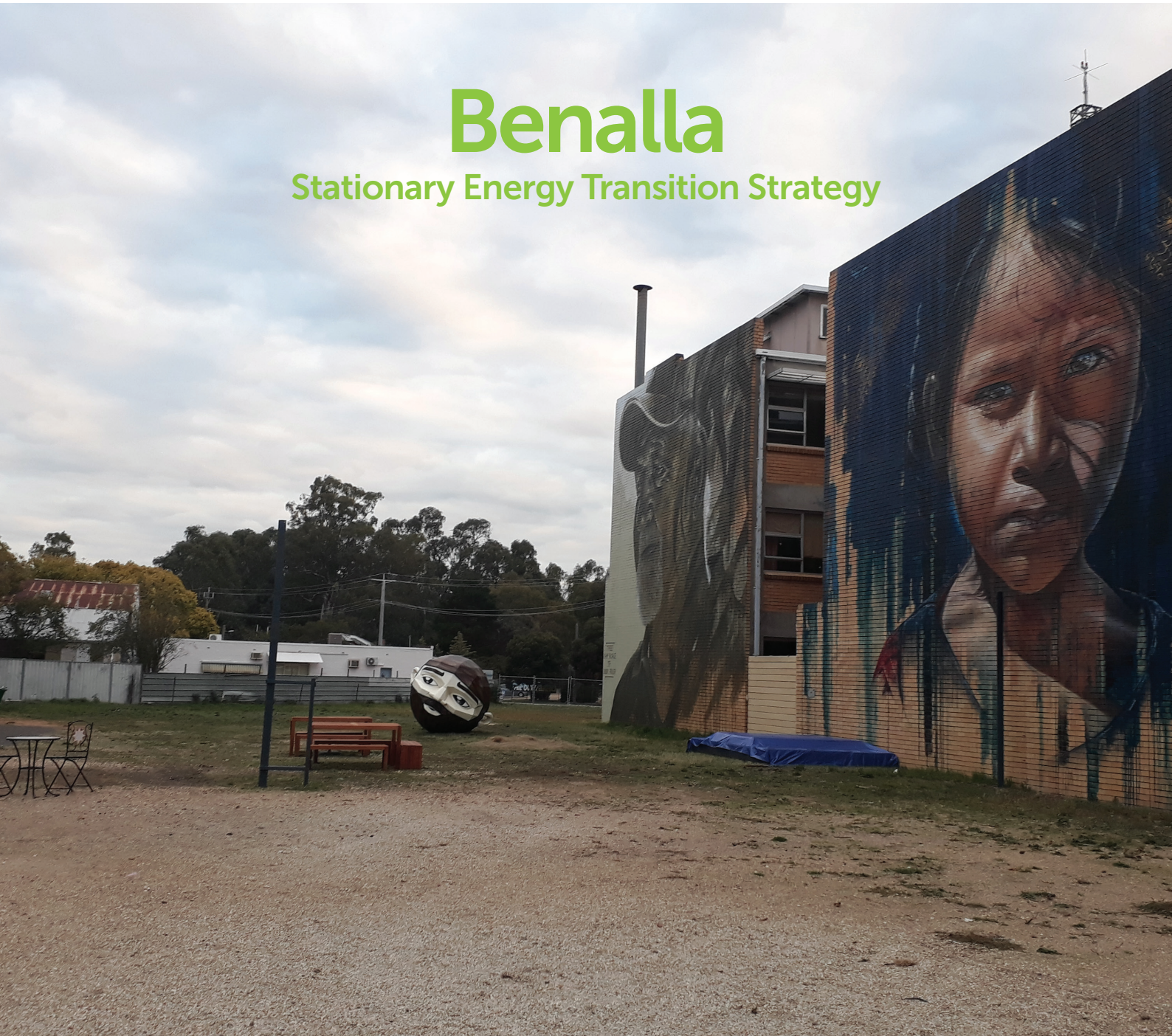




**Benalla
Sustainable
Future
Group**

Benalla

Stationary Energy Transition Strategy



Zero Carbon Communities

To develop appropriate strategies for 100% renewable energy

November 2017



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1.1 Background to the Zero Carbon Communities Program

Beyond Zero Emissions (BZE) is partnering with high-ambition local government areas and communities across Australia that are aiming to reduce emissions rapidly.

