2020

# BATHURST REGIONAL COUNCIL RENEWABLE ENERGY ACTION PLAN

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BATHURST REGIONAL COUNCIL

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# Contents

# Renewable Energy Action Plan

## Executive Summary

This Renewable Energy Action Plan (REAP) sets out Council's strategy and action plan to minimise its dependence on fossil fuel energy sources. It has a primary focus on alternatives to grid-sourced electricity, but also considers and makes recommendations about transitioning away from natural gas and liquid fossil fuels.

The plan employs an energy management hierarchy which prioritises energy efficiency actions. The plan includes an:

- Electricity efficiency target of 15% in comparison with 2018-19 electricity consumption of 15,069 MWh.

The plan also sets the following renewable electricity targets:

- Renewable Target 1 - 25% of Council's electricity consumption to be from renewable sources by 2023
- Renewable Target 2 - 50% of Council's electricity consumption to be from renewable sources by 2025

Current policy settings, uncertainty in the electricity market and rapidly evolving technology in the renewable energy and storage space make it prudent to set short- and medium-term targets which can be reviewed and raised, where appropriate, as the renewable market develops.

The plan explores the strategic drivers for Council to increase its use of renewable energy, considers the state of the electricity market and examines the opportunities available to Council.

Section 9.0 details the actions which have been identified to enable Council to meet the stated energy efficiency and renewable electricity targets.

# 1.0 Introduction

This Renewable Energy Action Plan (REAP) sets out Council's strategy to minimise its dependence on fossil fuel energy sources, with a primary focus on grid-sourced electricity. It describes Council's intention to source more of its energy from renewable energy sources and defines Council's short- and medium-term renewable electricity targets.

Energy savings actions and renewable energy projects undertaken to date have demonstrated there is a strong business case and community support for further action. Key benefits for Council are reduced operational costs, flow on social and economic benefits as resources are redirected and enhanced environmental outcomes.

# 2.0 Aims

The aims of the REAP are to:

1. State the renewable electricity targets for Council's operations.

2. Describe an achievable pathway, staged action plan and timeframe to meet Council's renewable electricity targets.

3. Describe a pathway to reduce Council's reliance on natural gas and liquid fuels.

# 3.0 Approach

Bathurst Regional Council will use an energy management hierarchy approach in its pursuit of a more sustainable energy use profile. An energy management hierarchy classifies and prioritises energy management options in order to progress towards a more sustainable energy system in the most efficient way (Figure 1). The highest priority is preventing unnecessary energy use, for example, by switching off air conditioning and lighting when not in use.

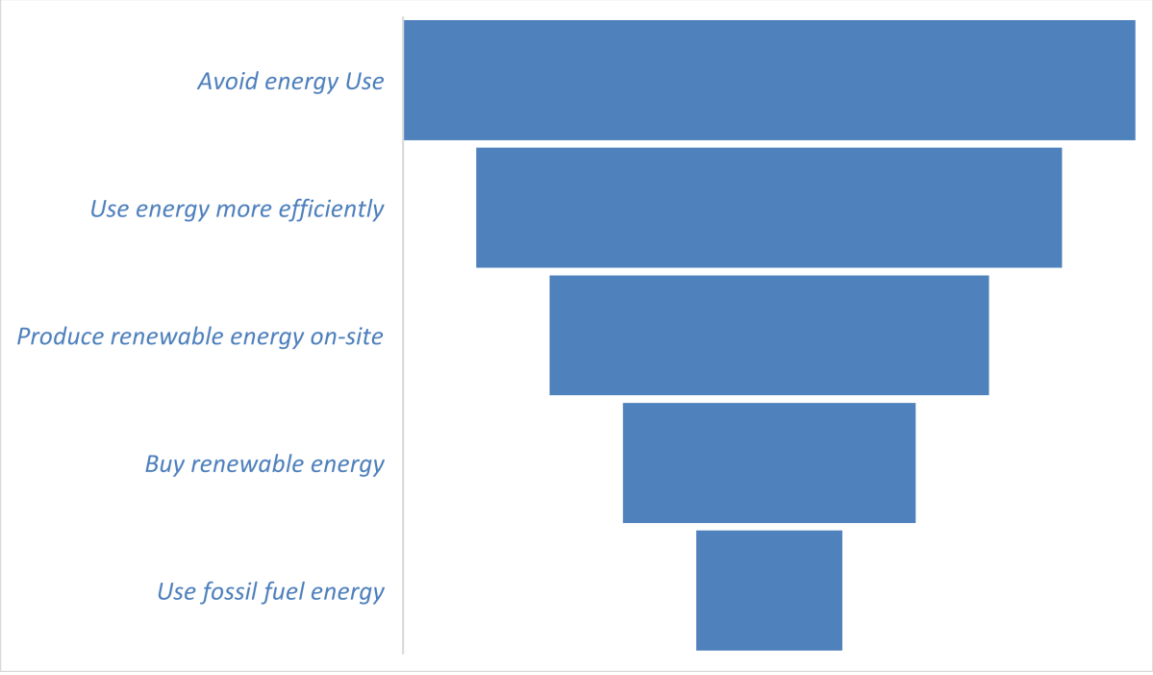


*Figure 1: Energy Management Hierarchy*

Improving energy efficiency is the next highest priority. Energy efficiency is simply using less energy to provide the same service. Reducing the total amount of energy consumed by implementing energy efficiency actions will reduce the overall amount of renewable energy which Council must install at its facilities or purchase to meet its renewable energy targets.

The primary focus of this REAP is the replacement of fossil fuel-sourced electricity with electricity produced from renewable sources. The plan also makes recommendations for further investigations to be undertaken to provide a transition pathway from natural gas and liquid fossil fuels to renewable energy sources. Detailed action plans for natural gas and liquid fossil fuels have not been included in this plan as Council did not want to delay the release of the REAP while these investigations were completed.

This plan does not specifically address greenhouse gas emissions, however in 2019 the NSW State Government announced a firm State target of zero net emissions by 2050 with an interim target of a 35% reduction by 2030. This commitment provides a signal to large emitters (including Councils) of the need to reduce the carbon intensity of their operations. The NSW Department of Planning, Industry and Environment is currently preparing its Net Zero Plan for the State and has released a draft Net Zero Emissions Guidance for NSW Councils. It is therefore timely for Council to consider setting emissions reduction targets and preparing an action plan to achieve these targets. The setting of emissions targets remains under investigation and will be the subject of a separate plan.

## 4.0 Council's Current energy use profile

Council, as a water and sewer authority and community service provider, uses a large amount of energy. The majority of this is derived from grid sourced electricity, with liquid fuels and natural gas making up the balance (Figure 2).

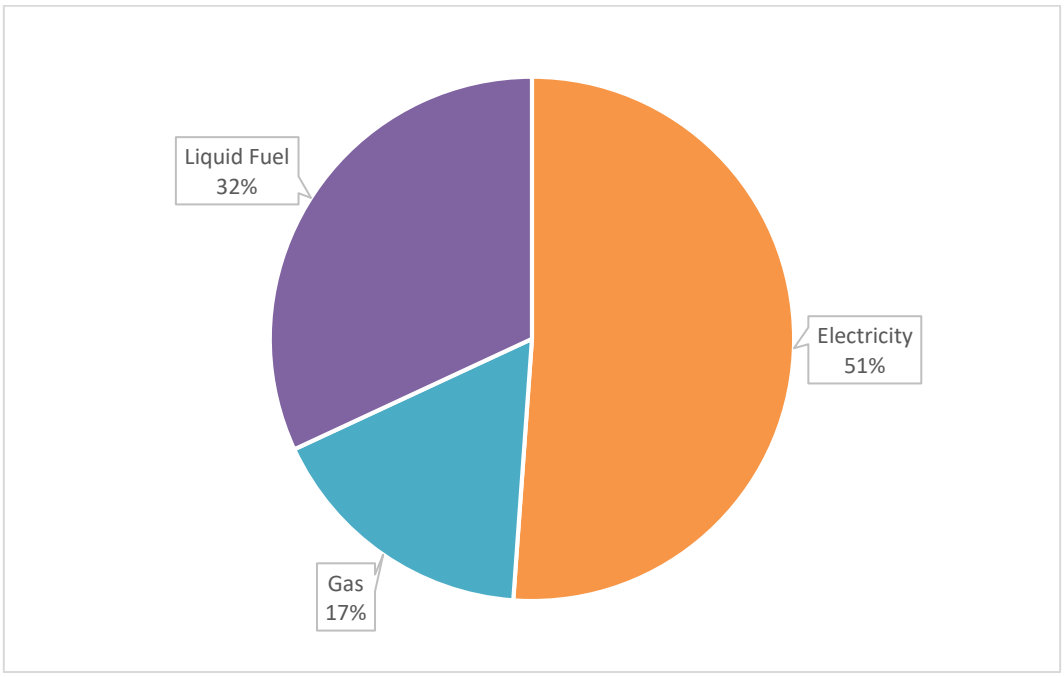


*Figure 2: Council Energy Mix GJ 2018-19*

## 4.1 Electricity

In 2018-19 Council facilities consumed 15,069 MWh[1] of grid sourced electricity at a cost of almost $3.5 million. The largest uses of electricity are for water filtration and pumping, sewage treatment, provision of street lighting and operation of the Bathurst Manning Aquatic Centre. Total Council electricity use has remained reasonably static over time despite a growing population being serviced by Council, and consumption at some sites being mitigated by targeted investment in energy efficiency and renewable energy projects (Figure 3). Higher electricity use in 2016-17 and 2017-18 was driven by higher outdoor water use as a result of dry climatic conditions. The introduction of water restrictions in late 2018 has seen electricity consumption fall, despite continued dry conditions, due to a reduction in outside water use.

