

Item No:	11.1
To:	Council
Date:	8 December 2020
General Manager and Division	Barry Cant – General Manager, Urban & Community
Contact:	8366 4223
Subject:	MEASURES FOR REDUCING COUNCIL'S CARBON FOOTPRINT
Attachments:	A: Additional information and FAQ responses B: Summary of audit results C: Assumptions in the Burnside CARES Tool D: Measures undertaken under Scenarios 3 and 4 E: Comparison of scenarios (annual investment balances)
Prev. Resolution:	C12673, 22/09/20 C12646, 25/08/20 C12402, 10/12/19 C12267, 24/09/19

Officer's Recommendation

That Council:

1. Sets a goal of becoming a carbon neutral organisation before 2030;
 2. Implements measures to progress towards that goal as outlined in this report as Scenario 4 ('Infrastructure development plus B-COS'), including allocating the required capital budget within the next review of Council's Long Term Financial Plan (LTFP) and adjusting Council's fees and charges as required from 2021/22 onwards;
 3. Receives a further report with the updated status and sufficient detail to enable a decision to be made prior to any investment in commercially-available carbon offsets; and
 4. Approves an increase to the current Full Time Equivalent (FTE) cap by 1.0, to support an additional resource in the environmental sustainability area to assist in delivering all of the environmental sustainability and waste management initiatives directed by Council.
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Purpose

1. In line with strategic imperatives to reduce Council's carbon footprint, this report provides Elected Members with an analysis of the potential for the organisation to become carbon neutral.

Strategic Plan

2. The following Strategic Plan provisions are relevant:

THEME: Environment

PRIORITIES: *Adapt and mitigate for climate change; Use natural resources efficiently and minimise waste*

PRINCIPLES: *Service Sustainability; Improvement and Innovation; Governing with Integrity*

Communications/Consultation

3. The following communication / consultation has been undertaken:
 - 3.1. Discussions with specialist consultants who conducted energy audits during 2020 and reviewed the preliminary work on the Burnside CARES Tool;
 - 3.2. Discussions with several other Councils and reviews of their work to reduce carbon footprints;
 - 3.3. Reviews of previous quotations and communications with providers of energy-related infrastructure;
 - 3.4. Reviews of previous energy audits conducted for the City of Burnside and discussions with the consultants;
 - 3.5. Discussions with a state government Heritage Conservation Architect regarding energy infrastructure on heritage-listed buildings (e.g. the Regal Theatre);
 - 3.6. Discussions with internal staff, including facility and infrastructure managers, fleet managers, the Finance and Governance team, and the Executive team; and
 - 3.7. Workshop with Elected Members held on 22 October 2020.

Statutory

4. The following legislation is relevant in this instance:

Local Government Act 1999

Climate Change and Greenhouse Emissions Reduction Act 2007

Policy

5. The following Council Policy is relevant in this instance:

Climate Change Policy

Asset Management Policy

Risk Assessment

6. The following risks have been identified:
 - 6.1. This work is designed to mitigate risks associated with climate change that are acknowledged in Council's Climate Change Policy, including:
 - 6.1.1. Increased costs driven by consumption (e.g. increases in power needs to cool buildings during heatwaves);

- 6.1.2. Increases in the costs of services (e.g. energy); and
 - 6.1.3. The potential for litigation or damage to corporate reputation if no action is taken on climate change.
- 6.2. Investment in new infrastructure carries financial risks that have been mitigated by:
- 6.2.1. Thorough analysis of potential actions to ensure recommended measures are timely, strategic and cost-effective;
 - 6.2.2. Extensive consultation and incorporation of corporate knowledge and expert advice; and
 - 6.2.3. Adaptive approach to carbon reduction that can account for changes in technology, policy or emergent opportunities.
- 6.3. In relation to the additional FTE, if Council does not employ an additional FTE, there will be a need to increase funding for external contractors to conduct the work required, which will cost more and will not develop internal capacity, or, could delay some works.

CEO Performance Indicators

- 7. This work builds on the CEO performance indicator to, “Develop a Roadmap for the City of Burnside with regard to environmental sustainability and climate change.”

Finance

- 8. The annual estimated investment and savings over the next 20 years to progress the Officer’s recommendation are summarised below:

Year	Annual investment forecast (A)	Annual Savings forecast (B)	Net Annual (Cost) / Saving (A-B)	Cumulative net result
1	\$0	\$0	\$0	\$0
2	\$163,072	\$23,468	-\$139,604	-\$139,604
3	\$168,411	\$78,700	-\$89,711	-\$229,315
4	\$187,843	\$124,251	-\$63,592	-\$292,908
5	\$199,986	\$156,376	-\$43,610	-\$336,518
6	\$138,736	\$189,107	\$50,372	-\$286,146
7	\$124,379	\$216,113	\$91,734	-\$194,412
8	\$88,020	\$232,119	\$144,099	-\$50,313
9	\$38,044	\$241,828	\$203,783	\$153,470
10	\$45,482	\$250,023	\$204,540	\$358,010
11	\$45,911	\$258,359	\$212,448	\$570,458
12	\$28,406	\$263,066	\$234,660	\$805,118
13	\$28,745	\$264,987	\$236,242	\$1,041,359
14	\$29,087	\$266,926	\$237,839	\$1,279,199
15	\$29,431	\$268,884	\$239,453	\$1,518,651
16	\$29,922	\$270,859	\$240,937	\$1,759,588
17	\$30,273	\$272,852	\$242,580	\$2,002,168

18	\$30,627	\$274,865	\$244,238	\$2,246,406
19	\$30,983	\$276,896	\$245,912	\$2,492,318
20	\$31,344	\$278,946	\$247,602	\$2,739,920

9. In addition, the proposed additional FTE will incur a commencing salary cost of approximately \$80,000 per year. By recruiting this position, the net savings achieved from implementation of these environmental initiatives, will outweigh this cost, and will reduce the need for the procurement of external contractors.
10. Further details on the financial implications of the officer's recommendation and alternative courses of action are outlined within the report.