BZE launched Zero Carbon Communities to highlight nation-leading initiatives for 100% renewables and zero carbon emissions and to encourage high ambition communities to put BZE's Zero Carbon Australia research into action. In 2017 BZE partnered with three Victorian communities: Benalla, Baw Baw and Nillumbik, to develop detailed plans to move to zero carbon emissions over ten years.

BZE's goal is to transform Australia from a 19th century fossil fuel based economy to a 21st century renewable powered clean tech economy. The aim is for Zero Carbon Communities to move to 100% renewable energy while demonstrating to all of Australia's communities how to 'go to zero' as quickly as possible.

In 2016 BZE undertook a desktop review and survey of all councils in Australia to identify what activities were already underway to reduce carbon emissions in councils and communities. We found that many councils are working with their communities on zero emissions targets and actions, with some setting 100% renewable energy and zero emissions targets. From this process it was clear that communities would benefit from sharing information and developing a network of peers to reduce costs, enhance synergies and inspire action. The Zero Carbon Communities program develops technical and governance blueprints that all communities can use to implement effective local 10-year zero-emission strategies.

1.2 State Context

The Victorian State Government currently has a 40% Renewable Energy Target by 2025 which will help facilitate the renewable utility scale power options. The State Government is also offering a range of grants for energy efficiency and renewable energy options. Leadership from Council and community will likely be supported by State Government initiatives.

1.3 Description of Benalla Rural City

Benalla Rural City is an area of 235,225 hectares located about 180 kilometres north-east of Melbourne. The city includes the township of Benalla and the communities of Baddaginnie, Devenish, Goorambat, Swanpool, Tatong, Thoona, and Winton. The Benalla Rural City Estimated Resident Population for 2015 is 13,962, with a population density of 0.06 persons per hectare.

Benalla Rural City is predominantly a rural area, but has substantial residential areas in and around the township of Benalla. Smaller townships are located at Baddaginnie, Devenish, Goorambat, Swanpool, Tatong, Thoona, Warrenbayne and Winton. Most of the City's retail space is in shopping strips in central Benalla. There is some industrial land use to the north-east and east of the city. Most of the rural area is used for agricultural purposes, including wool and meat production, dairying and crop farming.

There were 6,023 local jobs in Benalla Rural City, with Manufacturing as the largest employer.

A detailed map of the Shire of Murrumbidgee, Australia. The map shows a network of roads, including major highways like the A300 and A301, and local roads like C364, C373, and C371. Towns and localities are labeled throughout the region, such as Yundool, Dookie, Devenish, Bungee West, Thoonia, Taminick, Wangeratta, Oxley, Milawa, Everton, Greta West, Greta, Greta South, Winton, Benalla, Baddaginnie, Warrenbayne, Tatong, Molyullah, Myrree, King Valley, Whitfield, Cheshunt, Archerton, Tolmie, Dandongadale, Cheshunt South, Mount Samaria State Park, Lima East, Lima South, Kithbrook, Boho South, Marraweeney, Strathbogie, Gooram, Ruffy, Euroa, Riggs Creek, Violet Town, Tamleugh, Karamomus, Caniambo, Dookie College, and Wooragee. The map also shows geographical features like the Murrumbidgee River and various state parks. The Shire's boundary is outlined in red.

REB – Renewable Energy Benalla Action Group

1. Promote energy efficiency and reduce energy use within the community
2. Create awareness, promotion and support for renewable energy by community
3. Future Energy Plan developed for Benalla
4. Achieve a significant increase in local renewable energy generation
5. Keep increased financial benefits locally

Along with this Transition Strategy, REB have developed an Action Plan which details how these objectives will be achieved.

