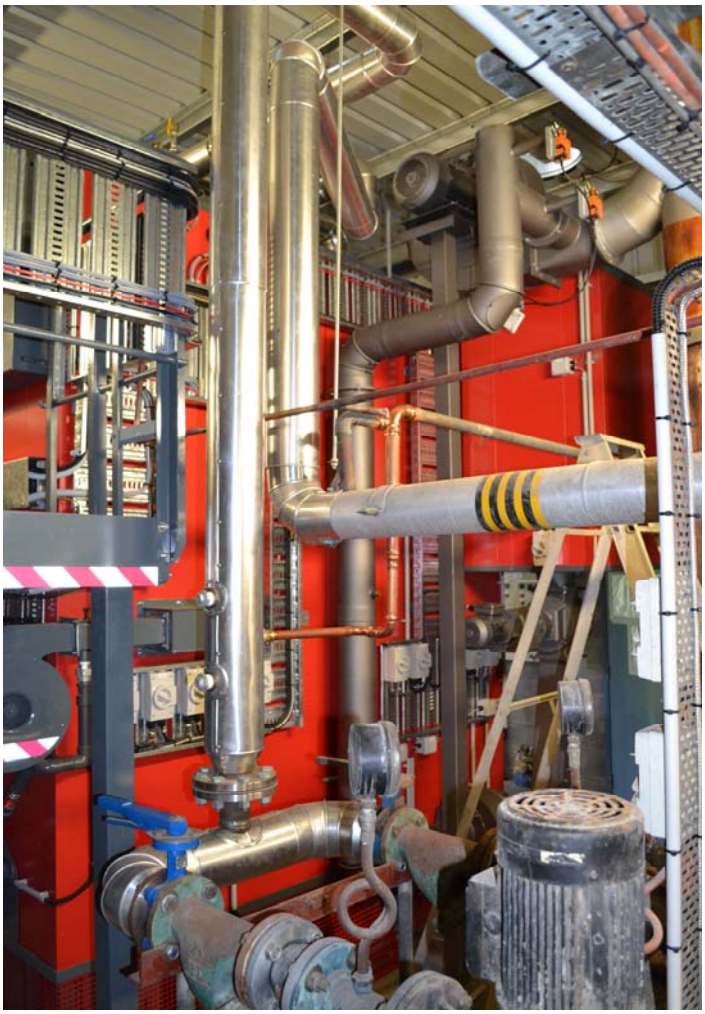
Council has considered using untreated urban timber waste collected at its Transfer Station, and may conduct a trial in the future. Even if the trial is successful this would only supplement the main source of feedstock.

## Performance

Running on dry wood chip the boiler heats the water very efficiently and without any issues. It is able to raise the temperature of the water much quicker than the previous system.

It was hoped that a newer more efficient boiler would use less feedstock than the previous boiler, but to date it has actually used more feedstock. For convenience sake it would have been preferred to maintain the existing feedstock supply chain, but the Binder boiler can only run on dry feedstock, which local timber mills are unable to provide. This has required establishing a new supply chain. Dry wood chip is more expensive per tonne than fresh sawdust, but it has a higher energy content.

Feedstock costs are higher with the new system, but it is still much cheaper to run than a gas system.



The unit uses between 5 m3 and 10 m3 of wood chips per day, the exact amount being influenced by the weather, with less wood chip being required in warmer weather. It is anticipated that the unit will use approximately 1,400 m3 (850 tonnes) of wood chips over the six months that the pool is open.

## Payback Period

When comparing the biomass system to the most likely alternative – a straight gas boiler – the payback period is approximately 4 years. If natural gas prices do increase significantly within the next few years as predicted[1], then this period becomes even shorter.

## Teething Problems

There have been some minor teething problems since the installation of the new system, with numerous being as simple as changing settings.

[1] Core Energy Group Pty Ltd (February 2012), Price Pathways to 2020 – Gas and Electricity.