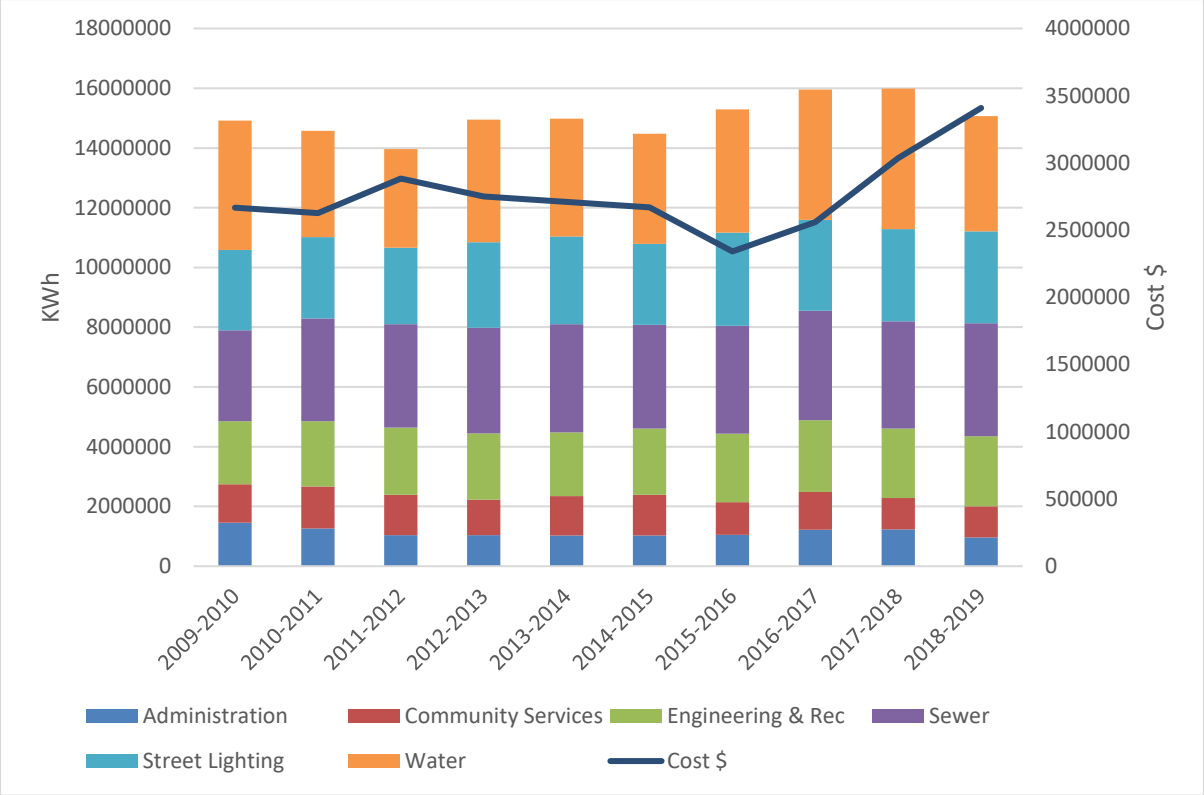


*Figure 3: Electricity Use kWh*

*Recommendation:*

Set energy efficiency and renewable electricity reduction targets as part of this plan.

[1] Includes all facilities including those not under Council operational control, for example Rural Fire Service buildings

## 4.2 Natural Gas

In 2018-19 Council facilities used 17,669 GJ of natural gas at a cost of $320,000[2]. More than 60% of this was used at the Bathurst Manning Aquatic Centre, with the balance primarily used for heating of buildings. The most likely path to a reduced reliance on non-renewable natural gas is through the electrification of these processes with electricity sourced from renewables.

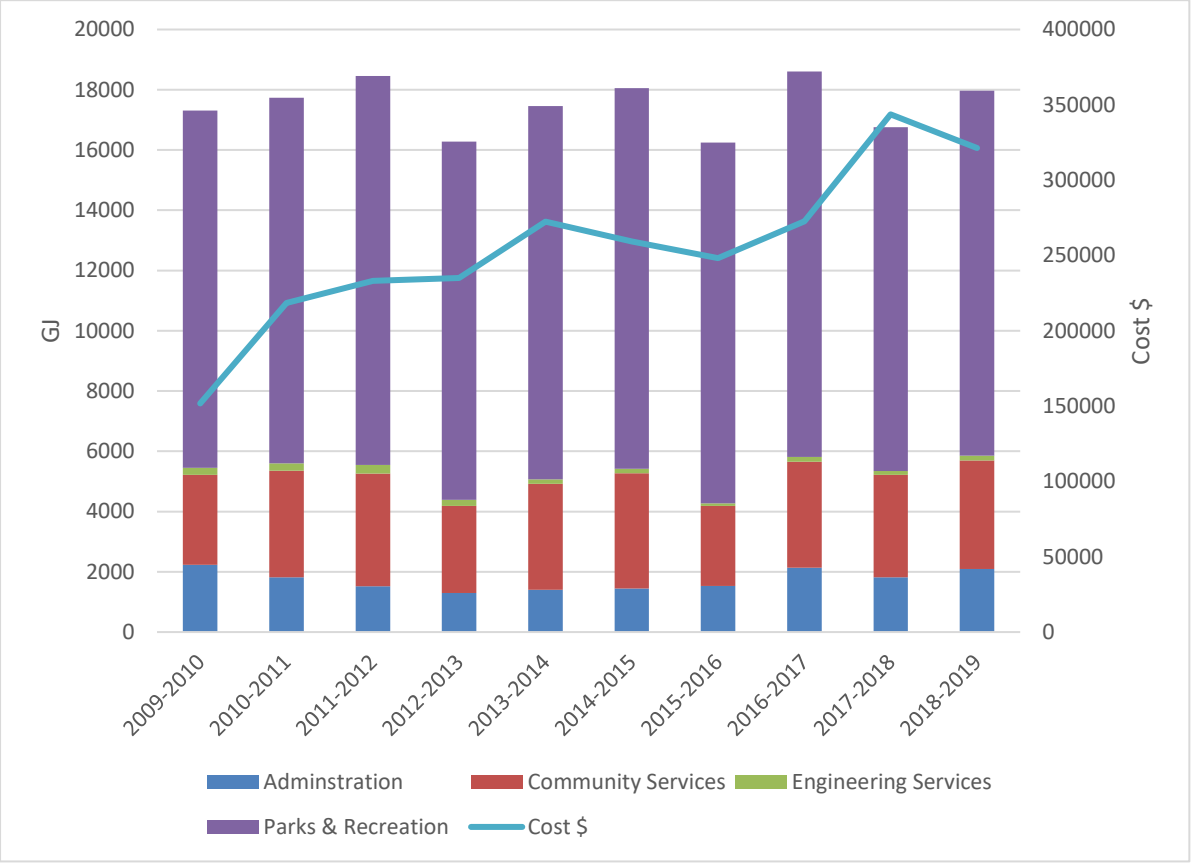


*Figure 4: GJ Natural Gas*

*Recommendation:*

Prepare an options paper for the replacement of natural gas with renewable energy. This options paper will inform the development of reduction targets and an associated action plan.

## 4.3 Liquid Fuel

Council's total liquid fuel use in 2018-19 was 878kL, with more than 85% of this comprising diesel consumption. Most of the fuel is used in Council's commercial and works vehicles, with only about 20% used in the passenger fleet. Total fuel consumption declined between 2011-12 and 2015-16

[2] Note cost of gas for Aquatic Centre is paid by Belgravia as part of the operations contract.

with increasing fuel efficiency of vehicles and a change to the fringe benefit tax rules[3], but since 2015-16 there has been a gradual increase in liquid fuel consumption.

