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City of Wagga Wagga

NSW GOVERNMENT | Planning & Environment

Wagga Wagga City Council

CORPORATE NET ZERO STRATEGY

Final Report

Date: 18 March 2022

www.100percentrenewables.com.au

Contents

1 EXECUTIVE SUMMARY 4

1.1 INTRODUCTION TO WAGGA WAGGA CITY COUNCIL TARGETS 4
1.2 WAGGA WAGGA CITY COUNCIL CARBON FOOTPRINT 5
1.3 ROADMAP TO ACHIEVE WAGGA WAGGA CITY COUNCIL'S NET ZERO TARGET 6

2 CONTEXT FOR ACTION TO REDUCE EMISSIONS 8

2.1 CLIMATE CHANGE 2021: THE PHYSICAL SCIENCE BASIS 8
2.2 INTERNATIONAL DRIVERS FOR CLIMATE ACTION 9
2.3 COMMONWEALTH AND STATE TARGETS 11
2.4 ALIGNMENT WITH NSW STATE TARGETS AND OTHER LOCAL GOVERNMENTS 12

3 WAGGA WAGGA CITY COUNCIL'S CARBON FOOTPRINT 13

3.1 SCOPE 1, SCOPE 2 AND SCOPE 3 EMISSIONS 13
3.2 FY2020 CARBON FOOTPRINT 14
3.3 BUSINESS-AS-USUAL FORECAST EMISSIONS FOR WAGGA WAGGA CITY COUNCIL 15
3.4 ANALYSIS OF ELECTRICITY USE BY COUNCIL ASSETS 18
3.5 ANALYSIS OF NATURAL GAS USE BY COUNCIL ASSETS 18
3.6 ANALYSIS OF FUEL USE (STATIONARY LPG AND TRANSPORT) 19
3.7 ANALYSIS OF LANDFILL WASTE 19
3.8 ANALYSIS OF WASTEWATER 20

4 PAST AND CURRENT ABATEMENT INITIATIVES 21

5 OPPORTUNITIES TO REDUCE CARBON EMISSIONS 22

5.1 GRID DECARBONISATION 24
5.2 BUYING CLEAN ENERGY 27
5.3 BEHIND-THE-METER SOLAR 29
5.3.1 Onsite solar PV opportunities 33
5.4 ENERGY EFFICIENCY 35
5.5 SUSTAINABLE TRANSPORT 37
5.6 WASTE MANAGEMENT 42
5.7 GAS TO ELECTRIC TECHNOLOGIES 44
5.8 CARBON SEQUESTRATION OFFSETS 45
5.9 SUSTAINABLE VALUE CHAIN 47

6 EMISSIONS REDUCTION PATHWAY TO MEET THE FY2040 TARGET 50

6.1 PATHWAY TO FY2040 TARGET 50

APPENDIX A 53

Table of tables

Table 1: FY2020 carbon footprint 14
Table 2: BAU changes to Wagga Wagga City Council's carbon footprint to FY2040 15
Table 3: Wagga Wagga City Council – grid electricity consumption (summary) 18
Table 4: Wagga Wagga City Council – natural gas consumption by facility 18
Table 5: Wagga Wagga City Council – fuel use 19
Table 6: Wagga Wagga City Council – Revised landfill waste emissions estimates 19
Table 7: Wagga Wagga City Council – landfill waste emissions incl ACCU credits sold from flaring 20
Table 8: Wagga Wagga City Council – wastewater emissions 20
Table 9: Wagga Wagga City Council – past, current & planned emissions reduction actions 21
Table 10: Wagga Wagga City Council – list of installed solar PV systems at City facilities 21
Table 11: Summarised solar PV opportunities at Wagga Wagga City council 33
Table 12: Opportunities for Wagga Wagga City Council to reduce its carbon footprint 50

Table of figures

Figure 1: Wagga Wagga City Council - Business-as-usual total emissions projection to 2040 5
Figure 2: Wagga Wagga City Council's indicative emissions reduction pathway with sequestration 7
Figure 3: Remaining global carbon budget (adapted from IPCC Working Group I report FAQs) 8
Figure 4: Global context for action on climate 9
Figure 5: Global Risks report – Risks to global economy (WEF 2022) 10
Figure 6: Australia's renewable energy and carbon goals – State & Territory level 11
Figure 7: Net zero commitments by local governments in NSW regional areas as at Dec 2021 12
Figure 8: Scope 1, Scope 2 and Scope 3 emissions 13
Figure 9: FY2020 carbon footprint by emission source 14
Figure 10: Wagga Wagga City Council - Business-as-usual energy-related emissions projection 17
Figure 11: Wagga Wagga City Council - Business-as-usual total emissions projection 17
Figure 12: Nine categories of emissions reduction for Wagga Wagga City Council 23
Figure 13: AEMO model of renewable energy penetration in ISP2022 scenarios (draft) 25
Figure 14: DISER model of electricity emissions in Australia 25
Figure 15: Wagga Wagga City Council's emissions reduction pathway 52

1 Executive summary

1.1 Introduction to Wagga Wagga City Council targets

Wagga Wagga City Council has committed to the following emissions reduction targets:

- A corporate target of Net Zero Emissions by 2040
- A community target of Net Zero Emissions by 2050

Council's targets for the community are aligned with the NSW Government's net zero emissions target for 2050, which is being strongly supported with action on multiple fronts including electricity supply, electric vehicle and infrastructure support, waste strategies, and other measures. The above corporate target demonstrates leadership by Council to show that net zero is achievable and positions it well for future changes that may see State targets legislated.

These targets are supported by both the Wagga Wagga Community Strategic Plan and the Wagga Wagga Local Strategic Planning Statement. This strategy addresses the first of these targets and identifies measures that can be implemented over time to help Council to achieve its corporate net zero target.

Emissions of greenhouse gases from landfill waste makes up the vast majority of Council's emissions and forms a significant part of the community's emissions. Achieving the NSW State Government's waste targets, including 10% total waste reduction, 80% waste diversion from landfill and 50% reduction in organic waste by 2030[1], will make a significant contribution to the achievement of both the corporate and community targets. The NSW Waste and Sustainable Materials Strategy also states that to minimise the impact of landfill gas emissions, the NSW Government will require:

- Separate collection of food waste from targeted businesses and other entities that generate the highest volumes of food waste, including large supermarkets and hospitality businesses, by 2025 and
- Net zero emissions for landfills that are subject to an environment protection licence by a prescribed timeframe.

Council's emissions profile does not include a wide variety of carbon sources and sinks such as existing trees on Council land, tree removal on Council land, closed former landfills, waste collection trucks, employee travel, road making and construction works etc which are mostly Scope 3 emissions. It is limited to the current and material emissions from activities where Council has operational or financial control over those activities or facilities. This includes emissions from:

- Electricity
- Gas
- Fuel
- Landfill operation
- Wastewater treatment
- Electricity for streetlighting

[1] NSW Waste and Sustainable Materials Strategy 2041

1.2 Wagga Wagga City Council carbon footprint

Wagga Wagga City Council's FY2020 carbon footprint was **86,339 t CO_2-e**. The majority of emissions (80%) come from landfill waste. Electricity usage is the second largest emissions source after landfill, contributing 10%. Other contributors to Council's corporate carbon emissions include fuel (diesel, petrol and ethanol) natural gas and wastewater emissions.

Population growth and planned changes to Council's facilities portfolio, allied to grid decarbonisation were used to forecast what the Council's emissions would be in FY2040 without further action to reduce emissions. It is projected that the Council's emissions would be around 86,414 t CO_2-e by FY2040, as shown below.

More detailed information on the 'business-as-usual' emissions profile for Wagga Wagga City Council can be found in Section 3.4.

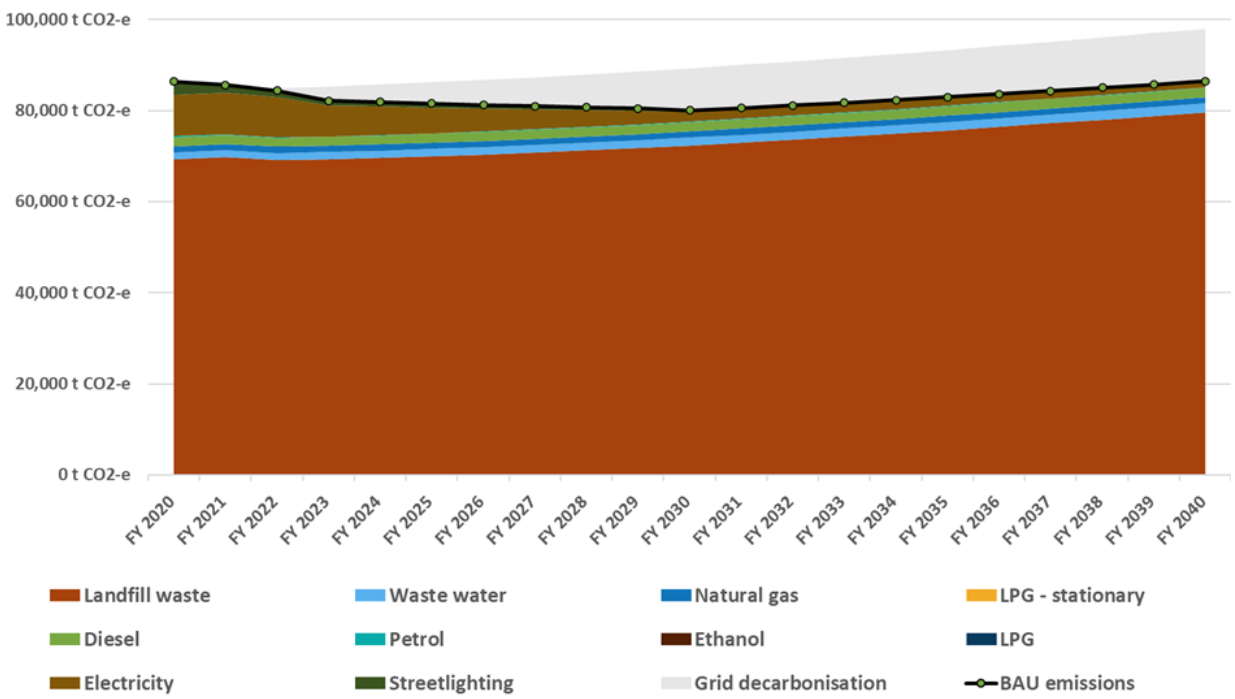

FIGURE 1: WAGGA WAGGA CITY COUNCIL - BUSINESS-AS-USUAL TOTAL EMISSIONS PROJECTION TO 2040

1.3 Roadmap to achieve Wagga Wagga City Council's net zero target

A roadmap to reduce emissions to net zero by 2040 should follow science-informed advice that emissions need to be reduced in the short term and continue to reduce over time. Limiting global warming over the long term to no more than 1.5°C calls for organisations and individuals to start now, make deep emissions cuts, and persist on this path for years to reach net zero emissions.

The Net Zero Emissions target for Wagga Wagga City Council can potentially be met by implementing the following abatement measures, in addition to abatement that will result from the greening of the electricity grid:

- Buying renewable energy through Council's electricity supply agreements out to 2040.
- Continuing to install onsite solar PV and battery energy storage systems.
- Continuing improvement to buildings and other assets, completing LED upgrades to streetlighting, and incorporating new LED technology and controls into future upgrades.
- Transitioning to low emissions and electric vehicles, with associated charging infrastructure, per the *Fleet Transition Feasibility Plan* to 2030, and extending electrification to larger fleet and plant over time.
- Reducing landfill emission by increasing FOGO, reducing waste and increasing diversion from landfill, implementing energy-from-landfill gas technology and retiring carbon credits (ACCUs) generated from flared landfill gas.
- Switching from gas to electric technologies by replacing gas boilers and cogeneration with electric heat pumps, and gas assets to electric at end of life.
- Sequester carbon through planting trees and/or purchasing carbon offsets to compensate for the remaining emissions from Council's operations.

In addition to these Council may work towards adopting and implementing sustainable procurement processes across Council's value chain. This could include, for example sustainable design, and purchasing of low and zero emissions goods and services. As an example, Council could source materials with recycled content for road contruction. While this is related to Scope 3 corporate emissions it can have a significant impact on community emissions.

Figure 2 shows a modelled emissions reduction pathway with abatement measures implemented. With all modelled abatement from mitigation measures, it is challenging to eliminate all of council's corporate greenhouse gas emissions. Depending on which abatement options are pursued and the success of those measures, the gap to net zero emissions may be as much as 28,700 tCO_2-e.

This gap can potentially be bridged through local carbon sequestration. Using a high-level estimated sequestration rate of 10 tCO_2-e/ha/year, a total of 2,870 hectares would need to be revegetated, through revegetating existing land and/or purchasing additional land specifically for revegetation. A complementary strategy could involve purchasing some carbon offsets to achieve net zero emissions to make up any shortfall in 2040. When a more detailed carbon offset plan is developed it may also consider how to account for sinks and sources related to Council controlled vegetation.

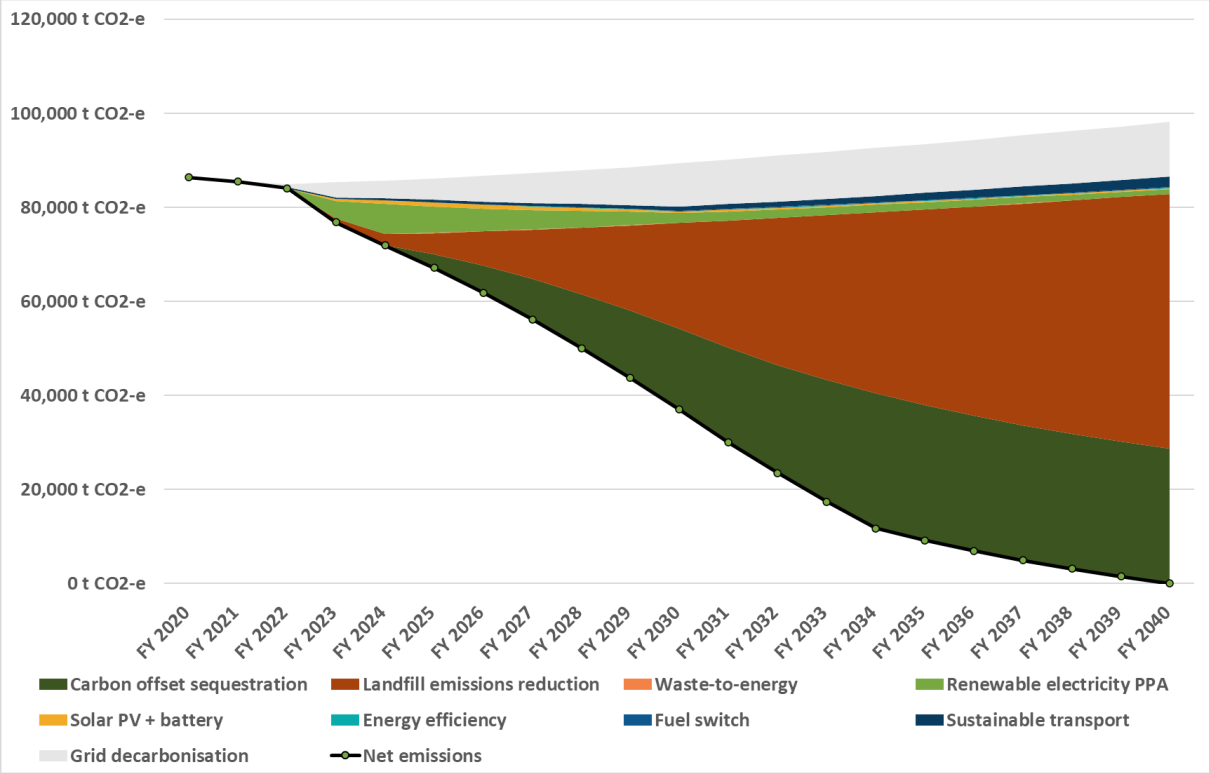

FIGURE 2: WAGGA WAGGA CITY COUNCIL'S INDICATIVE EMISSIONS REDUCTION PATHWAY WITH SEQUESTRATION

2 Context for action to reduce emissions

2.1 Climate Change 2021: the Physical Science Basis[2]

Due to all historical carbon emissions, average global temperatures have increased by ~1°C from pre-industrial levels; in Australia it is higher at ~1.4°C. The IPCC's recently-released report, *Climate Change 2021: the Physical Science Basis* has issued the strongest call yet for urgent and deep cuts to be made to global greenhouse gas emissions. The Working Group I Report says the window to deliver the "deep emissions cuts" needed to prevent the worst impacts of climate change is closing rapidly.