Discussion

Context

11. This report presents a component of the work being undertaken in line with Council's Strategic Community Plan and Environmental Sustainability Strategy 2019-2023 (C12402, 10/12/19), and in line with Council's declaration of a Climate Emergency (C12267, 24/09/19).
12. The focus of this report is specifically on reducing Council's carbon footprint (e.g. reducing energy use and investing in renewable energy), as opposed to broader environmental work (as previously reported to Council on 22 September 2020).
13. The recent Annual Environmental Sustainability Scorecard and Review 2020 (endorsed by Council 22/09/20, C12673) places this work in context and provides details of related and additional achievements and initiatives in environmental sustainability.
14. The focus of the work presented in this report is to efficiently reduce Council's carbon footprint, which is timely for several reasons:
 - 14.1. From a **community perspective**, Council can demonstrate leadership (in line with Council's Climate Change Policy);
 - 14.2. From a **financial perspective**, Council can save money and demonstrate the link between sustainable and cost-effective management of the City's assets and infrastructure (in line with Council's Asset Management Policy); and
 - 14.3. From an **environmental perspective**, action can be taken in alignment with the call from the Intergovernmental Panel on Climate Change (IPCC) for a significant upscaling of investments in climate change mitigation actions well before 2030 (<https://www.ipcc.ch/sr15/chapter/spm/>).
15. Work on reducing Council's carbon footprint is a continuation of previous work, with two excellent examples being:
 - 15.1. **LED streetlights**: the greenhouse gas emissions from streetlights reduced by 497 tonnes in 2019/20, with changes to Light Emitting Diode (LED) technology; and
 - 15.2. **Energy efficiency measures**: there was a 12 per cent reduction in the consumption of electricity at the Burnside Civic Centre from 2010/11 to 2018/19, attributable to building and office upgrades.

16. Beyond the Council's own policy agenda, there are several reasons why it is a good time to invest in energy efficiency and energy production measures at the City of Burnside:
 - 16.1. Local government investment in infrastructure will assist in the economic recovery from COVID-19; and
 - 16.2. A substantial reduction in the cost of photovoltaic solar systems means they can provide a fast return-on-investment, saving Council on electricity costs within a few years.
17. Reducing Council's carbon footprint fits well with State legislation and targets. For example, in February 2020, the Government of South Australia announced its aim for South Australian to achieve net zero emissions by 2050.
18. The policy context around energy at State and National levels is dynamic and technology is advancing. The analysis presented in this report accounts for current policy settings and technologies. While the actions recommended in this report will provide ongoing financial and environmental benefits, they should be the subject of ongoing review as policies change and technologies advance. Some examples include:
 - 18.1. New State or National policies to support renewable energy production will benefit the transition to carbon neutrality, likely reducing costs associated with carbon neutrality.
 - 18.2. GreenPower is a system designed to assist individuals and organisations in buying electricity that is generated by renewables. GreenPower is not currently recommended as there are several issues with how it is implemented. However, future changes to the GreenPower framework are likely and may make it beneficial for Council to purchase GreenPower.
 - 18.3. The recommended approach to electric vehicles is conservative, based on current policies and technologies. However, changes in policy or advances in technology could make electric vehicles a more attractive investment. A faster uptake of hybrid vehicles is recommended (further details are provided later in this report).
19. Because the policy around energy is dynamic, and energy technologies are advancing, this report recommends an initial suite of actions be pursued, to take the City of Burnside well towards becoming carbon neutral over the next few years. Then, final decisions on how and when to reach carbon neutrality can be made when required. This adaptive approach will enable decisions to be made without guessing what future policies or technologies will be in play. This adaptive approach ensures that Council can make sound investment decisions to achieve the best possible financial and environmental outcomes.
20. A further demonstration of potential future change relevant to the recommendations of this report is related to Council's purchasing of energy. The City currently purchases electricity through a contract established by LGA Procurement. These contracts cover most Councils in South Australia and expire at the end of 2022. Work has commenced to explore opportunities beyond the current contract. A key area of interest is how renewables might be included in any future contracts and how the falling cost of renewable power will be reflected. Changes to energy contracts will need to be considered as part of the adaptive management of Council's carbon footprint.
21. The steps recommended in this report will set Council on a path to become carbon neutral before 2030. Further, the investments recommended will provide savings to

Council that could be invested in supporting the community to move towards carbon neutrality.

Background: Council's carbon footprint

22. The notional baseline for City of Burnside greenhouse gas emissions in 2019/20 is 2008.2 tonnes CO₂-e/annum. This is the Council's carbon footprint for the year.
23. Different types of emissions can be included in assessments of greenhouse gas emissions. The following types of emissions were included in the calculations for the City of Burnside, following Australian Government protocols:
 - 23.1. **Scope 1 emissions** (direct emissions), generated by gas consumption in council facilities and the use of fuel in vehicles or machinery;
 - 23.2. **Scope 2 emissions** (indirect emissions), generated by electricity consumption in council facilities (emissions from electricity are considered indirect because the electricity is produced elsewhere); and
 - 23.3. **Scope 3 emissions** (other indirect emissions), including those emissions generated in the production and transport of gas, electricity and fuel.
24. The focus of the calculations was on greenhouse gas emissions that could readily be reduced through changes to infrastructure (e.g. solar panel installations, vehicle upgrades or energy efficiency measures) and staff behaviour. In future, additional emissions-causing activities could be added to this inventory, such as waste production, water use and the procurement of other goods and services. However, the additional work required to calculate these other Scope 3 emissions may not be worthwhile, particularly if the suppliers of the goods or services mitigate and offset their own emissions.
25. Further details of the calculations and sources of these emissions were presented in Council's Annual Environmental Sustainability Scorecard and Review 2020 (endorsed by Council Resolution C12673, 22/09/20).

Background: reducing an organisation's carbon footprint

26. There are many actions that can reduce the size of an organisation's carbon footprint. Actions may include reducing energy use, generating energy through renewables, purchasing renewable energy, or offsetting carbon emissions. All these actions can have environmental benefits by reducing greenhouse gas emissions or removing greenhouse gasses from the atmosphere.
27. Deciding which actions to adopt, and in what order, is a complex process. This report presents the results of modelling conducted to assist Council in decision making.
28. Decision-making can be guided by a hierarchy of potential actions (Figure 1). The most preferable actions are placed at the top of the hierarchy because they have the best outcomes for the organisation (long-term financial and environmental benefits). While the hierarchy can depict which actions should be given the highest preference, it must be remembered that a mix of actions will be required to achieve carbon neutrality, including some of the lower-preference actions.