Stationary Energy

This Transition Strategy focuses on the Stationary Energy sector. This sector covers emissions from the combustion of solid, gaseous and liquid fossil fuels, such as coal, natural gas, diesel and LPG, for stationary energy (non-transport) purposes and is generally the sector contributing the most to a community emissions inventory. This includes the consumption of electricity in residential, commercial and industrial buildings and facilities, the consumption of electricity for street-lighting, the combustion of natural gas for cooking and space heating and the combustion of liquid fuels for industrial purposes. Stationary Energy emissions also include the indirect emissions associated with the extraction, production and transportation of fuels as well as electricity transmission losses.

Transition Strategy Purpose

The purpose of transition planning is to layout the tasks and activities that need to take place to achieve the objective of Benalla becoming a zero net energy town in relation to stationary energy.

Purpose:

- Demonstrate a transition to 100% renewables in Benalla is possible and affordable.
- Communicate current emissions and steps to reduce them to zero in ten year timeframe.

Outcomes:

- Council and community support
- Clarity on how to proceed
- High priority projects established
- Investment
- Reduce emissions



2.1 Why calculate baseline emissions

The purpose of undertaking a greenhouse gas (GHG) inventory is to enable a community to understand the sources of its GHG emissions and relative contribution of these sources, from the different activities occurring within its boundary. It allows communities to prioritise mitigation efforts and create a strategy to reduce their emissions. A GHG inventory should then be undertaken annually to track the performance of their mitigation strategies over time. A community's baseline emissions refers to the emissions level in the historical base year used for comparison.

The Global Protocol for Community-Scale Greenhouse Gas Emission Inventories (GPC) is a globally-accepted framework used to identify, calculate and report community greenhouse gases. The GPC has been used to calculate the baseline emissions for Benalla.

For this report, Stationary Energy emissions are based on electricity and natural gas consumption for the Benalla postcodes as well as LPG sales in the region. Note that natural gas consumption could only be obtained for the 3672 postcode as APA does not service the other areas in the shire. Other fuels, such as heating oil and firewood are not included due to a lack of data on these sources at the time of writing.

2.2 Benalla Baseline Emissions 2016

In 2016, emissions relating to stationary energy for Benalla were 189,785 tonnes CO₂-e. Total energy use between 2012 and 2016 increased by 2.7%, representing a 3% increase in electricity consumption and 2% increase in gas use. However emissions fell by 6% during this same period which reflects a reduction in the GHG emissions intensity of Victoria's electricity over this period (i.e. a move to less emissions intensive energy sources).

In 2016 the industrial sector was the largest consumer of electricity at 48%, compared to 33% residential and 19% commercial. Similarly, the industrial sector consumed 63% of gas, the residential sector 29% and the commercial sector 8%. Industrial electricity is the sector contributing the largest to the rural city's GHG profile. The Gross Regional Product for the region was \$0.58 billion, representing 0.2% of the state's economic output.

The number of households in Benalla Rural shire rose from 6,343 in 2012 to 6,517 in 2016. During this time electricity consumption per household per day reduced from 18.3 kWh to 17.9 kWh.

Further detail can be found in the 2016 Benalla Stationary Energy Baseline Emissions Report and image in Figure 2. The main points to highlight from this report are that within the Benalla municipality in 2016:



1.07 million GJ energy was used



189,785t CO₂e produced



Approximately \$32 million was spent on energy by the community



The community spent approximately \$2,389 per person on energy

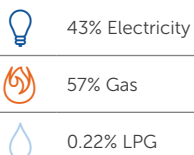
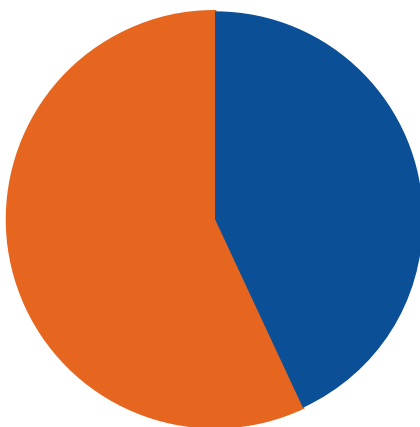
Table 1: 2016 Energy use, emissions and costs for the Benalla Rural City municipality