The main driver of long-term warming is the total cumulative emissions of greenhouse gases over time. Since 1750, emissions have been more than 2,560 billion tonnes CO_2. A key message from the report is that rapid reductions in emissions are required **this decade** to prevent long-term ecological and climate breakdown. The report predicts that it is near-certain that global warming will exceed 1.5°C in the next two decades, but that accelerated abatement and removals can reverse this situation beyond 2050.

We have a 50/50 chance to limit warming to 1.5°C if we stay within an added global carbon budget of 500 billion tonnes. At pre-pandemic global emission rates, this gives us under 11 years before we exceed 1.5°C. If we want a better chance – two in three – of achieving around 1.5°C of warming by mid-century, then we can emit just 400 billion tonnes globally, and we have even less time to act.

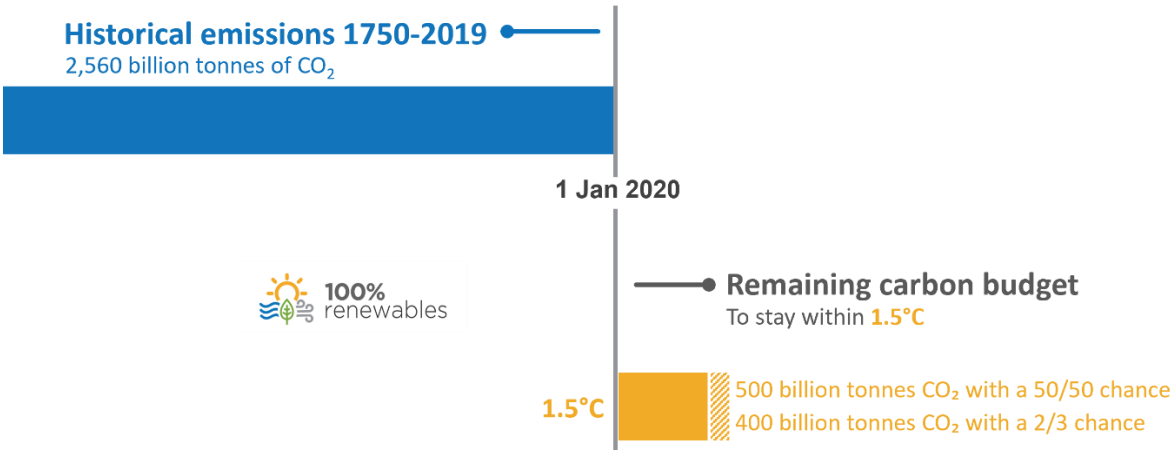

FIGURE 3: REMAINING GLOBAL CARBON BUDGET (ADAPTED FROM IPCC WORKING GROUP I REPORT FAQS)

From the perspective of an organisation, the clear pathway to follow if a safe future climate is a goal is to start now, make deep emissions cuts, and persist on this path for years to reach net zero emissions. To achieve net zero emissions in a local government context this would mean:

- GHG emissions from stationary fuel combustion such as natural gas and LP gas are minimised, and
- GHG emissions from transport fuel combustion are minimised, and
- GHG emissions from electricity consumption are minimised, and
- GHG emissions in the value chain – upstream and downstream are minimised, and
- Remaining emissions are offset or removed through sequestration measures

[2] https://www.ipcc.ch/report/sixth-assessment-report-working-group-i/

2.2 International drivers for climate action

The Working Group I report referred to above is the first in the IPCC's sixth assessment report cycle (AR6), and their synthesis report is due to be released in 2022, which will bring together the latest science, evidence, and projections for global warming.

The AR6 cycle builds on prior scientific evidence and will provide the international community with further data with which to build consensus to act to reduce emissions. At present, beyond the second commitment period of the Kyoto Protocol (from 2013 to 2020), there are three primary drivers for urgent climate action. These are:

1. **Sustainable Development Goals (SDGs)**

   In 2015, countries adopted the 2030 Agenda for Sustainable Development and its 17 Sustainable Development Goals[3]. The SDGs came into force on 1 January 2016 and call on action from all countries to end poverty and promote prosperity while protecting the planet.

2. **Paris Agreement**

   To address climate change, countries adopted the Paris Agreement at the COP21 in Paris on 12 December 2015. In the agreement, signatory countries agreed to work to limit global temperature rise to well below 2°C, and given the grave risks, to strive for 1.5°C Celsius[4].

3. **Special IPCC report on 1.5°C warming (SR15)**

   In October 2018 in Korea, governments approved the wording of a special report on limiting global warming to 1.5°C. The report indicates that achieving this would require rapid, far-reaching, and unprecedented changes in all aspects of society[5].

FIGURE 4: GLOBAL CONTEXT FOR ACTION ON CLIMATE

[3] Sourced from https://www.un.org/sustainabledevelopment/development-agenda/
[4] Sourced from https://www.un.org/sustainabledevelopment/climatechange/
[5] Sourced from https://www.ipcc.ch/news_and_events/pr_181008_P48_spm.shtml

In addition, the World Economic Forum's Global Risks Report 2022[6] highlights adverse climate change-related outcomes as among the most likely to occur with the *highest impacts to the global economy.* The *Figure 5: Global Risks report – Risks to global economy* from the WEF report shows the most severe risks to global economy over the next 10 years.

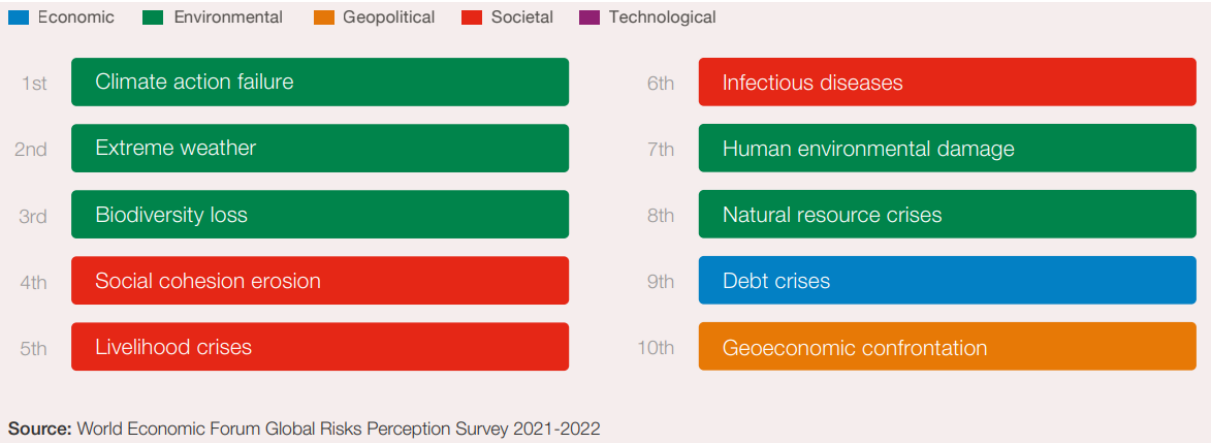

FIGURE 5: GLOBAL RISKS REPORT – RISKS TO GLOBAL ECONOMY (WEF 2022)

The report is underpinned by the Global Risk Perception Survey (GRPS) and gathers insights from nearly 1,000 global experts and leaders who highlighted the importance and urgency of international collaboration to address the economic, environmental, geopolitical, societal, and technological risks. Climate change continues to be perceived as the severest threat to humanity. Climate action failure, extreme weather, and biodiversity loss rank as the three most potentially severe risks for the next decade. The risks have been intensified by an ongoing COVID-19 pandemic.

An increasing number of organisations, including governments, businesses, investors and communities, are conversing on the need for a quicker transition towards the net zero emissions and committing to decarbonise. This transition may happen at different speeds, depending on decarbonisation ambitions, political will, economic structures and technological and financial capabilities. For organisations that move faster, the close attention to scope 3 emissions is increasingly advantegeous as this will shine a spotlight on value chains and increase focus on organisations, businesses and communities that value climate action initiatives.

[6] WEF_The_Global_Risks_Report_2022.pdf (weforum.org)

2.3 Commonwealth and State targets

All states and territories have established emissions targets as well as some legislated targets for renewable energy, as seen below. The Commonwealth has also committed to a net zero target by 2050, announced in the lead up to the climate conference in Glasgow in 2021.

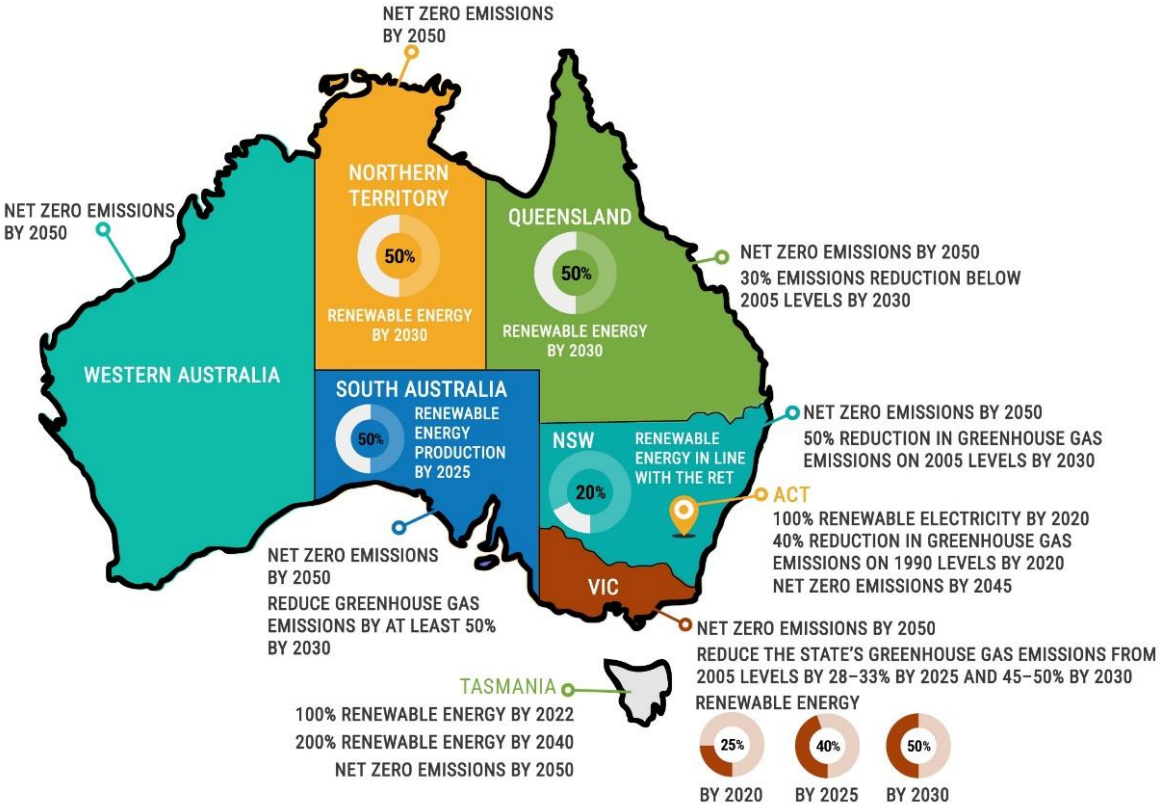

FIGURE 6: AUSTRALIA'S RENEWABLE ENERGY AND CARBON GOALS – STATE & TERRITORY LEVEL

Supporting the NSW Government's commitment to reach net zero emissions by 2050, NSW Government in 2020 released its **Net Zero Plan Stage 1: 2020–2030**[7]. This sees the first of three 10-year plans released that will set a pathway to net zero emissions in NSW by 2050. Within the net zero target NSW has a goal to reduce emissions by 50% by 2030, supported by measures outlined in this Stage 1 plan.

In addition the NSW Government has developed a **NSW Electricity Strategy**[8] which will help the State to deliver on its goal to attract renewable energy investment. On 27th November 2020 the NSW Government passed the *Electricity Infrastructure Investment Bill (2020)* which will help to drive the transition to renewables in the state in coming years by coordinating investment in new generation, storage and network infrastructure in New South Wales[9].

[7] © State of New South Wales 2020. Published March 2020
[8] https://energy.nsw.gov.au/renewables/renewable-energy-zones
[9] https://www.parliament.nsw.gov.au/bill/files/3818/XN%20Electricity%20Infrastructure%20Investment%20Bill.pdf

2.4 Alignment with NSW State targets and other local governments

Wagga Wagga City Council is committed to the following targets:

- A corporate target of Net Zero Emissions by 2040
- Wagga Wagga community to achieve Net Zero Emissions by 2050 in line with the State

Council's community target is aligned with the NSW State Government's net zero target for NSW by 2050, and Council's corporate target positions it as a leader for its community.

In addition to a net zero target by 2050 the NSW Government has an interim target of 50% emissions reduction by 2030. A Bill before the NSW Parliament (Climate Change (Emissions Targets) Bill 2021) may see these targets legislated in the near future[10]. As such, working towards Council's corporate and community targets will position Council well for this scenario.

Wagga Wagga City Council's net zero commitment also positions it alongside almost 30 regional NSW councils with ambitious emissions reduction and renewable energy goals.