The path to reduced dependence on liquid fossil fuels depends primarily on Council adopting electric &/or hydrogen vehicles into its fleet and sourcing electricity to run the vehicles from renewable sources. There are several barriers to the rapid uptake of electric vehicles into Council's fleet, not least of which is the high current upfront capital cost of electric vehicles, the lack of commercial electric vehicles available in the Australian market and Council's preference to service all vehicles in house. Hydrogen vehicles are not currently available in Australia, so this remains a longer-term option.

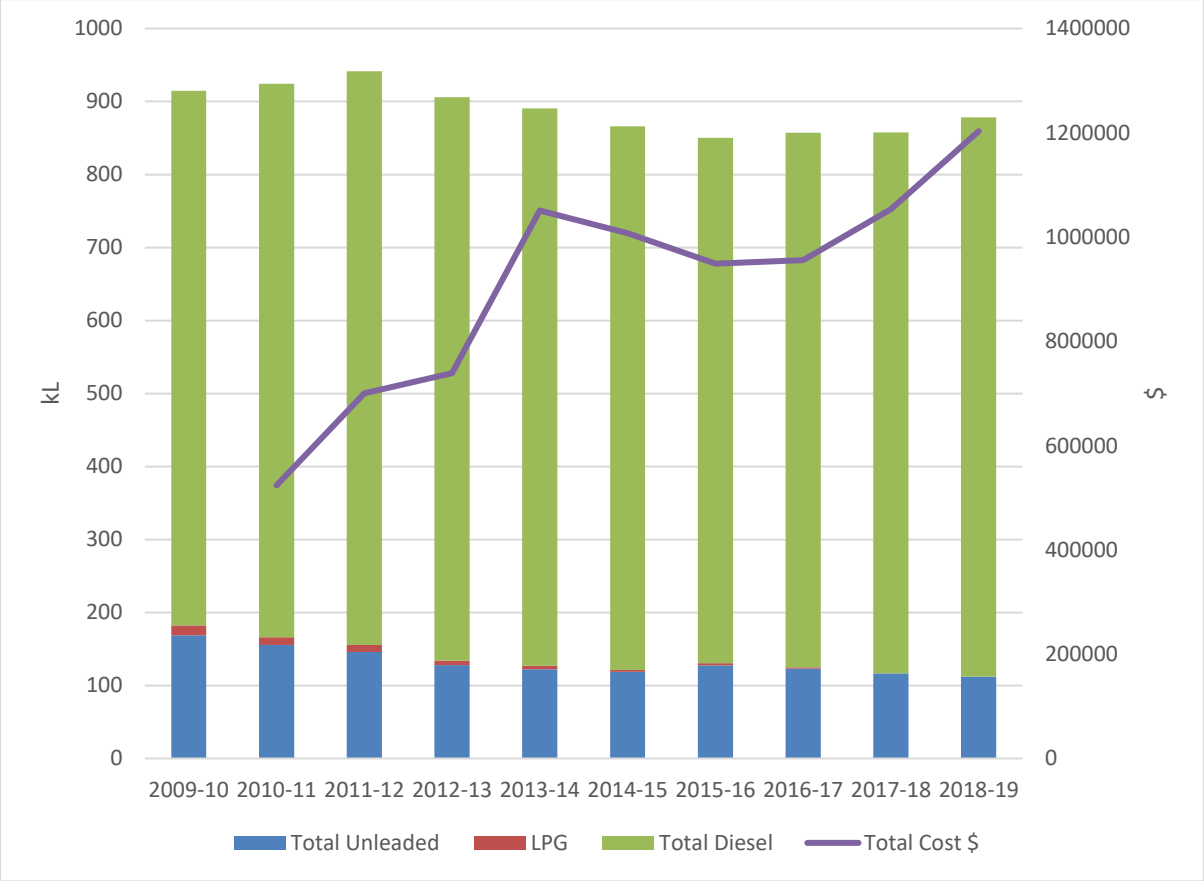


*Figure 5 Liquid Fuel*

### *Recommendation*

Develop an electric vehicle transition strategy for Council passenger and heavy vehicle fleet. The strategy should consider full life cycle cost benefit analysis, resale value, servicing (including barriers to in-house servicing), charging infrastructure and impact on Council productivity.

[3] From May 2011 to 31 March 2015 a new fringe benefit tax rule was phased in which saw the introduction of a 20% flat statutory rate for leaseback vehicles regardless of distance travelled. Prior to this time the statutory percentage decreased as the number of kilometres travelled in a year increased. The tiered rate provided a perverse incentive for leaseback vehicle owners to travel more kilometres.

# 5.0 What has Council done to reduce energy consumption?

In 2009 Council created the position of Sustainability Strategy Officer which has allowed an ongoing focus on the monitoring and management of energy consumption including the completion of energy audits and the implementation of energy efficiency projects.

In this time Council has prepared a distributed energy plan for 10 large Council sites, undertaken 8 detailed site energy audits and more than 28 energy efficiency projects. A full list of energy audits and energy efficiency projects implemented to date can be found at Appendix A.

A revolving energy fund (REF) was established by Council in 2011 whereby cost savings from energy efficiency projects are directed to new energy efficiency projects. The REF has funded 12 projects since its inception. A full list of these projects can be found at Appendix A.

Monitoring of Council energy and water consumption has been undertaken by Planet Footprint (now named Azility) under a subscription service since 2008. This service provides accurate consumption and cost data for each Council facility.

## 5.1 Solar on Council facilities

Since 2009, as funding and staff resources have allowed, Council has installed solar PV at suitable facilities. As of the end of 2019, Council has 14 facilities which have solar PV installations, with a total capacity of 450kW. Together these systems generate approximately 4.5% of Council's electricity consumption from a renewable resource. In 2018 Council installed its first system with battery storage at the Bathurst Visitor Information Centre. (See Appendix A for list of existing systems).

Due to the focus on energy efficiency and installation of behind the meter solar, since 2009/10 electricity use per capita has fallen from 1381 MJ per resident served to 1255 MJ per resident served (Figure 6). This is despite fluctuations in electricity use in response to climatic variability.

## 5.2 Power Factor

The power factor of an electrical load is the ratio of power that it draws from the mains supply and the power that it actually consumes. It is a measure of electrical efficiency. Improving power factor can help to reduce the total power (kWh) used at a site, however energy savings are very small (typically less than 0.5%). Achieving a higher power factor has other benefits including:

- Reduction in peak demand charges;
- Reduced heating in cables helping to increase equipment working lifespan;
- Reduced heating in transformers;
- Better voltage regulation; and
- Freeing up system capacity

Power factor correction has been undertaken at most of Council's large sites. Three remaining sites would benefit from power factor correction – Bathurst Memorial Entertainment Centre (BMEC) and two of Council's large water pump stations. Power Factor Correction will be installed at BMEC and variable speed drives at the two water pump stations in 2020.