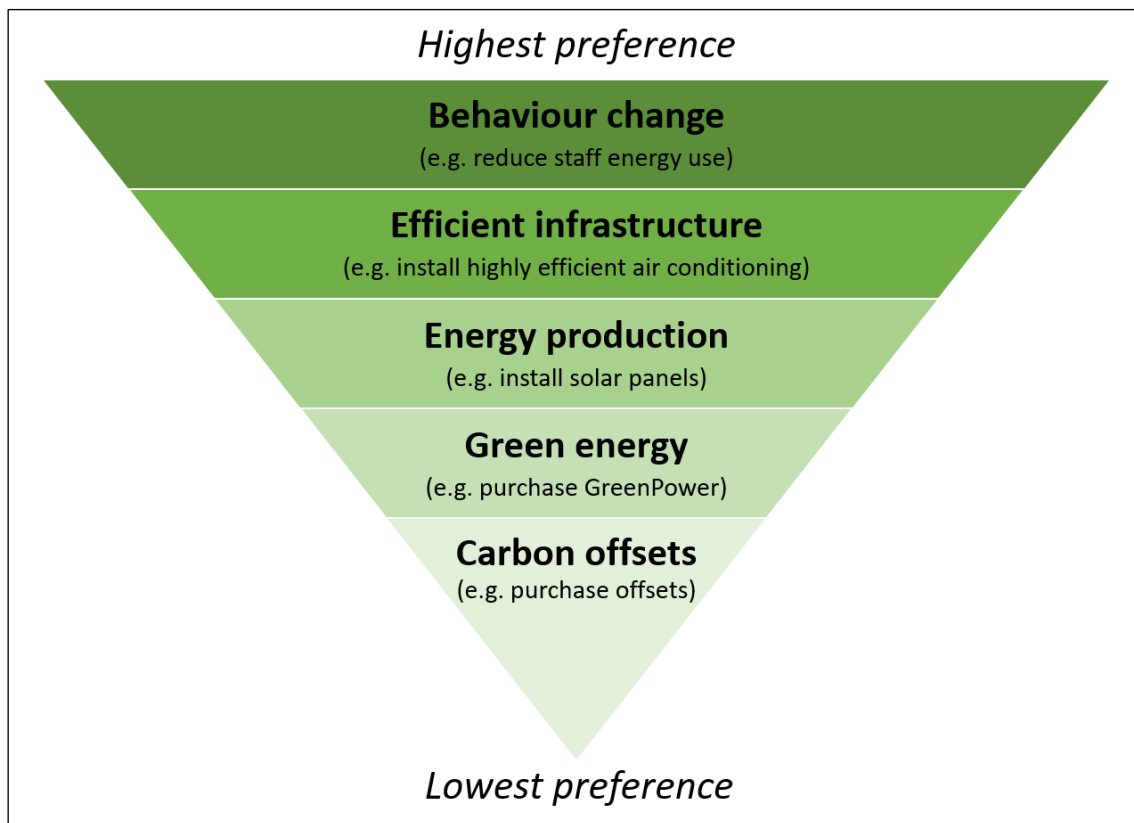


Figure 1. A hierarchy of actions to reduce the carbon footprint of the City of Burnside. All actions may be used, but most preference should be given to actions towards the top of the hierarchy.

29. Ideally, the organisation would focus on actions at the top of the hierarchy because these actions provide the best financial and environmental outcomes. However, in practice, there are several modifiers:
- 29.1. There are limitations to how each type of action can contribute (e.g. each of the top three items on the hierarchy have clear limitations, such as how much energy can be produced by local solar panels).
 - 29.2. Some actions have additional drivers which must be considered (e.g. if a piece of essential equipment needs replacing in a particular year, it does not matter where it sits in the hierarchy, it must be replaced).
 - 29.3. External influences may increase or decrease the desirability of some actions (e.g. GreenPower is not currently desirable because the framework is problematic – further detail is provided in Attachment A).
 - 29.4. There is one further caveat to the hierarchy, related to carbon offsets. Offsetting carbon emissions refers to actions taken by an organisation to prevent, reduce or remove carbon emissions elsewhere, to compensate for emissions of the organisation. Carbon offsets are typically utilised once other measures have been utilised, as the final step to carbon neutrality. The carbon offsets are used to negate any carbon emissions that the other actions could not efficiently remove. Hence, carbon offsets are at the bottom of the hierarchy. The Burnside Carbon Offset Scheme (B-COS), however, has been designed to be utilised quite differently to how most carbon offset schemes are used. Because the funding for B-COS carbon offsets comes from users of Council services, the Council budget is not used to fund the offsets. Therefore, B-COS can be actioned upfront as an early measure to help Council to efficiently reduce its carbon footprint. B-COS is highly efficient because it does not add cost to the organisation while it offsets carbon emissions. In the long term, B-COS can reduce the carbon footprint of the

Council and save money. Further information on carbon offsets is presented in Attachment A.

30. Thus, in practice, a mix of actions is necessary and desirable, with a focus on actions towards the top of the hierarchy where practical and efficient. Actions from all levels of the hierarchy will need to be utilised to reach carbon neutrality. Green Energy is currently an exception, but it may be beneficial to purchase Green Energy in the future.
31. While it is top of the hierarchy, behaviour change is not a key focus of this report, as it is happening as a matter of course across the organisation and does not require additional investment at this stage to implement. However, it is worth noting that Council is implementing various measures to change staff behaviours and reduce power consumption. Behaviour change can be encouraged in many ways (e.g. education, empowerment, training, incentives, restrictions). Council is instigating the Burnside Environmental Action Team (BEAT) to address change internally. The team will investigate actions that will reduce Council's carbon footprint and work to implement the actions across the organisation. Example actions to be considered are:
 - 31.1. Monitoring and changing the use of lighting, air conditioning and other electrical infrastructure;
 - 31.2. Driving cars more efficiently; and
 - 31.3. Using e-bikes instead of cars.