	Usage (MWh)	Usage (GJ)	Environment Impact (tCO ₂ e)	% emissions	% GJ	Cost *(\$m)	Cost per person**
Residential Electricity	42,161	152,000	51,242	27%	14%	\$12	\$862
Residential Gas	47,776	172,000	9,489	5%	16%	\$3	\$222
Industrial/Commercial Electricity	84,665	305,000	104,382	55%	29%	\$15	\$1,005
Industrial/Commercial Gas	121,836	440,000	24,672	13%	41%	\$3	\$200
Total Electricity	126,826	457,000	155,624	82%	43%	\$27	\$1,967
Total Gas	169,612	612,000	34,161	18%	57%	\$6	\$422
Total Electricity & Gas	296,438	1,069,000	189,785	100%	100%	\$ 32	\$2,389

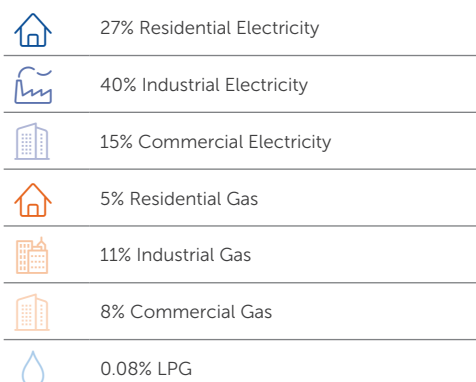
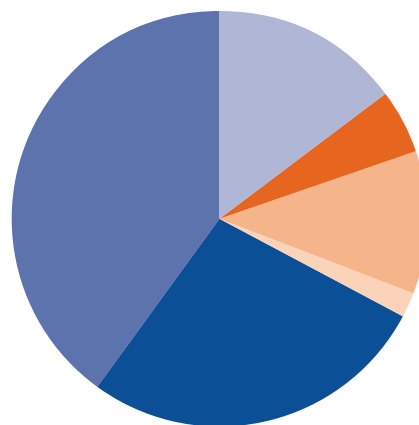
* based on Australian Energy Market Operator data and estimated/averaged generation, transmission, distribution, retail and environmental costs.

