Ironbark Sustainability

Coffs Harbour City Council

Renewable Energy and Emission Reduction Plan 2021

Prepared for
Coffs Harbour City Council

Version	Author	Date	Description of changes
V0a	Paul Brown/Evan Davies	April 2021	Drafting Process
V0b	Paul Brown/Natalie Isaac	30 April 2021	Review
V1a	Evan Davies	3 May 2021	Draft for Submission
V2a	Evan Davies	13 May 2021	Revised from Council Feedback
V3a	Paul Brown	5 July 2021	Revised from Community consultation
V3b	Evan Davies	4 August 2021	Revised Energy Consumption and Waste Inventory

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About Ironbark Sustainability
Ironbark Sustainability is a specialist consultancy that works with government and business around Australia by assisting them to reduce energy and water usage through sustainable asset and data management and on-the-ground implementation.

Ironbark has been operating since 2005 and brings together a wealth of technical and financial analysis, maintenance, and implementation experience in the areas of building energy and water efficiency, public lighting and data management. We pride ourselves on supporting our clients to achieve real action regarding the sustainable management of their operations.

Our Mission
The Ironbark mission is to achieve real action on sustainability for Councils and their communities.

Ironbark are a certified B Corporation. We have been independently assessed as meeting the highest standards of verified social and environmental performance, public transparency, and legal accountability to balance profit and purpose.

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1. Executive Summary

Coffs Harbour City Council (CHCC) has been implementing actions to increase renewable energy and reduce emissions for many years. The Renewable Energy and Emission Reduction Plan (REERP) was adopted in 2016 to provide a pathway for Council to achieve the previously adopted renewable energy and emissions reduction targets set out in Table 1: CHCC Existing Renewable Energy and Emissions Reduction Targets

Table 1: CHCC Existing Renewable Energy and Emissions Reduction Targets

Target Year	Renewable Energy	Emission Reduction (against 2010 baseline)
2020	25%	25%
2025	50%	50%
2030	100%	

In 2020 a Council motion was passed to review and update the REERP, including to update plans to meet the 2025 and 2030 renewable energy and emission reduction targets and to assess the feasibility and timeline for a net zero emissions target.

This report presents the findings of the REERP review that was conducted by Ironbark Sustainability.

It sets out 17 actions to reduce emissions and increase supply of renewable energy over the next 10 years, makes recommendations for the adoption of a 2030 zero net emission target and sets out a recommended pathway to achieve this target.

It is also recommended that this plan is again reviewed and updated in 2025 to take advantage of the emergence of new technologies and opportunities that may allow for a quicker and more cost-effective transition to zero net emissions.

1.1 A 1.5°C Science-derived Target

A Science-derived Target is a zero net emissions target that aligns with the Paris agreement objective of keeping global warming to well below 2°C and as close as to possible to 1.5°C as possible. SDTs were calculated for Coffs Harbour based on the population of the LGA, the operational responsibilities of Council and Council's current emissions profile. Figure 1 outlines the emissions reduction pathway for 1.5°C and 2°C trajectories.

Based on Council's existing targets and achievements to date, it is recommended that Council adopt a zero net emissions target of 2030. This is in line with Council's existing emissions reduction trajectory and with the Paris Agreement objective of keeping global warming as close to 1.5°C as possible.

Figure 1: CHCC 1.5˚C and 2.0˚C Emission Reduction Trajectories, excluding Landfill.

1.2 Landfill Emissions

Landfill emissions are the largest emissions source for Council. Council already implements a number of emissions reduction activities for landfill, including a waste diversion program and flaring of methane. These actions are estimated to save over 20,000 tCO_2-e per year compared to untreated landfill of a similar size.

Council also processes all household waste to remove organic material prior to sending the remaining waste to landfill. The extracted organic matter from the general waste stream is processed into a Mixed Waste Organic Output (MWOO) which up until 2018 was applied to land as a soil amendment. By keeping large volumes of organic material out of landfill (approximately 10,000 tonnes per year), this practice led to significant reductions in landfill emissions. Since 2018, however, the NSW EPA has banned the application of MWOO to land. As a result of this decision, CHCC have had to dispose of MWOO in landfill, leading to a significant increase in landfill emissions.

Council's current waste contracts operate up until 2027, providing limited opportunity to change current waste management practices and further emissions reduction. While a number of solutions post 2027 are already being discussed by Council, including waste to energy solutions, there is uncertainty regarding future waste management services.

Given this uncertainty it is recommended to create a separate target for achieving zero net emissions from Landfill.

A 2033 zero net landfill emissions target is recommended to provide Council with sufficient time to implement new landfill emission reduction actions after 2027, while still remaining close to a 1.5˚C target and well below 2˚C.

1.3 Renewable Energy and Emission Reduction Actions

Table 2: Summary of cost benefit analysis for key action areas summarises a set of identified actions to increase supply of renewable energy and reduce emissions.

In order to achieve the Net Zero Emissions target, over the next 10 years, around $10.9 million will need to be spent above business-as-usual operational costs, including the cost of offsets to achieve net zero in 2030/31. These projects will result in savings of around $22 million over their lifetimes and reduce Council emissions by over 21,000 tCO_2-e.

Table 2: Summary of cost benefit analysis for key action areas

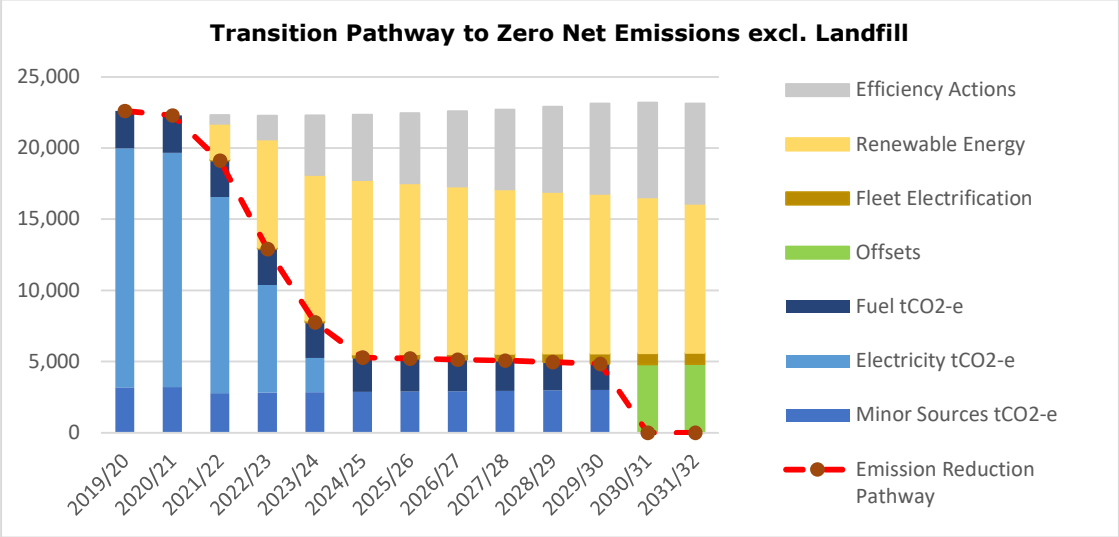
Action Area		Annual Emissions Reduction by 2030/31 (tCO2-e)	Capital Cost ($m)	Net Savings over Lifetime[1] ($m)
Electricity	Procurement of 100% renewable electricity (incl. installation of smart meters)	10,300 (in addition to other savings listed below)	$0.14	-$0.14
	Installation of additional behind-the-meter solar	830	$1.3	$3.6
Sustainable Buildings	Implementation of ESD Policy and energy and water efficiency actions across Council buildings	3915	$5.1	$16.5
Public Lighting	Replace all major road lighting with LEDs and deploy smart control systems	780	$2.3	$2.8
Fleet	Fleet transition to EVs and renewable electricity	800	$2.0	-$0.75
Offset	Offsets for residual emissions	4,700	$0.09	-$0.09
Total		**21,325**	**$10.93m**	**$21.94m**

[1] Savings after paying back the capital cost

Emissions reductions will be achieved through energy efficiency activities, increased supply of renewable energy and the electrification of Council's fleet. At the end of this process, it is estimated that approximately 4,700 tCO_2-e of residual emissions will remain which will need to be offset to achieve zero net emissions in 2030.

Figure 2 models the transition of key Council emissions sources against emissions reduction activities to achieve zero net emissions by 2030.

Figure 2: Transition Pathway to Zero Net Emissions



Between 2020/21 and 2030/31 the actions within this plan, if implemented, will successfully avoid the emission of over 150,000 tonnes of CO_2-e through energy efficiency, renewable electricity generation, reduced fuel use and offsets.

2. Introduction

2.1 Background

In 2014, Coffs Harbour City Council (CHCC) adopted a set of targets to increase renewable energy supply to Council and reduce Council emissions. The Renewable Energy target aimed for a staged increase in the proportion of energy used by Council that was generated from renewable sources; ramping up to 100% by 2030. The Emission Reduction Target also aimed for a steady increase in the amount of emissions reduction achieved by Council, stepping up to 50% reduction against the 2010 baseline year by 2025. The full targets are provided in Table 3.

Table 3: CHCC Existing Renewable Energy and Emissions Reduction Targets

Target Year	Renewable Energy	Emission Reduction (against 2010 baseline)
2020	25%	25%
2025	50%	50%
2030	100%	

Following the adoption of these targets, a Renewable Energy and Emissions Reduction Plan (REERP) was developed to set out how these targets would be achieved. In 2016, the REERP was adopted through a unanimous Council resolution. The unanimous endorsement of the plan provided Council with a clear direction to increase the uptake of renewable energy and reduce emissions from Council operations.

Since the adoption of the REERP significant work has been undertaken by Council to meet these targets. Notably this includes the Powering Ahead Project which has installed 620.5 kW of Solar PV across 13 Council sites since July 2019 and will add a further 1.72 MW of capacity to five Council water and wastewater facilities by the end of 2021. While Council did not achieve its 2020 Renewable Energy Target, with only 3% energy sourced from renewable sources, the completion of the Powering Ahead Project later this year will increase Council's supply of energy generated from renewable sources to 11%. Council made greater progress against its 2020 Emissions Reduction target achieving an 11% cut in emissions against the 2010 baseline (when comparing the same set of emissions sources). This is expected to increase to a 24% reduction in emissions at the completion of the Powering Ahead Project, just shy of the 25% target.

2.2 REERP Review

In early 2021, Ironbark Sustainability (Ironbark) was engaged to review and update Coffs Harbour's REERP including:

- Updating the existing baseline and emissions boundary;
- Updating Council's target, including on the adoption of a 100% emissions reduction target; and
- Developing a pathway of action to achieve Council targets.

Between March and April 2021, Ironbark conducted a review of Council's energy usage, other emissions related data and key actions undertaken as part of the first phase of the REERP.

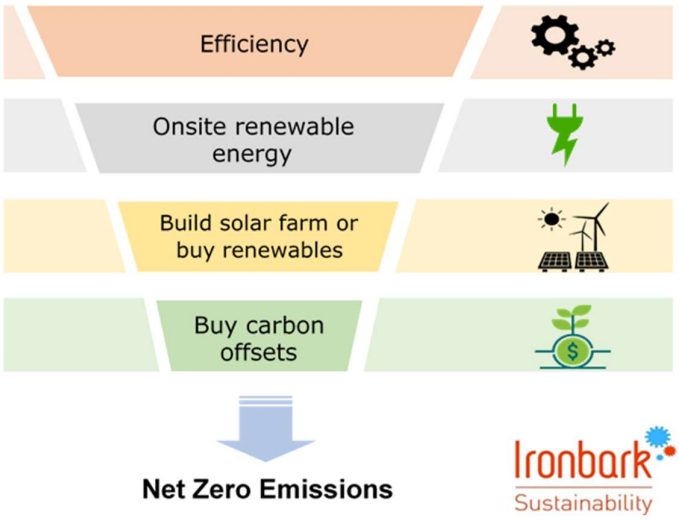
Stakeholder consultations were also undertaken with key sections of Council with management responsibility over the different functional areas discussed in this report. Consultation meetings were held with Councilors and the Executive Team, Council's internal Renewable Energy Committee and a community Stakeholder Advisory Committee.

This report summaries the key findings of the review undertaken and presents a revised Renewable Energy and Emissions Reduction Plan.

The revised plan is focused on the emissions of the CHCC as an organisation, and the steps that can be taken by Council to reduce these emissions and show leadership within the community. Importantly, it recognises Councils ongoing commitment to reducing GHG emissions and taking action on climate change by building on previously executed and considered renewable energy and emission reduction focused actions. The revised REERP maps out emissions reduction and offsetting opportunities for CHCC covering the period from to 2020/21 to 2030/31 and establishes an emissions reduction trajectory that will take Council to net zero emissions by 2030/31 for all emissions sources excluding Landfill, and to net zero for Landfill emissions by 2033. While actions have been included out to 2030/31 it is recommended that Council review and update this plan in 2025 to ensure ongoing Council actions are guided by the up-to-date information and take advantage of emerging technologies that could accelerate the transition to net zero emissions in different areas of Council operations.

The emissions reduction trajectory is presented as a practical pathway, that utilises the greenhouse emissions reduction hierarchy (Figure 3: Greenhouse Emission Reduction Hierarchy) and will result in net cost savings for Council as well significant emissions reductions over the lifetime of the investments.

Figure 3: Greenhouse Emission Reduction Hierarchy



The cost-benefit analysis carried out in preparing this plan has assessed opportunities within but not limited to the following key areas of Council's operations: energy efficiency improvements in buildings, renewable energy generation, low emissions technology upgrades in buildings and fleet, water and sewer, green power purchase agreements (PPAs), waste and

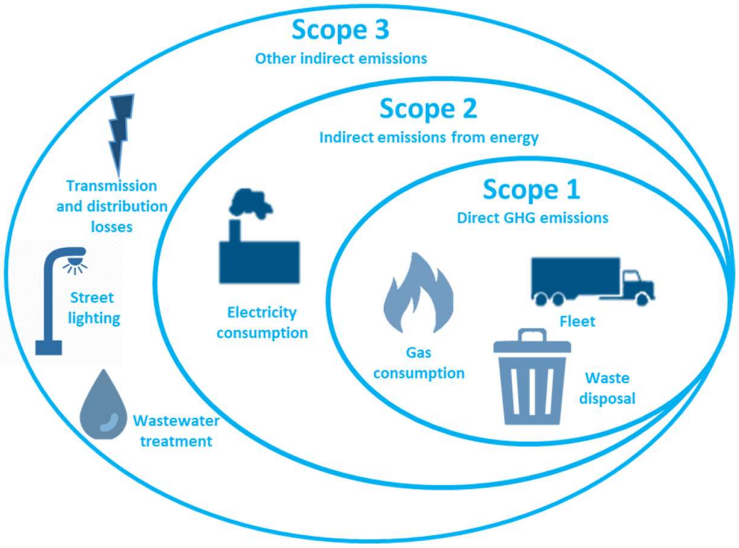
sustainable procurement. The pathway also includes options for offsetting remaining emissions to achieve zero net emissions status.

3. Council's Corporate GHG Inventory

3.1.1 Revised Emissions Boundary

As part of the REERP Review, Ironbark has calculated CHCC's GHG emissions inventory for Council's corporate operations for the 2019/20 financial year. The operational boundary for CHCC was defined using the scopes framework, which divides corporate emissions into three scopes as illustrated in Figure 4: Emissions scope summary.