Background: becoming accredited as a carbon neutral organisation

32. Council may wish to seek Australian Government-backed certification of climate neutrality through the organisation Climate Active.
33. Seven Australian Local Government Areas (LGAs) are currently certified as Carbon Neutral by Climate Active. No LGAs in South Australia are certified. All councils purchase some international carbon offsets to achieve carbon neutrality:
 - 33.1. City of Sydney (certified 2011)
 - 33.2. Moreland City Council (certified 2011), has a carbon offsets policy.
 - 33.3. City of Melbourne (certified in 2011/12), large events certified in 2018; purchases offsets according to the principles in a Carbon Neutrality Strategy (2012).
 - 33.4. City of Yarra (certified 2011/12).
 - 33.5. Brisbane City Council (certified 2017).
 - 33.6. Randwick City Council (certified 2017/18).
 - 33.7. Woollahra Municipal Council (certified 2020).
34. The process of certification is outlined on the government's Climate Active website: <https://www.climateactive.org.au/be-climate-active/certification>.
35. A typical accreditation process is depicted in Figure 2. City of Burnside has completed step 2, with the development of ongoing monitoring of carbon emissions that was first presented in the Annual Environmental Sustainability Scorecard and Review 2020 (C12673, 22/09/20).
36. The calculations presented in this report represent the first part of Step 3 (developing an emissions reduction strategy). The recommendations of this report, if endorsed, will

complete Step 3 of the depicted process. The recommendations of this report also suggest that Council should wait until key actions have been implemented before deciding how to become carbon neutral. Following the process in the Figure, that means completing Step 3 before deciding on how to action Step 4. At that stage, Council could also seek certification if desired.

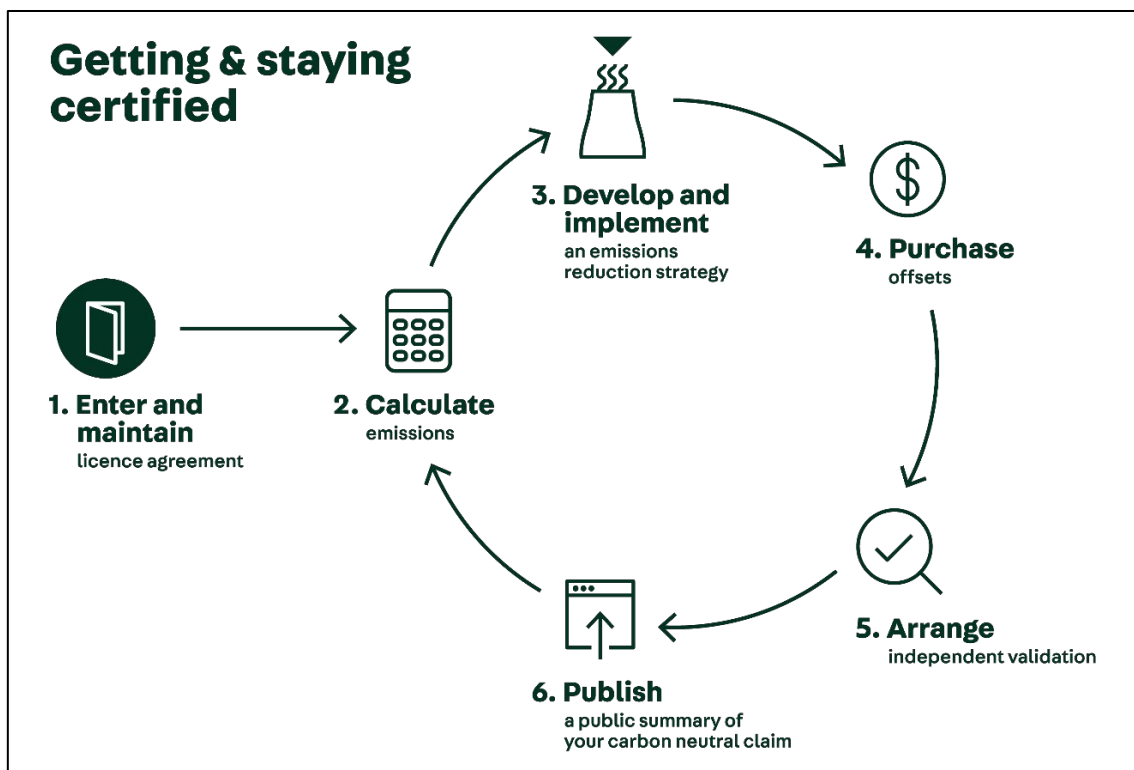


Figure 2. The typical process for an organisation to become certified as Climate Active (carbon neutral) with the Australian Government.

Analysis: Can the City of Burnside reduce its carbon footprint and save money?

37. The City of Burnside's Environmental Sustainability Strategy includes a priority for Strategic and cost-effective reduction of Council's carbon footprint. This priority requires that Council understanding the sources of carbon emissions associated with council facilities and activities. The priority also requires a critical comparison of potential actions, to ensure that action can be strategic and cost-effective.
38. To support this decision-making, a Carbon Reduction Scenario Tool (the **Burnside CARES Tool**) has been developed to assess potential actions for consideration. This tool has been designed to compare groups of actions that could be implemented to reduce Council's carbon footprint. For example, the tool has been used to compare the impacts of five potential scenarios:
- 38.1. Scenario 1: Business as usual
 - 38.2. Scenario 2: Purchasing carbon offsets
 - 38.3. Scenario 3: Infrastructure development
 - 38.4. Scenario 4: Infrastructure development plus B-COS
 - 38.5. Scenario 5: Carbon neutral fast track (2023/24)
39. The Burnside CARES Tool calculates both the financial and environmental impacts for each scenario. The environmental impact is the Council's carbon footprint. The financial impacts presented are the differences between the Scenario being analysed and

business-as-usual (i.e. costs of implementation and savings that are generated in comparison to business-as-usual).