** Australian Bureau of Statistics 2016

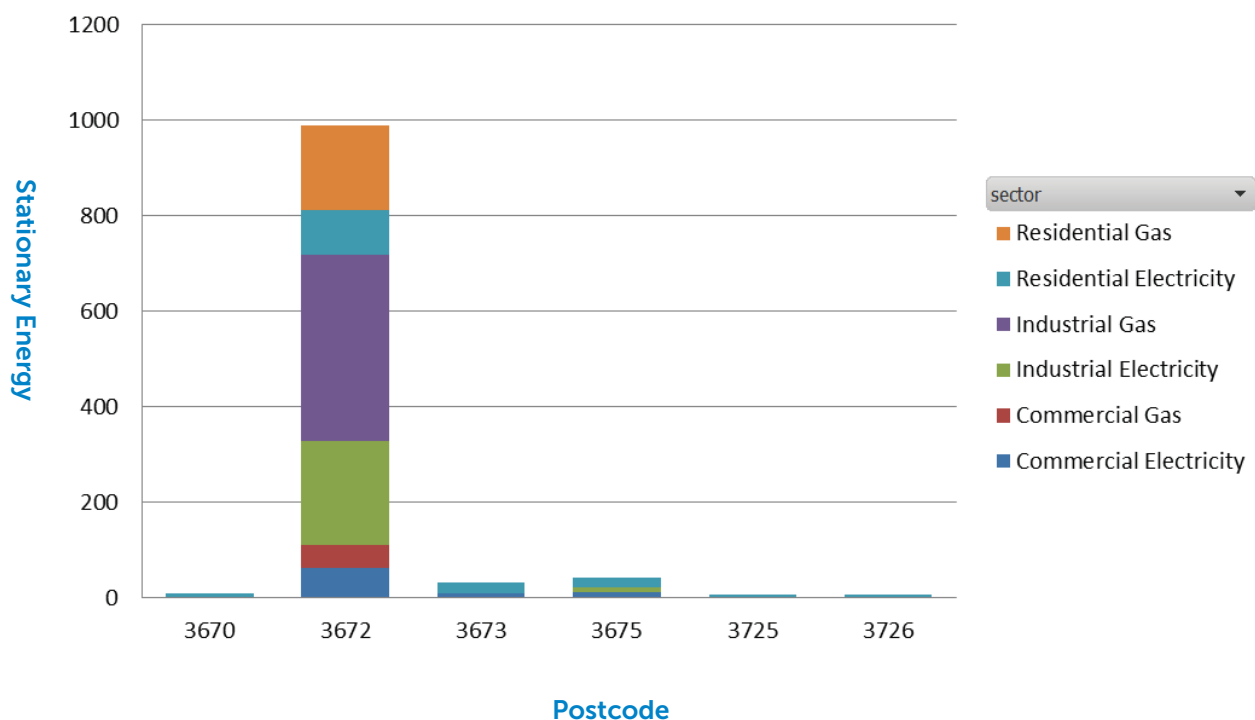
Stationary Energy Split 2016 (GJ)



GHG Emissions by Sector 2016



Total Stationary Energy Use by Postcode and Secor 2016 (GJ)



3670	Baddaginnie, Tarnook, Warrenbayne
3672	Benalla
3673	Broken Creek, Lima, Lima East, Lima South, Lurg, Goomalibee, Swanpool, Tatong, Samaria, Moorngag, Molyullah, Winton, Winton North, Upper Lurg, Upper Ryans Creek
3675	Boweya, Boweya North, Glenrowan West, Glenworan, Hansonville, Greta West, Greta, Greta South, Taminick, Mount Bruno
3725	Boxwood, Chesney Vale, Major Plains, Goorambat, Stewarton
3726	Bungeet, Bungeet West, Devenish, Thoona

4.1 Why reduce emissions to zero in ten years?

BZE recommends a ten year timeframe for transition because it is achievable and affordable. There are many reasons to move rapidly on reducing emissions.

- Emissions need to reduce fast to avoid the threat of severe climate change and costly adaptation measures.
- The international community has committed to limiting climate change to below 2C and to aim for no more than 1.5oC warming. This means we must rapidly reduce our GHG emissions to zero and beyond.
- There is widespread recognition that those who lead the renewable energy race will reap significant economic and social benefits. Proven and cost-effective solutions to reduce emissions and spending on energy already exist.
- Communities who start down this path will see significant growth in local jobs and investment, major cost savings and a cleaner, healthier environment for local residents.
- Without ambition to take this challenge seriously we will fail before we begin. Setting an ambitious target is challenging but also inspires leadership and innovative solutions.
- Acting within a local community can align our capabilities for change with a meaningful, motivating response.

4.2 How do we reduce emissions to zero in ten years?

A simple overview strategy to suggest possible steps to eliminate Benalla's stationary energy emissions has been devised by BZE and Renewable Energy Benalla.

Key steps:

- REDUCE 1/3 through efficiency
- REPLACE 1/3 with local renewables
- SWITCH 1/3 to renewable utility power

Efficiency

Most emissions in Benalla (82%) come from electricity use in residential homes (27%) and industrial and commercial (55%) businesses. This equates to approximately \$26 million per year in electricity costs to the community. Much of this expense is wasted in drafts, air leaks around openings, and outdated heating and cooling systems. By reducing these losses through energy efficiency upgrades, Benalla can save money and provide more comfortable homes and businesses. BZE's Energy Freedom Home is a resource that provides nine key steps to create more comfortable homes and buildings for lower ongoing running costs.