Figure 4: Emissions scope summary



- **Scope 1** emissions are defined as "direct emissions from owned or controlled sources" and are emissions created when Council burns a fuel in an owned asset such as fleet burning diesel or petrol, or a building using natural gas. Emissions from Council-owned landfill sites also fall into scope 1.

- **Scope 2** emissions are defined as "indirect emissions from the generation of purchased energy" and include electricity purchased for Council-owned and operated assets.

- **Scope 3** emissions are defined as "all indirect emissions (not included in scope 2) that occur in the value chain of the reporting entity (Council)" these include electricity purchased for Council-owned but not occupied buildings, electricity purchased for street lighting, emissions associated with water use and emissions from the extraction and production of fuels (including diesel, E10 or petrol, natural gas and electricity).

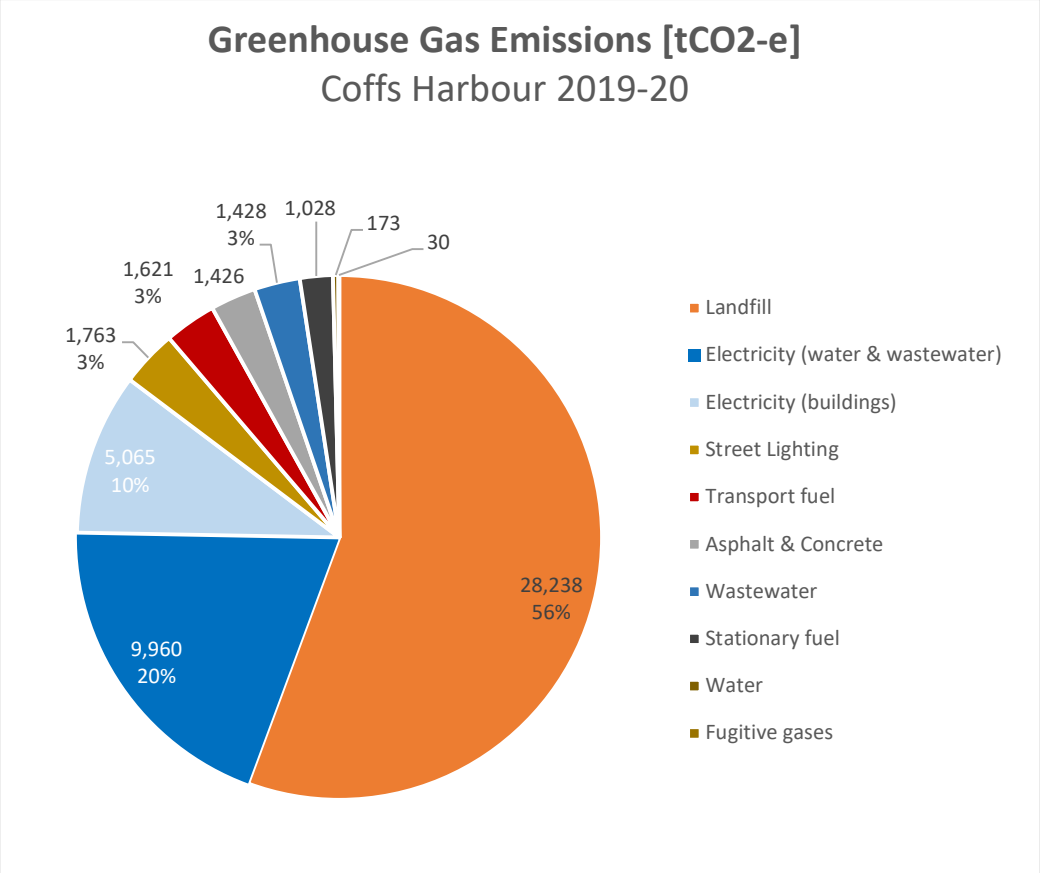
The revised boundary includes landfill, wastewater treatment and indirect scope 3 emissions that were not included in the 2010 emissions baseline that informed Council's previous emissions reduction targets. While the inclusion of these other emissions sources increases Council's reportable emissions, the scopes framework provides a more accurate account of emissions under Council's operational control and and is in line with the National Greenhouse and Energy Reporting Scheme (NGERs).

3.1.2 Corporate GHG Inventory - 2019/20

For the 2019/20 financial year Coffs Harbour City Council's emissions inventory has been calculated to be 50,731 tCO_2-e across scope 1, 2 and 3 emissions or 22,493 tCO_2-e excluding landfill emissions.

Figure 5: Greenhouse emission profile by sector 2019/20 provides an overview of Corporate GHG Emissions for CHCC by sector. Landfill is the largest source of greenhouse gas emissions, accounting for 28,238 tCO_2-e or 56% of total emissions. Electricity usage is the next largest contributor to emissions for CHCC, accounting for 16,787 tCO_2-e or 33% of total Council emissions. This includes electricity use in council buildings, water and wastewater facilities and streetlighting. This is then followed by transport fuel, asphalt & concrete and wastewater treatment emissions all approximately 3% of total emissions. Other emissions sources include stationary fuels (2%) and then minor sources including reticulated water, lubricants and fugitive emissions from air conditioners and industrial processes.

Figure 5: Greenhouse emission profile by sector 2019/20



Gaps in the availability of some activity data mean there may be some slight variation in the emissions inventory calculated, but these are not expected to be significant or impact decision-making regarding actions and opportunities to reduce emissions. Further detail on data gaps and recommendations are provided in Appendix B.

Based on this inventory the key focus for Council emissions reductions activities should be on:

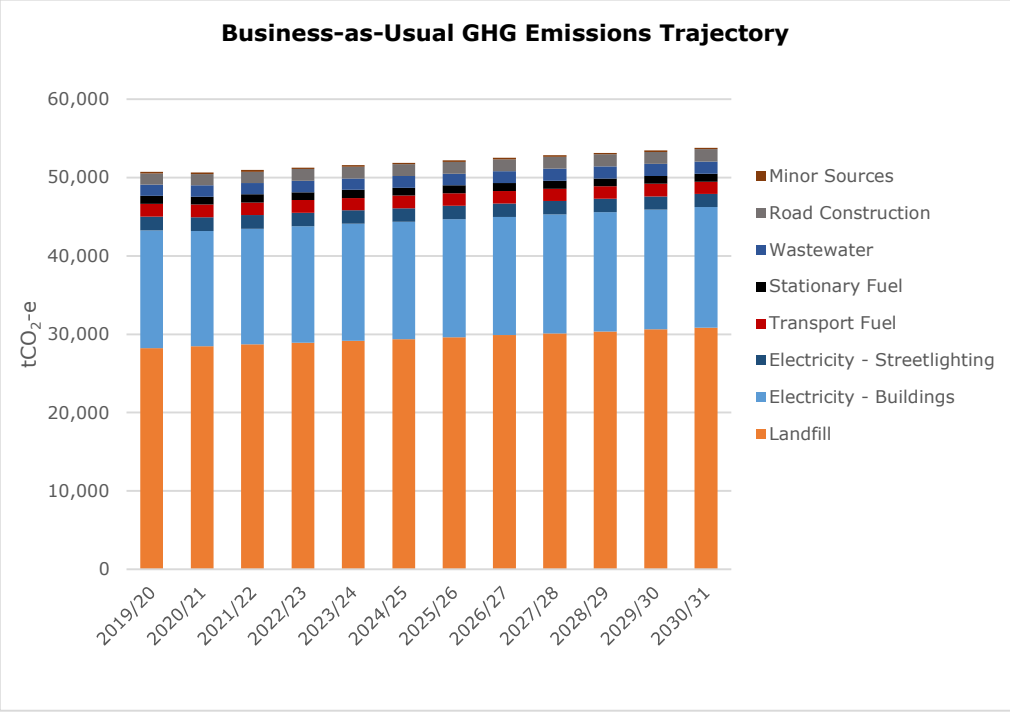
- reducing landfill emissions;
- transitioning to zero emissions electricity generation (renewables); and
- electrification of Council's fleet and stationary energy.

3.1.3 Emissions Projections to 2030/31

The business-as-usual trajectory for CHCC's corporate emissions has been modelled in Figure 6 to provide an understanding of Council emissions if no further action is taken to reduce emissions.

The modelling indicates that overall emissions are expected to remain relatively stable, increasing by approximately 7% over the next decade, if no action is taken by Council. This will be influenced by population growth within the municipality, which will subsequently impact Council's emissions through increases in number and use of buildings, increase in fleet miles travelled and increase in waste going to landfill. This increase will be partially offset by a reduction to the emissions intensity of grid supplied electricity and standardised improvements to energy efficiency in buildings and vehicle design.

Figure 6: Business-as-usual trajectory for Coffs Harbour's corporate emissions



It is important to note that this BAU trajectory does not include the impacts of any actions that have been modelled as part of the revised REERP, even if they have already been confirmed to be implemented.

4. Council Targets

4.1 Target Recommendations

It is recommended that Council maintain existing renewable energy and emissions reduction targets, while also adopting the following additional targets:

1) Zero Net Emissions Target for all emissions, excluding landfill, by 2030, and

2) Zero Net Emissions Target for landfill by 2033.

It is also recommended that the emissions reduction baseline be updated to the 2019/20 GHG Emissions Inventory, with an emissions boundary including scope 1, 2 and 3 emissions, as a more accurate reflection of emissions associated with Council operations.

The full set of targets is outlined in Table 4.

Table 4: CHCC Revised Renewable Energy and Emissions Reduction Targets

Target Year	Renewable Energy	Emission Reduction *Excl. Landfill*
2025	50%	50%
2030	100%	100%

Target Year	Landfill Emissions Reduction
2033	100%

These targets build on the work already undertaken by CHCC to reduce emissions and as shown in the analysis presented in this report are very achievable for Council. A separate target has been proposed for landfill given some of the unique challenges of reducing emissions in landfill. While a longer timeframe is likely required to achieve net zero for landfill, this should not delay progress on reducing emissions in other sectors where greater opportunities exist.

Both proposed targets are also in line with the rate of emissions reduction required to keep global warming to 1.5°C and avoid the worst impacts of climate change (See Section 4.2 Science-derived Targets).

Additional sub-targets are also recommended for key operational areas to build support and ensure sufficient action is taken to achieve Council's overall Renewable Energy and Emissions Reduction Targets.

Recommended sub-targets:

Renewable Energy

- 100% of electricity supplied from renewable sources by 2024/25.

Fleet

- 25% of the passenger vehicle fleet has transitioned to electric vehicles by 2024/25 and 100% by 2026/27
- 25% of the utility vehicle fleet has transitioned to electric vehicles by 2027/28 and 100% by 2030/31

Stationary Energy

- 50% of gas hot water systems in holiday parks and sports stadiums have been electrified by 2023/24 and 100% by 2026/27

Sustainable Infrastructure

- Emissions from road and path construction reduced by 10% by 2024/25 and 30% by 2027/28.

Sustainable Buildings

- All new buildings and major renovations meet Council Sustainable Facilities Policy (to be developed) by 2023/24.

All sub-targets recommended are in line with modelling and recommended actions in this report.

4.2 Science-derived Targets

At the United Nations Framework Convention for Climate Change (UNFCCC) Paris Conference in 2015, the Australian Government signed an international agreement between 195 countries to keep any temperature rise "well below 2°C", and to drive efforts to keep warming below 1.5°C higher than pre-industrial levels. Climate science tells us that warming beyond 1.5°C threshold is likely to have increasingly severe social, economic and environmental impacts, not least on a water scarce continent like Australia.

The Paris Agreement, entered into force on 4 November 2016, explicitly recognises and engages local and subnational governments and their critical role in supporting the transformation, including setting goals and strategies aligned with the science. In becoming a signatory to the Paris Agreement, Australia has a limited, established carbon budget within which to operate in order to meet its commitment to remaining well below 2°C of warming on pre-industrial levels and as close to 1.5°C as possible. The development of a science-derived target for a council or organisation enables us to understand the scale of action that is required to stay within this budget.

An emissions reduction target for an organisation, entity or community is considered "science-derived" or "science-based" when it is aligned with the broader emissions reduction required to keep global temperature increase below 1.5°C or 2°C compared to preindustrial temperatures, as described in the Fifth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC).

4.2.1 Target Methodology

The IPCC, the leading authority on current climate change scientific knowledge, has developed long-term emission scenarios which show a range of potential emissions trajectories and impacts based on highly detailed and rigorous modelling. These scenarios indicate the maximum total emissions allowable to limit the increase in global average temperatures to 1.5°C and 2°C which is considered the threshold for avoiding dangerous climate change.

Based on the above, the world's "1.5°C carbon budget" and "2°C carbon budget" are the total volumes of greenhouse gases that can be emitted while providing a degree of confidence (67%) that temperature rise will be limited to safe levels. The accepted global carbon budget established by the IPCC for no more than 2°C average warming is 1,701 GtCO2-e for the period 2000-2050.

This budget has then been scaled to Australia by the Australian Government's Climate Change Authority (CCA). The 2019/20 GHG inventory presented in Section 3.1.2 is used to connect the activities of CHCC to the national carbon budget developed by the CCA through apportioning the national budget.

4.2.2 Council's Science-derived Target

A science-derived carbon budget for a council's corporate emissions provides a framework for setting targets and demonstrating that a fair share of action is being undertaken. It allows a clear understanding of the scale of action that is genuinely required and helps define responsibility for action.

Ironbark has calculated carbon budgets for Council based on emissions reduction trajectories that align with 1.5˚C and 2˚C of average global temperature increases. Separate carbon budgets have also been calculated both including and excluding landfill, given some of the unique circumstances and different treatment options that have been identified and recommended in this plan (see section 5.7).

Table 5: Calculation of carbon budget for Council's corporate emissions, excluding Landfill

		CHCC – 1.5˚C excluding Landfill	CHCC – 2.0˚C excluding Landfill
Total carbon budget (tCO_2e)		105,559	248,337
Annual emissions (tCO_2e)		22,493	22,493
Required reduction p.a.	%	9.8%	4.2%
	tCO_2e	2,062	890
Net Zero Target Year		2030	2043

Figure 7: CHCC 1.5˚C and 2.0˚C Emission Reduction Trajectories, excluding Landfill.