40. Each scenario has been optimised to provide maximum return-on-investment, within the constraints of the scenario. For example, when considering various options for the development of infrastructure, actions with the fastest return-on-investment were given priority.
41. The building of each scenario has been informed by two key pieces of work that were conducted during the last year:
 - 41.1. The development of monitoring of Council's greenhouse gas emissions. This work has generated the baseline of Council's carbon footprint; and
 - 41.2. Specialist consultants audited the energy use at four Council facilities and provided advice on the potential to reduce Council's carbon footprint through solar power generation and energy efficiency measures. Attachment B provides a summary of the audit results and notes adjustments that were made when using the data in the Burnside CARES Tool.
42. Five scenarios are described below. For each scenario, a description and a discussion of the impacts (financial and environmental) is included. The impacts are provided in a table for each scenario at two points in time – 10 years and 20 years. It must be noted that the results at 20 years include all 20 years (i.e. they are not just the second 10 years). Thus, the results of two time points should not be added together. A graph of the impacts over 20 years is also included for each scenario. The graphs are all formatted on the same scales so that they can be readily compared.
43. Further comparative information is presented after the five scenarios.
44. All activities are expected to be funded through borrowings. Thus, the cost of interest is factored into every scenario where expenditure is required. Most of the scenarios make savings that can be used to repay the borrowings, except Scenario 2, which would present ongoing financial liabilities.
45. As the Burnside CARES Tool provides forecasts of future costs and returns, it was necessary to include various assumptions on variables that might affect costs and returns (e.g. the cost of electricity). A list of these assumptions is provided in Attachment C. Each assumption was applied to every scenario.

Scenario 1: Business as usual

46. This scenario follows a 'do nothing' approach.
47. Under a business-as-usual scenario, Council's carbon footprint become slightly lower each year for two reasons. First, the electricity purchased from the grid is becoming cleaner as more renewable electricity is produced in Australia. Second, there are ongoing improvements in energy efficiency at Council facilities as part of typical office and building upgrades. However, these improvements are relatively slow and in ten years the annual carbon footprint will still be around 81% of the current annual footprint.
48. Table 1 demonstrates the cumulative impacts of a business-as-usual scenario after 10 and 20 years.
49. Figure 3 depicts the carbon footprint over the next twenty years. Under this scenario, Council would not become carbon neutral. Further, this scenario does not generate long-term savings from investments in solar power generation and energy efficiency measures.

Table 1. Cumulative impacts of Scenario 1: Business-as-usual.

Years	Carbon footprint (CO ₂ -e)	Investment balance (\$)
10	17,916 tonnes	\$0
20	32,606 tonnes	\$0

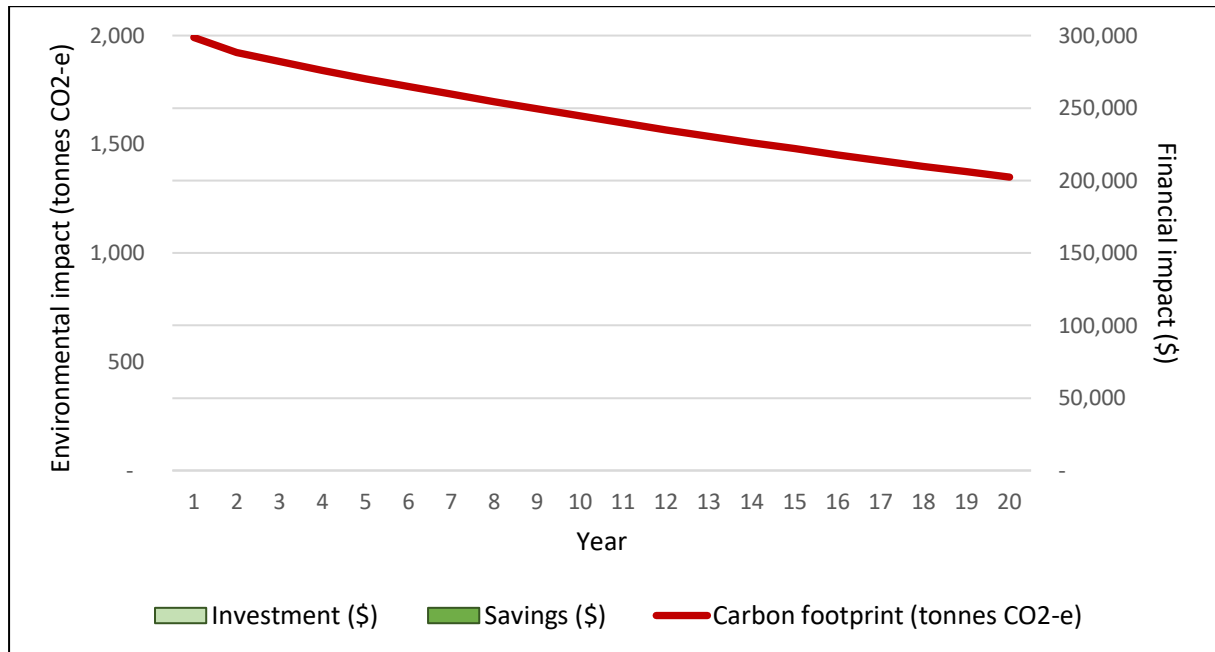


Figure 3. Annual environmental impacts of Scenario 1 (business as usual); no investment or savings are depicted because none are made.

Scenario 2: Purchasing carbon offsets

- 50. Council could purchase commercially-available carbon offsets and offset all emissions without making any other changes.
- 51. While this approach could dramatically reduce Council’s greenhouse gas footprint, it does not provide any long-term savings. In fact, the purchasing of offsets would become an ongoing financial constraint.
- 52. Committing to this ongoing cost would create transitional risks because the funds absorbed by the offsets could not be used for other purposes.
- 53. Table 2 demonstrates the cumulative impacts of a carbon offset scenario after 10 and 20 years.
- 54. Figure 4 depicts the carbon footprint and investment requirements over the next twenty years. Under this scenario, Council would become carbon neutral immediately but would also assume an ongoing financial liability.

Table 2. Cumulative impacts of Scenario 2: Purchasing carbon offsets.