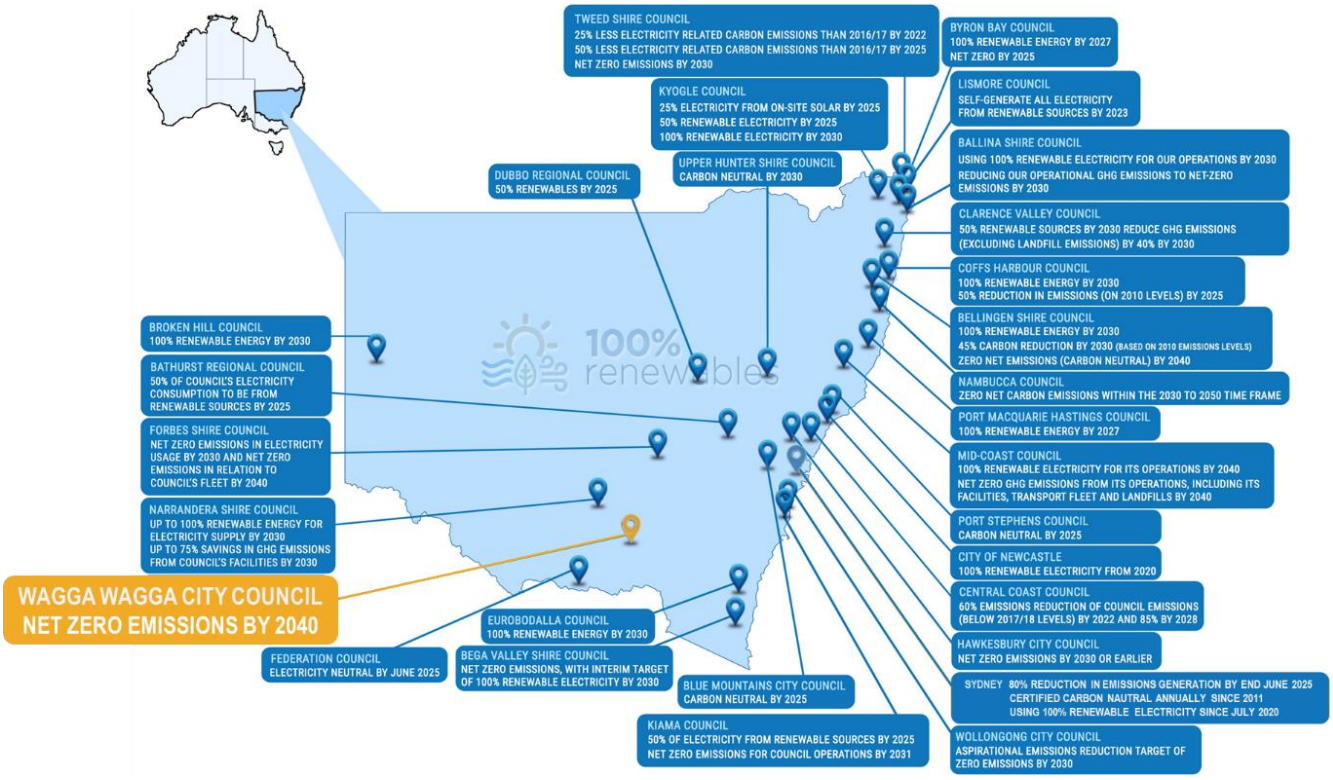

FIGURE 7: NET ZERO COMMITMENTS BY LOCAL GOVERNMENTS IN NSW REGIONAL AREAS AS AT DEC 2021

[10] Victoria has legislated 2050 net zero emissions reduction targets via its Victoria's Climate Change Act 2017, as well as 5-yearly interim emissions reduction targets. Similarly the ACT legislated net zero emissions by 2045, 100% renewable electricity and interim emissions reduction targets in its Climate Change and Greenhouse Gas Reduction Act 2010.

3 Wagga Wagga City Council's carbon footprint

This section describes types of greenhouse gas emissions and Council's current carbon footprint.

3.1 Scope 1, scope 2 and scope 3 emissions

To help differentiate between different greenhouse gas emission sources, emissions are classified into the following scopes according to the GHG Protocol[11] – Corporate Standard:

- **Scope 1 emissions** are emissions directly generated at your operations such as the production and treatment of waste, burning natural gas, driving company vehicles and plant, or leakage of refrigerant gases from your air conditioning equipment.
- **Scope 2 emissions** are caused indirectly by consuming electricity. Emissions are generated outside your organisation (e.g. coal-fired power), but you are indirectly responsible for them.
- **Scope 3 emissions** are also indirect emissions and happen upstream and downstream of your business. Typical examples are air travel, the consumption of goods and services, contractor emissions, or leased assets.

FIGURE 8: SCOPE 1, SCOPE 2 AND SCOPE 3 EMISSIONS

Under this strategy, emissions from waste are analysed as a scope 1 source. The landfill site is owned and operated by Council and therefore these emissions are regarded as directly produced by Council even though they represent emissions resulting from the community's activities.

At this time, Wagga Wagga City Council's carbon footprint coverage is limited to emissions relating to energy and waste from Council's operations, including energy for facilities and transport, and emissions from waste for both landfill and wastewater operations. A full scope 3 assessment of emissions has not been conducted, and this can be considered by Council as its journey towards net zero emissions progresses. At that time, Council's emissions coverage would likely be done in accordance with the Australian Government's Climate Active Standard[12].

[11] https://ghgprotocol.org/

[12] The Climate Active program is delivered by the Australian Government Department of Industry, Science, Energy and Resources (DISER)

3.2 FY2020 carbon footprint

The FY2020 carbon footprint (including ACCUs sold) is estimated to be 86,339 t CO_2-e.

Council currently has a fixed price contract with the CER to sell the carbon credits (ACCUs) generated from the flaring of landfill gas. Therefore, the emissions reduction from this measure can't be claimed by Council and are added to Council's reported landfill emissions under NGERS

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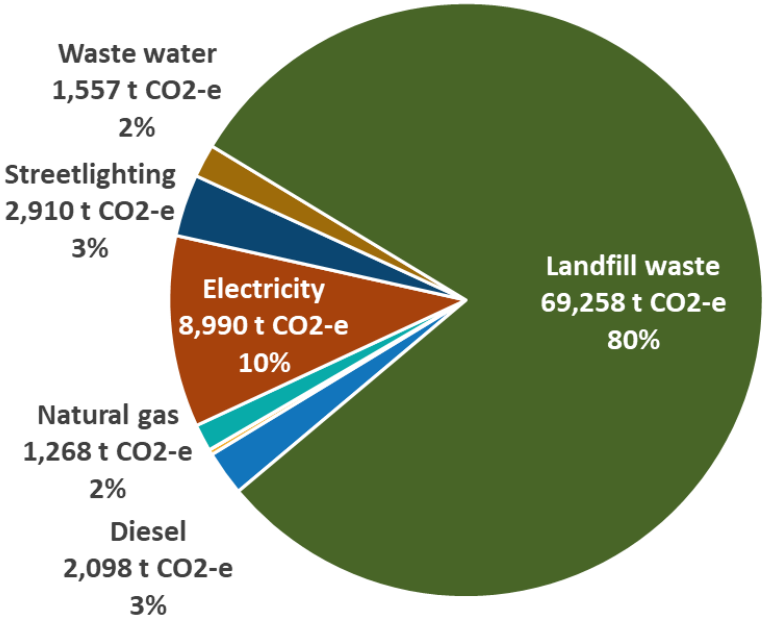


FIGURE 9: FY2020 CARBON FOOTPRINT BY EMISSION SOURCE

TABLE 1: FY2020 CARBON FOOTPRINT

Emissions Source	FY2020
Electricity - Council assets	8,990 t CO2-e
Electricity - streetlighting	2,910 t CO2-e
Natural gas	1,268 t CO2-e
LPG - stationary	7 t CO2-e
Diesel - fleet	2,098 t CO2-e
Petrol - fleet	243 t CO2-e
Ethanol - fleet	0 t CO2-e
LPG - fleet	8 t CO2-e
Waste water	1,557 t CO2-e
Landfill waste	69,258 t CO2-e
WWCC FY2020 emissions	**86,339 t CO2-e**

3.3 Business-as-usual forecast emissions for Wagga Wagga City Council

To understand the size of Council's net zero emissions task, it is important to develop both the current carbon footprint, as well as a forecast of future emissions considering expected or forecast changes in Council's operations as well as changes in external factors. In developing a high-level estimate of 'business-as-usual' emissions the following factors are considered:

- New facilities to be built,
- Facilities to be closed or divested,
- Emissions reduction that occurs because of external factors, such as grid decarbonisation,
- Population growth and any resultant increase or decrease in demand for Council services

These 'business as usual' or BAU changes are estimated out to FY2040, so that a picture of what the City's emissions could be without any new actions beyond FY2021 to reduce emissions can be developed.

Following this, we develop an emissions reduction pathway, based on the scope, timing and scale of new abatement measures over time, informed by discussions with Council's key stakeholders.

Based on discussions with key stakeholders, the following BAU changes are expected to occur and are incorporated into a BAU model to FY2040 for the City's carbon footprint.

TABLE 2: BAU CHANGES TO WAGGA WAGGA CITY COUNCIL'S CARBON FOOTPRINT TO FY2040

Emissions source / facility	Assumed business as usual (BAU)	Timing	Expected impact of BAU on energy demand and/or emissions
Population change	NSW planning suggests ~0.4%[13], forecast ID suggests 1.02%[14], and Council suggests ~2% per annum, with 0.8% pa growth over the last decade (LSPS).	FY2022 to FY2040	There is likely to be a marginal increase in many Council services based on population increase
Grid decarbonisation	Coal-fired power stations close at their scheduled end of life and are replaced with renewables.	FY2020 to FY2040	The emissions intensity of electricity from the grid decreases over time as coal power is replaced with renewables, in line with Federal Government (DISER) and AEMO forecasts
Fuel	More road and public open space development as green field projects are implemented, such as the new subdivision in the northern suburbs.	Start FY2022	Assume fuel consumption will increase by 0.5% year-on-year to reflect the increased task for Council's fleet to cover new release areas
Natural gas	There are no confirmed plans that would result in material increases or decreases in natural gas usage.	Start FY2022	Assumes 0% pa increase in natural gas usage
LPG - stationary	There are no confirmed plans that would result in material increases or decreases in (stationary) LPG usage - stationary usage.	Start FY2022	Assumes 0% pa increase in (stationary) LPG - stationary usage
Purchased electricity	Council continues to source electricity from 'regular' power supply agreements.	From FY2022	Electricity consumption excluding consumed solar energy will be treated as 'regular' grid electricity.

[13] https://www.planning.nsw.gov.au/Research-and-Demography/Population-projections/Projections
[14] https://forecast.id.com.au/wagga-wagga

Emissions source / facility	Assumed business as usual (BAU)	Timing	Expected impact of BAU on energy demand and/or emissions
Changes in electricity consumption	Several small changes in Council's electricity use will occur, including: - IT services may be increasingly migrated to the cloud, reducing demand - Bomen STP energy demand will increase in line with development of this area and the SAP - Demand at other STPs will likely be in line with population changes (Kooringal STP may be expanded in future as it reaches capacity, but this is assumed to occur after 2040) - Pomingalarna BMX track, velodrome and criterium track (66 MWh pa) - Upgrading gallery HVAC - Development of new and existing community facilities that are typically low energy users (Bolton Park, Museum of the Riverina, Riverside etc) - Water pumping from the river to lake	From FY2022	The changes to electricity demand noted here are typical business-as-usual activities and are likely to see an overall modest increase in electricity. For this work an annual BAU increase of 1.0% pa is used to 2040.
Streetlighting	BAU sees all eligible streetlights upgraded to LED	From FY2022	BAU is taken to be 1,700 MWh per year, a modest decrease from FY2021 (1,868 MWh) to reflect completion of the LED upgrade. Energy use is then estimated to grow by 0.25% pa for new release areas.
Wastewater	BAU emissions will be aligned with the population growth of Council	Start FY2022	Assumes wastewater emissions will increase by 1% year-on-year to align with the population growth.
Landfill waste	BAU emissions will be aligned with the population growth of Council. Baseline is emissions as reported to NGERS	Start FY2022	Assumes waste emissions will increase by 1% year-on-year to align with the population growth. Recent changes to the gas collection field is incorporated in the BAU project
Landfill waste	BAU emissions will assume that Council will continue selling the ACCUs generated from the flared landfill gas	Start FY2022	Council won't be able to claim emissions reduction from flared landfill gas. Therefore, the abated emissions should be accounted for in Council's inventory
Landfill waste	BAU emissions already accounts for the increased landfill gas capture and will assume that landfill gas capture will reduce overtime due to depletion of stored gas	Start FY2022	Assumes a new landfill gas capture of around 500,000 m^3 of CH_4 in FY2022 with a depletion rate of 1% per annum up to FY2040.

The assumptions in the above table are illustrated in the graphs below for energy-related emissions only, and for total emissions included in the scope of the net zero target.