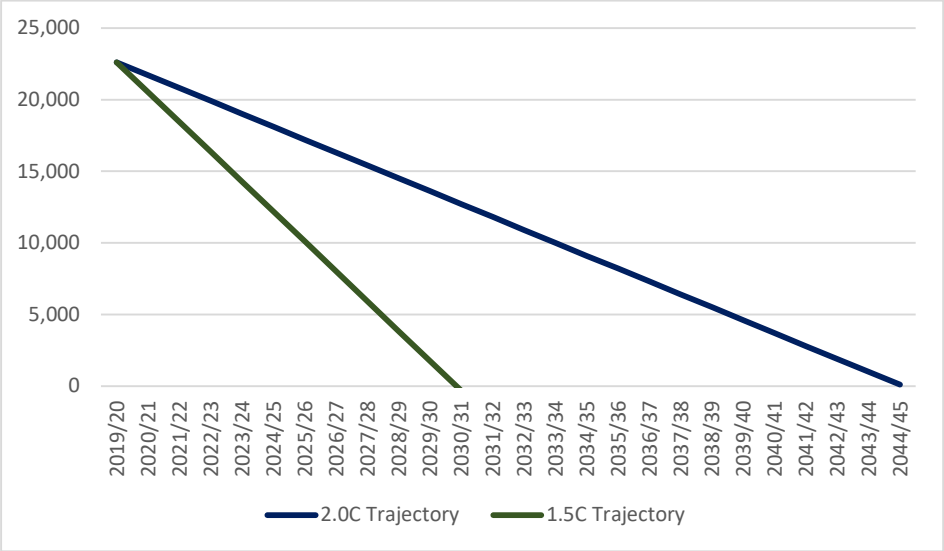
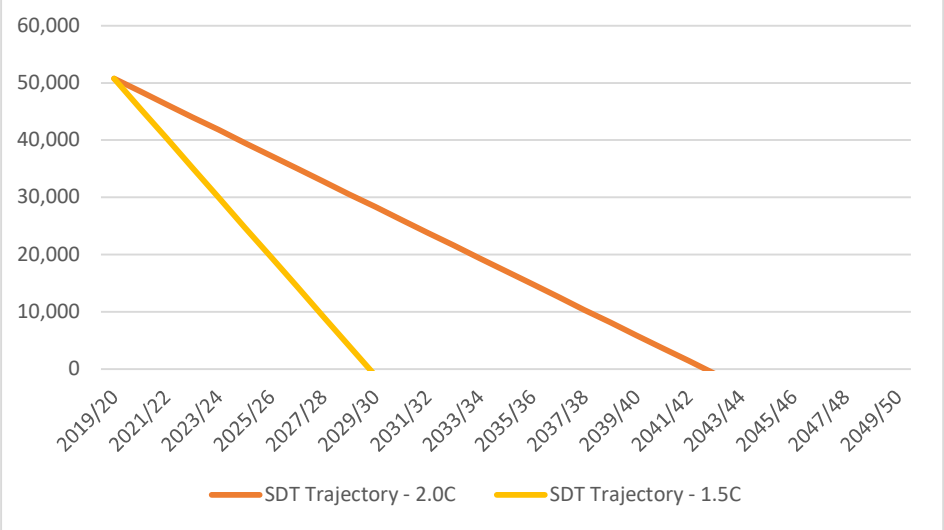


Table 6: Calculation of carbon budget for corporate emissions, including Landfill.

		CHCC – 1.5˚C including Landfill	CHCC – 2.0˚C including Landfill
Total carbon budget (tCO_2e)		242,595	571,583
Annual emissions (tCO_2e)		50,731	50,731
Required reduction p.a.	%	10.2%	4.4%
	tCO_2e	5,193	2,243
Net Zero Target Year		2030	2043

Figure 8: CHCC 1.5˚C and 2.0˚C Emission Reduction Trajectories, including Landfill.

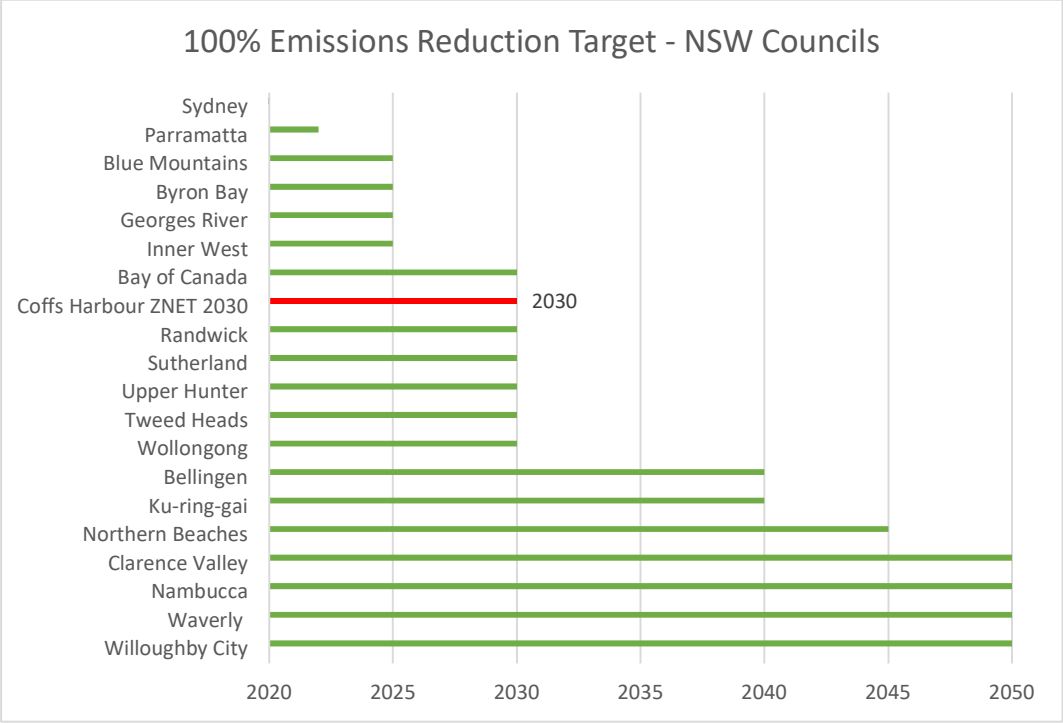


4.2.3 CHCC 1.5˚C Target

Based on the review of Council's existing targets, emissions, actions and opportunities (further detailed in the proceeding sections of this report) Ironbark recommends that Council adopt targets in line with 1.5˚C warming.

The total remaining carbon budget for Council emissions reduction to be in line 1.5˚C warming is 105,559 tCO2-e, excluding landfill emissions. A linear decrease of emissions from the 2019/20 GHG Inventory to net zero emissions would provide Council with a net zero target year of 2030. A 2030 net zero target (or 100% emissions reduction target) is also in line with the trajectory of the existing Council targets and positions Coffs Harbour among the leading Councils for emissions reduction in Australia.

Figure 9: Current 100% Emission Reduction Targets in NSW



The interim emissions reduction target of 50% renewable energy consumption and 50% emissions reduction against the 2010 baseline year are also in line with the 1.5˚C trajectory and are recommended to be maintained. Maintaining the interim targets will also enable Council to assess the efficacy of the plan at regular intervals, celebrate successes or adjust the action plan if required.

It is important when pursuing a science-derived target to understand that it is substantially different from other types of targets. Key differences which will be central to communications are that:

- the target is independent of any political or social considerations.
- the methods used for determining the target are transparent and available for review.

This science-derived target will be used to assess the impact of CHCC's actions relative to the emissions reductions required by the Paris Agreement and to communicate and engage with key stakeholders to drive the actions outlined in this plan.

4.2.4 SDT Landfill Target

The total 1.5°C carbon budget available for Coffs Harbour including landfill is 242,595 tCO_2-e. A linear decrease from 2019/20 gives a net zero emissions target year of 2030. While Council is scoping a number of future waste management solutions that will help further reduce landfill emissions (see section 5.7), it is locked into its current waste management contracts until 2027. This limits Council's ability to implement new emissions reduction opportunities over the next six years.

Given this situation it is recommended that Council adopt a 2033 target for zero net landfill emissions. This is target remains close to 1.5 °C and well-below a 2°C global warming trajectory. It is also considered to provide Council with sufficient time to transition to and fully operationalise new waste management solutions after 2027.

4.3 Achieving Council Targets - Discussion

This section discusses the approach to achieving the targets from a high level. Further detail on actions are outlined throughout this report.

4.3.1 2025 Renewable Energy Target

Based on 2019/20 energy consumption, approximately 30,000 MWh per year, the achievement of the 2025 Renewable Energy Target requires an additional 12,000 MWh of electricity to be generated from renewable sources per year. This is equivalent to the installations of an additional 8.5 MW of Solar PV capacity.

Improvements in energy efficiency and reductions in fuel consumption before 2025, however, would reduction the additional renewable capacity required. For example, a 10% improvement in energy efficiency across council facilities and a 25% reduction in fuel consumption would reduce the additional renewable energy required to meet the 50% target to 8,000 MWh per year.

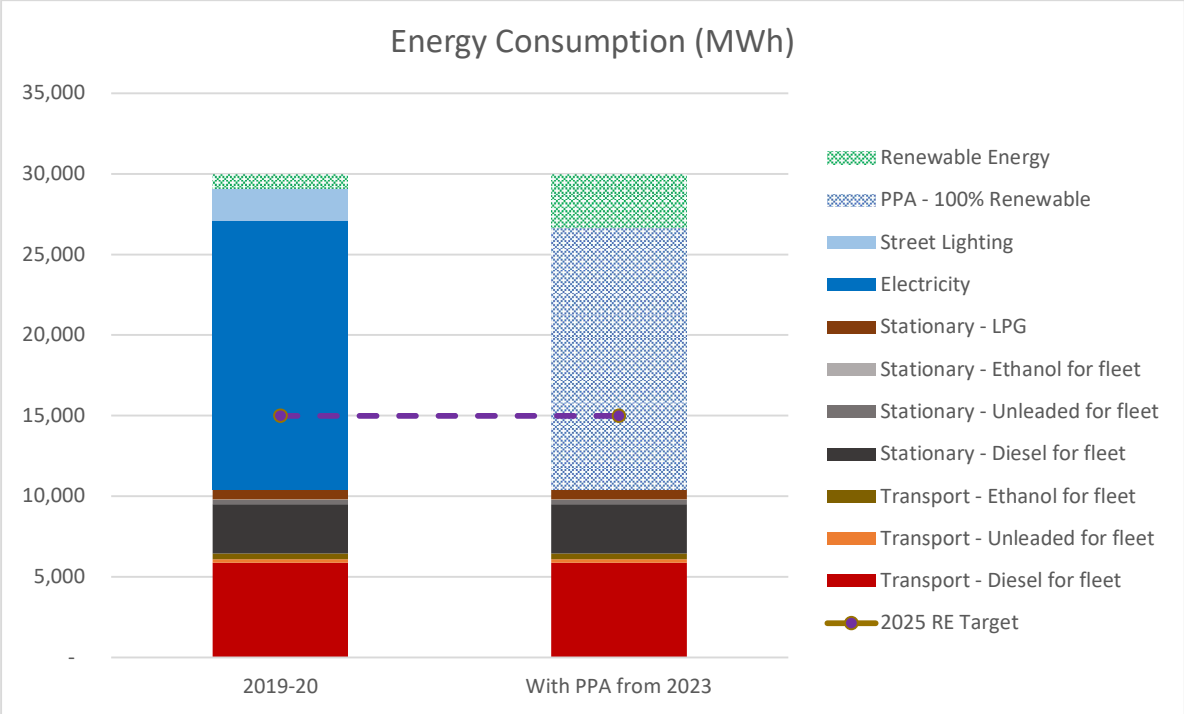
The additional renewable energy capacity could be achieved through a number of solutions, including: additional roof top solar, the development of a Council owned solar farm or the purchase of 100% renewable energy via a Power Purchase Agreement (PPA). Roof top solar represents the greatest return of investment for Council, and should be considered wherever feasible, but will not be able to be implement to the scale required to meet the target.

PPAs represent the quickest and easiest way of achieving the additional capacity required to meet the target. The establishment of a PPA for all Council sites and streetlights, from 2023, would increase the supply of renewable energy used by CHCC by 16,000 MWh per year. If Council adopted this solution, together with existing and already planned Council solar installation, total renewable energy generation in 2023 could exceed 19,000 MWh per year or two-thirds renewable energy use, based on current energy consumption. This would exceed

the 2025 Renewable Energy Target two years early. Further details on PPAs are provided in section 5.2.1.

Figure 10: Impact of 100% renewable energy PPA on energy source (MWh)illustrates the impact of a 100% renewable PPA on Council's renewable energy target.

Figure 10: Impact of 100% renewable energy PPA on energy source (MWh)



4.3.2 2025 Emissions Reduction Target

Table 7 outlines the total allowable emissions that Council can emit in 2025 to meet its target.

Table 7: Council 2025 Emissions Reduction Target in tCO_2-e

Target Year	ER Target	Maximum Net Emissions
2025	50%	11,325 tCO2-e

The supply of 100% renewable energy for all Council electricity consumption in 2023 would have a significant impact on the emissions reduction target. This action by itself would lead to a 75% reduction of emissions against the 2020 baseline (excluding landfill), greatly exceeding the 50% emissions reduction target.

4.3.3 2030 Renewable Energy Target

The 2030 Renewable Energy Target will be harder to achieve as it requires Council to reduce fuel use to zero, including for both transport and stationary energy. This will need to be achieved through the electrification of all of Council's fleet and plant as well as the transition of gas hot water and cooking facilities, in Holiday Parks and Sports Stadiums, to electric alternatives.

While many options exist for the electrification of cooking and heating facilities, passenger vehicles and smaller plant (e.g. mowers), there are a number of plant and vehicle types that currently do not have electric alternatives, such as diesel generators and heavy vehicles.

With bans on the sale of petrol and diesel vehicles beginning to be introduced in countries like the United Kingdom from 2030, it is expected new solutions will emerge for many of these issues which council will be able to adopt closer to 2030. The emergence of these new technologies will bring council closer to the 100% Renewable Energy Target.

It is recommended that the REERP is again reviewed and updated in 2025 to allow for the identification of new technologies and opportunities to help achieve the full electrification of Council fleet and plant and Council's 100% Renewable Energy Target.

4.3.4 2030 Emissions Reduction Target

The actions identified and described in this plan provide a pathway for achieving a net zero emissions target by 2030 (see section 6 for full pathway details).

If all actions modelled and costed in this plan are implemented by 2030, it is estimated that Council will have reduced its annual emissions by 17,500 tCO_2-e. This will leave approximately 4,700 tCO_2-e of emissions from hard to reduce sources, including fugitive emissions and vehicle and plant equipment without current electric alternatives, that will need to be offset to achieve zero net emissions. As electric alternatives come on to the market the amount of emissions that are required to be offset will reduce.

5. Emissions Reduction Actions and Opportunities

This section outlines the key actions to be undertaken by Council to achieve the goal, targets and objectives outlined in this plan. The actions have been broken down into key sectors, as follows:

1. Sustainability within the Capital Works Program
2. Renewable Electricity
3. Facilities
4. Public Lighting
5. Fleet
6. Water and Sewer
7. Waste
8. Community Impact of Council Actions

The offsetting of residual emissions (after the actions above are implemented) are covered in Section 6.2.

A cost-benefit analysis has been prepared that explores the costs, savings and abatement opportunity for the key opportunities outlined in this Plan. The metrics used to analyse the projects are outlined in Table 8: Cost benefit analysis metrics summary.

Table 8: Cost benefit analysis metrics summary

Impact in 2030/31 (tCO2-e)	This is the impact on emissions in 2030/31 from the relevant action. For actions that reduce electricity consumption (such as energy efficiency in buildings) the savings are included and do not include the impact of purchasing 100% renewable electricity (RE). For actions that increase electricity consumption such as the transition from fossil fuels to electricity (e.g. fleet EVs) the savings for these actions are included and include the impact of 100% RE purchasing. For RE procurement, the emission savings are calculated from the remaining emission from electricity and do not include the impacts outlined above.
Total Cost	This is the total cost-differential from business-as-usual. This includes the capital cost of any materials or infrastructure above what would have been spent under business as usual, as well as any increases to operation or maintenance costs. For example capital costs for fleet transition have been calculated for any additional costs of purchasing electric vehicle compared with standard internal combustion engine vehicles at the time of

	purchase. In general, this does not include depreciation of assets and is over the time period for the relevant action.
Simple Net Savings	This is the total savings over the lifetime of the investment minus the total cost including implementation and maintenance costs. Asset lifetimes assume: Buildings 50 years Plant and Equipment 8-15 years Solar systems 25 years EV passenger vehicles 3 years (assumes Council will sell the vehicles after 3-5 years)

5.1 Sustainability within the Capital Works Program

Council currently spends around $30m for capital works annually. Around 54% is allocated to the sewerage and water systems (see Table 9: Capital Works expenditure 2020/2021), with the remainder for facilities (21%). Other infrastructure (such as roads and paths, 22%) and building maintenance (3%).