Switching fuel from sawdust to woodchip caused some problems, though these related to the existing feed system and not the boiler.

Some of the sensors and alarms on the new boiler had to be adjusted to suit the local situation.

## Advantages and Disadvantages

Advantages

In this particular situation a biomass system is much cheaper to run than a straight gas system. Even though it has a higher capital cost, when the capital and operating costs are averaged out over ten years the biomass system is still much more cost effective on an annualised basis than gas.

The utilisation of wood chips from the local forestry industry supports local jobs. The skill set of local workers involved in the project is also expanded.

It is the most environmentally friendly of the options analysed, as it is carbon neutral and utilises a renewable energy supply.

Disadvantages

The main disadvantage with this kind of biomass systems is that it requires more human input than a straight gas system. With the latter system, the fuel is piped in and the system runs mostly automatically, requiring little human input. With a biomass system, the trees need to be harvested and chipped (which in most situations will be occurring regardless, wood chips are simply purchased that were going to be made anyway), the chip needs to be stored (unless they can be made on demand, but for smaller systems this is unlikely to be cost effective), and it needs to be delivered to the site. Even with these costs factored in, it is still cheaper to run than a gas system, and it is supporting local jobs.

## Final Reflections

Biomass boilers are not common for this kind of application in Australia, but are very common in Europe, North America, and becoming more common in New Zealand. Biomass systems can compare financially favourable when compared to gas systems – especially when gas prices are projected to significantly increase in 2015 for a variety of reasons, including the export of significant volumes of Australian gas to the international market[2]. Capital costs may be higher, but operating costs can be significantly lower, though this needs to be analysed for each particular situation.

One of the keys to making a bioenergy project financially viable is to utilise the heat. Some systems can create electricity, but the heat still generally needs to be utilised to make them viable.

[2] Core Energy Group Pty Ltd (February 2012), Price Pathways to 2020 – Gas and Electricity.

However, these projects can be viable when they are only generating heat, and not electricity, which is the case with the Mount Gambier Aquatic Centre installation.

A level of energy independence can be achieved, through securing a local source of energy (biomass feedstock), as opposed to importing fossil fuel energy from outside the region. The energy source is also renewable, carbon neutral and environmentally friendly. It is important that a reliable long term source of feedstock is secured for bioenergy projects to be viable.

Bioenergy projects support local jobs through the purchase of feedstock from local industry, rather than importing gas or electricity from outside the region. The skill set of local workers can also be improved. Local companies were used as part of the installation of the biomass boiler at the Mount Gambier Aquatic Centre, and were trained up on the job by staff from Living Energy.

Councils may wish to investigate utilising woody material that they collect directly or at their transfer stations, as a feedstock for a biomass unit. The Mount Gambier Aquatic Centre experience indicates that logs and branches that are left to dry for 6-12 months can be chipped and provide a good source of feedstock. It is essential that the resulting wood chip is within the ideal moisture content range, and also that it is screened to remove over-sized pieces which can jam feed systems. In theory un-treated urban timber waste could also be chipped and utilised, but this has not been tested at the Mount Gambier facility as yet. In addition to screening, a magnet would also be required to remove nails, screws and other pieces of metal. Clear separation from treated timber, painted timber, and timber with other contaminants such as plastics would need to occur, as these should not be burned in a biomass system. Using these woody materials may not only save on feedstock costs for a biomass system, it may also provide a beneficial use for a waste stream.

On this last point, biomass projects can make beneficial use of a waste stream. A significant amount of biomass in a variety of forms routinely goes to waste throughout Australia. Much of this can be utilised beneficially, including for energy.