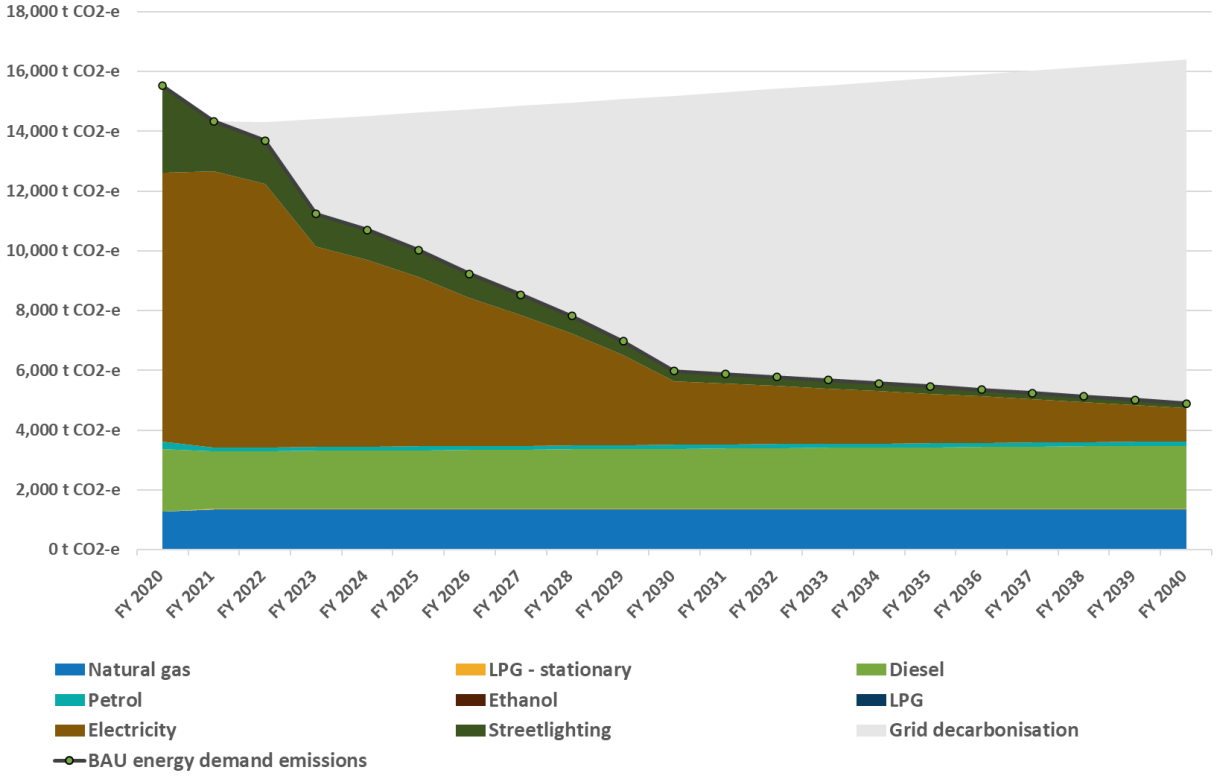


FIGURE 10: WAGGA WAGGA CITY COUNCIL - BUSINESS-AS-USUAL ENERGY-RELATED EMISSIONS PROJECTION

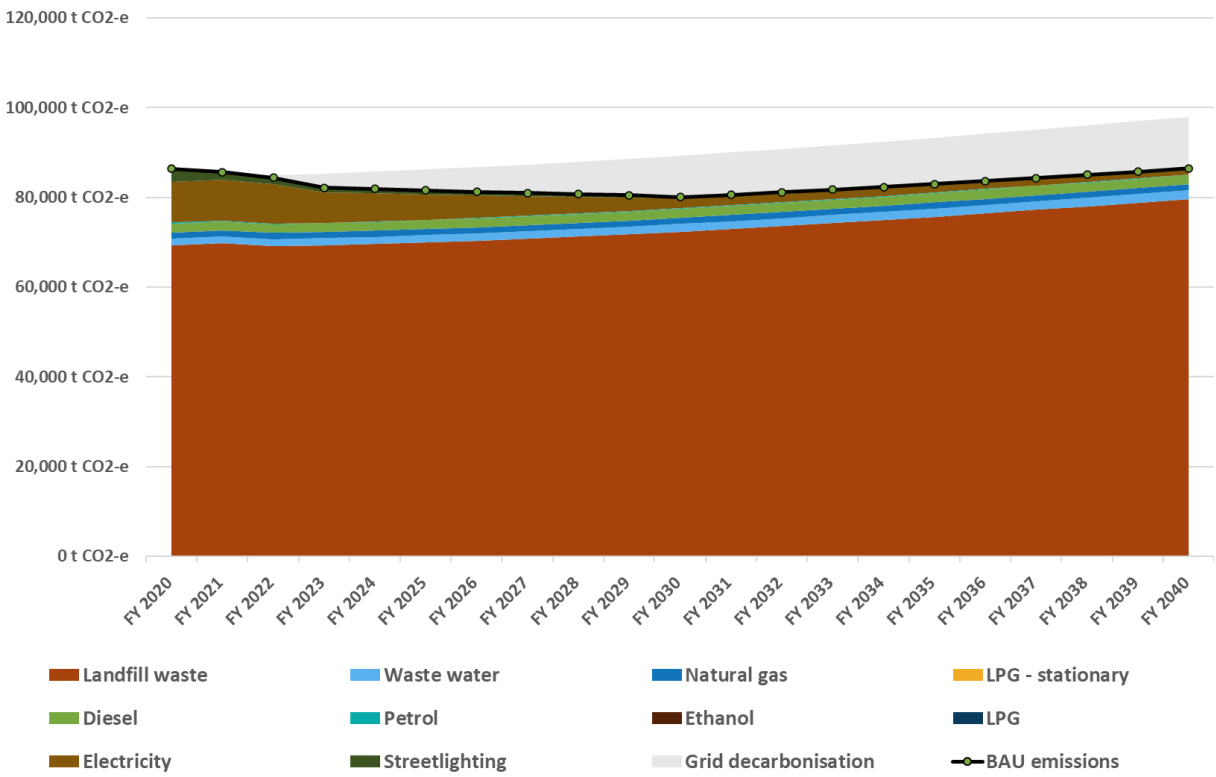


FIGURE 11: WAGGA WAGGA CITY COUNCIL - BUSINESS-AS-USUAL TOTAL EMISSIONS PROJECTION

3.4 Analysis of electricity use by Council assets

The table below shows a summary of Council's main electricity using assets by asset type. The Narrung Sewerage Treatment Plant is Council's largest single asset.

TABLE 3: WAGGA WAGGA CITY COUNCIL – GRID ELECTRICITY CONSUMPTION (SUMMARY)

Council facility / asset type	FY2020
Sewerage treatment plants	4,026,415 kWh
Buildings	2,896,297 kWh
Unmetered streetlighting	3,232,938 kWh
Sports, parks, public lighting & amenities	1,002,883 kWh
Swimming pools	837,068 kWh
Water and sewer pumping	736,020 kWh
Depot	224,332 kWh
Others	187,848 kWh
Emergency services	78,044 kWh
Grand total	**13,221,845 kWh**

3.5 Analysis of natural gas use by Council assets

Natural gas represents only ~2% of Council's carbon footprint. Most of the natural gas consumption was due to the Oasis Aquatic Centre which contributes around 87%. This and the next three largest gas-using sites account for almost 99% of Council's total gas use.

TABLE 4: WAGGA WAGGA CITY COUNCIL – NATURAL GAS CONSUMPTION BY FACILITY

Council facility / asset type	FY2020
Oasis Aquatic Centre	17,320,249 MJ
Cemetery Brunskill Road	810,018 MJ
Eternal Flame	637,966 MJ
Wagga Wagga Airport	388,145 MJ
Visitor Information Centre	128,839 MJ
Civic Centre Administration Offices	88,612 MJ
Alan Turner Depot	40,977 MJ
All other sites	61,436 MJ
Grand Total	**19,476,242 MJ**

3.6 Analysis of fuel use (stationary LPG and transport)

Fuel (other than natural gas) contributes around 3% of Council's carbon footprint. Diesel contributes around 87% of the total fuel consumption of Council, followed by petrol with around 12%.

TABLE 5: WAGGA WAGGA CITY COUNCIL – FUEL USE

Fuel type	FY2020
Diesel	733,244 L
Petrol	99,679 L
LPG – transport	4,908 L
LPG – stationary	4,484 L
Ethanol	939 L
Total	**843,253 L**

3.7 Analysis of landfill waste

Landfill waste contributes around 80% of Council's carbon footprint. Landfill waste emissions are estimated using the NGER Solid Waste Calculator that adopts the First Order Decay methodology. This method includes the emissions generated from previous years' waste since the opening of the landfill site in 1981.

The Clean Energy Regulator (CER) updates its methodologies periodically, including recent increases to the methane factor in the NGER Solid Waste Calculator which resulted in a higher estimated FY2021 emissions compared to Council's reported waste emissions in FY2020.

In addition to a change in the methane factor, the landfill waste emissions figures were calculated using an updated methodology following consultation with the CER, specifically applying a per-capita waste estimate to calculate historical emissions rather than the current reporting method which assumes that waste levels estimated for the year 2000 were the same historically, back to 1981 when the landfill opened.

Since these combined factors lead to different emissions estimates than have been previously reported, it is recommended that Council share and discuss the revised estimates with the regulator ahead of the next reporting period. The waste inputs prior to the first-year reporting period were adjusted to those shown in Table 6.

TABLE 6: WAGGA WAGGA CITY COUNCIL – REVISED LANDFILL WASTE EMISSIONS ESTIMATES

Landfill waste	FY2020
Potential revision	62,405 t CO2-e

Council has implemented kerbside FOGO (Food Organics and Garden Organics) collection to reduce the food and garden waste going to landfill. In addition, the landfill site has a gas capture system which helps reduce greenhouse gas emissions.

The ACCUs generated from the flared landfill gas are currently subject to a fixed price contract with the CER, therefore the emissions savings from this measure should be accounted for in Council's reported waste emissions for this strategy.

TABLE 7: WAGGA WAGGA CITY COUNCIL – LANDFILL WASTE EMISSIONS INCL ACCU CREDITS SOLD FROM FLARING

Landfill waste	FY2020
Potential revision	69,258 t CO2-e

3.8 Analysis of wastewater

Wastewater contributes around 2% of Council's carbon footprint. Council has seven existing sewage treatment plants and these are not above the facility reporting threshold of NGERS. The NSW Sewage Treatment Works Calculator was used to estimate emissions.

TABLE 8: WAGGA WAGGA CITY COUNCIL – WASTEWATER EMISSIONS

Wastewater	FY2020
Emissions estimate	1,557 t CO2-e

4 Past and current abatement initiatives

Wagga Wagga City Council has implemented a range of initiatives that have served to reduce its emissions well below what they would otherwise have been, and further measures are in progress. Past and current actions are tabulated below.

TABLE 9: WAGGA WAGGA CITY COUNCIL – PAST, CURRENT & PLANNED EMISSIONS REDUCTION ACTIONS

Emissions reduction action	Description of action taken
Waste Management	FOGO services were introduced in April 2018. An expanded landfill gas capture network was completed in October 2020.
Electricity purchasing	Council has signed a renewable energy PPA for large sites and street lighting that commences on 1 January 2023 and concludes 31 December 2029. For small sites, 'standard' power will be supplied, with an option to buy LGCs.
Wastewater pumping and treatment	Upgrades to control systems and implementation of VSD control for larger pumps in the SPS network and at treatment works has occurred over several years.
Solar PV	Council has installed solar PV systems at 10 of its facilities with total installed capacity of 235 kW. These are tabulated below.
Streetlighting LED and smart control upgrades	Council has largely switched to LED for its streetlights. Smart control upgrades may be considered in future.
Low emissions vehicles	Council is currently operating 5 hybrid passenger vehicles and 1 electric vehicle. Council has a fleet transition plan which describes pathways for fleet upgrade to EVs.
Oasis Aquatic Centre	Council is currently tendering for some improvement works following an energy audit of the facility. Works to be implemented that are likely to have an energy efficiency dividend include a new BMS, solar PV, VSD control of some pumps, improvements to AHUs, and some lighting works.
Civic Centre	Lighting Upgrades - installation of new LED lighting to library, art gallery and national glass gallery in December 2019. HVAC was upgraded in June 2020.
Civic Theatre	HVAC was upgraded in November 2019. Lighting upgraded to LED in April 2020.
Bolton Park Stadium	Lighting upgrade to LED in May 2019.

TABLE 10: WAGGA WAGGA CITY COUNCIL – LIST OF INSTALLED SOLAR PV SYSTEMS AT CITY FACILITIES

Site	Size (kW)	Install date (mm/yyyy)
Civic Centre	100	May 2020
Livestock Marketing Centre pump	30	June 2015
Alan Turner Depot	25	May 2010 and June 2012
Livestock Marketing Centre	20	June 2013
Glenfield Road Animal Shelter	15	June 2015
RRL Galling Place	15	June 2018
Visitors Centre	15	June 2021
Senior Citizens Centre	6	June 2015
Glenfield Community Centre	5	June 2015
Ashmont Community Hub	4	July 2015
Total capacity	**235**	

5 Opportunities to reduce carbon emissions

Wagga Wagga City Council's pathway towards meeting its FY2040 net zero emissions target will be affected by factors both within and outside its influence.

1. Grid decarbonisation
    - The NSW electricity grid is decarbonising rapidly, and this will see some of the abatement task delivered without the need for action by the Council.
2. Buying clean energy (e.g. via a renewable energy power purchase agreement or PPA)
    - Wagga Wagga City Council has entered into an agreement to buy renewable energy, and can scale this up and extend to 2040 to further reduce emissions. In addition, it is recommended that Council purchases LGCs for small sites to achieve zero electricity emissions from 2025 onwards.
3. Behind-the-meter solar
    - Council can continue to install onsite solar, plus battery energy storage systems, which reduces emissions in the short to medium term as the grid decarbonises, and delivers long-term cost savings.
4. Energy efficiency
    - Continuing improvement to existing buildings and other assets (e.g. 6-Star NABERS ratings), and incorporating new LED technology and controls into future upgrades. New buildings could be built to 6-Star Green Star level, exceeding Section J Building Code compliance for sustainable thermal solutions.
5. Sustainable transport
    - Transitioning to low emissions and electric vehicles, with associated charging infrastructure, per the Fleet Transition Feasibilty Plan to 2030, and extending for larger fleet and plant to 2040.
6. Waste management
    - Increasing FOGO diversion, reducing overall waste to landfill, energy-from-landfill gas facilities, maximising gas capture / flaring. It is recommened that any ACCUs generated are retired to claim carbon emissions reduction.
7. Gas to electric technologies
    - Replacing gas boilers and cogeneration with heat pumps at the aquatic centre, as well as shifting away from gas for other assets and facilities over time.
8. Carbon sequestration offsets
    - Sequester carbon through planting of trees on Council-owned or acquired land to offset the balance of Council's emissions. If desired, Council could also look to purchase carbon offset units to compensate for the balance of its emissions.
9. Sustainable value chain
    - Though not part of the current carbon footprint for this strategy, Council can start to consider opportunities to influence emissions in its value chain, such as sustainable design, purchasing of goods and services, and road and pavement construction materials. All of these actions will also contribute to acheiving the Community NZE 2050 target.

These nine measures are illustrated in the graphic below. Following this, a general summary of the scope, scale, cost-effectiveness and risks associated with each of these abatement categories is presented that can enable the success of Council's abatement efforts. This is then followed by the development of a pathway that shows how these measures can together deliver Council's targets, drawing on consultation with key stakeholders.

FIGURE 12: NINE CATEGORIES OF EMISSIONS REDUCTION FOR WAGGA WAGGA CITY COUNCIL

5.1 Grid decarbonisation

Description

In NSW there are five coal-fired power stations with combined 10,240 MW capacity that supply most of the State's electricity and make up most NSW electricity sector emissions (Liddell, Vales Point B, Eraring, Bayswater, Mt Piper).

The state is largely self-reliant for power, with this supplemented by interstate links as and when required. Since 2010 three coal-fired power stations with 1,744 MW of capacity have closed in NSW (Wallerawang C, Redbank, and Munmorah).

As more coal-fired power stations approach the end of their life – the five coal-fired stations above will likely close between 2023 and the early 2030s' – they are most likely to be replaced with renewable energy. This is most likely to be from large-scale wind and solar PV plants with battery storage, together with Distributed Energy Resources (DER) and demand-side measures.

In recent years several thousand MW of large-scale solar, wind energy and rooftop solar PV generation capacity has been built in NSW and much more is planned. In recent years rooftop solar installations have accelerated.

In September 2021 the NSW Government released the draft declaration of the Central-West Orana Renewable Energy Zone for exhibition. This process will ultimately formalise this REZ under the Electricity Infrastructure Investment Act 2020 and will lead to the development of some 3 GW of network capacity (the expressions of interest process elicited more than 27 GW of renewable energy and storage proposals). Recently, EOIs closed for the New England REZ, where more than 8 GW of renewables and storage will be built in coming years. Other REZs' are proposed to be located at Hunter-Central Coast, Illawarra, and the South-West region of NSW.

Given this shift to renewable energy generation, the future carbon intensity of the NSW grid will decline. The grid emissions intensity will be influenced by a range of factors, and the Australian Energy Market Operator's (AEMO) draft Integrated System Plan 2022[15] (ISP2022) models scenarios with differing assumptions for key influencing factors including demand drivers, DER uptake, emissions, large-scale renewable build cost trajectories, investment and retirement considerations, gas market settings and coal price settings, together with assumptions regarding policy settings and transmission infrastructure development.