Table 9: Capital Works expenditure 2020/2021[2]

	Operational Expenditure 2020/21	% of total
Infrastructure	$6,700,000	22%
Facilities	$6,400,000	21%
Building Maintenance	$800,000	3%
Water and Sewer	$16,300,000	54%
Total	**$30,200,000**	

The major ways to influence these spends to ensure they maximise outcomes to reduce emissions and ongoing operating costs are through:

- Sustainable Infrastructure Management Policy (or guidelines) and the integration of relevant changes into existing specifications and policies. This would cover the construction and maintenance of roads and sewer and water systems.
- Sustainable Design Policy (or guidelines) for new buildings and renewals.
- Technical Specifications for minor works and plant and equipment replacements and upgrades that includes relevant energy efficiency requirements.

[2] 2020_21 Revised Operational Plan, CHCC

Each of these are discussed within this section.

Table 10 outlines the predicted impact of the actions by incorporating more sustainability requirements within the capital works program. Further details of these actions are provided in sections 5.1.1, 5.1.2 and 5.1.3. The GHG impact is calculated per year, while the capital cost and simple net savings are calculated over the lifetime of the investment.

Table 10: Impact of actions for Sustainability within the Capital Works Program

Action	Start Year	Annual Emissions Reduction by 2030/31 (tCO2-e)	Total Cost	Simple Net Savings
Sustainable Infrastructure Policy	2021/22	430	$20,000	N/A
Implement ESD policy for all new builds and renewals	2021/22	1,200	$2.4m	$12.6m
Technical Specifications for minor works, plant and equipment	2022/23	40	$60,000	$40,000
Total		**1,670**	**$2.4m**	**$12.6m**

5.1.1 Sustainable Infrastructure Policy

The majority of emissions from capital works for roads, sewer and water infrastructure are as a result of either the project (materials, plant and equipment during the works as well as any clearing of vegetation) or the ongoing operating costs associated with the project (such as electricity used for water pumping). Electricity used within equipment should be integrated within relevant technical specifications (see Section 5.1.3).

Councils are responsible for a wide range of hard surface infrastructure construction repair and specification, that includes the following:

- Roads
- Footpaths and driveway cross overs
- Shared paths
- Car parks
- Drainage and water infrastructure
- Outdoor sporting courts such as tennis, netball, basketball and skating

In 2019/20 Council used 2,078 tonnes of Asphalt and 3,638 cubic metres of concrete resulting in 144 and 1283 tCO_2-e respectively.

This action models the potential savings from this project if leading sustainable road construction standards are implemented using a conservative emissions reduction factor of 30%, based on Transport for NSW (TfNSW) best practice specifications. Higher specifications could reduce this further, to 50-60%. This would involve requiring contractors to increase the use of recycled products and lower emission treatments such as warm mix asphalt.

At 3% of Council's corporate GHG inventory and using approximately 11,000 tonnes of rock, concrete and asphalt, these projects have significant environmental impacts. There are many ways to reduce emissions and Council can at the same time reduce local waste problems by including the use of rubber, glass and crushed concrete instead of virgin materials.

Actions to reduce emissions may involve a change in design, altering processes or using different materials. Updates to infrastructure guidelines and processes can consider the following requirements, in-line with relevant specifications:

- Use of low emission recycled priority materials (e.g. glass, plastic, rubber) and recycled civil materials (e.g. soil, rock, crushed concrete, recycled asphalt pavement) in Council infrastructure projects. These are core components of concrete and asphalt and form a substantial part of the modelling for this program. Of particular importance from an emissions perspective is the substitution of Portland cement for slag or flay ash in concrete. Access to these materials will depend on what is available locally. Council will need to work with road contractors and Council waste teams to identify relevant material sources.
- Use of low emission processes (such as warm mix asphalt).
- Training of engineers and designers as well as road construction and maintenance crews to identify the potential site issues and best practices to adopt.
- Review of road, path, sewer and water systems design to identify design changes that can reduce the use of materials. This may also be an opportunity to review the volume of hard surfacing and opportunities to introduce more non-permeable and green space within relevant streetscapes (especially residential roads and key precincts).

It is recommended Council collect data to identify current achievements within the design of relevant infrastructure. This will enable greenhouse emissions to be tracked and over time relevant alternatives sought. Council can identify opportunities for further improvements by implementing simple changes in the short term (first 12 months) and then initiate an internal working group to progress some of the longer-term elements that require investigation or detailed consultation over time. It is critical that this action be led by Council's infrastructure team and includes close collaboration with local contractors and road crews to ensure the solution is appropriate and accessible locally.

5.1.2 Ecologically Sustainable Design (ESD) Policy for New Buildings and Renewals

Ensuring that energy efficiency is considered at the design stage of any new buildings or major renovations is crucial. This will be achieved through the implementation of an Ecologically Sustainable Design (ESD) Policy. Features of these policies include requirements for improvements to the following within all new buildings and renewals:

- Project Management,
- Water,
- Energy,
- Stormwater,
- Indoor Environment Quality (IEQ),
- Transport including EV charging points,
- Waste, and
- Urban Ecology.

A strengthened and more robust ESD policy has the opportunity to greatly impact Council's financial and carbon emissions footprint. These policies are common and widespread and will be relatively straight forward for Council to produce. The challenge is ensuring the policy is adhered to and reported on within relevant projects.

5.1.3 Technical Specifications for Minor Works, Plant and Equipment

It is common for Councils to use technical specifications to guide contractors in the replacement of aging equipment and for minor works. It is recommended to update these specifications (or creating new specifications if these are absent) to include relevant clauses that ensure these products minimise energy and water consumption and ensure the installation of equipment that is durable and of high quality.

These will typically be used for minor works and the replacement of plant and equipment when replacing the current system or equipment with a new one.

The Specifications commonly encompass the following common equipment:

- Lighting (indoor and outdoor but not street lighting)
- Air Conditioning
- Hot Water Systems
- Insulation
- Water Fixtures
- Water Tanks
- Paints, carpets, adhesive and sealants
- Electrical white goods: dishwashers, clothes dryers, televisions, refrigerators and freezers

This does not replace the need for consideration of appropriate systems within large capital projects during the design process. A process for the embedding and updating of these specifications will also needs to be considered and implemented. Of primary concern is ensuring relevant staff managing contractors understand and have input into the specifications during the development process.

5.2 Renewable Electricity

Electricity usage is the highest emission source for Council accounting for 43% of Council emissions but provides the greatest opportunity for emissions reduction in the near term. By achieving Council's existing renewable energy targets of 50% by 2025 and 100% by 2030, Council can reduce electricity related emissions by 10,000 and 13,500 tCO_2-e per year respectively (includes emissions reduction from fleet transition).

Table 11 provides an overview of the modelled impact of the different renewable energy actions outlined in this section. The emissions impact is calculated per year, while the capital cost (including annual maintenance) and savings (net present value) are calculated over the lifetime of the investment. While the solar and battery solution are also recommended for future consideration, the cost or impact of this solution have not been modelled at this stage.

Table 11: Impact of Renewable Energy Action

Action	Start Year	Annual Emissions Reduction by 2030/31 (tCO2-e)	Total Cost	Simple Net Savings
Procurement of 100% renewable electricity through PPA	2023	10,300	N/A	N/A
Installation of smart meters at all Council small sites	2021/22	n/a	$140,000	-$140,000
Increase solar capacity at six sites and install new solar PV systems at an additional 13 Council managed sites	2022/23	0 incl. PPA 630 excl. PPA	$1m	$3m
Install 150kWp solar PV system at Moonee WRP	2022/23	0 incl. PPA 200 excl. PPA	$300,000	$0.6m
Total		**10,300**	**$1.4m**	**$3.5m**

5.2.1 Electricity Procurement

The purchase of 100% renewable energy through a power purchase agreement (PPA) is the simplest way for Council to decarbonise its electricity.

A PPA is a contract between an electricity buyer and seller. In the context of this Plan, PPAs refer to an agreement that the seller will ensure that a certain amount of energy is generated from renewable sources, such as large-scale solar or wind farming. This is now a common method for procuring electricity for local governments. It enables the purchase of zero emissions electricity through current electricity contract operating expenses. This also has the added benefit of locking in contract certainty for a nominated period, typically 7-10 years.

If CHCC enters into a PPA for 100% renewable energy from the beginning of 2023 (when current electricity contracts end), Council would exceed both its 2025 Renewable Energy and Emissions Reduction targets and go a long way to achieve its 2030 targets.

There are many existing procurement agents who are offering PPAs as part of standard contracting processes. This report assume that Council will be able to transition the electricity procurement contract to a PPA from the beginning of 2023.

The purchasing of renewable energy presents a direct investment in Australia's green energy transition and is of value for Council from a reputational and communications perspective as well as purely an emissions perspective.

5.2.2 PPA at Small Council Sites

CHCC manages over 280 sites that are deemed small market electricity sites, including water and sewerage pumping stations. In 2019/20 Council small market sites consumed 2,790 MWh of electricity. Currently is not viable to install behind-the-meter at the majority of Council small sites. Many of these small sites will also need to have smart meters installed before they can be integrated into a PPA.

For Council to achieve its 2030 renewable energy target all sites must be powered by 100% renewable energy.

To achieve this, it is recommended to implement a project to install smart meters at all Council small sites by the end of 2022, so that these sites can be added to the renewable energy PPA. The best agreement for small sites will be achieved if they can be integrated into Council's PPA at the time of negotiation. Negotiating a separate small site PPA or integration of small sites into a PPA after it has commenced is likely to yield less favourable terms.

The installation of smart meters at small sites may also be able to be negotiated as part of the PPA.

5.2.3 Onsite Solar for Council Facilities

Installing solar photovoltaics (PV) at the point of use, for example on the rooftop of a building, presents a simple opportunity to generating clean energy, reduce emissions and save money. The reduced need to purchase grid-electricity means that these projects should be considered by Council even if a 100% renewable PPA has been entered into, due to the cost savings and highly favourable payback periods. For every kWh generated from behind-the-meter solar Council will typically saves between 20 to 30 cents.

Since 2010, Council has already installed 658.5 kW of solar PV across 16 sites, while another 1.720 MW of solar PV systems are due to be installed at another five sites in 2021 under the Powering Ahead Project. At the completion of the Powering Ahead project 12 of Council's 20 highest electricity consuming sites will have behind-the-meter solar installations, self-generating on average 32% of each site's electricity usage. This is commonly the benchmark generation capacity of behind-the-meter without batteries.

While CHCC has already invested heavily in onsite solar there are still further opportunities to deploy additional behind-the-meter PV systems. Based on electricity usage Ironbark estimates an additional 210 kW of Solar PV could be added to six sites with existing systems, while another 270 kW could be installed across 13 sites currently without any solar.

Table 12: Sites with the potential to install further solar

Installation of additional Solar PV at existing sites	Installation of Solar PV at new sites
Airport Terminal	Sportz Central (PCYC) Stadium
Park Beach Holiday Park	Vernon Street Car Park
International Stadium	Woolgoolga Swimming Pool
Sawtell Beach Holiday Park	RFS Headquarters
Woolgoolga Lakeside Holiday Park	Hall Tent Sites
Woolgoolga Beach Holiday Park	Park Avenue Car Park
	Sawtell Swimming Pool
	Coffs sport & leisure park
	Jetty Theatre
	Sawtell Reserve
	Community village - Block F
	The Environmental Lab

A number of these sites were already considered for solar PV installation as part of the Powering Ahead project but were not included due to a range of different factors, from heritage considerations to planned upgrades or renovations. While these issues made the installation of solar PV systems unviable at the time these sites should be reconsidered in the future if or when previously identified issues have been resolved.

The CHCC Central Administration Building was also considered but not included as Ironbark understands the building will be soon sold.

Feasibility studies will need to be carried at potential sites to ensure investments are only made where the business case is favourable and where the sites can accommodate these types of installations.

5.2.3.1 Solar at Moonee WRP

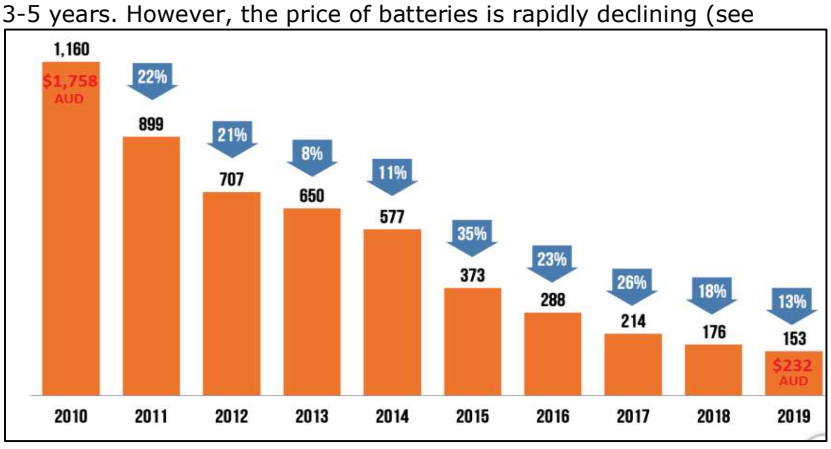
Solar PV was not installed at Moonee Water Reclamation Plant (WRP) as part of the Powering Ahead project due to uncertainty over whether the plant would be decommissioned. Now that it has been confirmed that Moonee WRP will not only continue operations but also increase treatment capacity to accommodate growth around the local area, installation of another large solar site at the WRP should be considered.

Based on electricity usage in 2019/20 Moonee could currently accommodate the installation of a 150 kW system, however, if use of the plant is increased greater capacity systems could be considered.

5.2.3.2 The impact of batteries to increase solar uptake

It is expected over the period of this plan that the incorporation of solar and batteries at relevant sites will lead to further cost savings for Council. By adding batteries Council can store the electricity from solar panels and release it at times of the day when solar is not contributing to onsite generation. This has the effect of shifting the viability of larger scale solar systems and enabling the installation of more solar panels on existing systems and the installation of new solar systems on previously more marginal sites. In addition, this solar + battery combination can be used to create uninterrupted power sources for critical infrastructure to replace polluting fossil fuel generators and removing an additional asset that requires management and maintenance.

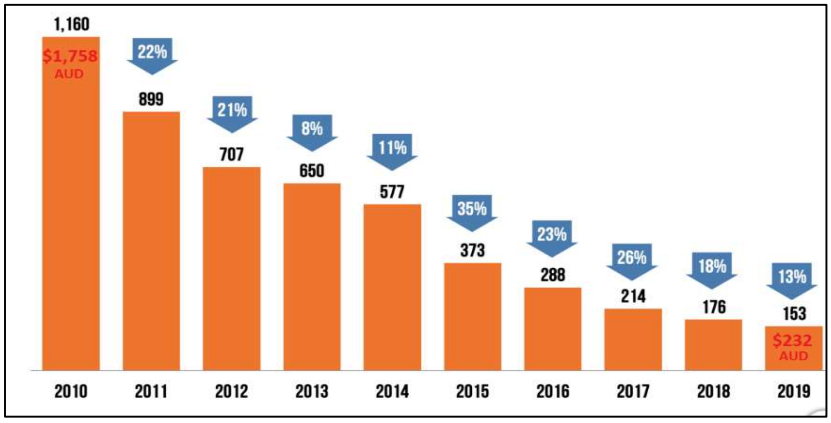
The current payback period for batteries is around 10 years. Behind the meter solar is around 3-5 years. However, the price of batteries is rapidly declining (see



) and it is expected that within the next 3-4 years paybacks of 6-8 years will be achieved. At this point an overall program to expand the size of behind-the-meter solar supported by battery storage is highly recommended.