Years	Carbon footprint (CO ₂ -e)	Investment balance (\$)
10	0 tonnes	- \$341,030 (cost)
20	0 tonnes	- \$980,065 (cost)

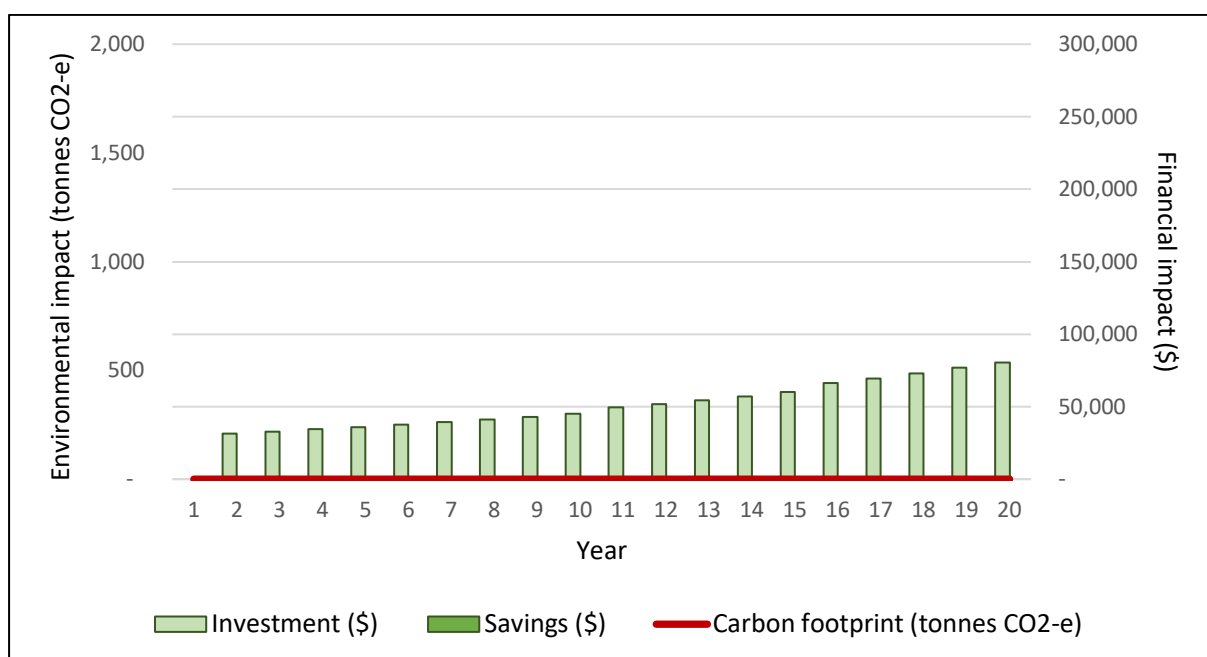


Figure 4. Annual environmental and financial impacts of Scenario 2 (purchasing carbon offsets).

Scenario 3: Infrastructure development

- 55. Two types of investments in infrastructure will reduce Council’s carbon footprint and provide financial savings in the long-term. First, Council can invest in solar power generation on Council buildings. Second, Council can invest in energy efficiency measures, such as upgrades to lighting and air-conditioning. Additionally, this scenario includes funding to support an ongoing transition to hybrid and electric vehicles.
- 56. The actions modelled for Scenario 3 will reduce Council’s carbon footprint to 37% of current levels by 2028/29. Following that year, this scenario includes the purchasing of carbon offsets so that Council is carbon neutral from 2029/2030. At that point, the financial savings generated by investments in infrastructure are far greater than the cost of the offsets. Thus, over time, Council saves money.
- 57. While the complete path to carbon neutrality is presented here, if Council wanted to implement this scenario, an adaptive approach is recommended, as described in the ‘background’ section of this report. Thus, decisions on purchasing of carbon offsets would not be made until 2029/30, when they can account for any changes in policy or technology.
- 58. Table 3 demonstrates the cumulative impacts of the infrastructure scenario after 10 and 20 years. There is no further change in the cumulative carbon footprint after nine years because all emissions are reduced or offset at that point in time (i.e. the cumulative carbon footprint is the same after 20 years as it was after 10 years). The financial savings continue to accumulate because the infrastructure measures are ongoing (i.e. solar panels continue to produce power and efficiency measures continue to save power).

Table 3. Cumulative impacts of Scenario 3: Infrastructure development.

Years	Carbon footprint (CO ₂ -e)	Investment balance (\$)
10	11,588 tonnes	\$349,859 (savings)
20	11,588 tonnes	\$2,640,333 (savings)

59. For Scenario 3, the investment required in the first five years is around \$720,000. During that time, savings in power costs total almost \$390,000. Thus, the net investment in the first five years is around \$330,000. In the sixth year the annual savings become greater than the annual investment that is required (Figure 5). By the ninth year, the cumulative savings are greater than the cumulative investment. The measures that would be implemented under Scenario 3 are provided as Attachment D.