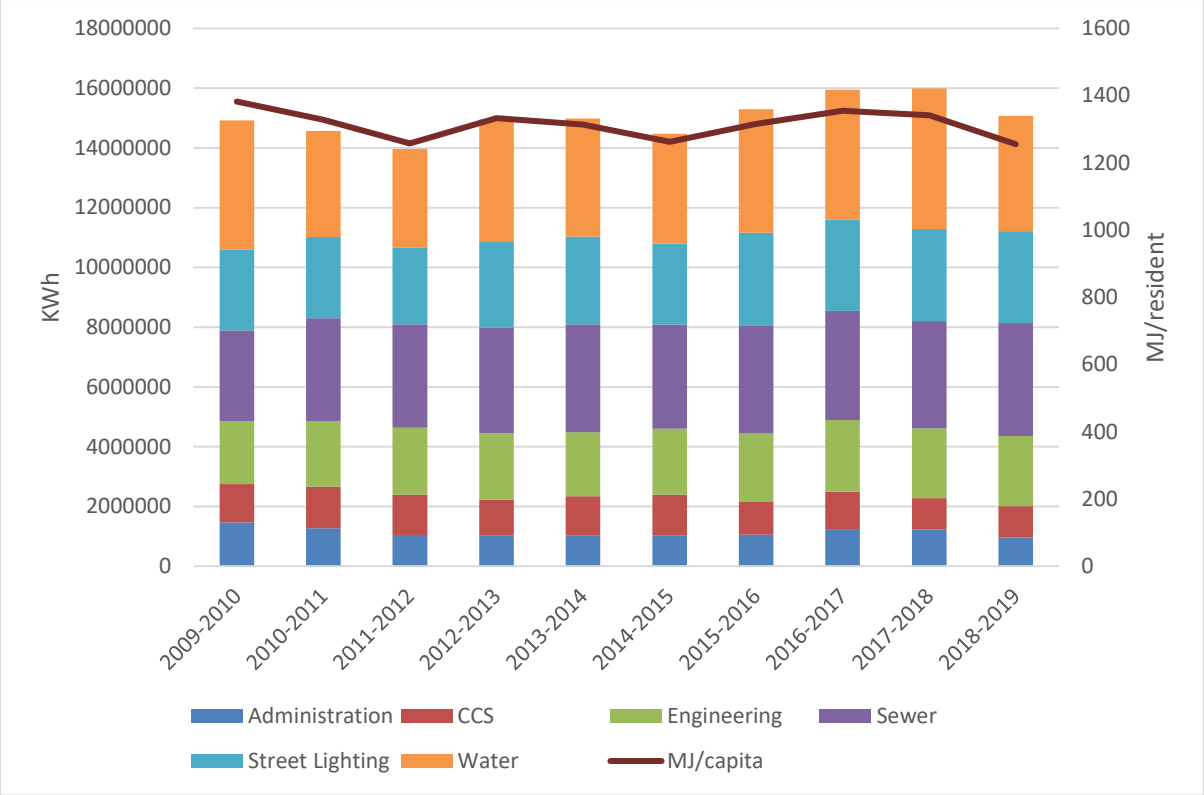


*Figure 6: MJ electricity consumed per resident served*

# 6.0 Strategic drivers for renewable energy

There are a range of strategic drivers operating to motivate Council to increase its use of renewable energy:

## 6.1 Climate change

Based on long-term (1910–2011) observations, temperatures have been increasing in the Central West and Orana since about 1970, with higher temperatures experienced in recent decades. The region is projected to continue to warm during the near future (2020–2039) and far future (2060–2079), compared to recent years (1990–2009). Maximum and minimum temperatures are projected to increase by 0.7°C in the near future and by 2.1°C in the far future. Spring and summer will experience the greatest changes in maximum temperatures, with temperatures increasing by 2.5°C by 2070. The number of hot days (>35oC) is expected to increase by 5-10 days per year by 2070. These increases are projected mainly in spring and summer although in the far future hot days will extend into autumn, resulting in lengthening of summers. The number of cold nights will decrease and result in fewer frosts. Rainfall is projected to decrease in spring and to increase in autumn. Average and severe fire weather is projected to increase in summer, spring and winter. (Office of Environment and Heritage, 2014). The combination of these impacts is predicted to result in lower soil moisture. Further detail on climate projections for the Central West and Orana region can be found at the Adapt NSW website at https://climatechange.environment.nsw.gov.au/Climate-projections-for-NSW.

Council is committed to ensuring that it takes action to minimise the impacts of climate change. Council joined the Cities Power Partnership in 2017 with pledges to install renewable energy at Council facilities, roll out energy efficient public lighting, provide fast charge infrastructure for electric vehicles, strengthen the community's capacity in renewable energy and energy efficiency and provide support for cycling in city infrastructure.

At its ordinary meeting in November 2019, Council passed a motion "Bathurst Regional Council acknowledges that current weather patterns are outside the normal range because of a change in the climate and that Council should continue its focus on improving energy efficiency, investigating other renewable energy opportunities in order to reduce costs …"

## 6.2 Leadership Role of Council

As the level of government closest to the community, Council has an important role in demonstrating leadership in the areas of resource efficiency and responding to climate change by reducing energy use and emissions in its own operations.

## 6.3 Community Sentiment

### 6.3.1 Bathurst 2040 Community Strategic Plan

The Bathurst community has identified generation of renewable energy as one of the top three action areas for Council with 73.6% of people rating this as moderately to extremely important (Bathurst Regional Council, 2018).

The Community Strategic Plan (CSP) commits Council to continue to support the pursuit of energy efficiency measures at its facilities and to offset its energy use through renewable energy projects. Council is aiming for a declining trend in the total greenhouse emissions from Council facilities, to increase its reliance on renewable energy sources and increase energy efficiency gains. Council is working towards reducing its total electricity consumption, per resident.

### 6.3.2 Community uptake of solar

The Bathurst community, along with the rest of Australia, has embraced roof-top solar. As of 30 November 2019, Bathurst residents have installed 3,569 small scale solar systems with capacity of 18.8 MWh (Clean Energy Regulator, 2019). When surveyed about renewable energy, 83% of respondents in NSW said they want more energy generated from renewable sources (Office of Environment and Heritage, 2015)

## 6.4 Increasing cost of energy to Council

Energy costs have increased significantly year on year over the last five years, and in 2018-19 Council spent approximately $5.4 million on energy, street lighting services and liquid fuel, which is approximately 5% of its overall operating expenditure and 12.5% of non-salary operating expenditure. Improving energy efficiency and increasing the amount of on-site renewable generation will reduce Council's expenditure on electricity. Savings can be diverted to other Council services.

## 6.5 State targets

The NSW Government has released a Climate Change Policy Framework, which includes an objective to achieve net-zero emissions by 2050. The biggest source of greenhouse gas emissions in New

South Wales is the stationary energy[4] sector (including electricity generation), which is responsible for almost 40% of emissions. Stationary energy emissions have declined since 2009 due to reduced electricity consumption and increased energy efficiency. The second biggest source of emissions is from transport. Transport emissions have grown since 1990 due to an overall increase in travel. Emissions in all other sectors have declined since 1990 (Office of Environment and Heritage, 2016).

A recent survey by the Australia Institute found that almost two-thirds of Australians support a national target of net-zero carbon emissions by 2050 or earlier (The Australia Institute, 2019).

This REAP will support the NSW governments target for net zero emissions, however it should be noted that the proportion of total greenhouse gases emitted from Council operations which is derived from electricity use is just over 27%, from gas approximately 1.9% and from liquid fuels 5.3%. The largest proportion of greenhouse gases emitted from Council operations is from the Bathurst Waste Management Centre which emits almost 65% of Council total emissions[5][6].

## 6.6 Improving air quality

Traditional generation of electricity can release substances that are directly harmful to human health, including but not limited to particulate matter (PM), nitrogen oxides (NOx) and sulfur oxides (SOx). As an example, the electricity sector contributes 88 per cent of SOx emissions and 53 per cent of NOx emissions, as well as 5 per cent of direct particulate matter (PM 2.5) emissions in the NSW Greater Metropolitan Region (State of NSW and Department of Planning, Industry and Environment, 2019). Burning of liquid fuels in vehicles is also a source of harmful air pollutants. Transitioning away from fossil fuels for electricity generation and liquid fuels will reduce levels of these harmful emissions.

## 6.7 Fuel Security

Australia's domestic liquid fuel production is declining but demand continues to grow as the economy is reliant on liquid fuel and will be for some time to come. Australia is therefore heavily reliant on imports of liquid fuels. The transport sector makes up 75 per cent of total liquid fuel demand. Over 60 per cent of refined product and 80per cent of crude oil feedstock is imported. The rest of the world is transitioning to other transport energy sources faster than Australia. To maintain reliable energy supply, particularly for transport, Australia needs to keep pace with global trends, or risk being left behind with ageing infrastructure and potentially more limited supply of oil (Commonwealth of Australia, 2019).

[4] Stationary energy includes electricity generation, fuels consumed in the manufacturing, construction and commercial sectors and domestic heating.
[5] Emissions data is from the 2018-19 Financial Year.
[6] There is a methane flare at the Bathurst Waste Management Centre which collects gases (including methane and other gases) produced from the breakdown of organic waste. The flare burns this gas and by doing so reduces the warming potential of gases released to atmosphere. This flare is not currently owned by Council with a third party agreement in place until 2027.

# 7.0 Energy Market

## 7.1 Analysis and Implications

The energy market in 2018 was characterised by high prices and rapid change, with widespread concerns about affordability, reliability and security of supply, and the industry's carbon emissions (Australian Energy Regulator, 2018). Electricity prices rose by 56 per cent in real terms over the 10 years to 2017–18. Network costs were the largest driver of retail electricity prices for several years, but since 2016, wholesale cost increases have been the main driver. Policy and market uncertainty have been a significant contributor to recent cost increases and have created barriers to investment to replace retiring coal fired generators.

Advances in metering and electricity generation, management and storage technologies are changing how the retail market works. 'Power of choice' reforms, introduced in NSW in 2017, aim to provide customers with opportunities to benefit from these changes. Reforms include a market led rollout of smart meters, the introduction of cost reflective network pricing (demand charges) and enabling wider use of demand response (Australian Energy Regulator, 2018). Council must keep abreast of these changes and take advantage of options that fit its needs.