Local renewables

Local renewables can be used to generate energy on residential and commercial properties to increase resilience to higher electricity costs and to reduce emissions. Community energy may play an important role in increasing local renewables. Community energy refers to projects where a community group initiates, develops, operates and benefits from a renewable energy resource. In most instances solar PV will be the most accessible behind the meter local renewable option.

Renewable utility power

Generating renewable energy using appropriately located wind turbines and solar farms will enable Benalla residents to purchase large scale renewable power. Battery storage will also enable energy generated on-site to be stored for later use. Community or Council owned options may also be viable; for example, the Sunshine Coast Council is the first local government to offset its entire electricity consumption from renewable energy generated at the 15MW [Sunshine Coast Solar Farm](#).

Key Steps

REDUCE through better building and efficiency	<ul style="list-style-type: none">• Retrofits, insulation, double glazing, pelmets and blinds• Smart data power use
REPLACE with renewable sources	<ul style="list-style-type: none">• Household and business solar• Solar and community energy
SWITCH- Build utility scale and storage	<ul style="list-style-type: none">• Support large scale investments• Micro-grids and batteries

4.3 Key Focus Areas

To achieve a reduction to zero emissions in 10 years will take a variety of methods and actions as described below.

Inform/Promote:

Council and many homes and businesses have made great progress with increasing efficiencies and installing rooftop solar. There are many great initiatives within the Benalla municipality and elsewhere in Australia and worldwide that are getting traction but many people aren't aware of the momentum and possibilities that are developing. A critical activity is to promote options and inform people so they have hope, feel part of something bigger, feel this change is inevitable and be active in supporting it.

Reduce demand:

As described above, there are many opportunities for households and businesses to improve efficiencies, save money on energy bills and reduce emissions. REB can curate information to streamline the research process for people who want to make changes. REB and Council may also have a role to play in bulk buy incentives, financing options and other initiatives, such as the refrigeration app trial currently underway, which will benefit the community.

Behind the meter:

Generating behind the meter energy on residential and commercial properties will off-set energy consumption and potentially export energy for use by others. Rooftop solar, battery storage and perhaps micro-grids are tools that can be used to reduce emissions and save money.

Utility scale renewables:

Utility-scale generation refers to large-scale, grid-connected generators. Local projects using these technologies compete with wholesale generation electricity prices and may be within or outside the Rural City. State Government targets (40% by 2025) for renewable energy may dovetail nicely with the ten year timeline. Solar and wind farms, biomass or concentrated solar thermal have the greatest utility scale potential but are more complex and expensive projects which take a longer lead time to eventuate.

Gas transition:

The transition from gas needs to be treated differently to that for non-renewable electricity. Gas accounts for 57% of stationary energy consumption in Benalla but only 18% of GHG emissions. The long term scenario is to move away from gas but it can be done gradually - noting that changes such as removal of gas infrastructure need long term planning and lobbying to achieve success. A significant factor is the capital investment in appliances. A key strategy is to transfer appliances from gas to electric as they age.

Table 2: The following table summarises the key focus areas to guide actions and projects to implement the transition strategy.

	Focus Area	Objectives	Actions
1	Inform/Promote	Build momentum and energy	<ul style="list-style-type: none"> • Curate information to simplify access. • Learn and share • Community engagement and advocacy to develop expectations to drive change in this area and change to state and federal policy. • Lobbying for legislation change - i.e. building codes and carbon pricing • Support and encourage Council action
2	Reduce demand	Generate increased efficiency in buildings (new and existing)	<ul style="list-style-type: none"> • Retrofits, LED lighting, heat pump hot water, insulation, double glazing, pelmets and blinds • Smarter use of power using data and emerging technology • Bulk buys of energy efficient appliances
3	Replace with Behind the meter renewables and storage	Increase household and business solar PV generation	<ul style="list-style-type: none"> • Micro-grids and batteries • Bulk buys of PVs and batteries • Investment and crowdfunding
4	Replace with: Utility scale renewables and storage	Increase renewable energy generation and storage	<ul style="list-style-type: none"> • Initiate community energy projects • Support large scale renewable investments • Promote GreenPower
5	Gas transition	Transition away from gas	<ul style="list-style-type: none"> • Replace appliances with electric as they become obsolete • Clean gas options (bio-gas)