## Environmental Sustainability Program 2014 – Project Progress

***Updated: 25th February 2014***

| Project | Summary | Progress Notes | % Complete |
|---|---|---|---|
| CHAT Roll Out | These tools are to be used to assess all major projects and programs, to ensure they are in line with Beyond 2015, the Natural Step Framework, and represent a good holistic option for Council. | Tool has been rolled out across the organisation. Training will be delivered to councillors in early March 2014. | 90 % |
| Park & Stride Mount Gambier | The aim of the project is to encourage community members who come to central Mount Gambier to shop, to park in an off-street car park and walk to shop, rather than be "drive-through" shoppers, who drive from shop to shop. | The development of a community education program will commence in the near future. | 5 % |
| Waste Education Strategy | The purpose of the strategy is to provide consistent and clear waste and recycling information to the community in order to improve waste management amongst residents. | Bin lids have been spot checked, approximately 80-90% of bins have a sticker. A final bin run on bicycles is being considered. | 45 % |
| Resource Efficiency Review | Review of Council operations to identify what level of resources are currently being used, and identify opportunities for increased efficiency. | Some initial data received from Finance and suppliers. One interesting finding so far is that in 2012-2013 the organisation used 779,500 sheets of copy paper. That averages out to over 11,600 sheets per office based staff member – almost 50 pages per day each! We all need to do our best to reduce this. | 10 % |
| Salvage Yard Options Investigation | The aim of this project is to investigate options to give the community avenues for disposing their unwanted items for beneficial reuse – rather than going to landfill or being dumped. The project will involve investigating both physical and virtual options. | EOI is currently being reviewed by FWS and FEO. | 45 % |
| Organics Use Options Investigation | This project involves investigating the potential options for diverting organic waste from landfill, as well as researching what that organic waste can be used for. | The tender for the consultancy has been awarded to Blue Environment. The project inception meeting is on Thursday, 6th March 2014. | 45 % |
| Efficient Homes Project | This project involves installing temperature loggers in houses constructed of a variety of materials – limestone, brick veneer, weatherboard – and leaving them in situ for 12 months. Heating and cooling actions will be recorded by residents, and operating costs of equipment calculated. | The interim report has been put on Council's website. | 40 % |

| | | | |
|---|---|---|---|
| Renewable Energy Options Investigation | This project involves investigating the various options in a holistic sense with a view to making a recommendation to Council. The various options include purchasing green power, Council installing solar power, Council installing wind power, or Council installing bioenergy (from organic materials). | The report and recommendations are contained in the agenda of this meeting. | 50 % |
| Carbon Reporting | Measure and report on Council's carbon emissions for the 2012-2013 financial year. Assess if Council triggers any carbon and/or climate change legislation. | Reporting will commence when final 2013-2014 utility bills are received in August. | 0 % |
| Fruit Tree EOI | The 2013 EOI will be assessed to see if it is recommended to do another planting in 2014. | In February 2014 Council staff will revisit the six fruit and nut trees that were planted in June 2013. They will be assessed to see how they are doing. Residents involved in the submission will be contacted to get their feedback. | 0 % |
| 2014 KESAB Awards | Nominate City of Mount Gambier for numerous categories within the KESAB awards. | The collation of initiatives to be included in the 2014 City of Mount Gambier nomination has commenced. If you are aware of any relevant projects please forward the details to the Environmental Sustainability Officer. | 5 % |
| Smaller Projects | - Smart Living profiles.<br>- Talks at schools and community groups on environment and sustainability topics. | - Four Smart Living profiles have been completed.<br>- As required. A talk about urban water management was given to primary school students in conjunction with the clean out of the large Cave Gardens GPT. | Ongoing<br>Ongoing |
| Environmental Events | - World Wetlands Day<br>- Clean Up Australia Day<br>- Earth Hour<br>- Environment Month<br>- Ride to Work Day<br>- Walk to Work Day | - Sunday 2 February<br>- Sunday 2 March.<br>- Saturday 29 March.<br>- June.<br>- Wednesday 15th October.<br>- Friday 7 November. | 100%<br>30 %<br>10 %<br>0 %<br>0 %<br>0 % |