In late 2019 the NSW Government released its NSW Electricity Strategy to plan for a reliable, affordable and sustainable electricity future. The plan acknowledges that firmed renewables[7] are now the most cost competitive form of new generation and cost less than the current wholesale electricity price. (State of NSW and Department of Planning, Industry and Environment, 2019). The plan provides support for investment in new generation and transmission and reduces risk for investors through the creation of three renewable energy zones, the first of which is a 3,000 MW pilot Renewable Energy Zone (REZ) in the Central-West. Where appropriate, the NSW Government will change the regulatory settings to incentivise generators to cover part of the cost of building new transmission for the REZs. The plan also extends and expands the Energy Savings Scheme, now labelled the Energy Security Safeguard, with expanded targets and the introduction of a demand reduction scheme.

While Bathurst is not in the proposed Central West REZ, it is expected that there would be flow on benefits to Council through increased renewable generation in the region and increased capacity in transmission as the REZ is linked to major consumer markets.

In January 2020 the Federal and NSW State Government announced a bilateral energy deal which aims (amongst other things) to improve grid security by supporting transmission interconnection and network access. It will provide financial support for the establishment of the REZ in Central West NSW.

## 7.2 Should Council build and operate its own solar PV plant?

There has been some interest in Council developing a large-scale renewable energy generation project to supply a large portion of its electricity needs or to become an energy supplier to local energy consumers in a community-based scheme. In effect this means that Council would become an energy generator operating in the regulated market. Any such project would have a high level of

[7] Firming is the mechanism by which intermittent or fluctuating electricity load is made firm in terms of volume.

risk associated with it and, at this point in time, becoming a generator is not considered Council's core business. Council's appetite for risk is necessarily diminished by its responsibility to ratepayers as its primary source of funds. While energy policy at the national level is still uncertain and contributing to significant market volatility, it is not recommended that Council pursue this approach. There are many energy efficiency and small-scale renewable energy options still available to carry out. The option to enter a Power Purchase Agreement with a large-scale renewable energy generator will also be pursued.

## 7.3 Behind-the-meter solar, feed-in tariffs and battery storage

Behind-the -meter solar installations are generally the most cost-effective renewable energy solution for an individual facility, but this does depend on site characteristics including the site load profile, available space, heritage restrictions, capacity restrictions in the network and other site limitations. Behind-the-meter systems provide power that can be used on-site without passing through the meter. This reduces electricity being drawn from the grid and offsets not just the energy cost but also the network and market costs associated with that electricity which would have otherwise been drawn from the grid.

Photovoltaic systems without storage produce electricity to be used immediately. In a grid connected system if solar generated electricity is not used it is fed back into the grid. Electricity fed back into the grid receives a feed in tariff from the retailer. The value of this feed in tariff is dependent on the contract in place. In NSW there is a recommended benchmark feed in tariff set by the Independent Pricing and Regulatory Tribunal. In 2019/20 FY this is 8.5 to 10.4 cents per kw hour. Electricity network operators may place an export limit on a new solar installation in order to protect the stability of the grid. If a system is export limited the inverter or export limiting device, will be programmed to throttle the export to the export limit set by the network operator. Any solar energy that a system produces above that will be wasted, typically as heat.

The electricity demand profile of a site and how well it matches the typical bell-shaped daytime curve of solar PV production is a key factor which influences the suitability of behind-the-meter solar at a site. For example, solar will not be as advantageous at a site which has high winter electricity demand and low summer demand, or where the load profile is biased to nighttime hours.

Battery storage can assist where there is a mismatch in the daily profile of site consumption and solar production, storing some of the energy produced in the day to be used at night. Battery storage does not however solve a seasonal mismatch in site consumption and solar production. In this situation if the solar PV system is sized for the winter load, excessive amounts of solar generated electricity may be exported to the grid. Alternatively, if the system is sized for the summer load, in the winter the site will be more reliant on grid drawn electricity.

## 7.4 Renewable Energy PPA

A Power Purchase Agreement (PPA) is an agreement between an independent power generator and a purchaser for the sale and supply of energy. They can be used for the supply of any type of energy, but in more recent times have often been used for the supply of renewable energy especially solar and wind.

### 7.4.1 Behind the meter or on-site Power Purchase Agreements

'Behind the meter' is a type of a Power Purchase Agreement (PPA) where an energy provider installs renewable energy equipment on a business' site. The system is owned by the energy provider and the business pays the provider a pre-determined rate for electricity for an agreed time period. This type of arrangement can be useful when a business does not have the available capital upfront to install the system itself, but it locks the user into a long-term contract. Ownership of the system usually passes to the business at the end of the agreed term for a nominal fee.

### 7.4.2 Off-Site or Corporate Power Purchase Agreement

In the emerging renewable energy market, corporates and (groups of) organisations can buy renewable energy from specific renewable energy projects. This approach is called a 'corporate PPA'. Organisations enter into these agreements primarily to lock in future energy prices and to meet carbon reduction or renewable energy targets (DPIE, 2019). In a corporate PPA an organisation agrees to purchase power (typically over a longer term than a standard electricity contract) at a rate per kWh from a renewable energy generator remote from the site of consumption. The organisation still must pay the network costs to deliver the electricity to site and still requires an agreement with a retailer to cover both the general grid and renewable electricity.

There are various models of Corporate PPA's operating in the market, not all which a local government authority is able to participate in.

Buy-side (sleeved) PPA model

A sleeved PPA is like a regular grid power agreement, except that a portion of the underlying electricity generation is from a specific renewable energy project. Under this model, a Council will not have a direct agreement with a renewable energy project developer. Instead, a retailer has a direct agreement with a specific renewable energy project and will sleeve the PPA through Council's electricity retail agreement. The retailer manages the risk of price fluctuation by obtaining the electricity at a fixed rate from the renewable energy project, or by using a contract for difference (100% renewables, 2019). The duration for the renewable component of the sleeved PPA has typically been between ten and 15 years, however there is a recent push by corporations for shorter renewable PPA terms. The retail agreement is subject to wholesale market pricing, whereas the pricing for the renewable component will reflect the developer's costs and may be fixed or variable over the term of the PPA.

Sell-side (direct) PPA model

A direct PPA involves an agreement between an organisation and a renewable energy project developer. The final price of the delivered energy is a combination of the offtake price of the renewables project plus transmission and distribution costs, as well as billing, reconciliation and risk management costs from the retailer. Prices are generally fixed over a longer term of up to 15 years. An agreement with a retailer is required to pass through the terms of the agreement with the renewable energy project developer (100% renewables, 2019).

Virtual PPA or contract for difference model (CFD)

A virtual PPA involves an agreement with a renewable energy project developer, however the agreement is a financial arrangement and no physical electricity is delivered. These types of PPAs are

essentially financial hedges or contracts for difference, under which fixed prices are settled against floating or spot prices in the National Energy Market. A virtual PPA is a stand-alone financial derivative agreement. Due to a Ministerial Order, NSW Councils cannot invest in financial derivatives.

The Central NSW Joint Organisation pursued a sleeved corporate PPA option as part of the electricity procurement process in 2019 with Bathurst seeking to procure 20 to 35% of its load from renewable sources if the pricing was cost competitive. Unfortunately, uncertainty in the market, including uncertainty relating to operating rules for large scale solar and voltage instability issues in the network, impacted the renewable offers received for the tender and a renewable PPA was not able to be achieved without a significant cost penalty. This outcome was not consistent with the results other Council groups have achieved and it appears that the timing of the approach to market was unfortunate. The recently announced Central West Renewable Energy Zone (discussed in Section 7.1) may provide future opportunities in this space.

Council will continue to pursue a renewable PPA in the short term within the limitations of its current electricity contract which contains a +/- 20% volume clause and expires in December 2022.

LGC'S

A Large-Scale Generation Certificate (LGC) is created for the Renewable Energy Target (RET) scheme when a plant with over 100 kilowatts (kW) capacity generates 1 megawatt hour (MWh) of renewable energy. In 2019, electricity retailers were required to surrender LGCs equal to 18.6% of the electricity consumed by their customers. LGC's excess to this requirement are available to be traded and purchased by corporations to meet renewable energy and or emissions targets.

## 7.5 Other Opportunities in the market

The following examples are a snapshot of market led initiatives which are being developed to assist renewable energy adoption and sharing. This is a very dynamic space and other options and schemes are expected to emerge during the course of this plan.

### 7.5.1 Virtual Net Metering or Peer to Peer Trading

Peer-to-peer energy trading is the buying and selling of energy between two or more grid-connected parties. Often in the form of solar energy, any excess energy can be transferred and sold to other users via a secure platform. Peer-to-peer energy trading allows consumers the choice to decide from whom they purchase electricity, and who they sell it to (100% renewables, 2018).

Peer-to-peer trading is not yet at the stage of commercial mass deployment in Australia. Several trials have occurred including an ARENA funded trial by AGL. Some companies (for example Power Ledger) have developed software products that allow for peer-to-peer energy trading from rooftop solar panels. Using blockchain technology they enable households to trade their excess rooftop solar power with their neighbours.