Figure 11: Price of battery pack, change over time3

[3] Based on weighted average price, li-ion battery packs, real 2018 dollars/kWh, Source NEF Bloomberg. AUD annotations Solarquotes.com.au.



The determinant of the amount of solar will be driven by the site electricity and energy security needs as well as the availability of suitable locations. For these reasons the installation of increased solar and battery storage would be a great option at Council's water and wastewater facilities. These facilities operation 24 hours a day and typically have sufficient land size to accommodate large solar installations.

Were solar and battery solutions to be installed at the Karangi Water Treatment facilities and the three Council Water Reclamation Plants, we estimate an additional 3.7 MW of behind-the-meter capacity could be installed on top of existing and proposed installations based on current electricity consumption.

5.3 Facilities

Council buildings and facilities (excluding water and wastewater facilities) currently account for 10% of Council's emissions (5,065 tCO_2-e). In addition to sourcing renewable electricity for these sites an ongoing program to improve energy efficiency and to remove existing gas systems will drive significant costs and emissions savings. Table 13 outlines the impact, cost and saving of energy efficiency actions identified in this section. Further information is provided on these actions is provided in sections 5.3.1 - 5.3.3 below.

Table 13: Impact of actions for energy efficiency in buildings

Action	Start Year	Annual Emissions Reduction by 2030/31 (tCO2-e)	Total Cost	Simple Net Savings
Energy and Water efficiency at remaining top 14 electricity consuming facilities.	2022/23	1350	$1.5m	$2.5m
Energy and Water efficiency at medium sized facilities	2022/23	670	$760,000	$1.3m
Utility monitoring & sub-metering systems on 14 largest facilities	2022/23	225	$450,000	$650,000

Total		**2245**	**$2.71m**	**$3.9M**

5.3.1 Energy Efficiency at Large Facilities

The 14 largest facilities utilise 77% of total electricity consumption (from data collected from over 160 Council sites, excluding water and wastewater facilities). Energy efficiency measures sit at the top of the emissions reduction hierarchy and should be the first option to be assessed and implemented, where feasible. A systematic process that includes conducting audits, implementing efficiency upgrades, monitoring and reporting on the outcomes over a 3-5 year period is recommended for the 14 largest energy consuming facilities.

For these sites, the project costs have been estimated based on comparable projects in other municipalities and conservative savings estimates. They include actions such as lighting upgrades, hot water and heating and cooling improvements and appliance upgrades. For the purpose of this report, we have modelled the impact of implementing these actions across the top 14 energy consuming sites butCouncil may choose to include more or less than this number. (image: *Coffs Harbour War Memorial Olympic Pool, courtesy Coffs Coast Outlook*)

The expected cost savings and emissions abatement from these actions have been included within the modelling for the first 3-5 year period only. The GHG impact is calculated per year, while the capital cost and savings are calculated over the lifetime of the investment. These sites are listed below:

Table 14: Fourteen largest electricity using facilities (exc. Water and Sewer facilities)

Site Name	Annual Electricity Usage (kWh)	Annual Energy Cost ($)
Airport Terminal	881,919	$182,344
Park Beach Holiday Park	646,249	$152,991
CHCC Central Administration Building[4]	502,969	$101,641
Coffs Harbour War Memorial Olympic Pool	423,354	$78,412
Sawtell Beach Holiday Park	329,374	$76,587
International Sports Stadium	326,599	$85,239

[4] It is expected that this facility will not be under Council management long term. However, new facilities, such as the Coffs Harbour Cultural and Civic Space will replace it on this list.

CHCC Rigby House	297,817	$86,314
Vernon Street Car Park	151,182	$32,269
Woolgoolga Lakeside Holiday Park	149,878	$34,887
CHCC Work Depot	145,560	$34,751
Woolgoolga Beach Holiday Park	130,922	$32,273
Sportz Central (PCYC) Stadium	118,506	$27,249
Woolgoolga Swimming Pool	105,735	$22,494
RFS Headquarters - Aviation Drive	101,710	$23,014

5.3.2 Energy Efficiency at Medium Sized Facilities

At medium sized facilities actions to reduce energy will also be present. For the purpose of this report, we have considered the sites (excluding water and sewer infrastructure) that represent the top 15 to 51 electricity using sites. These represents 19% of total electricity consumption from data collected from over 160 of Councils' largest sites. Similar to larger buildings, it is recommended to conduct a systematic process that includes repeating ongoing energy audits followed by implementation of actions and monitoring of outcomes. In contrast these facilities can be assessed less frequently. An assessment process every 6-10 years is appropriate.

5.3.3 Utility Monitoring & Sub-Metering Systems on Ten Largest Facilities

Implementing an ongoing management system for Councils' largest sites will enable real time identification of system issues such as leaks and equipment or control failures. It is recommended that an active management program be implemented on the largest ten sites. This system would include installing a smart metering system to capture electricity and mains water data in 15 or 30 minute intervals. Sub metering can also be installed on key plant and equipment and the overall system connected to a centralised building management system.

This will enable either Council staff, or contractors to monitor system performance and enable automatic exception reporting to identify issues as they occur.

5.3.4 Electrification of Hot Water Systems at Holiday Parks and Sport Stadiums

Council currently uses an estimate 80,000 litre of LPG, via gas bottles, per year in its Holiday Parks and the International Sports Stadium. Solar hot water with gas boosters are the main users of gas in these locations. In addition, the International Sports Stadium uses gas for cooking in its kitchens.

Across all the Holiday parks there are eight amenity blocks, each with four to six solar hot water with gas booster systems. Each system costs approximately $25,000 – $30,000 and are

typically four to seven years old. In addition, 80 villas within the parks are currently serviced by solar hot water with gas booster systems.

In addition to emissions from the burning of the gas, these systems also present a maintenance issue for Council should bottles run out of gas afterhours or on weekends. Converting gas to electric systems, which can then be powered by renewable energy will also be required to achieve Council's 2030 Renewable Energy Target.

A project to replace all the gas systems with electric systems is recommended. Twelve villas in the holiday parks already have solar hot water with electric booster systems.

Across the holiday parks the conversion of 80 villas and 40 amenity block systems to electricity is estimated to cost up to $1.5 million but more data is required to provide accurate estimates. Costs for conversion of gas facilities at the International Sports Stadium has also not been calculated.

5.4 Public Lighting

Table 15 outlines the cost benefits for the public lighting projects outlined in the section below. The greenhouse gas emissions impact is calculated per year, while the capital cost and savings are calculated over the lifetime of the investment.

Table 15: Impact of actions for public lighting

Action	Start Year	Annual Emissions Reduction by 2030/31 (tCO2-e)	Total Cost	Simple Net Savings
Replacement of all Major Road Street Lighting with LEDs.	2023/24	480	$900,000	$2m
Adding Smart capability and energy savings to the Major road lighting LED changeover.	2023/24	110	$370,000	$120,000
Update all parks and sports lights to LED and smart controls	2023/24	190	$1.0M	$700,000
Total		**780**	**$2.3m**	**$2.8m**

Electricity from almost 5,000 streetlights accounts for 3.5% of Council's total emissions in the 2019/20 inventory. In addition, a high-level estimate of the number of outdoor lights within parks and open spaces as well as outdoor sporting facilities suggests a further 700 lights could be present in these areas.

Council has successfully replaced the majority of its residential streetlights to LED lighting (just over 3200 lights), saving as much as 70% of the energy for these assets and reducing Council's emissions by around 500 tCO_2-e each year. The remaining street lighting assets include major road assets (approximately 1,100) and decorative lights (370 lights). There are readily available LED products to replace both major road and decorative options over the next few years. Within this section a summary of the estimated business case for replacing the remaining streetlights is outlined. There are LED options that can reduce energy for these assets by between 50 and 80% depending on the product choice.

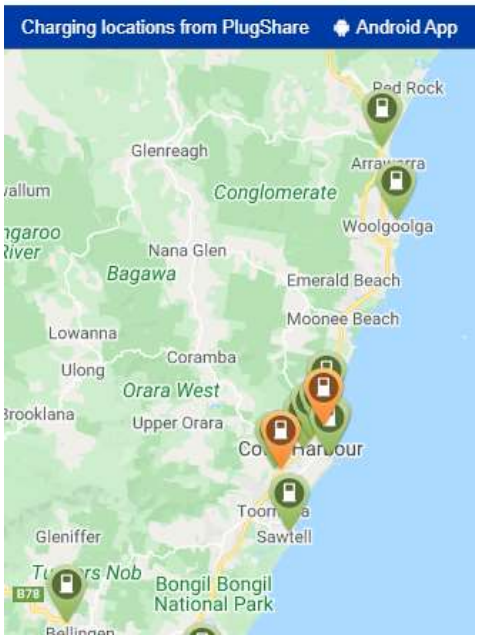
In addition, the utilisation of smart lighting can be considered within the major road program in order to enhance energy savings and improve maintenance outcomes and road safety. Current smart lighting programs are increasing energy savings from these projects by as much as 30% of the energy of the LED replacement.

Council will need to work with Essential Energy for any street lighting changeover.

An estimated 700 of Council's outdoor lighting are located in parks, foreshore, car parks and sporting fields (i.e., not street lighting). There are efficient options to replace these assets with lower energy assets with enhanced management through smart lighting control systems. It is recommended that a detailed audit be undertaken for these assets to identify locations, types and to detail costs and benefits for a wide scale replacement program. Utilisation of planned expenditure and upgrades should be leveraged wherever possible as well as a dedicated program to audit, plan and deliver upgrades.

5.5 Fleet

Transport fuels currently account for 3.2% of Council's emissions. Replacing petrol and diesel vehicles with electric vehicles (EVs) can dramatically reduce greenhouse gas emissions as well as overall operational cost over the course of the vehicle's lifetime. As EVs emit no exhaust fumes, they also have many additional health and environmental benefits for the broader community.



While the full electrification of Council's fleet will be a necessary step to meet CHCC's 2030 Renewable Energy Target, it is recommended that transition is phased over the next decade. This will allow for different vehicle classes to transition at different times, as technology and vehicle performance improve, and costs reduce. While the range of passenger EVs are steadily increasing in Australia, currently there are no EV Utes for sale in Australia and limited options for heavy vehicles.

A phased transition will also allow Council to ensure the right policy settings are in place for Council to accommodate an electrified fleet, while also allowing for the gradual increase in the EV charging stations at Council facilities. Importantly it will also allow Council staff time to familiarise themselves and build confidence with the technology.

Table 16: Impact of actions for fleet outlines the impact and cost benefit of fleet transition actions identified. The greenhouse gas emissions impact is calculated as the annual savings in 2030/31, while the capital cost and savings are calculated over the lifetime of the investment.

Table 16: Impact of actions for fleet

Action	Start Year	Impact in 2030/31 (tCO2-e)	Total Cost	Simple Net Savings
Development of Sustainable Fleet Policy, including driver training every two years.	2021/22	60	$50,000	$230,000
Replace all passenger vehicles and with electric vehicles by 2026/27	2021/22	280	$56,000[5]	$75,000
Replace all ute vehicles with electric vehicles by 2030/31	2025/26	460	$270,000	$550,000
Install sufficient charging stations to support new EV fleet.	2021/22	n/a	$1.6m	-$1.6m
Total		**800**	**$2.0m**	**-$745,000**

5.5.1 Mitigating Risk in the Fleet Transition

As of June 2020, more than 14 countries have proposed banning the sale of petrol and diesel vehicles and over 20 cities have proposed banning these vehicles within their city centres[6]. Timelines range from 2025 to 2040 but the direction of change is clear. While Australia has not yet set any targets for banning the sale of either petrol or diesel vehicles, both national and international pressure is mounting, and it is likely that similar targets will come into effect within the next decade.

Regardless of whether such targets are adopted in Australia, there will nonetheless be a shift in international markets and car manufacturing away from ICE and towards EV, as evidenced by General Motors announcement in January 2021 that it would stop manufacturing petrol and diesel cars by 2035[7].

Council manages a large vehicle fleet with a high turnover of vehicles each year. It is therefore critical that Council acknowledges the implications of these trends and incorporates them into the motor vehicle and fleet policy and strategy documents. Council currently replaces passenger vehicles every 3 years or 80,000 kms and utility vehicles every 5 years or 120,000 kms. This offers a significant opportunity to transition Council's fleet within the timeframe to meet the 2030 Renewable Energy Target at minimum additional capital expenditure.

As well as demonstrating leadership within the region, taking a planned approach to transitioning away from ICE vehicles will mitigate the real risk to Council of locking in an

[5] Costs are calculated as cost above business-as-usual fleet replacement.
[6] International Energy Agency *(IEA), Clean Energy Ministerial, and Electric Vehicles Initiative (EVI) (June 2020). And* "Global EV Outlook 2020: Enterign the decade of electric drive?". *IEA Publications*. Retrieved 15 June 2020. See Table 2.1
[7] https://indaily.com.au/news/2021/01/29/general-motors-flags-end-to-petrol-diesel-cars-in-bid-for-carbon-neutrality, accessed 30 April 2021.

obsolete fleet. It will also enable Council to manage the transition strategically, allowing for the costs of vehicles and charging infrastructure to be spread over a number of years.

5.5.2 Sustainable Fleet Transition Planning

As the first step in the fleet transition, it is recommended that Council conduct a detailed fleet transition planning and develop a Sustainable Fleet Policy and Transition Plan. This plan will help Council set a trajectory for the timely transition to EVs by identifying relevant points when the transition of different vehicle classes makes economic and technical sense, as well as the supporting infrastructure and policy settings required to enable the transition. The plan should also consider ways to increase staff familiarity with EVs and charging stations and provide incentives for early adopters, while also including actions to improving fuel efficiency within the existing petrol/diesel fleet prior to transition.

Recommended actions for consideration in the plan include:

- A phased installation of EV Charging facilities at Council sites.
- The establishment of a target for the transition of all passenger and utility vehicles to EVs.
- Identification of opportunities for the incorporation of EVs into the heavy vehicle fleet where feasible (this has not been modelled).
- Utilisation of telematics system, already installed in Council utes, to ensure best practice fuel and emissions management.
- Regular driver training for employees to ensure safe and efficient driving.
- Requirement for waste contractor to utilise fleet management software to reduce fuel consumption and utilise EV waste trucks in the next contract (this has not been modelled).
- Transition of small equipment such as mowers, whipper snippers, to electric. Consider installation of solar panels on utes for trickle charging over time.

Council currently owns the large majority of its fleet. This analysis assumes this will remain the case, however, if Council was to transition to a leased fleet, then opportunities open for Council to have third party fleet managers fund the transition to EVs. This could occur through these leases, thus avoiding the upfront capital required to fund the transition.

5.5.3 Transition of Passenger Vehicles

Council currently own 88 petrol and diesel passenger vehicles, which have (or are expected to have within the 2-3 years) readily available EV replacement options. This plan recommends upgrading these vehicles to EV in line with the existing vehicle replacement schedule between 2021/22 and 2026/27. As an initial step it is recommended that Council purchase two electric passenger vehicles in 2021/22 for inclusion in the pool cars. This will provide Council staff with opportunity to test out and familiarise themselves with EVs and charging stations. A phased

transition could then occur over the subsequent five years adding 5 to 25 new EVs to Council's fleet per year as existing petrol and diesel cars are replaced.