The resultant scenario outcomes for penetration of renewable energy in the NEM is illustrated below, highlighting the increasing likelihood of a rapid transition to renewables.

The NSW Government's Electricity Infrastructure Investment Bill will facilitate the rapid transition to renewables in NSW, and ISP2022 forecasts reflect this.

[15] AEMO: https://aemo.com.au/consultations/current-and-closed-consultations/2022-draft-isp-consultation

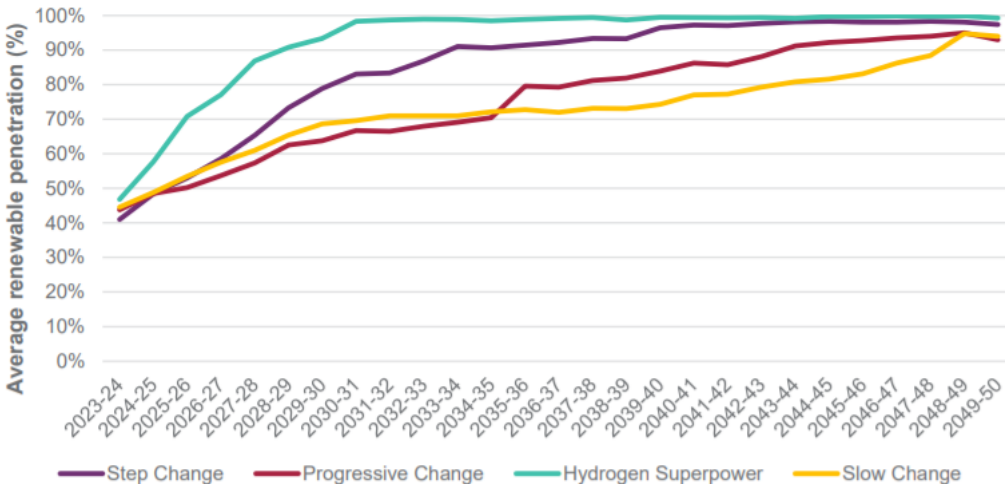


FIGURE 13: AEMO MODEL OF RENEWABLE ENERGY PENETRATION IN ISP2022 SCENARIOS (DRAFT)[16]

This AEMO view is reflected in the Department of Industry, Science, Energy and Resources (DISER) model of electricity emissions over the decade up to 2030, which assumes a high amount of renewable energy development and displacement of coal and gas-fired power over the next 8 years.

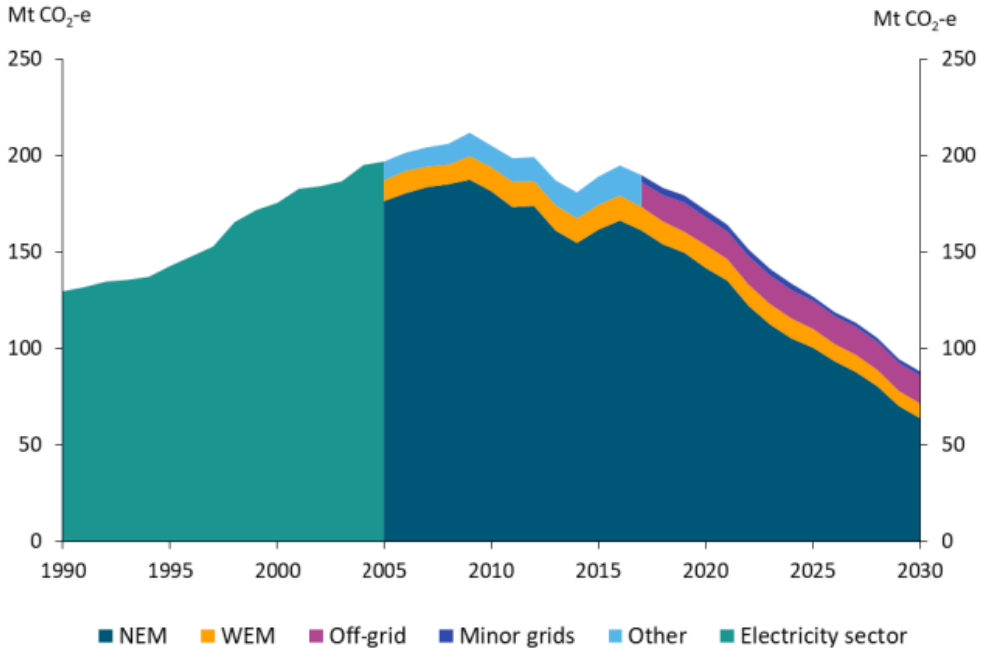


FIGURE 14: DISER MODEL OF ELECTRICITY EMISSIONS IN AUSTRALIA[17]

[16] AEMO: https://aemo.com.au/consultations/current-and-closed-consultations/2022-draft-isp-consultation
[17] DISER: https://www.industry.gov.au/sites/default/files/October%202021/document/australias_emissions_projections_2021_0.pdf

Scope for abatement

The above potential change to the NSW grid carbon intensity would have a significant impact on energy related GHG emissions for Wagga Wagga City Council, with the potential for Council's electricity emissions to move towards zero emissions. Vehicle transition towards EV and fuel switching away from gas to electricity for heating will also see emissions decline over time as the grid becomes greener.

Under DISER's projection most of this impact will be seen over the decade up to 2030. Wagga Wagga City Council will see its electricity emissions reach zero from 2025 through its renewable energy power purchase agreements.

Risks and mitigation

Wagga Wagga City Council has little influence over the rate of change in the grid carbon intensity, and the main risk mitigation strategy is to try and build capacity across Wagga Wagga City Council to respond with local solutions to reduce emissions.

Costs and benefits

There is no direct cost to Wagga Wagga City Council associated with decarbonisation of the electricity grid, excepting impacts on energy pricing in future years.

5.2 Buying clean energy

Description

The single biggest opportunity to reduce electricity emissions is to purchase renewable energy and/or renewable energy offsets via Council's electricity procurement process. Electricity consumption represents a large part of Council's carbon footprint. The following accounts consume 76% of total electricity consumption:

- Narrung Sewerage Treatment Works
- Streetlighting
- Oasis Aquatic Centre
- Civic Centre Administration Offices
- Kooringal Sewerage Treatment Works
- Wagga Wagga Airport
- Alan Turner Depot
- Bomen Industrial Sewage Treatment Facility
- Livestock Marketing Centre

There are three main ways in which an organisation can source renewable energy, illustrated below.

The first of these – entering into a renewable energy power purchase agreement (PPA) is by far the most prominent approach, with more than 10,000 GWh of electricity being sourced under PPAs entered into over the last four years, mostly by businesses located in NSW, Queensland, and Victoria. This approach has been taken by several local governments in the National Electricity Market (NEM, eastern states) in recent years and underpins most goals to reach net-zero emissions[18].

Scope for abatement

From 2023 to 2029, large sites and streetlighting will be supplied with 100% renewable energy, with the option to buy LGCs for smaller sites, which would make Council's electricity supply 100% renewable from 2025.

Potential emissions reduction for electricity is 9,254 t CO2-e for facilities plus an additional 1,673 t CO2-e for streetlighting, with this abatement declining as the grid decarbonises.

[18] Examples of NSW Councils' purchasing renewables as part of their electricity supply include: Southern Sydney Regional Organisation of Councils, City of Sydney, City of Newcastle, Northern Beaches Council, Eurobodalla Shire Council and Hawkesbury City Council.

Risks and mitigation

Renewable electricity procurement is well established, and incorporates robust risk assessment processes that address market, delivery, counterparty, policy change and other risks as applicable.

Costs and benefits

The cost savings to Council will be based on an assessment of the difference between the bundled electricity / LGC pricing and the forecast price for wholesale electricity over the contract term. PPA prices achieved in the new contract represent significant savings compared to current electricity contracts.

5.3 Behind-the-meter solar

Description

Solar PV is a well-established technology, and nearly 30% of Australian homes and an increasing number of businesses are installing solar panels to reduce their grid energy costs and greenhouse gas emissions. Uptake of battery energy storage (BESS) remains low but will become more cost effective in future.

Current status of solar PV in Wagga Wagga City Council

Wagga Wagga City Council has installed solar PV systems at 10 of its facilities with total installed capacity of 235 kW, capable of generating and estimated 329 MWh annually which equals ~2.6% of City's electricity demand (based on 2021 electricity consumption data). Some of these systems have been installed more than 10 years ago and Council could consider replacing them with more efficient solar modules.

There are other planned solar PV systems across Council facilities such as a ~500 kW system at Oasis Aquatic Centre, and a ~47 kW system at the Museum of the Riverina (Williams Hill Museum). At several sites more than one option can be considered; the development of the net zero pathway accounts for projects that have the largest abatement potential. At some sites implementation of solar and storage may be a staged approach.

The following is a summary of the solar PV and BESS opportunities that have been identified and assessed at a high level across Council-operated sites.

Site name	Behind-the-meter solar potential
Alan Turner Depot	Council can potentially implement a 51 kW roof-mounted solar PV system at the depot. This system can reduce the site's annual electricity demand by ~23%. To further maximise the solar PV potential, the system could be coupled with 48 kWh battery storage unit to reduce the site's annual electricity consumption by ~28%.
BISTF	The Bomen Industrial Sewage Treatment Facility has the potential to implement a 100 kW ground-mounted solar PV system adjacent to the filtration tank. However, due to the high variability in energy usage, the system would export ~45% of the energy back to the grid. Therefore, to increase the savings potential, Council could consider expanding the system to a 150 kW ground-mounted solar PV system with a ~96 kWh battery storage unit to reduce >50% of the annual grid electricity demand at this site.
Botanic Garden Depot and Nursery	Council can implement a 22 kW roof-mounted solar PV system at the Botanic garden depot. As the site is a high energy consumer, ~100% of the generated solar energy is self-consumed, reducing the site's annual electricity consumption by 23%.
Civic Centre Administration Offices	This site is supplied via two electricity meters, and Council has already implemented a 100 kW solar PV

	system that supplies to the main NMI. An opportunity that could be considered is expanding the system with an additional 34 kW roof-mounted solar PV system, which could further reduce the site's annual electricity demand by ~9-10%. However, this system would be deemed LGC-scale, and may not be as financially attractive as other projects.
Equex Centre	There are two NMIs that supply to the Equex Centre, one for the main building and the other for the netball courts. A 69 kW roof-mounted solar PV system has been proposed for the Netball court NMI; however, a solar PV system could have high exports due to the typical load profiles of rec reserves and sports grounds. Therefore, it would be beneficial to investigate opportunities to either consolidate these meters to a single parent meter; else assess the viability of splitting this solar PV system across both the NMIs to meet most of the daytime electricity demand at the Equex Centre.
Forest Hill Sewerage Treatment Works	The Forest Hill Treatment works has two NMIs that supply to the main treatment plant and the pasveer system. Based on the land availability, Council can consider installing a 22 kW ground-mounted solar PV system to meet most of the site's daytime electricity demand. Alternatively, this system could be expanded to a 41 kW ground-mounted system with a 45 kWh battery storage unit to reduce the site's annual electricity demand by ~45%. For the pasveer system, a 25 kW ground-mounted solar PV system has been proposed, and we have assumed the annual savings potential based on an estimated solar PV export of ~30%.
Jubilee and Conolly Complex	Based on the interval data analysis, this complex has variable and intermittent electricity consumption. A 35 kW roof-mounted solar PV only option would export ~80% of the electricity back to the grid. Therefore, consider implementing a 35 kW roof-mounted solar PV system with an 80 kWh battery storage unit to meet at least 40% of the site's electricity demand.
Kooringal Sewerage Treatment Works	The Kooringal STP is 5th largest electricity consumer at Wagga Wagga council. Therefore, based on land availability, a 158 kW ground-mounted solar PV system is suggested for this site. With this system, the STP would reduce its annual electricity demand by ~27%. Furthermore, we have noted that Council has access to land nearby, which could host a mid-scale solar farm sized ~2-3 MW. This could be further investigated as a community solar farm project, as a mid-scale project

	integrated into Council's electricity supply agreements in future.
Livestock Marketing Centre	Multiple NMIs supply this site, and Council has already implemented ~50 kW solar PV systems across this site to meet most of the daytime electricity demand. Due to the operation hours being outside solar generation hours, a solar PV only opportunity would have large exports with minimal savings potential.
Narrung Sewerage Treatment Works	The Narrung STP is the largest electricity consuming site at Wagga Wagga Council. Based on land availability, a suggested opportunity is to install a 480 kW ground-mounted solar PV system that could reduce the site's annual electricity demand by ~30%. We have been advised that Council has access to land adjacent to this treatment works, which could potentially host ~3-4 MW of solar, subject to land suitability. This project could be implemented to meet most of the daytime electricity demand across both the NMIs at the Narrung facility. Furthermore, Council could consider developing this mid-scale solar farm project as a community initiative or as a mid-scale project integrated into Council's electricity supply agreements in future.
Robertson Oval	We have designed a 25 kW roof-mounted solar PV system at the Robertson Oval to meet most of the site's daytime electricity demand. However, based on a typical load profile for an Oval, we expect large exports from this solar PV system.
Rural Fire H/Qtrs Fernleigh Road, Wagga Wagga	Install a 35 kW roof-mounted solar PV system at the new Rural Fire Headquarters. This system would be mostly self-consumed as these sites are generally operational throughout the day.
Wagga Wagga Airport	The Wagga Wagga Airport is a large consumer of electricity. Council may implement a ~99 kW roof-mounted solar PV system at this site. Based on our calculations, a 99 kW roof-mounted solar PV system can reduce the site's annual electricity demand by ~17%. Alternatively, Council can expand this system to a 217 kW roof-mounted system, which could reduce the site's electricity demand by ~34% annually.
Oasis Aquatic Centre	The Aquatic Centre is the 3rd largest electricity consumer at Wagga Wagga Council. There are preliminary designs to implement a 531 kW roof and ground-mounted solar PV system at this site. We would suggest Council complete this project in stages, for e.g., phase one, the development of rooftop solar PV and

	phase two, the development of ground-mounted solar PV based on the performance of phase one system. Council could implement a 390 kW roof-mounted solar PV system which could meet at least ~36% of the annual electricity demand at this site. Expanding the system to a 531 kW solar PV system would increase the savings potential to ~39%. With both the systems, the solar exports are higher than ~40% due to the seasonal operation of the pools.
Museum of the Riverina	Council plans to install a 47kW roof-mounted solar PV system at the Museum of the Riverina (Willans Hill Museum). This system is expected to export majority of the generated energy as the site consumes around 23 MWh per annum only.

Scope for abatement

The above opportunities can be summarised as:

- Council-operated sites have scope for **~1.51 MW – 1.96 MW** of solar PV, with potential to implement **~269 kWh** of storage **(**BESS) across sites with low or intermittent demand.
- This can generate from **~2,415 MWh to 3,148 MWh** of electricity per year with most of this consumed on Council sites and some export to grid.
- Abatement at current grid carbon intensity would be **2,173 to 2,833 t CO_2-e** per year based on self-consumed solar, with additional abatement associated with export of surplus solar energy to the grid.