There are barriers to full commercialisation including that consumers are only trading the energy component of their power. Full network charges must still be paid for any electricity consumed at a site, even if that site is next door. Another barrier is that many retailers have not yet been convinced of the business case of the model.

### 7.5.2 Grid credits for solar feed-in

Reposit, in partnership with retailers Powershop and Diamond Energy, have created a 'currency' called GridCredits which can be earned by selling excess solar power from a battery back to the grid. Diamond Energy for example pays 100c/kWh during a Grid Credit event and these credits can be used to reduce a customer's electricity bill. Power Shop on the other hand pays battery owners a fixed amount per annum dependent upon battery size.

### 7.5.3 Local Area Trading with Network Credits

Local Electricity Trading (LET) is where electricity exported from solar generation at one site is credited to another site. Full network charges are still payable on the electricity. Exports from the generation site are netted off at whatever LET sites are included, and any remaining residual exports are valued according to the retailer buy-back rate. Network businesses do not currently offer a network tariff which reflects only partial use of the network, so no network credits are applicable. Council has one site where this kind of arrangement is currently operating. Although not named as Local Area Trading it is in effect operating in this way: the solar system at the Pit Paddock toilet block is on a generation only meter. The feed in tariff credits are offset against other sites on the same collective bill.

# 8.0 Energy Efficiency and Renewable Energy Targets

This plan proposes targets for Bathurst Regional Council in relation to energy efficiency and renewable electricity.

## 8.1 What targets have other Councils set?

Many NSW Councils have made either renewable energy or carbon emissions reduction commitments. Current targets at the date of publication are listed in Table 1.

*Table 1: Renewable Energy and Emissions Targets set by other NSW Councils (adapted from (100% renewables, 2019))*

| LOCAL GOVERNMENT | RENEWABLE ENERGY COMMITMENT | CARBON COMMITMENT |
|---|---|---|
| Bayside City Council | | Carbon neutral by 2020 |
| Blacktown City Council | | Zero-net emissions from operational electricity, fuel and gas use by 2030; Zero net community emissions by 2020 |
| Blayney Shire Council | Renewable energy plan with no specific target | |
| Broken Hill Council | 100% renewable energy status by 2030 | |
| Blue Mountains City Council | | Carbon neutral by 2025 |
| Byron Bay Council | 100% renewable energy by 2027 | Net zero by 2025 |
| City of Newcastle | 100% renewable electricity from 2020 | |
| City of Sydney | 100% renewable energy for council operations by 2021 | council operations by 2021 Carbon neutral from 2008 |
| Coffs Harbour City Council | 100% renewable energy by 2030 | |
| Eurobodalla Shire Council | 100% renewable energy by 2030 | |
| Inner West Council | 100% renewable electricity by 2025 | Carbon neutral by 2025 100% divestment from fossil fuel |
| Ku-ring-gai Council | | Reduce greenhouse gas emissions to achieve net zero emissions by 2045 or earlier |
| Kyogle Council | 25% electricity from on-site solar by 2025 50% renewable electricity by 2025 100% renewable electricity by 2030 | |
| Lismore City Council | Self-generate all electricity needs from renewable sources by 2023 | |
| Nambucca Council | | Zero net carbon emissions within the 2030 to 2050 period |
| Parramatta Council | | Carbon neutral by 2022 |
| Port Macquarie- Hastings Council | 100% renewable energy by 2027 | |
| Randwick Council | 100% renewable by 2030 for stationary and transport energy | Zero emissions by 2030 |
| Tweed Shire Council | 50% renewable energy by 2025 | |

| LOCAL GOVERNMENT | RENEWABLE ENERGY COMMITMENT | CARBON COMMITMENT |
|---|---|---|
| Willoughby City Council | | By 2028 emit 50% less GHG emissions from operations compared with 2008/09 Achieve net zero emissions by 2050 |
| Wollongong City | | Net zero emissions by 2030 for its own operations, net zero emissions by 2050 for the City as a whole |

Dubbo Regional Council has a Renewable Energy Action Plan in development. Temora and Cowra Councils are also in the process of developing Renewable Energy Plans.

## 8.2 Bathurst Regional Council Energy Efficiency Target

As outlined in Section 3.0, Council's energy management hierarchy stipulates that energy efficiency actions should be prioritised, so that the amount of renewable power that must be sourced to meet Council's renewable energy targets is minimised. Accordingly, Council has set the following energy efficiency target:

*Reduce Council's electricity consumption through energy efficiency measures by **15%** of 2018-19 levels by 2023*

See Table 2 for Council's Action Plan to achieve 15% reduction in electricity use by 2023.

## 8.3 Bathurst Regional Council Renewable Energy Targets

Council has set the following targets for renewable energy:

### Renewable Energy Target 1

***25%** of Council's electricity consumption to be from renewable sources by 2023*

Rationale for Renewable Target 1

An interim target of 25% has been determined based on:

- Council's current electricity contract which expires on 31 December 2022. This contract has a +/-20% variability clause. This means that Council cannot reduce its electricity consumption below 80% of the contracted volume prior to the end of the contract without risk of financial penalties being applied by the retailer. (Note that the timing of Renewable Target 1 corresponds with the end of current electricity contracts).
- Limited availability of funding outside of existing allocations in the short term to pursue energy efficiency and behind-the-meter solar.

Council's Action Plan with projects listed to meet this target is outlined in Table 3.

## Renewable Energy Target 2

***50%*** *of Council's electricity consumption to be from renewable sources by 2025*

Rationale for Renewable Target 2

A medium-term target of 50% has been determined based on:

- A 50% target by 2025 is an achievable target over a five-year period, working off a low base of approximately 4% in 2018-19
- Challenges in matching Council's current electricity load profile with the time of renewable generation (whether behind-the-meter or purchased through a PPA) without significant energy storage capacity.
- Current policy settings, uncertainty in the electricity market and rapidly evolving technology in the renewable energy and storage space make it prudent to set short- and medium-term targets which can be reviewed and raised as the renewable market develops.

Council's Action plan with listed projects which will allow Council to meet Renewable Target 2 is outlined in Table 4.

# 9.0 Action Plan

## 9.1 Energy Efficiency Action Plan

While Council has undertaken many energy efficiency projects in the past, more projects have been identified which will allow Council to reduce its total electricity consumption by 15% from 2018-19 levels (Table 2).

*Table 2: Energy Efficiency Action Plan (2020-2023)*

| Project | Detail | Estimated annual reduction in electricity from grid MWh | Funding Source |
|---|---|---|---|
| Streetlights to LED | Replacement of 5639 streetlights with LED | 1942 | Operating Plan 2019-20 (loan funds) |
| Heritage listed Street and Park lights LED lamp replacement | 162 lights | 68 | Existing budgets 2019-20 |
| Machattie Park lights to LED lamps | 55 lights | 12 | REF – existing funds |
| Fluorescent T5 to LED panel | 1000 lights across multiple facilities | 124 | NSW renewable energy certificates |
| VSD on Water Pump Stations x 2 | Estimate 10% energy saving | 61 | Water Fund 2019-20 |
| Street Lighting Smart Controls & Dimming profiles | Estimate 20% of P4 | 50 | Operating Plan 2020-21 |
| Total | | 2256 | |

Supporting information (analysis of all projects including assumptions and calculations) can be found in Appendix B

Net electricity consumption following implementation of the actions identified in Table 2 is 12813 MWh. This is calculated from 2018-19 baseline consumption of 15069 MWh[8] and is a 15% reduction over the baseline year.

## 9.2 Renewable Energy Action Plan to meet Target 1 (2020 – 2023)

To meet its target of 25% renewable electricity by 2023 Council proposes to install additional solar generating systems and purchase renewable energy through a renewable power purchase agreement. Proposed actions to allow Council to meet the 25% by 2023 target are outlined in Table 3.

Council's existing solar systems produce approximately 4% of total energy consumption, therefore Target 1 projects will seek to add an additional 21% of renewable electricity.

[8] 2018-19 has been chosen as the baseline year against which energy efficiency targets are set as it is the most recent full financial year of data available. Council acknowledges that a growing population, proposed new facilities and increased service levels may result in increased electricity consumption, changing the baseline against which efficiency targets and renewable energy targets will be measured. However Council has chosen not to employ an escalating baseline due to: 1) nonlinear impacts of population growth on Council energy consumption, 2) uncertainty over what the actual design and energy consumption of proposed new facilities will be and 3) the short timeframe before the first review of the REAP in 2023.