The cost and impact of this action has been modelled in Table 16. This modelling includes only costs above currently available petrol or diesel options and assumes price parity for electric passenger vehicles by 2025. It also assumes a proportion of costs will be reclaimed at sale of the vehicles. Once all vehicles currently on the asset register have undergone an upgrade to EV it is assumed that the purchase of EV becomes business as usual and no costs are modelled for subsequent replacement cycles.

5.5.4 Transition of Ute Vehicles

Council has over 140 utility vehicles (utes), which are used throughout Council operations and do not have current EV replacement options available within the Australian market. In overseas markets, however, a number of utes and pick-up trucks are already available, with the launch of many more planned. This includes a planned launched of the Ford F-150 electric pick-up truck (as shown above) in early 2022 (the Ford F-150 has been the best-selling pick-up truck in the US since 1977).

The range of options around EVs are steadily increasing year on year, while prices are falling. For this action we have assumed EV utes have entered the Australia market by 2025 and that price parity is reached by 2028/29. Adopting a similar approach to the phased transition of passenger vehicle, Council should be able to transition the entire utility fleet by 2030 as part of the normal replacement cycle. Once all vehicles currently on the asset register have undergone an upgrade to EV it is assumed that the purchase of EV becomes business as usual, and no costs are modelled for subsequent replacement cycles.

5.6 Water and Sewer

Emissions associated with water and sewage treatment come from three main sources:

1. Release of Methane (CH_4) and Nitrous Oxide (N_20) emissions during wastewater treatment (Scope 1),

2. Electricity usage during water and wastewater treatment (scope 2 and 3), and

3. The consumption of fuels within the operations of water and wastewater treatment, for example the use of diesel generators (Scope 1).

5.6.1 Emissions from wastewater treatment

The total wastewater treatment emissions (Scope 1) for CHCC have been estimated to be 1,427 tCO2-e. This includes approximately 1,243 tCO_2-e of N_20 and 182 tCO_2-e of methane.

The three operational Water Reclamation Plants in Coffs Harbour largely use aerobic treatment processes which do not produce methane. Woolgoolga WRP and the now decommissioned Corindi WRP use shallow sludge lagoons to dewater biosoilds which do produce small amounts of methane, in this case an estimated 182 tCO_2-e. Introduction of a mechanical dewatering process (similar to Coffs Harbour or Moonee WRP) would eliminate these emissions, however

given the high cost of establishing this new piece of infrastructure, compared to the emissions saving, it would only be recommended as part of larger upgrade to the WRP.

The majority of scope 1 emissions comes from nitrous oxide produced as fugitive emissions during the treatment process. Currently there are limited options for reducing nitrous oxide without fundamental change to the biological processes within the treatment. No actions have been identified for the reduction in these emissions within this plan. It is recommended that these emissions are offset in order to reach net zero emissions by 2030.

5.6.1.1 Disposal of Biosolids

The disposal of biosolids at the end of wastewater treatment processes is another potential source of emissions. Currently all biosolids are sent to Council's biomass facility after dewatering to be processed with other organic matter into compost. This practice effectively reduces emissions from the disposal of biosolids to zero and is recommended to continue.

Consideration will however, need to be given to what occurs to the biosolids after 2027 when the current contract with Council's waste contractors ends to ensure any change of disposal arrangements do not create new emissions sources.

5.6.2 Emissions from Electricity Usage in Water and Sewage

In FY 2019/20 electricity usage at water and wastewater treatment facilities accounted for 20% of Coffs Harbour City Council's total emissions, releasing 9,960 tCO2-e. Electricity consumption across these facilities also cost Council close to $2.5 Million in FY 2019/20.

Coffs Harbour WRP is the single largest electricity consumer across Council operations and accounted for 21% of Council electricity consumption (3,975 MWh) in 2019/20. Karangi Water Treatment Plant is the next largest electricity user at 2,011 MWh (11% of Council's electricity usage), followed by Woolgoolga WRP (7%), the water pumping station at Cochranes Pool (5%) and Moonee WRP (3%).

Although under a 100% renewable PPA the emissions for the electricity usage from these facilities would be zero, energy efficiency and process optimisation are still recommended due to the high operational cost savings that these actions could achieve. Energy efficiency is understood to already be a key consideration in the replacement and renewal of water and wastewater infrastructure, for example with Council opting to replace pumps with lower power pumps wherever possible.

Two existing initiatives are currently being implemented that will also significantly reduce Council's electricity usage in water and wastewater treatment. These are described in sections 5.6.2.1 and 5.6.2.2 below. Planned upgrades to the WRPs and onsite renewable energy generation present the key other opportunities identified to reduce electricity usage.

5.6.2.1 Inflow Strategy

Council is currently implementing a 10-year inflow strategy to reduce the volume of wastewater entering the sewer system. This is expected to lead to substantial decreases in energy consumption across the sewerage pumping and treatment system.

As part of the strategy Council is identifying rainfall and stormwater leakages into the sewer system as well as illegal connection into the system from residential or commercial properties. The result of these leakages and illegal connections significantly increases wastewater volumes (up to 8 times normal flow rate) during heavy rainfall events, as stormwater unnecessarily enters the sewer system. The additional inflow results in a significant increase in electricity usage across the pumping system. During these events the WRPs also have to increase pumping capacity to manage the additional inflow. At the Coffs Harbour WRP, for example, the operation of two additional 75 kW pumps are required to manage the additional wastewater volume.

To date Council has conducted initial smoke and camera assessment of 1,000 properties (of 32,000 connected across the sewer system) and identified 15 illegal connections from household rooftops to the sewer system. The additional inflow from these 15 illegal connections has been determined to increase the volume of wastewater entering the system from those 1,000 properties by 50% on wet weather days.

Combined the sewerage pumping stations across the LGA are one of the largest Council energy users, using 1,857 MWh in 2019/20 approximately 10% of Councils total energy usage. Reducing the volume of stormwater entering the sewer system will have a substantial impact in reducing council electricity consumption for pumping.

5.6.2.2 Clarence Valley Water Treatment Facility

The completion of the Clarence Valley Water Treatment Facility in 2021/22 will reduce reliance on Coffs Harbour to supply and pump water to the LGA during heavy rain or drought events when Clarence Valley reservoirs are unusable.

For approximately three months in 2019/20 Coffs Harbour pumped water to Clarence Valley as a result of the drought affecting the area. The additional energy consumption required for this pumping will have led to a sizable increase in electricity consumption for Coffs Harbour. While Clarence Valley paid the costs of the additional electricity usage, the resulting GHG emissions will still be imbedded within Council's 2019/20 emissions inventory.

We do not have a current estimate of the amount of electricity used to pump water to Clarence Valley but with the new water treatment facility expected to come online in 2021/22, Council can expect an ongoing reduction in electricity usage as compared to FY 2019/20.

5.6.2.3 WRP Facility Upgrades

Scheduled upgrades to Water Reclamation Plants present the greatest opportunity for large-scale energy savings across the Council's water and wastewater facilities. Coffs Harbour WRP is scheduled for an upgrade in 2035 and Woolgoolga in 2030. Moonee WRP is the oldest of the facilities and had been considered for decommission but will now continue to service expected population growth in the area. While it already has the operational capacity to handle the expected population growth, investment in the facility is needed due to its age. In 2019/20 Moonee WRP used 610 MWh of electricity. Council staff estimate that at least 30% energy

savings could be achieved through modernisation of the facility. This would save approximately 180 MWh of electricity per year and $40,000.

Facility level upgrades at Coffs Harbour and Woolgoolga could produce similar levels of energy and cost savings. For example, Coffs Harbour WRP's current treatment process employs a combined aeration and mixing system. Splitting these processes as part of a facility upgrade would allow for greater optimisation of the two processes resulting in large energy savings.

Council could elect to move the planned upgrades of these facilities forward, however, while the electricity supplied to the facilities comes from renewable sources, either through a PPA or from behind-the-meter generation, this will have no impact on overall Council emissions. While significant operational cost savings would be achieved, they are unlikely to offset the additional expense of bringing planned upgrades forward.

When WRPs are upgraded, the following principles are recommended to guide decision-making processes:

- Ensure energy efficiency is a key driver in decision-making.
- Ensure power output of new equipment match the design specification of new system. Where design of specification of new facilities is subject to population growth aim to design systems that can be stepped up rather than continuously operating at a higher capacity.
- Ensure that any changes in treatment processes do not create new emissions sources.
- Ensure planning considers the opportunity to integrate biosolids treatment with waste contracts (see section 5.6.1.1).

5.6.2.4 Onsite Renewable Energy Generation

The energy intensive nature of water and wastewater treatment facilities, continuous 24-hour operations and typically large facility sizes, make these sites ideally suited for onsite renewable energy generation.

As discussed in section 5.2.3 solar PV and solar plus battery systems are options well suited to water and wastewater facilities.

Other onsite options include capturing wastewater emissions to generate electricity through a biogas facility or the installation of micro hydro generation as part of gravity fed water transfer systems.

As CHCC currently employs aerobic treatment processes and disposes of biosolids as compost, biogas generation is unfeasible as insufficient waste gas is produced. Converting treatment processes to anaerobic process as part of facility upgrades could make this more viable but detailed assessments would need to be undertaken.

No research has been conducted into micro-hydro as part of this review.

5.7 Waste

Emissions from landfill make up the largest proportion of corporate emissions for CHCC. In addition to Coffs Harbour's own waste, Council also manages the waste for the two neighbouring shire Councils Bellingen and Nambucca. In 2019/20, the total scope 1 emissions generated from landfill, including waste from Bellingen and Nambucca, was 28,238 tCO_2-e, accounting for 56% of total corporate emissions.

5.7.1 Waste Diversion

Council already undertakes a number of waste diversion activities, including curbside organics collection and processing of general waste to remove organics at local biomass facility.

Curbside Organic (Green Bin) Collection

CHCC was one of the first Councils in the region to introduce food and organics curbside collection (Green Bins) from around 2005. In 2019/20 over 12,000 tonnes of organic material was collected through the curbside Green bin collection and turned into compost, *saving up to 18,000 tCO_2-e from Council's annual emissions.*

Mixed Waste Organic Output

The extracted organic matter from the general waste stream is processed into a Mixed Waste Organic Output (MWOO) which up until 2018 was applied to land as a soil amendment. By keeping large volumes of organic material out of landfill (approximately 10,000 tonnes per year), this practice led to significant reductions in landfill emissions. Since 2018, however, the NSW EPA has banned the application of MWOO to land. As a result of this decision, CHCC have had to dispose of MWOO in landfill, leading to a significant increase in landfill emissions.

5.7.2 Methane Flaring

Council has carried out methane flaring since 2009. In 2019/20 692,000 m^3 of landfill gas was flared with an average methane content of 46.8%.

This led to emissions savings of 5,311 tCO2-e.

Further emissions reductions are unlikely to be achieved through flaring, given the high degree of diversion of organic waste in Coffs Harbour, which results in significantly less methane being produced than other similar landfill sites.

5.7.3 Waste to Energy

Waste to energy initiatives are currently being considered by Council's waste teams as potential waste management solutions once the current waste contracts end in 2027.

While in the very early stages of consideration current options include:

- The development of a regional waste to energy facility in Coffs Harbour or another North Coast LGA, or

- The development of a pelletisation plant to turn waste into feed stock for other waste to energy facilities (e.g. in the Hunter Valley).

A potential use of waste to energy electricity generation is to power the conversion of water into hydrogen to be used as an alternative fuel source. As hydrogen technology emerges in the years to come, in particular as a heavy fleet fuel source, the viability of a regional waste to energy site for the production of hydrogen may increase.

Waste to energy facilities, however, require a large volume of waste, a minimum of 200,000 tonnes per year to be viable, with ideal volumes up around 400,000 tonnes. Initial scoping undertaken by Council's Strategic Asset Management (SAM) team found that all North Coast Councils combined only just generate 200,000 tonnes of waste per annum. More detailed studies and assessments will therefore need to be undertaken to determine different viable models for Council to consider.

5.7.4 Waste Recommendations

Given current contractual arrangements, no changes can be made to Council's waste management processes until after the end of the contract in 2027.

To meet the target of net zero landfill emissions by 2033, Council will need to consider new solutions to reduce landfill to zero. Waste to energy currently presents one of the main opportunities to achieve this and should be part of the conversation when planning for waste after 2027.

5.8 Community Impact of Council actions

As well as the impacts on corporate greenhouse gas emissions, two of the actions listed in this plan will have a direct impact on community emissions.

For a more detailed analysis of actions to reduce community emissions Council can undertake a Community focused Evidence Based Action Planning process.

5.8.1 Contractor Waste Fleet to EVs

Council also has an opportunity presented through contracts for waste collection. The upgrade of select heavy fleet to EVs will save emissions and demonstrate innovation and leadership within the local government sector. Council's current waste contract ends in 2027. During the new contracting process, it is possible to negotiate the use of EV waste trucks and the inclusion of fuel and emission management software to ensure lowest greenhouse emission.

Electric trucks generate savings through both reductions in fuel use and maintenance, so the more the truck is used the more rapid the payback. While currently EV waste trucks are better suited to shorter collection routes, technology improvements over the next six years to 2027 are expected to improve the suitability for longer municipal collection routes.

This is a nascent area and the costs of upgrading to EV are still high. Contractors may seek to negotiate extended contract terms in order to ensure that the payback for their investment in EV trucks pays itself back. With technology improvements and greater uptake of EV waste trucks costs are expected to reduce over time.

When considering new contractual arrangements, it is recommended to begin discussions with contractors early to ensure they are aware of the preferred outcome from Council well in advance of the contracting period.

5.8.2 Sustainable Procurement

With a capital budget of around $30 million in the 2020/21 financial year, Council has the opportunity to have significant influence over local (and major) suppliers and service providers through its supply chain decisions. An important step towards influencing Council's supply chain from a sustainable procurement perspective (environmental, social and economic) is to strengthen those aspects of Council's Procurement Policy with the inclusion of easy to understand and follow procedures that incorporate clear sustainable objectives and metrics.

Ensuring sustainable procurement considerations are embedded in Council's supply chain through standard procurement processes:

- minimises the environmental, social and economic impact of purchasing decision making
- provides incentives for suppliers and service providers to improve their sustainable procurement systems and practices

Strengthening the sustainable procurement metrics will also support Council's Governance and Procurement team to apply, manage, monitor and report on emissions related to sustainable purchasing decision making. It will assist Council Officers to develop an understanding of product life cycles, fair trade and ethical procurement whilst also supporting Council to meet sustainable procurement aspirations, obligations and requirements under:

- Council's own Procurement Policy 'Procurement Objectives', and
- The Local Government NSW 'Sustainable Procurement Guide'

Including significant supply chain emissions (for example emissions associated with the purchase of concrete) in Council greenhouse gas emissions reporting is another powerful way to influence procurement purchasing decision making and to raise awareness of the positive impacts of sustainable procurement to Council and the Community.

Recommended actions for consideration in the plan include:

- Implement the specific actions outlined in Section 5.1
- Council to investigate opportunities to influence supply chain improvements that deliver social, environmental and economically sustainable outcomes, including:
    - increase opportunities for those experiencing disadvantage
    - support safe and fair workplaces
    - minimise waste to landfill
    - increase use of waste as a resource
    - maximise energy efficiency in the Planning System
    - maximise water conservation
    - reduce greenhouse gas emissions in the products and services supplied to Council
- Influence the supply chain to provide sustainable solutions by
    - strengthening the sustainable aspects of Council's Procurement Policy
    - reporting on significant supplier emissions as part of Council GHG emissions annual reporting

5.8.3 Sustainable Investment

Council invests significant capital into short and long term investments. These reserves arethen used by Council to invest for community benefit. Recent analysis has shown that the allocation of these investments to low emission investments can have a significant impact.