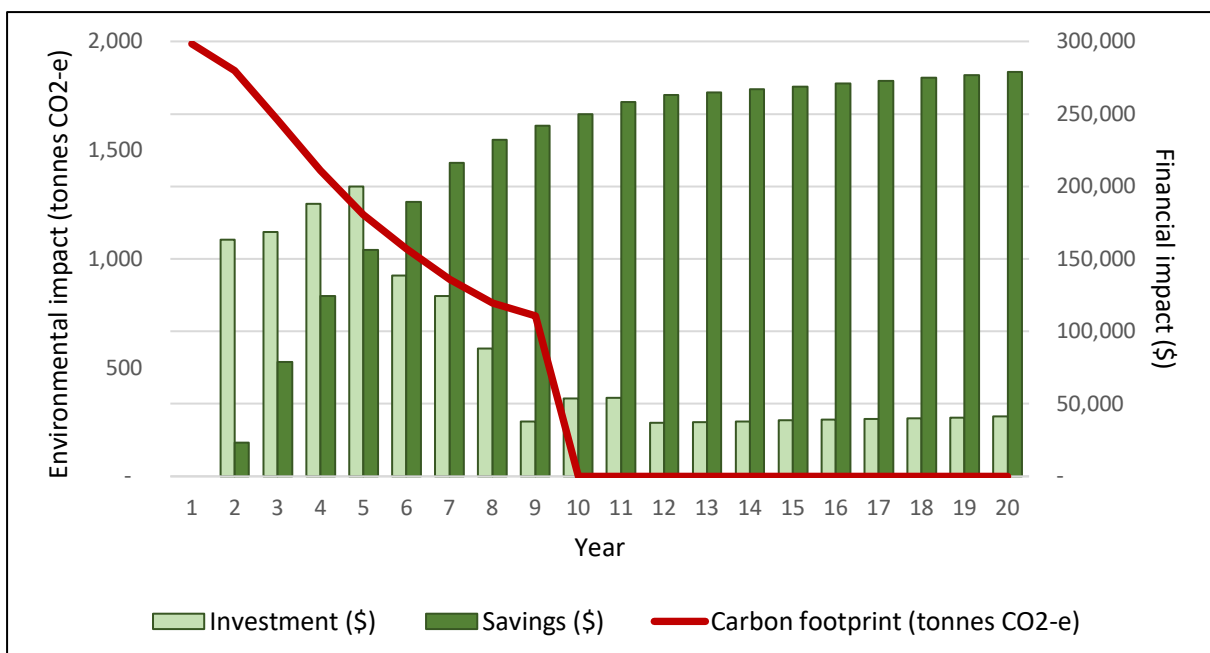


Figure 5. Annual environmental and financial impacts of Scenario 3 (infrastructure development).

Scenario 4: Infrastructure plus B-COS

60. This scenario is the same as Scenario 3, but with one additional measure – the implementation of the B-COS scheme (as detailed in a report to Council on 25 August 2020). The B-COS scheme effectively funds carbon offsets at no cost to Council. The scheme is funded through negligible increases of user charges at Council’s swimming centre and theatre (e.g. 10 cents per individual visit), plus a charge on additional bin services. This scenario includes the same infrastructure development as outlined in Scenario 3, plus the implementation of B-COS.
61. Table 4 demonstrates the cumulative impacts of Scenario 4 after 10 and 20 years. Over the first ten years, the implementation of B-COS would offset over 3,300 tonnes of carbon emissions (relative to Scenario 3). The annual emissions baseline of Council is 2,008 tonnes. Therefore, the B-COS scheme would save around one-and-a-half years’ worth of carbon emissions. Additionally, the B-COS scheme would save Council funds –over twenty years, the savings attributed to B-COS would be almost \$100,000. The savings are generated by reducing the need for Council to purchase carbon offsets to become carbon neutral. The financial savings would continue to accumulate beyond the 20-year horizon at around \$10,000 per annum. Under this scenario, Council would become carbon neutral in 2029/30.
62. While the complete path to carbon neutrality is presented here, if Council wanted to implement this scenario, an adaptive approach is recommended, as described in the ‘background’ section of this report. Thus, decisions on purchasing of carbon offsets would not made until 2029/30, or earlier if desired, when they can account for any changes in policy or technology.

Table 4. Cumulative impacts of Scenario 4: Infrastructure plus B-COS.

Years	Carbon footprint (CO ₂ -e)	Investment balance (\$)
10	8,243 tonnes	\$358,010 (savings)
20	8,243 tonnes	\$2,739,920 (savings)

63. For Scenario 4, the investment settings are very similar to Scenario 3, however, the ongoing annual investment from year 9 onward is less due to the addition of B-COS (Figure 6). By the ninth year, the cumulative savings are greater than the cumulative investment. The measures that would be implemented under Scenario 4 are provided as Attachment D.

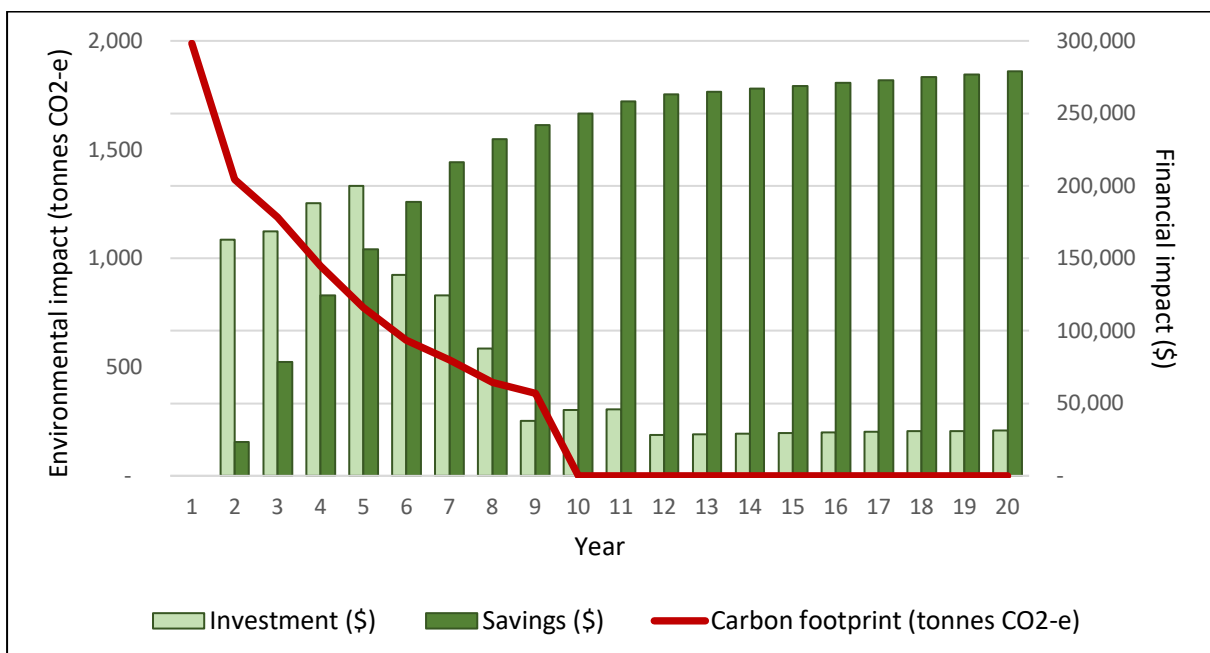


Figure 6. Annual environmental and financial impacts of Scenario 4 (infrastructure plus B-COS).