Risks and mitigation

Risks associated with solar PV implementation are minimal provided systems are appropriately sized, designed, installed, connected, and maintained on sound buildings and structures, as with any other asset.

The cost effectiveness of solar PV has long been demonstrated, and panel prices continue to fall. The commercial sector has embraced solar PV in recent years, and this has driven further acceleration in the implementation of rooftop solar.

Costs and benefits

Solar is cost-effective and provides good returns for Council's investment. The maximum investment required for solar, which is based on the maximum solar PV and battery potential, is estimated at **~$2.60 million**, delivering annual savings of **~$326,000** per annum. The annual savings are based on the energy generated by solar PV systems and assume an average electricity rate of **$0.15/kWh**. The estimated payback period for these systems is **~8 years.**

5.3.1 Onsite solar PV opportunities

A high-level data analysis and desktop assessments were used to identify sites that are most likely suitable to install solar PV. Please note that there are some sites with multiple opportunities assessed, which indicate different feasible solar PV opportunities at those sites.

TABLE 11: SUMMARISED SOLAR PV OPPORTUNITIES AT WAGGA WAGGA CITY COUNCIL

	Site name	Annual electricity consumption	Solar PV size	BESS size	Annual solar generation	Annual savings	Electricity reduction	Exports
1	Alan Turner Depot	230,204 kWh	51 kW	-	71,990 kWh	52,947 kWh	23%	28%
2			51 kW	48 kWh	71,990 kWh	62,155 kWh	27%	16%
3	BISTF	216,773 kWh	100 kW	-	167,955 kWh	78,038 kWh	36%	45%
4			150 kW	96 kWh	250,418 kWh	112,722 kWh	52%	44%
5	Bolton Park Stadium	37,928 kWh	10 kW		15,570 kWh	6,448 kWh	17%	60%
6			10 kW	27 kWh	15,570 kWh	22,757 kWh	60%	10%
7	Botanic Gardens Depot & Nursery	123,662 kWh	22 kW	-	31,146 kWh	27,849 kWh	23%	0%
8	Civic Centre Administration Offices	1,034,951 kWh	34 kW		45,780 kWh	93,146 kWh	9%	2%
9	Civic Theatre	197,357 kWh	42 kW		56,020 kWh	53,286 kWh	27%	11%
10	Netball Courts, Equex	150,090 kWh	69 kW		107,200 kWh	42,025 kWh	28%	60%
11	Forest Hill Sewerage Treatment Works	127,563 kWh	22 kW		35,640 kWh	33,166 kWh	26%	15%
12			41 kW	45 kWh	66,782 kWh	56,128 kWh	44%	22%
13	Forest Hill Pasveer	75,219 kWh	25 kW		41,062 kWh	45,884 kWh	61%	30%
14	Jubilee and Conolly Complex	79,595 kWh	35 kW		53,900 kWh	11,143 kWh	14%	80%
15			35 kW	80 kWh	53,900 kWh	31,838 kWh	40%	40%
16	Kooringal Sewerage Treatment Works	944,008 kWh	99 kW		166,618 kWh	160,481 kWh	17%	0%
17		944,008 kWh	158 kW		265,973 kWh	245,442 kWh	26%	2%
18	Narrung Sewerage Treatment Works	2,148,372 kWh	479 kW		800,500 kWh	644,512 kWh	30%	14%
22	Robertson Oval	93,179 kWh	25 kW		39,890 kWh	18,636 kWh	20%	50%

	Site name	Annual electricity consumption	Solar PV size	BESS size	Annual solar generation	Annual savings	Electricity reduction	Exports
23	Rural Fire Headquarters	68,740 kWh	35 kW		52,080 kWh	37,120 kWh	54%	30%
24	Wagga Wagga Airport	847,124 kWh	99 kW		141,619 kWh	144,011 kWh	17%	0%
25		847,124 kWh	217 kW		320,863 kWh	288,022 kWh	34%	15%
26	Oasis Aquatic Centre	1,067,421 kWh	390 kW		645,100 kWh	384,272 kWh	36%	35%
27			531 kW		879,100 kWh	410,957 kWh	39%	47%
28	Museum of the Riverina	23,665 kWh	47 kW		65,800 kWh	6,580 kWh	28%	90%

5.4 Energy efficiency

Description

Energy efficiency remains the cheapest form of greenhouse gas abatement in many situations. Wagga Wagga City Council has been implementing numerous energy efficiency upgrades and upgrading to LED is standard practice when replacing City-owned public lights, passive and active field lights, as well as building lighting.

Efficiency gains can be made via retrofit and asset upgrade works, and lighting typically offers the quickest and the most predictable savings. ICT systems tend to have a rapid turnover compared with other energy-using assets, providing opportunities to upgrade to digital, cloud-based and low wattage IT devices every few years.

Longer life assets such as air conditioning (10-25 years) and motor systems for irrigation and pumping may have short-term opportunities for smart controls and minor retrofits that save power, but the major savings come when these assets are at the end of their life and require replacement. As such the rate of improvement in energy use for these services tends to be modest and over a long period of time.

Efficiency plans and budgeting will be informed by regular auditing of facilities and equipment and by Operational Budget planning and Delivery Program planning that considers projects that will continuously reduce the City's energy footprint.

Examples of energy efficiency measures that Council could implement:

- **Lighting upgrades to LEDs** at sites with large energy demand
- **BMS optimisation** at the Civic Theatre, Civic Centre and Art Gallery
- **HVAC upgrades and humidity controllers** at the above sites
- **SCADA system** for water treatment
- **Mechanical and electrical upgrades** at the Oasis which includes the following:
    - New BMS
    - Main AHU upgrades

Council should endeavour to improve the NABERS and Green Star rating of its existing facilities and ensure that new buildings will meet the required star rating according to the latest Section J requirements.

In modelling of the continuing energy efficiency opportunity, it is assumed that Council can achieve a 0.5% year-on-year reduction per annum, beyond BAU.

Scope for abatement

The scale of abatement will depend on renewable energy purchasing decisions. If 100% renewable energy is chosen, then the scope for abatement is zero but the scope for cost-effective savings to the Council and better services to the community is high.

Risks and mitigation

The risks associated with energy efficiency upgrades are generally low provided business cases, specifications and contractor management processes are robust. Some of the main risks and mitigants will include:

- Designing effective measurement and verification at an affordable cost that provides useful feedback about the success of projects
- Persistence of energy savings – it is not uncommon, particularly for education initiatives and control settings to lapse in their performance and be changed back to poor practices or inefficient settings, and providing resources to sustain energy savings is also important
- Regular review processes for energy management are important. For example, design guidelines and procurement guidelines should stay at the level of development of new technologies, practices, and services

Costs and benefits

Most energy efficiency upgrades to Council facilities are achieved through annual funding, asset improvement funding for outdoor amenities and sporting facilities, grants, as well as funding committed for upgrading Council's streetlighting. It is estimated that Council will require an annual budget of around **$50,000** to achieve a 0.5% year-on-year annual reduction from energy efficiency measures. This estimate is based on an average electricity rate of **$0.15/kWh** and an average payback of **6 years**.

5.5 Sustainable transport

Description

Transport emissions are a relatively small GHG emissions source for Wagga Wagga City Council, primarily from diesel used in truck and plant fleet, and to a lesser extent in the City's passenger and utility vehicle fleet. Presently, Council operates 5 hybrid vehicles and 1 electric vehicle.

In June 2021, Wagga Wagga City Council finalised its *Towards Zero – Council fleet transition plan*. The plan includes three potential pathways for Council fleet.

- Business as usual – a baseline which assumes no further rollout of EVs, rather replacement with more efficient ICE or Hybrids on a Total Cost of Ownership (TCO) basis.
- Planned transition – a scenario with phased replacement with EVs in conjunction with a roll out of charging infrastructure. EVs are preferred where TCO can justify the switch. Where no suitable EV is available the remaining fleet is upgraded to more efficient ICE or hybrid similar to BAU.
- Leadership transition – in this technology–based opportunity, there is a phased replacement to EVs in conjunction with the roll-out of charging solutions at least cost and EVs are preferred in all cases where the technology can satisfy the business/service need. Where no suitable EV is available the remaining fleet is upgraded to more efficient ICE or hybrid similar to BAU.

Wagga Wagga City Council abatement modelling for electrification of vehicles

At this time there is no firm commitment to one or other of the pathways outlined in the Council fleet transition plan. From a net zero emissions perspective a slower switch to electric vehicles may mean that more needs to be done in other areas to achieve Council's targets.

For the purpose of the strategy the Leadership transition pathway is used to model the carbon abatement opportunity to 2030 for Council, while recognising that this may not be Council's chosen approach. This strategy assumes that Council will have 140 EVs in its fleet by 2030 including non-passenger vehicles. Most of these EV additions are forecast to be implemented after 2026. After 2030 the modelling for this strategy assumes that the balance of fleet will migrate to electric technologies by 2040 on a linear basis.

NSW Government support for electric vehicles

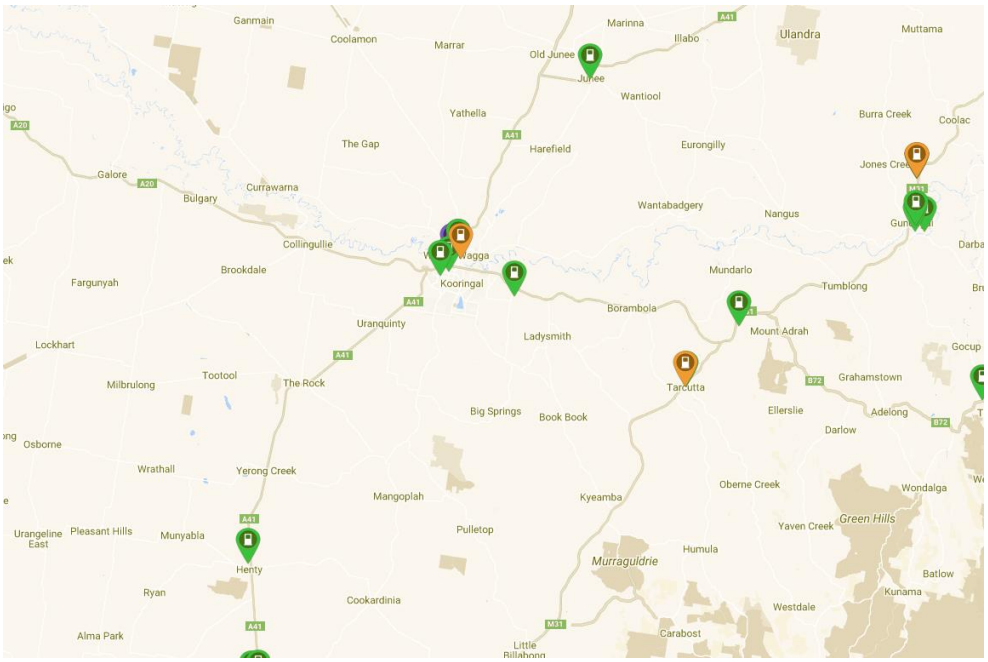
NSW Government's Net Zero Plan 2020-2030 is developing a range of measures that will start to shape the future of transport in the State. Current measures under development in relation to electric vehicles (EV) include:

- Financial support for purchasing EVs, including:
  - Removal of stamp duty for BEVs under $78,000 from Sept 2021
  - $3,000 rebates for up to 25,000 EVs sold after 1 Sept 2021
- EV infrastructure including:

    - $171 million over four years for ultra-fast charging, EV commuter corridors, destination charging in commuter carparks and regional tourist locations
- Transport Consumer Information
- Fleet optimisation including pilots for vehicle-to-grid and base charging
- EVs in Government fleet, including:
    - Fleet incentives for local councils via reverse auctions
    - NSW Government will electrify its fleet by 2030, with 50% EV procurement by 2026
- Electric buses/trucks

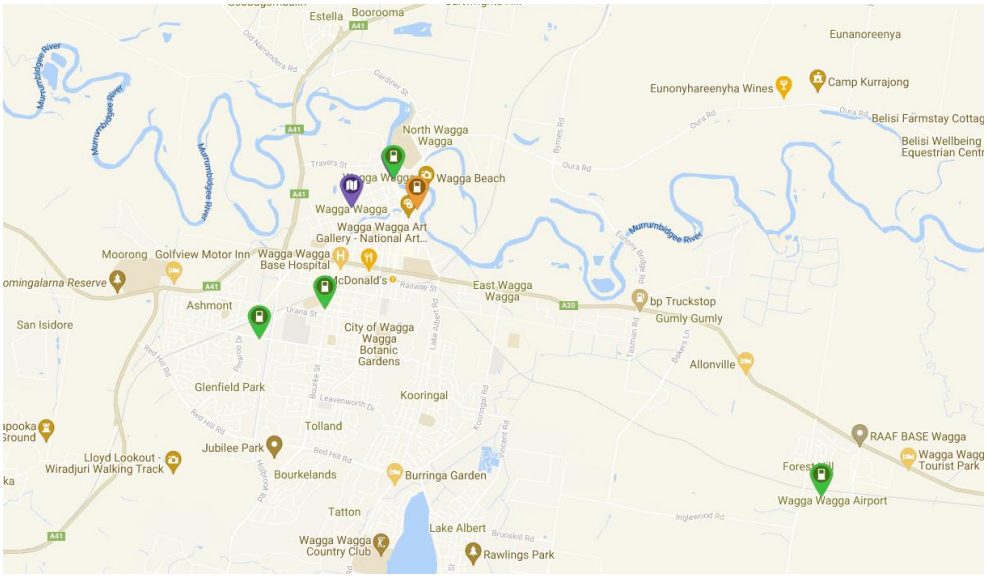
EV charging infrastructure

In August 2021 the Electric Vehicle Council reported that there were over 3,000 public chargers in Australia, of which 470 are rapid DC chargers[19]. Locations of DC and public chargers are readily accessible, see below[20], where green pins denote public chargers and orange pins denote fast, or rapid chargers. Increasing numbers of private chargers are also being installed, retrofitted to homes and businesses as well as designed into new buildings.



PLUGSHARE MAP OF PUBLIC (GREEN) AND FAST (ORANGE) EV CHARGERS (WAGGA WAGGA AND NEARBY LGAS), MARCH 2022

[19] https://electricvehiclecouncil.com.au/wp-content/uploads/2021/08/EVC-State-of-EVs-2021-sm.pdf, p11
[20] https://www.plugshare.com/



PLUGSHARE MAP OF PUBLIC (GREEN) AND FAST (ORANGE) EV CHARGERS (IN WAGGA WAGGA), MARCH 2022

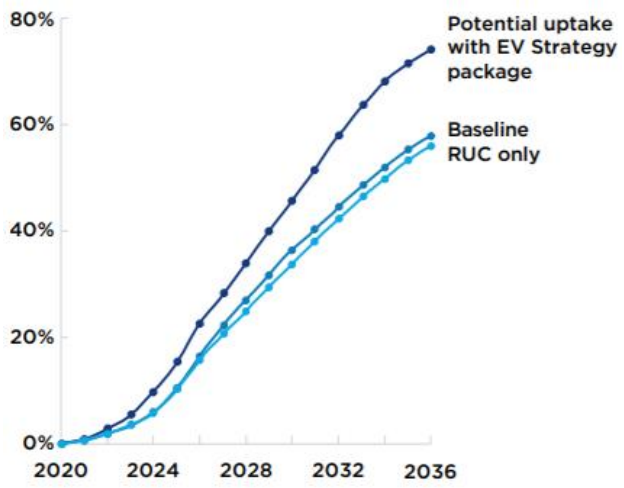
Council already has 4 public EV charging stations located in different places and 1 fast EV charging station located at the Cross St Car Park. Council's fleet transition plan includes the installation of EV charging stations for Council fleet vehicles up to FY2030.