Analysis by AMP has shown that selecting a low/no emission investment fund will reduce the emissions footprint of the investment by as much as 65%[8]. It is recommended that Council undertake an analysis of appropriate investments and ensure relevant criteria to reduce emissions footprint in included. Further ethical considerations are also recommended to be included within this work.

[8] Comparison of AMP Ethical Leaders Australian Share Fund compared to S&P/ASX 200 Accumulation Index Emissions of Fund demonstrates an investment footprint of 37 kgs CO2/Thousand $ Invested compared to 106 kgs (Source: AMP_ESG_Carbon-Footprint_Funds).

6. Greenhouse Gas Reduction Pathway

By implementing all activities outlined in this Plan and purchasing 100% zero emissions power through a renewable energy PPA, Council will reduce overall emissions by 66% (14,908 tCO_2-e) on 2019/20 levels by the year 2025 and 79% (17,773 $_tCO2$-e) by 2029/30, excluding landfill.

Figure 12: 2030 Zero Net Emission reduction pathway, excluding landfill.

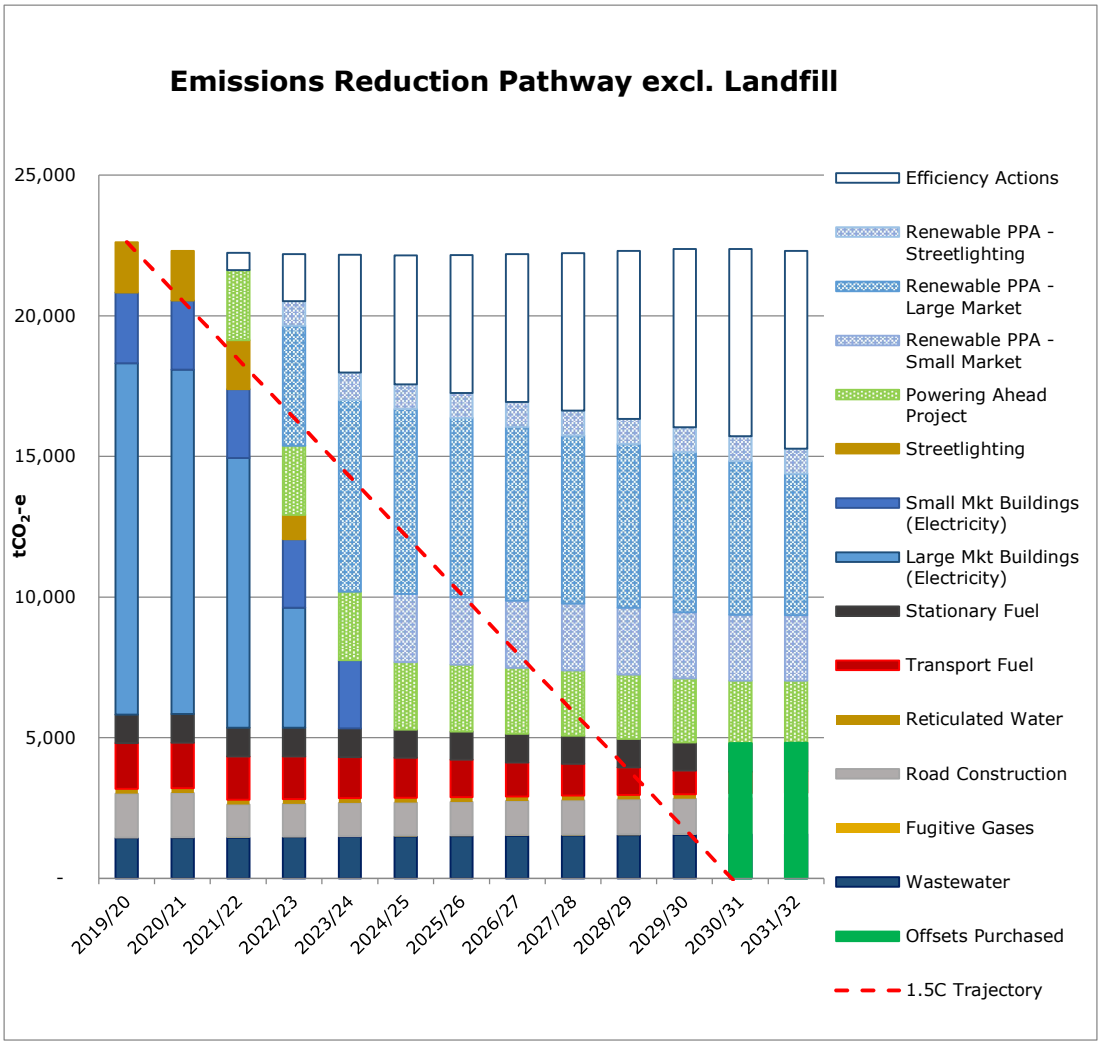
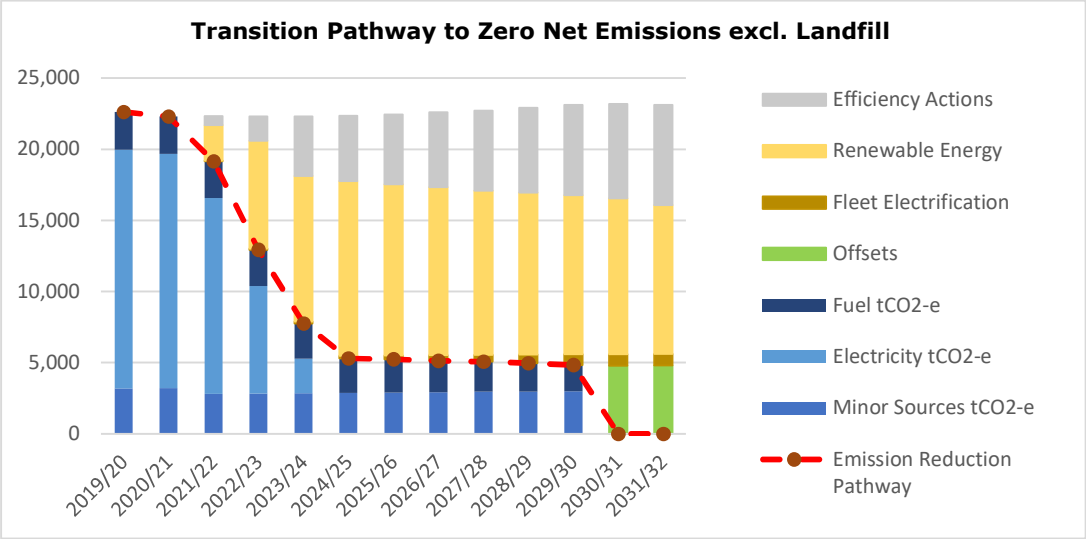


Figure 13: Transition Pathway to Zero Net Emissions shows a simplified transition pathway to zero net emissions, highlighting the transition from key emissions sources: electricity, fuel and minor sources through emissions reduction activities including: energy efficiency, renewable energy, fleet electrification and offsetting.

Figure 13: Transition Pathway to Zero Net Emissions



After completing all the recommended actions within this plan, it is anticipated there will still be approximately 4,700 that must be accounted for before Council can achieve Net Zero Emissions status in 2030/31. These are typically from sources that are difficult to reduce or eliminate through efficiency projects, such as nitrous oxide from wastewater treatment, fugitive emissions from air conditioning and refrigeration and some stationary energy, plant and fleet that do not currently have viable electric alternatives.

To achieve the 2030 Zero Net Emissions 2030 Council will need to purchase carbon offsets to cover the remaining emissions. The implications of this are discussed in Section 6.2.

Current landfill management and treatments practices employed by Council already achieve significant emissions savings. Further reduction in landfill emissions, however, will be difficult to achieve during the life of the current waste contracts, up to 2027. The development of a new waste to energy facility post-2027, or the diversion of landfill to a regional facility, however, presents good opportunities to further reduce landfill emissions and achieve net zero by 2033. The further development of circular economy policies and practices at state and federal levels, together with greater education on waste reduction practices at the local level will also play a very important role in reducing the total volume of waste generated by the community and therefore the total potential landfill emissions.

Other actions that have been discussed in this plan but not modelled have not been included in the emissions reduction pathway of the cost break down in section 6.1. While it is strongly recommended that Council considers investigating these actions further they are not required to be implemented to reach net zero emissions via the pathway presented.

The pathway outlined here demonstrates what is achievable if identified actions are implemented as outlined in this plan. It may be that for some of these actions it will not be timely to implement by 2030/31, while in other cases technology improvements prior to 2030 may provide further opportunity to reduce these residual emissions. In this case the number of offsets purchased will need to be adjusted to account for changes in residual emissions.

6.1 Cost of Achieving GHG Reduction Pathway

In order to achieve the Net Zero Emissions target, over the next 10 years, around $10.9 million will need to be spent above business-as-usual operational costs, including the cost of offsets to achieve net zero in 2030/21. These projects will result in savings of around $22 million over their lifetimes.

Table 17: Summary of cost benefit analysis for key action areas

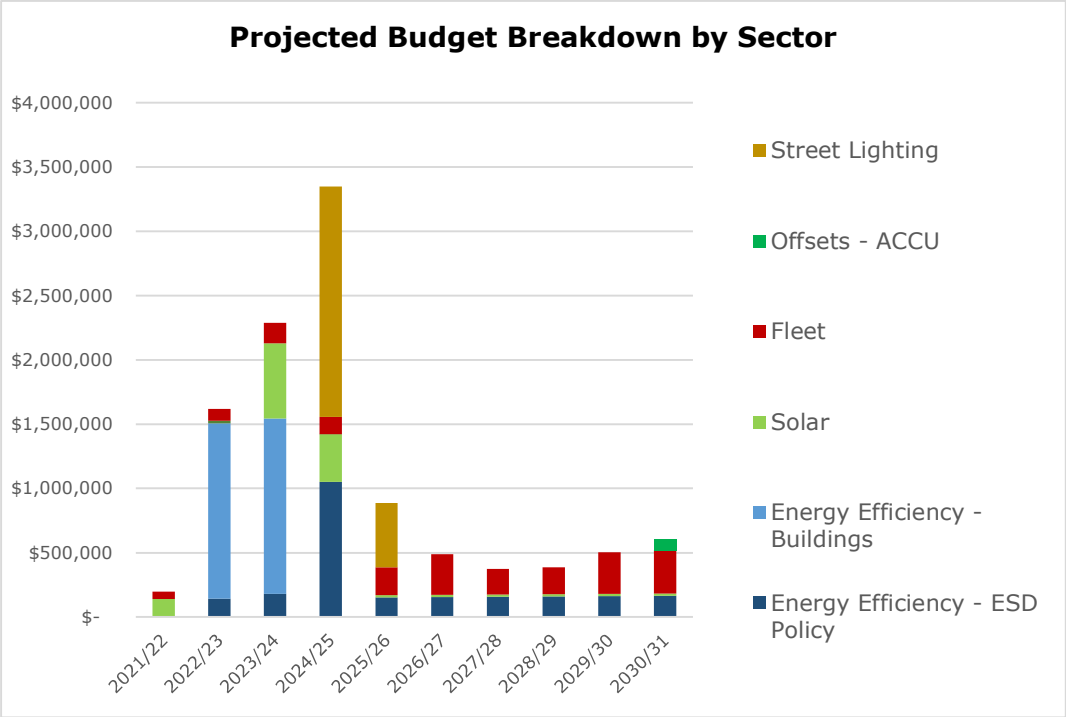
Action Area		Annual Emissions Reduction by 2030/31 (tCO2-e)	Capital Cost ($m)	Net Savings over Lifetime[9] ($m)
Electricity	Procurement of 100% renewable electricity (incl. installation of smart meters)	10,300 (45%) (in addition to other savings listed below)	$0.14	-$0.14
	Installation of additional behind-the-meter solar	830 (3.6%)	$1.3	$3.6
Sustainable Buildings	Implementation of ESD Policy and energy and water efficiency actions across Council buildings	3915 (17%)	$5.1	$16.5
Public Lighting	Replace all major road lighting with LEDs and deploy smart control systems	780 (3.4%)	$2.3	$2.8
Fleet	Fleet transition to EVs and renewable electricity	800 (3.5%)	$2.0	-$0.75
Offset	Offsets for residual emissions	4,700 (20%)	$0.09	-$0.09
Total		**21,325 (93%)**	**21,325 (93%)**	**$21.94m**

[9] Savings after paying back the capital cost

The overall budget required to meet this plan is outlined in Table 17. This should be considered indicative and provides a pathway to delivery of the main elements within this Plan.

There are notable large projects which can be seen as spikes in the budget. The phasing below is suggested only and can be phased as appropriate for Council's budget.

Figure 14: Projected 10 Year Budget Breakdown by Sector

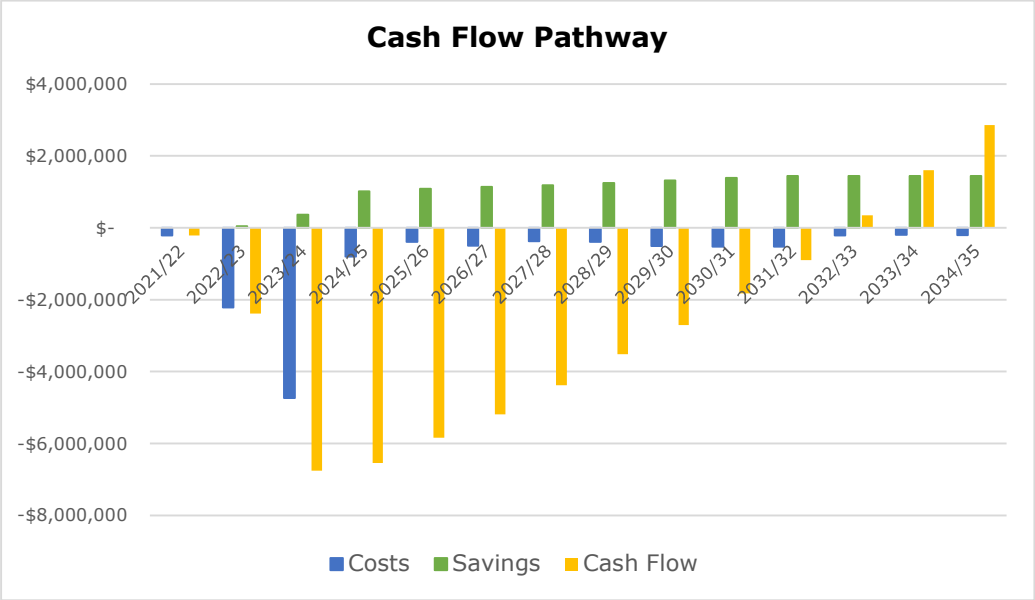


The average annual budget required to implement the remaining actions averages at around $1.1m per year to 2030/31. Post 2027/28 the budget required largely comprises costs from ESD features and the cost of EV charging facilities to manage a large EV fleet.

The cost of purchasing Australian Carbon Credit Units (ACCUs) to offset the remaining emissions at 2030/31 are also illustrated. Assuming all the actions within this plan have been implemented by this point, the cost implications of purchasing offsets is approximately $90,000.