Not all of this will be possible without change to state and federal policy. Community expectations can drive change in this area. REB, Council and the Benalla community have a role to play via the following community engagement and advocacy activities:

- Council and community expectations and behaviour
- Investment and crowdfunding
- Lobbying for legislation change - i.e. building codes and carbon pricing

4.4 Implementation

Resourcing

The intention is for the bulk of the work of REB to be carried out by volunteers. Opportunities to fund a paid administrative position may be practical in the future. Other funding will be sought for discrete projects.



Administrative considerations

- Develop processes and policies for how REB operates – i.e. being intentional about how we bring people on board, strategies to engage people effectively and in a timely manner to build awareness of tasks and roles which need filling.
- This area is quickly and constantly evolving – mechanisms for regular review and adjustment of strategy is required. For the most part changes should make economic sense
- Once we have the strategy we must ensure we have the skill sets required on the REB committee in order to meet our objectives – for example governance, legal, financial, corporate, marketing and promotion.
- Avoid reinventing the wheel, network with stakeholders, use available resources and share learning with others.

Table 3: Timeline of key project phases

Phase - Year	1	2	3	4	5	6	7	8	9	10
Project and target established										
Baseline emissions reporting										
Council endorsement										
Community engagement										
Project options and action plans										
Transition strategy										
Projects initiated										
Communications										
Investment raising										
Projects underway										
Reporting and review										
30% emissions reduction										
50% emissions reduction										
70% emissions reduction										
90-100% emissions reduction										

Table 4: List of project options to be considered

 Buildings and efficiency	 Solar and community energy	 Utility scale and storage
Home retrofits - Air flow pressure testing, energy reports and thermal assessment	Small renewable projects	Floating solar - local reservoir
Community engagement and communication	Public lighting	Roofing car park with solar panels
Building compliance and design	Learn from others	Wind turbines/hydro combination
Attract state energy efficiency target activities	2 MW and up large centralised power	More PV on underutilised space e.g. road cuttings
Industry accreditation and training	Education and training	Microgrids in areas scheduled for service upgrade
Local list of sustainable builders/suppliers for recommendation	Community forums	Storage for thermal back up electrical (fuel cell) batteries
Water heater retrofits	Library - Behind the meter	Geothermal and heat exchange
Six star ++ ratings	Solar savers in rates	Smarter grids - intelligent metering and data collection
Advocate for energy upgrades in social housing	Landfill compost - energy	Micro hydro
Energy efficient upgrades to appliances	Employee investment solar saving scheme	Biomass
Investigate schemes for landlords and renters	Lobbying government	Waste to energy - landfill gas
Bulk buy of insulation, heat pumps and hot water	Stepped power structure	Technical analysis skill building
Retrofit seals, windows and doors	Solar farm above car parks	Pumped hydro
Improve efficiency legislation	Car charging points	
Workshops for tradies to upskill	Shared battery projects	
	Project management advisory service	

5.1 Plan/Priorities for next 12 months

Next steps

- Determine priority projects
- Create small scale local solar installation as motivating example
- Communicate stories of zero emissions actions in Benalla and other communities
- Pursue Benalla Business opportunities
- Seek investment for a range of projects
- Develop an ongoing communication plan
- Develop action plans for specific projects

Endnotes

1. <http://www.benalla.vic.gov.au/index.asp?h=-1>, 6/3/17
2. <http://economy.id.com.au/benalla/about>, 6/3/17
3. <http://www.ghgprotocol.org/city-accounting>
4. <http://economy.id.com.au/benalla>, 1/5/17



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