Projected growth in electric vehicles

The NSW Government's Electric Vehicle Strategy[21] forecasts that EVs are expected to make up 52% of new car sales in 2030-31 and it is the NSW Government's objective to achieve that uptake and see most new car sales as EVs by 2035.

Where fuelled with regular grid power in NSW, EVs currently have higher operational emissions than hybrids, whereas where fuelled from renewables this is not the case. As the grid changes with retirements of coal fired power stations, this situation will change and emissions from EVs will become less than those from hybrids.

21 https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Climate-change/nsw-electric-vehicle-strategy-210225.pdf, p30



NSW GOVT EV STRATEGY: FORECAST SHARE OF BATTERY ELECTRIC VEHICLES IN ANNUAL SALES

Availability of electric passenger vehicles in Australia

According to the Electric Vehicle Council[22], Australians now have access to 31 passenger EV models from 12 carmakers, a small increase compared with 2020. A total of 14 EV models are priced at under $65,000. There are currently more PHEV models on the Australian market than BEVs.

By the end of 2022 it is expected that Australians will have access to a further 27 EV models, with 20 of these expected to be BEVs.

Corporate and government fleets make up more than 50% of new EV sales, and many Councils are now developing long term transport strategies that explicitly include a shift in their fleet to low and ultimately zero-emissions fleet. Most prominent at this time is still the ACT Government, which is switching its passenger fleet to EVs for all new leases from 2020-21 and has trialled electric buses with a view to shifting these to all-electric by 2040 as part of the ACT's carbon neutral commitment.

Commercial Electric Vehicles in Australia

The EV Council also reports that there is still a limited supply of light and heavy vehicles, which include the Renault Kangoo van and several models available from SEA Electric including a van and minibus as well as specialised vehicles and multiple truck-cab chassis. The EV Council report forecasts that several more models are coming on to the Australian market, but that there is a need for a nationally coordinated approach for this category.

Utility vehicles are commonly used as part of council fleets and can account for a sizeable proportion of fuel use. Plans by manufacturers such as Mitsubishi (Triton), Toyota (HiLux), Nissan (Navara) and Ford (Ranger, Everest) to introduce hybrid-

[22] https://electricvehiclecouncil.com.au/wp-content/uploads/2021/08/EVC-State-of-EVs-2021-sm.pdf, p07

electric models from the early to mid-2020s have been announced, but the pathway to full-electric utility vehicles may be some years away.

Scope for abatement

The scope for emissions reduction for Wagga Wagga City Council from transport measures is around 2,052 t CO_2-e inclusive of both scope 1 and scope 3 emissions. The speed of emissions reduction will depend on the rate of adoption of EVs and hybrids, and on the selection of renewable energy as the fuel source for EVs.

Risks and mitigation

Wagga Wagga City Council should assess the range of factors influencing the uptake of EVs for different types of vehicle users – wholly owned by Wagga Wagga City Council, salary-sacrificed by staff, or driven by contractors. Factors will include:

- Whole of Life costing basis that considers purchase price, incentives, resale, and operating costs including electricity price
- Range and charging infrastructure
- Fitness for purpose
- Availability, serviceability, warranties

Costs and benefits

According to the *Towards Zero – Council fleet transition feasibility plan* the premium for procuring EVs and hybrid models in the leadership transition is estimated to be $3.9 million higher than the BAU scenario. However, the future resale value of EVs and hybrids is estimated to be higher, and operating costs (fuel, registration, insurance, and maintenance cost savings) are $1.4 million lower than BAU[23].

Other options for a Council transition to EVs will incur lower initial costs and have lower accompanying savings.

[23] Wagga Wagga City Council "Towards Zero- Council Fleet Transition Plan", June 2021

5.6 Waste management

Description

Landfill waste generated 69,710 t CO2-e in FY2021 (including legacy waste and emissions from the landfill gas capture) is 81% of the total Council carbon emissions. Although Council has already implemented (and recently expanded) landfill gas capture technology, the abatement from flaring captured gas are included as Council emissions as Council sells the ACCUs generated.

Beyond the expanded gas capture project, Council may have added emissions reduction opportunities through anaerobic digestion and extraction of methane to treat leachate.

Council has plans to install a landfill gas-to-energy plant to generate electricity from captured landfill gas. The plant will have a capacity of 120 kW where 22 kW will be used on site and the rest will be exported to the grid. The consumed electricity from the plant can be claimed as zero emissions if the associated LGCs generated from the consumed electricity are retired by Council.

For community waste, Council has a three-bin system for kerbside collection – residual waste, recyclables and food and garden organic waste (FOGO). No ACCUs have been created from FOGO at this time.

The NSW Waste and Sustainable Materials Strategy 2041[24] was developed by DPE to update the Waste Avoidance and Resource Recovery Strategy 2014–2021. This is in accordance with the NSW Waste Avoidance and Resource Recovery Act 2001 which commits the NSW government to review and update its waste strategy every five years. The strategy aims to achieve the following targets for landfill waste by 2030:

- Implement waste reduction measures to achieve 10% waste reduction per person by 2030
- Increase FOGO capture to achieve 50% organics collection by 2030
- Implement waste diversion from the landfills to achieve 80% waste diversion by 2030

Council has not formally committed to these targets, but Council should start assessing the options available to achieve the targets and take advantage of the programs and funding from the NSW Government.

It is expected that after 2030, there would be new targets that reflect the long term goal of reaching net zero emissions. However, for the purpose of modelling, no change to these targets is assumed between 2031 and 2040. It is also assumed that Council will start retiring ACCUs generated from the flared landfill gas capture by FY2031 at the latest.

Scope for abatement

An indicative high-level estimate for potential abatement shows that the following abatement measures can reduce waste emissions by 54,201 t CO_2-e in FY2040:

- Retiring of ACCUs generated from the flared landfill gas
- 10% waste reduction per person
- 50% organics collection
- 80% waste diversion

[24] NSW Waste and Sustainable Materials Strategy 2041

- On-site electricity use from the landfill gas-to-energy plant

ACCUs generated from flared landfill gas could be reduced if the waste-to-energy plant will use the same pipeline. For simplicity, it is assumed that the waste-to-energy plant will have a dedicated gas extraction system and supply line which will not affect the ACCUs generated from the flared landfill gas.

Risks and mitigation

Achieving emissions reduction targets for waste is integral to Council's ability to achieve its overall net zero emissions goal. The success of Council's landfill emission reduction will depend on the effectiveness of the community waste collection program, improvements in the FOGO collection system, and overall diversion from landfill. Council does not currently have a waste strategy. Council could consider allocating resources to develop a strategy and undertake more detailed modelling.

Costs and benefits

Costs and benefits associated with Council's waste management abatement measures are not estimated as part of this project.

5.7 Gas to electric technologies

Description

Gas consumption at Council is dominated by the Oasis Aquatic Centre, where gas is used for cogeneration and boilers. Pool heating can be achieved with electric heat pumps which, where supplied with renewable energy, offer a zero-emissions pathway for pool heating.

Council is aware of the opportunity to replace gas heating with electric heat pumps, and the potential to move from cogeneration to grid power for all of its electricity needs. The cogeneration plant which has been installed since 2012 could be decommissioned, as per the recommendations in a recent report to Council[25].

For the purpose of this net zero strategy, it is assumed that Council's gas-using assets will be converted to electricity in FY2030, apart from the Crematorium and the Eternal Flame. It is also recommended that any new buildings and facilities are fully electric.

Scope for abatement

The potential for abatement is 1,360 t CO2-e. The Oasis Aquatic Centre is the site with largest gas consumption, representing 87% of total gas consumption.

Risks and mitigation

Risks and mitigation strategies should consider technology itself. In the case of switching gas boilers to heat pumps, the type, proper sizing, ability to operate at low temperatures in winter and other performance factors have to be considered.

Similar to energy efficiency, some of the main risks and mitigants will include:

- Designing effective measurement and verification at an affordable cost that provides useful feedback about the success of projects.
- Persistence of energy savings – it is not uncommon, particularly for education initiatives and control settings to lapse in their performance and be changed back to poor practices or inefficient settings, and providing resources to sustain energy savings is also important.
- Regular review processes for energy management are important. For example, design guidelines and procurement guidelines should stay at the level of development of new technologies, practices, and services.

Costs and benefits

Based on the WSP report, the cost for switching to electric heat pumps at Oasis Aquatic Centre will require an indicative investment of $350,000. The estimated annual gas and electricity savings are between $30,000 and $70,000, depending on the revised usage of electricity after implementing the solar PV and BMS controller solutions.

The costs associated with decommissioning the cogeneration plant are estimated to be $30,000, while O&M costs for cogeneration of $50,000 per year will be saved.

[25] Wagga Wagga Oasis Aquatic Centre, Energy Saving Project – Options report, WSP, September 2020

5.8 Carbon sequestration offsets

Description

In order to achieve net zero emissions by 2040, Council will likely have to invest in carbon offsets, whether through purchasing offsets or by creating its own offsets through sequestration.

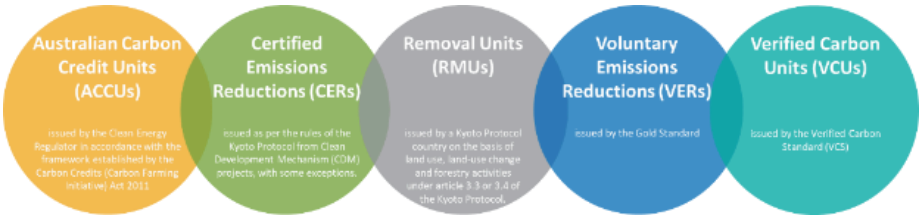
Wagga Wagga City Council has reviewed at a high level the potential to generate their own carbon offsets as an alternative to investing in ACCUs or overseas carbon offsets. Some examples of projects that have been evaluated thus far using the "Mixed Environmental Planting" ERF methodology set up by Clean Energy Regulator include:

- **Reforestation by environmental or mallee planting** which involves establishing and maintaining native vegetation on land that has been clear for at least 5 years
- **Avoided clearing** action which involves retaining areas of native forest that would otherwise be cleared

Based on Council's high-level estimates using CER's approved methodology, carbon sequestration projects may have a sequestration potential of around 10 t CO_2-e/ha/year. Based on Council's emissions reduction targets and any shortfall from other measures compared with net zero, this figure can be used to develop an estimate of the area that would need to be vegetated.

As a complementary or alternative measure, Council may wish to purchase carbon offsets to meet some of any potential shortfall to net zero emissions. If so, it should consider buying offsets that are approved under the Climate Active Standard. These include:

- Australian Carbon Credit Units (**ACCUs**) issued by the Clean Energy Regulator in accordance with the framework established by the Carbon Credits (Carbon Farming Initiative) Act 2011 which has now been amended to establish the Emissions Reduction Fund (ERF).
- Certified Emissions Reductions (CERs) issued as per the rules of the Kyoto Protocol from Clean Development Mechanism (**CDM**) projects, with some exceptions.
- Removal Units (**RMUs**) issued by a Kyoto Protocol country on the basis of land use, land-use change and forestry activities under article 3.3 or 3.4 of the Kyoto Protocol.
- Voluntary Emissions Reductions (VERs) issued by the **Gold Standard**.
- Verified Carbon Units (VCUs) issued by the **Verified Carbon Standard** (VCS).



Scope for abatement

The scale of the carbon offsets / sequestration task is the net emissions left after the other types of abatement measures have been implemented. The other types of emission reduction measures have been described in previous chapters and include grid decarbonisation, buying clean energy, energy efficiency, sustainable transport, landfill emissions reductions and gas to electric technologies. The carbon offsets abatement equals the total BAU emissions of Council's operations less the impact of other abatement measures.

Risks and mitigation

Local assessments based on current and planned tree plantings, the actual size and condition of available areas, and other local factors should be used to develop more correct estimates of the carbon sequestration potential.

If Council considers purchasing carbon offsets, Council should conduct due diligence of the carbon offsets to determine its integrity and alignment to Council's values.

Costs and benefits

It is estimated that Council will require approximately 2,870 ha of land area to offset the net emissions (~28,700 t CO_2-e) using sequestration by revegetation alone. Based on Council's estimated rates, carbon sequestration from revegetation has an estimated cost of around **$13.8 million to $18.0 million** inclusive of land purchase. This has long term benefit as carbon sequestration projects are expected to store carbon for 25 years. Council also has the opportunity to receive Biodiversity payments which would help offset this cost.

Carbon offset prices have gone up in the last year due to the increased demand worldwide. If Council choose to purchase carbon offsets to offset the net emissions in FY2040, using the current prices (as of early 2022) of ACCUs, the estimated cost of ACCUs is around **$817,800 to $1,721,800 per annum**. International carbon offsets are cheaper than ACCUs. Yearly purchase of carbon offsets is required to claim carbon neutrality every year from FY2040. Council should actively monitor the prices of carbon offsets in the market to make informed decisions.

5.9 Sustainable value chain

Description

Based on the current scope of Council's carbon footprint, opportunities for Wagga Wagga City Council to make deep emissions cuts encompass landfill emissions, renewable energy power purchasing (PPA), installing solar PV systems, improving energy efficiency, switching gas to electric technologies, sustainable transport, in addition to grid decarbonisation.

Sustainable procurement processes underpin these opportunities and can also incrementally reduce the Council's broader scope 3 (value chain) emissions over time through multiple individually small purchasing decisions, such as for building materials, appliances, ICT equipment, etc.[26]. Three components to sustainable procurement include:

- Policy frameworks that incorporate a sustainable procurement focus and weight low emissions / good environmental outcomes
- Engagement and training of staff to drive use of a sustainable procurement framework in all aspects of Council operations
- Continual review of equipment and services specifications, to identify opportunities to incorporate the sustainable procurement framework into the procurement and use of equipment and services

Sustainable procurement policy and framework

A policy relating to sustainable procurement can set out Council's overall intent to procure products and services with consideration of Council's sustainability goals, such as emissions reduction, energy efficiency and water conservation (among others). Alongside a policy, Council should develop its internal sustainable procurement guidance, drawing on an appropriate framework.

The NSW Department of Planning and Environment (DPE) is developing a Value Chain Emissions pilot program (2022), which will help to inform guidance and future programs for organisations seeking to decarbonise their value chain. This, allied to the NSW Local Government Guide to Sustainable Procurement may provide such a framework.