The cash flow pathway (Figure 15: Cash flow pathway to 2034/3) shows that the initial capital outlays of the plan begin to pay themselves back around 2032/33. From 2024/25 Council is expected to save more than $1m of operating costs as the program investment completes and the savings are accrued.

Figure 15: Cash flow pathway to 2034/35



6.2 Resourcing the Plan

Ensuring adequate staff resourcing to manage and track progress against the REERP is critical to deliver the plan and achieve Council's targets.

To support the effective and timely implementation of the REERP the following additional resourcing is recommended:

i. *A dedicated Project Manager, 0.8 – 1.0 FTE.*

ii. *A dedicated Active Building Management Support Officer, 0.6-0.8 FTE*

6.2.1 REERP Project Manager

As identified in this plan, reducing emissions to net zero requires engagement, collaboration and coordination across a wide range of council operations. This role will be responsible for the effective management of these cross-organisational actions and key relationships. Other key tasks include monitoring and reporting of actions and emissions data, creating Council policies and reports and managing projects. This role is required to enable the delivery of this Plan.

6.2.2 Active Building Management Support Officer

This role would coordinate the roll out of energy audits and efficiency actions across Council buildings. This role would also be responsible for the active management of energy consumption across Council's larger buildings (as outlined in Section 5.3Facilities) to identify opportunities to reduce energy and manage the facilities better. The role would support the Project manager. This role can be internalized or, alternatively external systems and contractors engaged for this role. However, given the recommendation is to create this role as an ongoing one, internal resourcing is preferred.

6.3 Carbon Offsets

Carbon offsets fall at the bottom of the emissions reduction hierarchy and can be implemented in 2030/31 to cover any remaining emissions that cannot be eliminated or diverted to the Net Zero Emissions PPA. Assuming all actions in this plan are implemented by 2030/31, Council will need to purchase offsets to cover around 4,700 tCO_2e per year to maintain Net Zero Emissions status.

When offsetting carbon emissions there are a number of options available. The most obvious and common way to offset emissions is to purchase offsets through a certified provider. These offsets vary greatly in price and in quality, but there are a number of reputable providers. This is the only way to offset emissions that is allowed under Climate Active, the Australian Government's Net Zero Emissions certification program which is the process used by leading Councils.

Council may choose to purchase Australia Carbon Credit Units (ACCUs), international Verified Carbon Offsets (VCUs) or a combination of both. At the time of preparing this report, the latest spot price published by the Clean Energy Regulator for ACCUs was \$18/tCO_2e[10].

Many Councils have a preference for purchasing Australian offsets due to perceived superior quality and because there is greater knowledge of the regulation surrounding the production of these offsets. However, VCUs can typically be purchased at a much cheaper rate than ACCUs and are also subject to regulation and approval. The price for international offsets can vary greatly, but at the time of preparing this report, Australian Councils had secured offsets for prices varying from \$2/tCO_2e - \$3.50/tCO_2e.

In addition, Council can choose to work regionally to assist the community to reduce emissions and create emission reduction certificates within the local community, or via agreements with regional communities. Options to reduce emissions beyond efficiency and renewable energy are greater in regional areas where tree planting and treatments for agricultural land provide greater opportunities than in high density urban settings.

The indicative costs for Council to achieve Net Zero Emissions status once all the actions within this plan are implemented are around \$90,000 per annum worth of ACCU's, or \$10-17,000 per annum worth of VCUs based on the latest spot prices.

[10] Clean Energy Regulator (2020), *Quarterly Carbon Market Report – June 2020*, Australian Government, Canberra

7. Monitoring, Evaluation and Learning

There are two types of monitoring that will be undertaken during the implementation of this Plan: progress monitoring and impact monitoring.

7.1 Progress Monitoring

Progress monitoring ensures that the Plan is being implemented within the expected timeframes, quality and budget. Council will track whether projects have been implemented within the expected timeframes and whether actual expenditure aligns with the budgeted amount.

7.2 Impact Monitoring

Impact monitoring aims to understand whether the projects have resulted in the predicted reduction in emissions and costs. Impact monitoring for this plan in recommended in the following ways:

- Firstly, the annual review of Council's corporate GHG inventory will provide an understanding of changes to actual emissions and can be measured against the GHG pathways shown in Section 6 of this plan to understand if they are at the expected level.
- Secondly, periodic review of energy bills for selected sites before and after relevant projects are implemented will demonstrate where cost savings are occurring. In some cases, a full year of billing data may be required to allow for seasonal usage patterns.

7.3 Program Evaluation

At five years this Plan will also undergo a full program evaluation that takes a deeper dive into what has made each project successful (or not) and share these learnings internally and externally. This is particularly important for this Plan where some innovative technologies and market approaches are being considered, such as electric utility vehicles, new funding methods and ESD building systems.

Understanding what does and doesn't work with real data is incredibly useful to local governments across Australia and will present Coffs Harbour as a leading Council, regardless of whether the shared learnings present wins or losses.

Appendix A: Methodology

General Assumptions

Utility Prices

It is assumed that the PPA contract will come into effect in 2023 for all sites (Large Market, Small Market and Streetlighting) and will constitute 100% green power.

Table 18: Utility price assumptions

Council energy contract	Unit	Most recent value	Year	Reference
Water Price	$/kL	$3.18	2019/20	https://www.coffsharbour.nsw.gov.au/Your-Council/Our-Responsibilities/Documents/Corporate%20Planning%20and%20Reporting/2020-21/Fees%20Charges%202020-21%20Web.pdf
Large Market - Grid Electricity	$/kWh	$0.2168	2019/20	Average for large market sites from Council data sourced from Azility.
Small Market - Grid Electricity	$/kWh	$0.2906	2019/20	Average for small market sites from Council data sourced from Azility.
Street Lighting (unmetered) - Grid Elec	$/kWh	$0.1946	2019/20	Average for streetlights from Council data sourced from Azility.
Electricity – Price Projections	%	1.0	2019	Retail energy price analysis based on Australian Energy Market Operator (AEMO) forecasting
Petrol	$/L	$1.2217	2019/20	ACCC Quarterly Petrol Reports - Coffs Harbour 2019-20
Petrol and Diesel – Price Projections	%	1.142	2019	https://www.bitre.gov.au/publications/2019/prices-for-petrol-and-gasoline-modelling-a-global-phenomenon
Diesel	$/L	$1.2173	2019/20	ACCC Quarterly Petrol Reports - Coffs Harbour 2019-20

Emissions Factors

Emissions factors are sourced from the National Greenhouse Accounts Factors – October 2020.

Business-as-usual Projections

Business-as-usual (BAU) ten-year emissions projections include the following assumptions:

- Buildings efficiency improvements of 0.1% per year
- Street lighting efficiency improvements of 0.1% per year

- Vehicle efficiency improvements of 1.0% per year
- Improvements to state emissions factor, in line with targets proposed by the State Government
- Population growth rate of 1.01% in line with historic trends.

Energy Efficiency Actions

Area	Assumptions
Street Lighting	All calculations are based on assessment of Council billing data and lighting stock. Savings are indicative only and detailed analysis for Council will be required prior to project confirmation.
Facilities Energy Efficiency	**Large market electricity:** Active energy and water management and sub-metering on Council's top 14 sites. Savings assumes 5% reduction in energy consumption from this action across the sites based on savings identified at similar sites and a 6 year payback period. Energy Auditing and project delivery for top 14 electricity using sites (exc water and sewer infrastructure). Assumes a 20% energy efficiency saving and an 8 year payback. Energy and Water efficiency at remaining medium sized facilities (top 15-51 energy consuming sites excluding water and sewer). Assumes a 20% energy efficiency saving and an 8 year payback. Where available, costs and savings have been taken from existing audit reports and business cases. Where audits have not been conducted, estimated savings for energy efficiency improvements have been calculated based on benchmarks for savings achievable within the available budget for similar building types. Large scale energy efficiency investments for new buildings and renewals are assumed to be included in the additional costs and savings generated by the ESD policy.
Solar PV	Solar PV installation costs are $1.50/Watt. Conversion rate for solar is 4.2kWh/kW/day. 90% of onsite solar generation for buildings directly translates to a reduction in grid-supplied electricity. Sites with solar PV already installed have been excluded except where solar generation is significantly less than is optimum for the site. Other than through the assessment of total electricity consumption the suitability of selected sites for solar PV has not been assessed as part of the cost benefit analysis.
Buildings and Facilities ESD Policy	An ESD Policy would be applied in the following scenarios and have the following impact: **New Build:**

	20% reduction in electricity from new major buildings and 10% for new minor buildings. 3% increase in capital cost for new buildings **Renewals:** 20% reduction in electricity from new major buildings and 10% for new minor buildings. 3% increase in capital cost for renewals Existing buildings are renewed at a rate of 2.5% per year (i.e., 40-year lifespan)
Fleet	The cost benefit analysis uses the consumption data provided as part of the 2019/20 inventory. The vehicle numbers used in the recommendations refer to the active number of vehicles as provided by Council. **Passenger Vehicles and vans:** Replace 88 passenger vehicles with EV. Cost differential based on annual decline in EV costs such that the current price difference is eliminated by 2024/25. Electric passenger vehicle example models and related efficiency and cost information have been sourced from https://fleets.chargetogether.org/vehicle-guide/ Passenger vehicle recommendations assume a 3-year life span of the vehicle and include costs recovered from resale. Resale costs recovered assume 50% of costs are recovered at three years based on standard depreciation rates for hybrid vehicles for example: https://www.whichcar.com.au/car-advice/ev-depreciation **Charging Stations** Costs include installation of 230 charging stations to cater for the required parking at Council locations for corporate staff and $8k per charging unit. **Utility Vehicles:** Replace 142 utes with EVs from 2025/26 onwards. Cost differential based on annual decline in EV costs such that the cost differential is eliminated by 2028/29. ICE Ute fuel efficiency - 7.4 L/100km **Telematics:** Utilise telematics to maximise fuel economy and emissions reductions in utility vehicles. This could be expanded to other vehicle classes and result in larger savings. Cost of telematics itself excluded as this is already part of Council's business as usual fleet spending. Additional costs of $3k every 2 years for management of the program. An annual fuel saving of 7.5% has been assumed based on conservative industry averages (10%-20%) for example: https://www.eroad.com.au/five-ways-telematics-can-save-on-your-fleets-fuel-costs/ **Strategy and Training:**

	Assumes costs of $17.5k for developing the initial strategy repeated every five years for review. Costs of $3,000 every two years for driver training. Savings assume 3% reduction in fleet emissions as a result of driver training (adjusted from industry estimates of 5% savings). **Additional Load from Fleet Electrification:** The increase in electricity consumption from the electrification of Council's fleet has been estimated and included in modelling. Additional load has been added to future projections of large market sites, where it is assumed the majority of charging stations will be located.

Appendix B: Data Gaps

Council tracks and records a large amount of data across its operations. A Data Management Plan has also been developed as part of this project to outline the process and requirements for ongoing data capture required to support the implementation of this Plan.

In the course of this project, Council provided a significant amount of data and information to Ironbark to inform the calculation of the GHG inventory and the development of the Renewable Energy and Emissions Reduction Plan.

Where data was unavailable or incomplete estimates and assumptions were made. In instances where greater uncertainty and reasonable estimates could not be confidently made actions were not modeled or included in the net zero emissions pathway.

Where estimates could not be made for emissions sources, sources were excluded from the inventory. However, this only occurred for minor emissions sources which are unlikely to significantly change the overall emissions inventory.

A list of minor scope 3 emissions sources for which data is not collected by Council is provided in Table 19 below.

Table 19: Scope 3 Emissions Categories not included in Council's inventory

Contractor fuel	Contractor Fuels
Business Travel	Flights
Business Travel	Accommodation
Business Travel	Taxis
Other goods & services	Telecommunications
Other goods & services	IT Equipment
Other goods & services	Stationery
Other goods & services	Packaging materials and supplies
Other goods & services	Merchandising
Other goods & services	Clothing
Other goods & services	Office furniture
Other goods & services	Cleaning Services
Other goods & services	Food & Catering
Other goods & services	Postage
Other goods & services	Couriers
Other goods & services	Printing
Other goods & services	Advertising
Other goods & services	Drinks (Wine & Spirits)
Other goods & services	Drinks (Soft drinks)

Other key data gaps for this project have been summarised below.

LP Gas

Council has no mains gas supply and only uses gas in the form of bottles. Data for the total volume of gas used by Council in 2019/20 was unavailable. The only information Ironbark was able to obtain was the total expenditure for gas bottles purchased by Council for the financial

year. This information was used to estimate the approximate volume of gas consumed and the associated emissions.

While actions to replace gas hot water and cooking facilities were discussed in the report, these actions could not be modelled for emissions reduction or cost-benefit as volumes of gas used at different sites was not known. As a result, none of these actions were included in the emissions reduction pathway analysis. Replacing gas with electric systems will help reduce emissions beyond what was modelled in this plan.

Going forward, it is recommended that gas bottles are recorded in Azility to ensure the amount and cost of gas can be effectively tracked and monitored. This will also enable a more accurate calculation of emissions associated with gas use by Council.

Transport and Stationary Fuel

Ironbark was provided with the total litres of ULP95, E10 and Diesel used by Council in 2019/20 as well as Council fleet numbers across different classes. We were not provided with a breakdown of litres used or kilometers travelled for different vehicle classes or plant equipment. The proportion of fuel used by different fleet classes was estimated from accounts records but amount of fuel used by different plant equipment or other stationary uses could not be determined.

While having the total volume of petrol used allowed for an accurate calculation of emissions from fuel use, without further activity data the proportion of emissions associated with different activities could not be accurately determined. For example, the total emissions or fuel used by passenger vehicles or construction and maintenance equipment.

More accurate information of kilometers travelled by passenger vehicles, utes and trucks and petrol consumed by different plant equipment would allow for more accurate modelling of the impact of electrification of different vehicle classes.

Wastewater Treatment

Determination of emissions associated with wastewater treatment relied on previous consultant assessment reports. The latest report supplied to Ironbark was a 2019 GHD report which reported CHCC wastewater treatment emissions (Scope 1) as 1,389 tCO_2-e for 2016/17. Since the GHD assessment was conducted Corindi WRP had been decommissioned with wastewater now piped to Woolgoolga WRP for treatment. Corindi and Woolgoolga used very similar treatment processes, including the use of shallow sludge lagoons for dewatering. As a result, no overall change in treatment emissions was assumed from the closure of this facility. No other changes in treatment processes were identified from the GHD report that would affect the generation of nitrous oxide or methane emissions during treatment. Wastewater treatment emissions were, however, scaled for population growth in the LGA since 2017.

Landfill

Exact tonnages of Municipal, Commercial and Industrial, and Construction and Demolition waste were provided to Ironbark. However, the exact amount of organic waste removed from these waste streams after processing at the biomass facility was not provided. In addition,

further information on the final tonnage and composition of waste that was sent to landfill after processing at the biomass facility was requested but not provided.

The removal of residual organic waste from mixed waste streams at the biomass facility plays an important role in reducing overall emissions from landfill for Council. Without specific data, anecdotal information from meetings with Council staff was relied upon to estimate the amount of organic material diverted from the general waste stream (10,000 tonnes) and the composition of the final waste sent to landfill (assumed to be a similar composition to construction and demolition material).

Given that a separate target has been identified for landfill, these estimates do not affect the modelled emissions reduction pathway. These estimates also do not impact future emissions reduction options for landfill, as Council is seeking to change its waste management arrangements after 2027. More accurate data, however, would enable a more accurate calculation of Council's current landfill emissions.