*Table 3: Renewable Projects to meet Target 1 (2020 – 2023)*

| Project | Detail | Estimated annual reduction in electricity from grid MWh | Funding source |
|---|---|---|---|
| Aquatic Centre Solar | 100kW solar system | 153 (0% export to grid) | Operating Plan 2018-19 - complete |
| NMRM Solar | 25.9kW solar system | 32 (20% export to grid) | REF 2019-2020 - complete |
| Scallywags Solar expansion | Additional 10kW solar system with 13kWh battery storage | 15 (14% export to grid) | ≈$20,000<br>REF 2019-20 |
| BMEC Solar | 80kW solar system with 50kWh battery storage | 104 (15% export to grid) | ≈$140,000<br>REF 2019-20 |
| Chifley Fire Station Solar | 50kW solar system | 77 (load profile not available to estimate % export) | Behind the meter PPA (externally funded) FY2019-20 |
| Basketball Stadium Solar & Storage | 40kW solar system with 50kWh battery storage | 46 (25% export to grid) | ≈$95,000<br>REF 2020-21 |
| WFP additional 50kW | 50kW solar system | 77 (<3% export to grid) | ≈$50,000<br>Water Fund 2020-21 |
| Depot additional Solar | 25kW solar system plus 30kWh battery storage | 34 (12% export to grid) | ≈$60,000<br>REF 2020-21 |
| Waste Management Centre Solar | 30kW solar system | 30 (35% export to grid) | ≈$30,000<br>Waste fund 2020-21 |
| Pit Complex Solar | 50kW solar system | 62 (19% export to grid) | ≈$50,000<br>REF 2021-22 |
| Aerodrome Solar | 50kW solar system | 66 (15% export to grid) | ≈$50,000<br>REF 2021-22 |
| Renewable PPA | For 15% volume of large site contract | 1922 | Assume no cost penalty |
| **Total** | | **2618** | **20.5%** |
| **Existing solar installations**[9] | | | **4.5%** |

Supporting information (analysis of projects including assumptions and calculations) can be found in Appendix B

## 9.3 Renewable Energy Action Plan to meet Target 2 (2023 -2025)

To meet its target of 50% renewable electricity by 2025 Council proposes to install additional solar generating systems and purchase more renewable energy (Table 4). Council's current electricity contracts expire on 31st December 2022, which will allow further scope to enter into additional renewable power purchase agreements.

The recommended actions to achieve Target 1 and Target 2 along with current renewable installed capacity achieve 55% predicted renewable electricity. This exceeds the stated target of 50% but provides a buffer if some identified actions cannot be achieved or if baseload electricity consumption increases due to introduction of new services or other unforeseen impacts.

[9] Existing solar installations are listed in Appendix A

*Table 4: Renewable Energy Projects to meet Target 2 (2023-2025)*

| Project | Detail | Estimated annual reduction in electricity from grid MWh | Funding Source |
|---|---|---|---|
| 1MW solar at WWTW | Ground mount at 1.3m | 1533 | Capital project - operating plan FY 2023-24<br>Estimate $1.2M |
| Aquatic Centre additional solar | 100kW solar | 153 | ≈$100,000<br>REF 2022-23 |
| Solar Evans Shire Council Building | 50kW with storage | 92 | REF 2023-24 |
| Solar Car Park | 100kW to be offset against Civic Centre[10] | 153 | Capital project operating plan FY 2024-25<br>Estimate $400,000 |
| Renewable PPA | For additional 15% volume of large site contract | 1922 | Assume no cost penalty |
| | | | |
| **Total** | | **3853** | **30%** |

## 9.4 Financial Implications

Most of the identified energy efficiency actions and renewable energy actions to meet Target 1, already have identified funding in the operating plan or can be funded from existing allocations or from Council's Revolving Energy Fund.

Capital funding in future operating plans will be required for actions identified for Target 2, including the 1MW solar at WWTW and the Solar Car Park. Consideration should be given to redirection of savings from the Street Lighting LED upgrade and the SLUOS savings arising from the 2019 AER determination to fund these and other identified renewable energy projects.

[10] Based on the assumption that a mechanism for virtual net metering will be available in the market by 2024

# 10.0 Conclusion

A target of 50% renewable electricity by 2025 is a reasonably ambitious but achievable target for Bathurst Regional Council operations. This will be achieved by implementing the identified energy efficiency and renewable energy actions outlined in Section 9. While energy efficiency actions and some renewable energy actions can be funded from existing allocations and Council's Revolving Energy Fund, capital funding will need to be sourced for some of the larger projects identified for Target 2.

Given the dynamic nature of the current electricity market and rapidly advancing technology in the renewable energy industry, particularly the predicted improvement in the cost of electricity storage options, it is recommended to undertake an interim review of this REAP in 2023, followed by a comprehensive review in 2025. It is anticipated that at this time Council will have a clearer understanding of the most efficient way to achieve 100% renewables in each energy use portfolio.

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# Definitions and acronyms

*Table 5 Acronyms*

| | |
|---|---|
| AER | Australian Energy Regulator |
| CSP | Community Strategic Plan |
| EV | Electric Vehicle |
| kW, MW | Units of power – usually used for electricity |
| kWh, MWh, GWh | Units of energy – usually used for electricity |
| LED | Light Emitting Diode (lighting technology) |
| LGC | Large Scale Generation Certificate |
| PPA | Power Purchase Agreement (for the purpose of this document PPAs are assumed to be with renewable energy projects only) |
| REAP | Renewable Energy Action Plan |
| REZ | Renewable Energy Zone |
| REF | Revolving Energy Fund |
| Solar PV | Solar Photovoltaic |
| | |

*Table 6 Definitions*

| | |
|---|---|
| Behind-the-meter | A renewable energy system that is installed behind your main meter. The purpose of the renewable energy generation is to serve the building's energy demand. |
| Cities Power Partnership | A free, national program that brings together Australian towns and cities making the switch to clean energy. An initiative of the Climate Council. |
| Electric Vehicles | Electric vehicles (EVs) refers to cars or other vehicles with motors that are powered by electricity rather than liquid fuels. There are currently four main types of EVs:<br>• Battery electric vehicles (BEVs): these vehicles are fully electric, meaning they are solely powered by electricity and do not have a petrol, diesel or LPG engine, fuel tank or exhaust pipe. BEVs are also known as 'plug-in' EVs as they use an external electrical charging outlet to charge the battery<br>• Plug-in hybrid electric vehicles (PHEVs): these vehicles are powered by a combination of fuel and electricity. They can be charged with electricity using a plug but also contain an internal combustion engine that uses liquid fuel<br>• Fuel cell electric vehicles (FCEVs): these vehicles use a fuel cell instead of a battery, or in combination with a battery or supercapacitor, to power their electric motors. FCEVs are typically fuelled by hydrogen<br>• Non-plug-in hybrid EVs (HEVs): instead of using an external plug to charge the vehicle, the electricity generated by the HEV's braking system is used to recharge the battery. This is called 'regenerative braking'. |
| Feed-in Tariff | A rate offered by a retailer for renewable energy exported to the grid, typical in many retail energy supply agreements. |

| | |
|---|---|
| Firming | Firming is the mechanism by which an intermittent or fluctuating electricity load can be made firm in terms of volume. Renewable projects can use financial or physical firming products to guarantee delivery of a set amount of MWh of electricity even in times of low or no generation. |
| Net Zero Emissions | Net-zero emissions as defined by the NSW State Government means NSW emissions will be balanced by carbon storage. The more emissions are reduced, the less sequestration is needed to achieve net-zero. |
| Solar PV | Solar Photovoltaic (PV) is a technology that converts sunlight (solar radiation) into direct current electricity by using semiconductors. When the sun hits the semiconductor within the PV cell, electrons are freed and form an electric current. |