*"Sustainable procurement takes into consideration responsibility for the **economic**, **environmental**, **social** and **governance** impacts of any purchase – products or services. These four factors are referred to as the quadruple bottom line and relate to a total purchase cost, and not just the upfront dollar expense. Sustainable procurement, applied to NSW councils' spending, represents a significant opportunity to drive social and environmental change throughout a wide range of not only direct suppliers, but also the associated supply chains[27]".*

[26] Scope 3 GHG emissions are emissions upstream and downstream of the Council's operations and are associated with goods and services sourced for City activities, as described for the city's carbon footprint in this report.

[27] Sustainable Procurement Guide for Local Governments in NSW, 2017: https://www.lgnsw.org.au/files/imce-uploads/127/esstam-sustainable-procurement-guide-30.05.17.pdf

Engagement & Training

Even with a policy and sustainable procurement framework in place, decisions to source services and products that deliver best practice emissions reduction outcomes will happen when people who are buying these services and products take these decisions.

Underpinning this should be a program of continuing engagement, education and training of staff who procure services and products. This could encompass:

- Capital works staff involved in the design of new projects such as new / renovated community facilities, or new / renovated parks & reserves, where energy and water efficiency and onsite renewables and battery storage could be specified,
- Sourcing of professional and other services for the Wagga Wagga City Council,
- Roads and pavement construction and repair / maintenance teams who specify the types of materials to be used, where there may be opportunities to use more sustainable materials,
- Fleet procurement staff who assess plant and vehicle needs and specify new purchases and leases that will impact fuel use and other environmental performance measures for several years,
- Operational staff who may repair or replace equipment as it fails, such as appliances, air conditioners, lights, where there are opportunities to ensure that replacements are fit for purpose and energy efficient.

Design, Equipment and Services Specifications

Policy, procurement frameworks and education / training should ultimately lead to the specifications for services and works / products being continually improved to include the City's requirements for low or net zero emissions.

In addition, the evaluation criteria and weighting of responses to tenders and quotes should be periodically revised to evaluate and weight performance against these updated emission requirements, while achieving the other key goals of the City's procurement policy. Products and services where Wagga Wagga City Council could continually update specifications include:

- **Road and pavement construction**: look to source low embodied emissions materials and encourage or require potential suppliers to reduce emissions in their materials.
- **Building design policies:** Wagga Wagga City Council can continue to go further than code requirements, by continuing to require new buildings to be 6-Star Green Star (design and as-built) and having a pathway for ongoing improvement in its design requirements to work towards the implementation of 'net-zero buildings'.
- **Business Services**: procurement of services is typically a significant source of emissions in a local government's value chain. By requiring that suppliers of services to the City lower their own emissions (e.g., by being certified Climate Active carbon neutral), the City's scope 3 emissions can be significantly reduced.
- **Building lighting:** design and replacement with LED and smart controls together with passive measures to reduce demand for lighting.

- **HVAC:** many facilities will see air conditioning replaced over the next ten years, providing opportunities to improve passive heating and cooling, specify efficient fit-for-purpose technologies and smart controls, and specify low and zero-emissions refrigerant gases.
- **Power & appliances:** Power and appliances represent a modest % of the City's electricity use, including servers that run 24/7, office equipment such as computers, copiers and printers, and appliances like fridges, boiling water units, microwaves, dishwashers, and televisions. Efficient appliances and 'green IT' options are available, and many are already being pursued, and specifications can be developed that ensures all equipment such as these is energy efficient when purchased.
- **Wastewater and irrigation pumps** are upgraded or rebuilt from time to time. Upgrades offer opportunities to assess system design, evaluate VSD opportunities and improve control systems, such as moisture sensors.
- **Public park and reserve lighting:** LED and solar lighting are becoming the default technologies here for the City.
- **Sporting oval lighting:** it is increasingly common to select LED as the default technology for new sporting oval lighting. Smart controls can both centralise oversight and provide users with control and incentives to manage their use of sports lighting.

Scope for abatement

The scope for abatement from sustainable procurement can be sizeable, with incremental gains made via all purchased goods and services over the long-term complementing potentially large abatement from the procurement of electricity from renewables via supply agreements and the sourcing of electric vehicles. Wagga Wagga City Council also has the capacity to influence emissions reduction by its suppliers and contractors, and this may be increasingly important in future years in the context of reducing value chain emissions to reach net zero emissions.

Risks and mitigation

An assessment of risks and mitigation strategies would be part of any periodic review of procurement policies and processes for goods and services.

Costs and benefits

A robust sustainable procurement approach would see sustainable services and goods sourced on a whole-of-life cost basis, which will tend to favour efficiency and lower lifetime cost. Similarly, contractors and suppliers who are sustainable in their own operations are likely to have lower, not higher costs.

6 Emissions reduction pathway to meet the FY2040 target

6.1 Pathway to FY2040 target

Resulting from meetings with stakeholders, 100% Renewables has built a potential emissions reduction pathway that Wagga Wagga City Council could implement to reduce its carbon footprint to meet the FY2040 target emissions level. It is noted that this is based on a combination of BAU assumptions as documented above, known initiatives such as renewable energy power purchasing and streetlighting upgrades, and on possible abatement pathways for sources such as transport and value chain emissions. The timing and scale of any of the measures included in the pathway may well change over time, and this pathway therefore highlights one possible scenario.

TABLE 12: OPPORTUNITIES FOR WAGGA WAGGA CITY COUNCIL TO REDUCE ITS CARBON FOOTPRINT

Emissions source	Scenario to reduce emissions	Timing
Purchased electricity	Enter into PPA contracts starting from 1 January 2023 up to 31 December 2029: 1. Supply renewable power for all large sites and streetlights 2. Supply standard power to small sites with an option priced to buy LGCs It is assumed that Council will continue purchasing renewable power after the initial contract expires and that renewable energy generation will have value beyond 2030 when the Renewable Energy Target ends.	From 1/1/2023
Electricity – on site solar PV and batteries	Install new solar PV systems and batteries in the next 5 years which will increase the solar capacity by ~1.85 MW. The following are the estimated sizes of the solar PV systems: 1. Museum of the Riverina - 47 kW **(already planned)** 2. Oasis Aquatic Centre - 531 kW **(already planned)** 3. Narrung Sewerage Treatment Works - 479 kW 4. Civic Centre Administration Offices - 34 kW 5. Kooringal Sewerage Treatment Works - 158 kW 6. Wagga Wagga Airport - 99 kW 7. Alan Turner Depot - 51 kW 8. Bomen ISTF - 150 kW 9. Civic Theatre - 42 kW 10. Netball Courts, Equex - 69 kW 11. Forest Hill Treatment Works - 40 kW 12. Botanic Gardens Depot & Nursery - 22 kW 13. Robertson Oval - 25 kW 14. Jubilee and Conolly Complex - 35 kW 15. Forest Hill Pasveer - 25 kW 16. Rural Fire H/Qtrs Fernleigh Road - 35 kW	From FY2022 to FY2026, modelling selects 2-4 projects per year from the list shown and this may change based on Council's plans
Electricity – energy efficiency	Implement energy efficiency measures to achieve a 0.5% year-on-year electricity demand reduction beyond BAU. The following are some examples of measures that Council could implement: 1. Lighting upgrades to LEDs at sites with large energy demand like Civic Centre, Civic Theatre with specialised stage lighting, Tourist Information Centre, Library, Depots and Sportsgrounds 2. BMS optimisation at the Civic Theatre, Civic Centre and Art Gallery and installing controllers for demand-based ventilation in the Art Gallery 3. HVAC upgrades and humidity controllers at the above sites	From FY2022

Emissions source	Scenario to reduce emissions	Timing
	4. SCADA system for water treatment 5. Mechanical and electrical upgrades at the Oasis which includes the following: a. New BMS b. Main AHU upgrades	
Natural gas	Replace all gas usage except in the Crematorium and Eternal Flame by FY2030. Avoid gas installations in upgrades or new facilities.	From FY2030
Transport fuel	Implement the Planned Transition in Council's *Towards Zero - Council Fleet Transition Feasibility Plan.* The largest number of EVs are added into the fleet after 2026 as vehicle availability and suitability increases and they reach TCO price parity. From 2031, continue to transition to EV at an even rate per year, until all fuel assets are switched to EV by FY2040.	From FY2021
Wastewater	Improve the data quality for wastewater emissions and implement any feasible emission reduction actions identified.	From FY2022
Landfill waste	Retire the ACCUs generated from the flared landfill gas to claim emissions reduction.	From FY2030
Landfill waste	Develop a Waste Strategy and implement identified emission reduction projects and waste reduction measures to achieve the following NSW targets: 1. 10% waste reduction per person by FY2030. 2. Increase FOGO capture to halve the amount of organics going to landfill by FY2030. 3. Implement waste diversion measures to achieve 80% average recovery rate from all waste streams by FY2030.	From FY2022 to FY2030
Landfill waste	From FY2031 to FY2040 no further measures have been recommended to be implemented, and continued emissions reduction will occur as legacy gas continues to be captured and flared / used for energy generation. More opportunities may be identified with further analysis or technological advances.	From FY2031
Electricity – generation (waste-to-energy)	Install a landfill gas to-energy plant at the landfill site which has the capability to generate ~120kW. Around 22kW of generated energy will be used onsite and any LGCs associated with the consumed energy will be retired by Council.	From FY2024
Carbon sequestration	Develop an offset strategy that could include a 2,870-ha carbon sequestration project, sized to offset the balance of Council's forecast emissions in FY2040. Improve data quality for net vegetation.	From FY2025

The assumptions in the above table are reflected in the graph below to show an emissions roadmap for Council.

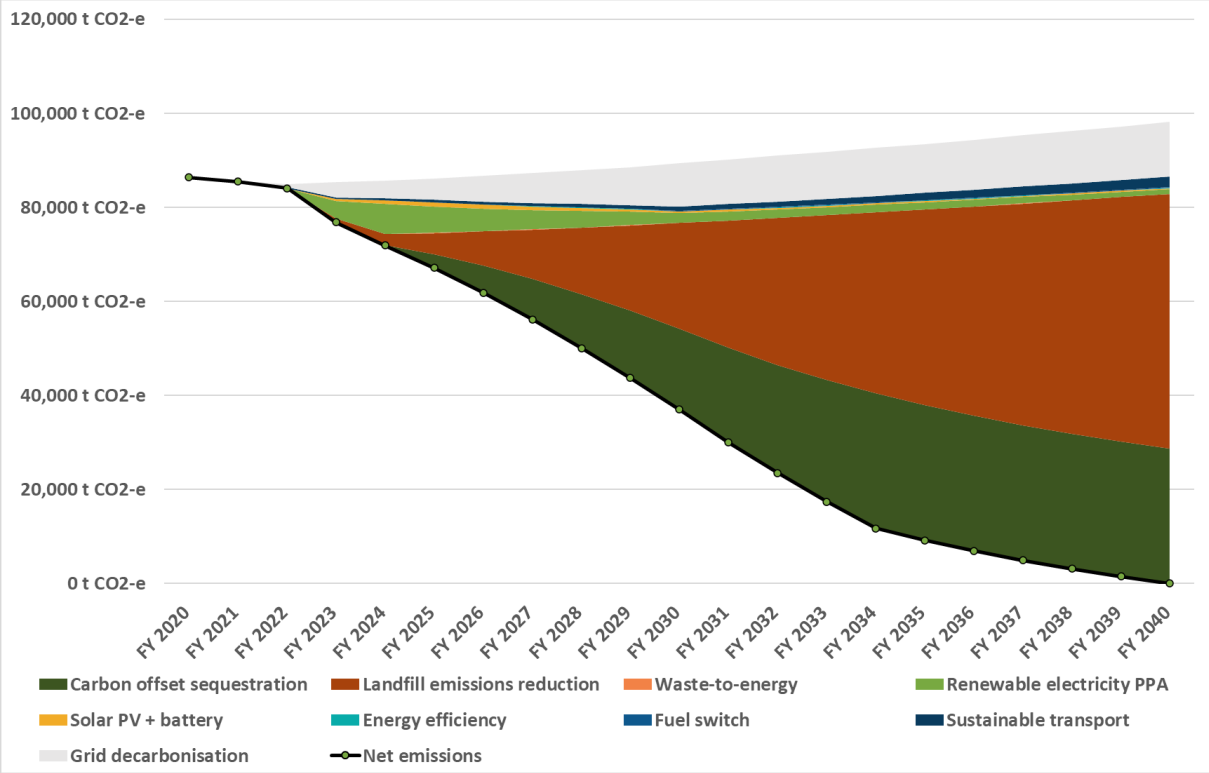


FIGURE 15: WAGGA WAGGA CITY COUNCIL'S EMISSIONS REDUCTION PATHWAY

APPENDIX A

Clean Energy Regulator's advice on waste inputs in the Solid Waste Calculator

OFFICIAL

CAS-149666-D6K8H1

Dear Joseph

Sorry for the delay in response.

In response to your questions:

1. Section 5.13 2.(c) of the 'National Greenhouse and Energy Reporting (Measurement) Determination 2008 (NGER Determination) states that:

> (c) by using industry estimation practices (such as the use of accepted industry weighbridges, receipts, invoices, other documents or records or population and per-capita waste generation rates).

Based on this, it appears reasonable to calculate the waste per capita from the known waste data and population data and back-cast the landfilled waste up to the opening of the landfill site.

2. Section 1.13 of the NGER Determination provide 'General principles of measuring emissions and energy' and are as follows:

> Estimates for this Determination must be prepared in accordance with the following principles:
>
> (a) transparency—emission and energy estimates must be documented and verifiable;
>
> (b) comparability—emission and energy estimates using a particular method and produced by a registered corporation or registered person in an industry sector must be comparable with emission and energy estimates produced by similar corporations or persons in that industry sector using the same method and consistent with the emission and energy estimates published by the Department in the National Greenhouse Accounts;
>
> (c) accuracy—having regard to the availability of reasonable resources by a registered corporation or registered person and the requirements of this Determination, uncertainties in emission and energy estimates must be minimised and any estimates must neither be over nor under estimates of the true values at a 95% confidence level;
>
> (d) completeness—all identifiable emission sources mentioned in section 1.10 must be accounted for and production and consumption of all identifiable fuels and energy commodities listed in Schedule 1 of the Regulations must be accounted for, subject to any applicable reporting thresholds.

Estimates of 'Waste received at the landfill' are required to meet that above stated principles.

3. The waste mix types for solid waste are provided in section 5.11 of the NGER determination and are as follows:

> (1) For subsection 5.9(3), the waste mix types are as follows:
>
> (a) food;
>
> (b) paper and cardboard;
>
> (c) textiles;
>
> (d) garden and park;
>
> (e) wood and wood waste;
>
> (f) sludge;
>
> (g) nappies;
>
> (h) rubber and leather;
>
> (i) inert waste.

Based on this list of waste categories, waste that is not contained in one of these categories could not be diverted from the landfill as it is not a input category and as such should not be counted in the 'waste received at a the landfill'.

I hope this helps answer your questions, if you have any additional questions, don't hesitate to contact us again.

Thank You

CLEAN ENERGY REGULATOR

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