# Appendix A

*Table 7: Energy Audits, energy efficiency, renewable energy projects at Bathurst Regional Council*

| Energy Action | When completed/implemented |
|---|---|
| Energy Audit Level 1 Bathurst Visitor Information Centre | 2008 |
| Energy Audit Scallywags Level 1 | 2008 |
| Energy Audit Little Scallywags Level 1 | 2009 |
| Solar BVIC 2kW | 2009 |
| Solar Learmonth Park Toilet Block 1.05kW | 2009 |
| Energy Audit Civic Centre Level 2/3 (CDE) | August 2010 |
| Energy Pilot study Civic Centre Finance Section | October 2010 |
| Solar Pit Paddock Toilet Block 10kW | May 2011 |
| Solar Scallywags 7.22kW | May 2011 |
| Solar NMRM 6kW | May 2011 |
| Civic Centre Energy Efficient Lighting Project | 2011/2012 |
| Council Greenhouse Gas Inventory (Hyder) | February 2011 |
| Hi Bay Lighting retrofit NMRM | May 2011 |
| BMEC energy efficiency lighting upgrades (replacement of Tungsten and Halogen lights) – BMEC staff project | Progressively from 2011 - 2014 |
| Energy Audit Level 2 Water Filtration Plant (KMH) | February 2012 |
| Energy Audit Level 2 Waste Water Treatment Plant (KMH) | February 2012 |
| Energy Audit Level 2 Library Art Gallery (KMH) | February 2012 |
| Cogeneration Feasibility Study Aquatic Centre | April 2012 |
| Little Scallywags Ceiling Insulation | June 2012 |
| Basketball Stadium Hi Bay Lighting Retrofit | June 2012 |
| Retrofit of T8 to T5 lighting across 11 sites | June 2012 |
| Solar BVIC expansion 4.2kW | 2012 |
| Hi Bay Lighting retrofit Depot | September 2012 |
| Installation of VSD's on raw water and clear water pumps Water Filtration Plant | Progressively from 2012 - 2014 |
| Distributed Energy Plan (ARUP) Water Filtration Plant, Waste Water Treatment Plant, Aquatic Centre, Street Lighting, Library Art Gallery, Civic Centre, Post Office, Pit Complex, Bathurst Memorial Entertainment Centre and the Works Depot | December 2012 |
| Solar Depot 27.4kW | July 2013 |
| Replacement of Hot Water Services (HWS)with solar HWS at seven Council facilities under the Federal Government LGEEP program | July 2013 |
| Solar Small Animal Pound 5.2kW | September 2013 |
| Replacement of Halogen display lights with LED at AFMM | November 2013 |
| Energy Audit Level 2 Depot | March 2014 |
| Install shade sail Little Scallywags | June 2014 |
| Replacement of Halogen Track Lighting at NMRM with LED | 2014 |
| Solar Water Filtration Plant 50kW | August 2014 |
| Solar Neighbourhood Centre 7.2kW | November 2014 |
| Solar Little Scallywags 4kW | May 2015 |
| Aerodrome Apron Floodlights change to LED | February 2016 |

| | |
|---|---|
| Solar Waste Water Treatment Plant 100kW | June 2016 |
| Library Art Gallery HVAC upgrade, BMS Upgrade – Engineering project | 2016 |
| Art Gallery Track Lighting LED Upgrade | March 2016 |
| Waste Management Centre LED lighting Retrofit | January 2017 |
| Solar Library Art Gallery 80kW | May 2017 |
| Centroc Virtual Net Metering Project with Institute of Sustainable Futures | May 2017 |
| Lighting upgrade Post Office Car Park | June 2017 |
| Aerodrome Ceiling replacement and insulation | November 2017 |
| Art Gallery wall relining – Engineering project | December 2017 |
| Solar BVIC solar storage design | February 2018 |
| Street Lighting LED Business Case Development and Pilot Trial | 2017-2018 |
| Demand Response Program signed with AGL | February 2018 - ongoing |
| Civic Centre Council Chambers, Committee Room, Toilets LED Lighting retrofit | Current project |
| Renewable Energy Options Analysis – solar car parks | March 2018 |
| Solar Storage BVIC Design and Construct 35kW with 10kWh storage | August 2018 |
| Replacement library T5 lights with LED | 2018 |
| Post Office HVAC Upgrade – Engineering Project | 2018-19 |
| Street Lighting LED review of road hierarchy and lighting levels in preparation for LED roll out | April 2019 |
| BMEC upgrade of theatre lights to LED | 2018-19 |
| Aquatic Centre Solar | July 2019 |
| NMRM Solar | November 2019 |
| Power Factor Correction BMEC | December 2019 |
| | |

REF Funded or part funded project

Note the above list is not exhaustive as there may be energy efficiency projects and actions undertaken by facility managers independently of the Environment Section of Council.

*Table 8: Solar Installations at Council Facilities*

| Installed | Location | System Size | estimated kWh per year | estimated t CO2 e saved |
|---|---|---|---|---|
| 2009 | BVIC | 2 | 3066 | 2.5 |
| 2009 | Learmonth Park | 1.05 | 1610 | 1.3 |
| 2011 | Pit Paddock | 10 | 15330 | 13 |
| 2011 | Scallywags | 7.22 | 11068 | 9 |
| 2011 | NMRM | 6.0 | Decommissioned in 2018 | |
| 2012 | BVIC expansion | 4.2 | 6439 | 5 |
| 2013 | Depot | 27.4 | 45005 | 37 |
| 2013 | Pound | 5.2 | 8541 | 7 |
| 2014 | WFP | 50.2 | 76957 | 63 |
| 2014 | Neighbourhood Centre | 7.2 | 11826 | 10 |
| 2015 | Little Scallywags | 4 | 6132 | 5 |
| 2015 | Winburndale Cottage | 5 | 7665 | 6 |
| 2016 | WWTW | 100 | 153300 | 126 |
| 2017 | Library Art Gallery | 80 | 122640 | 101 |
| 2018 | BVIC | 35 | 53655 | 44 |
| 2019 | Aquatic Centre | 100 | 153300 | 126 |
| | | | | |
| | Total | 438.5 | 676533 | 555 |

Note that projects installed after June 2019 are included in Table 3 of this plan.

# Appendix B

| | | Grid Sourced | BRC Solar as of 2018/19 | % |
|---|---|---|---|---|
| **Baseline Electricity Use** | Council Grid Electricity use 2018/19 (Baseline Year) | 15069 | 676.5 | 4.3% |

| **Energy Efficiency Projects** | **Detail** | **Estimated annual reduction in grid electricity (MWh)** | **Assumptions** | **%** |
|---|---|---|---|---|
| Street Lights to LED | Replacement of 5639 street lights with LED | 1942 | | |
| Heritage listed Street lights unmetered inventory replaced with LED | 102 x 125w MV (142w load) replaced with 30w LED | 50 | assume operating 4500 hours per year | |
| Heritage listed lights Machattie Park etc replacement with LED | 37 x 80w MV (95.8w load) replaced with 30w LED | 9 | assume operating 4500 hours per year | |
| Heritage listed Chifley Park | 8 x 150w replaced with 30w LED | 4 | assume operating 4500 hours per year | |
| Heritage listed Kings Parade | 15 x 80w MV replaced with 30w LED | 4 | assume operating 4500 hours per year | |
| Machattie Park lights to LED | 55 x 70w MH lights to LED | 12 | assume operating 4500 hours per year | |
| Fluorescent T5 to LED panel | | 124 | TBC based on 1000 from 56 to 22 w, 10 hours per day | |
| VSD on Water Pump Stations x 2 | | 61 | assume conservative 10% savings based on 2018 calendar year consumption | |
| Street Lighting Smart Controls & Dimming profiles | | 50 | 20% estimate on 248MWh (P4 lighting) | |
| | | | | |
| | Total (MWh) | 2256 | | 15% |
| | Net grid sourced following Energy Efficiency projects (MWh) | 12813 | | |

| **Renewable Energy Projects Target 1** | **Detail** | **Estimated annual reduction in grid electricity (MWh)** | **Assumptions** | **%** |
|---|---|---|---|---|
| Aquatic Centre Solar | 100kW solar system | 153 | 0% export | |
| NMRM Solar | 25.9kW solar system | 32 | 20% export | |
| Scallywags Solar addition | Additional 10kW solar system with storage | 15 | 14% export | |
| Chifley Fire Station Solar | 50kW solar system with storage | 77 | - | |
| Basketball Stadium Solar & Storage | 40kW solar system with storage | 46 | 25% export | |
| BMEC Solar | 80kW solar system | 104 | 15% export | |
| WFP additional 50kW | 50kW solar system | 77 | <3% export | |
| Depot additional Solar | 25kW solar system plus storage | 34 | 12% export | |
| WMC Solar | 30kW solar system with storage | 30 | 35% export | |
| Pit Complex Solar | 50kW solar system | 62 | 19% export | |
| Aerodrome Solar | 50kWh solar system with storage | 66 | 15% export | |
| Renewable PPA | 15% volume of large site contract | 1922 | Assume no cost penalty | |
| | | | | |
| | Total (MWh) | 2618 | | 20.4% |

| **Renewable Energy Projects Target 2** | **Detail** | **Estimated annual reduction in grid electricity (MWh)** | **Assumptions** | **%** |
|---|---|---|---|---|
| 1MW solar at WWTW | Ground mount 1.3m | 1533 | | |
| Evans Shire Council Building Solar | 50kW with storage | 92 | 0% export | |
| Additional Solar Aquatic Centre | 100kW with storage | 153 | 0% export | |
| Solar Car Park | 100kW with storage | 153 | Offset to Civic Centre | |
| Renewable PPA | 15% volume of large site contract | 1922 | Assume no cost penalty | |
| | | | | |
| | Total (MWh) | 3853 | | 30.1% |

Note:

1. Solar production calculated based on each kW solar producing 4.2KWh electricity per day on average over a year.

2. Estimated exported solar is not included in calculated RE percentage.