Scenario 5: Carbon neutral in 4 years (2023/24)

- 64. This scenario is the same as Scenario 4, but with one additional measure – the purchasing of additional carbon offsets. Under this scenario, Council would reduce carbon emissions by 59% in the first three years and then begin purchasing commercially-available carbon offsets to become carbon neutral in 2023/24.
- 65. Council would continue to implement additional energy-efficiency measures and further solar power generation projects beyond the fourth year, which would reduce the number of offsets that would need to be purchased in each subsequent year. This option has all the advantages of the previous scenario and provides a faster route to becoming carbon neutral (i.e. faster than Scenario 4), without the transitional risks presented in Scenario 2.
- 66. This scenario almost halves the cumulative carbon footprint of the previous scenario over ten years. However, the offsets required to become carbon neutral in four years carry an additional cost of around \$77,500. This additional cost does not continue to accumulate after ten years (compared to Scenario 4) because offsets were included in Scenario 4 at that point. In the long term (20 years; Table 5), this scenario provides a slightly better return-on-investment than Scenario 3 because the B-COS scheme is included and saves Council funds. But Scenario 4 has the greatest financial return-on-investment.
- 67. While a complete and fast-tracked path to carbon neutrality is presented here, if Council wanted to implement this scenario, an adaptive approach is recommended, as described in the ‘background’ section of this report. Thus, decisions on purchasing of carbon offsets would not made until 2023/24, when they can account for any changes in policy or technology.

Table 5. Cumulative impacts of Scenario 5: Carbon neutral fast track.

Years	Carbon footprint (CO ₂ -e)	Investment balance (\$)
10	4,541 tonnes	\$280,551 (savings)
20	4,541 tonnes	\$2,662,462 (savings)

- 68. For Scenario 5, the investment required in the first five years is around \$751,000. During that time, savings in power costs total around \$383,000. Thus, the net investment in the first five years is around \$368,000. In the sixth year the annual savings become greater than the ongoing investment that is required (Figure 7). By the ninth year, the cumulative savings are greater than the cumulative investment.

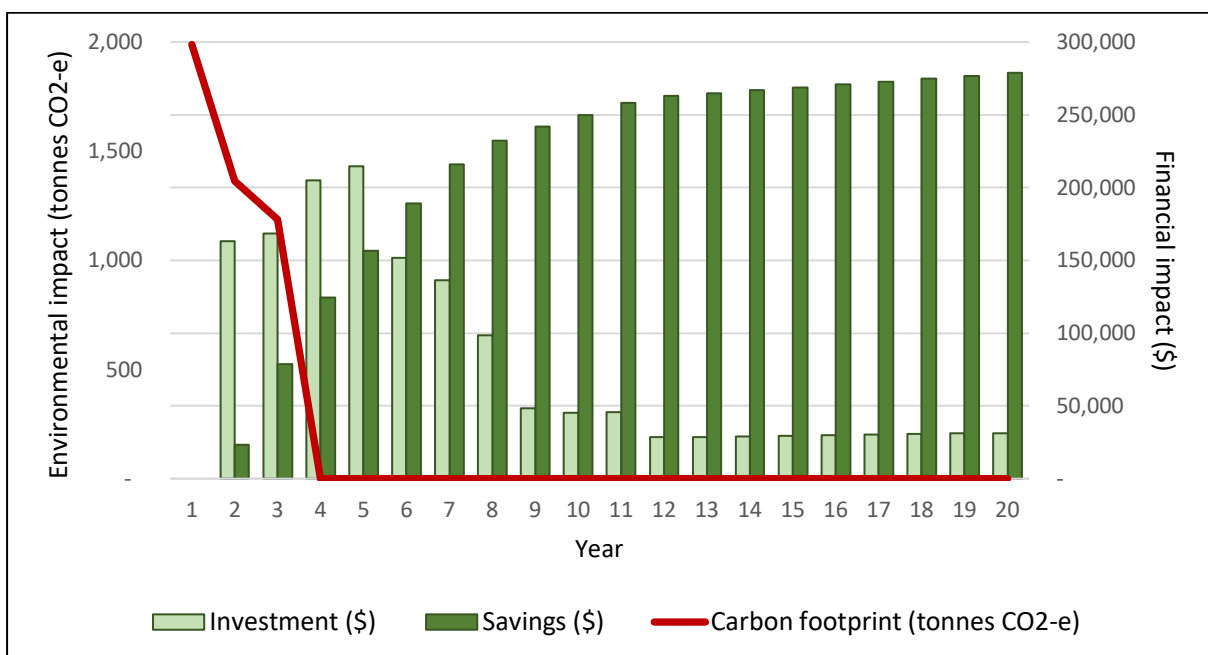


Figure 7. Annual environmental and financial impacts of Scenario 5 (carbon neutral fast track).

Comparison of scenarios

69. For ease of comparison, the following tables and figures present and compare the financial and environmental impacts of each scenario. Table 6 includes the financial impacts, at 10 and 20 years, for each scenario.

Table 6. Cumulative financial impacts of all five scenarios.

Years	Scenario 1: Business as usual	Scenario 2: Purchasing carbon offsets	Scenario 3: Infrastructure development	Scenario 4: Infrastructure plus B-COS	Scenario 5: Carbon neutral fast track
10	\$0	-\$341,030 (cost)	\$349,859 (saving)	\$358,010 (saving)	\$280,551 (saving)
20	\$0	-\$980,065 (cost)	\$2,640,333 (saving)	\$2,739,920 (saving)	\$2,662,462 (saving)

70. Figure 8 depicts the net cumulative financial outcomes of all five action scenarios over twenty years, with Figure 9 showing the annual investment only (i.e. does not include savings) required of each scenario. These graphs demonstrate that:

- 70.1. There are no financial implications for Scenario 1: Business as usual.
- 70.2. Scenario 2 (purchasing carbon offsets) is the only scenario to incur ongoing costs without making savings in the long term.
- 70.3. Scenarios 3, 4 and 5 all provide similar returns on investment, with annual savings greater than annual costs after five years. Under each of these scenarios, the investment in early years is fully realised after eight years; from the ninth year the cumulative savings are greater than cumulative costs.

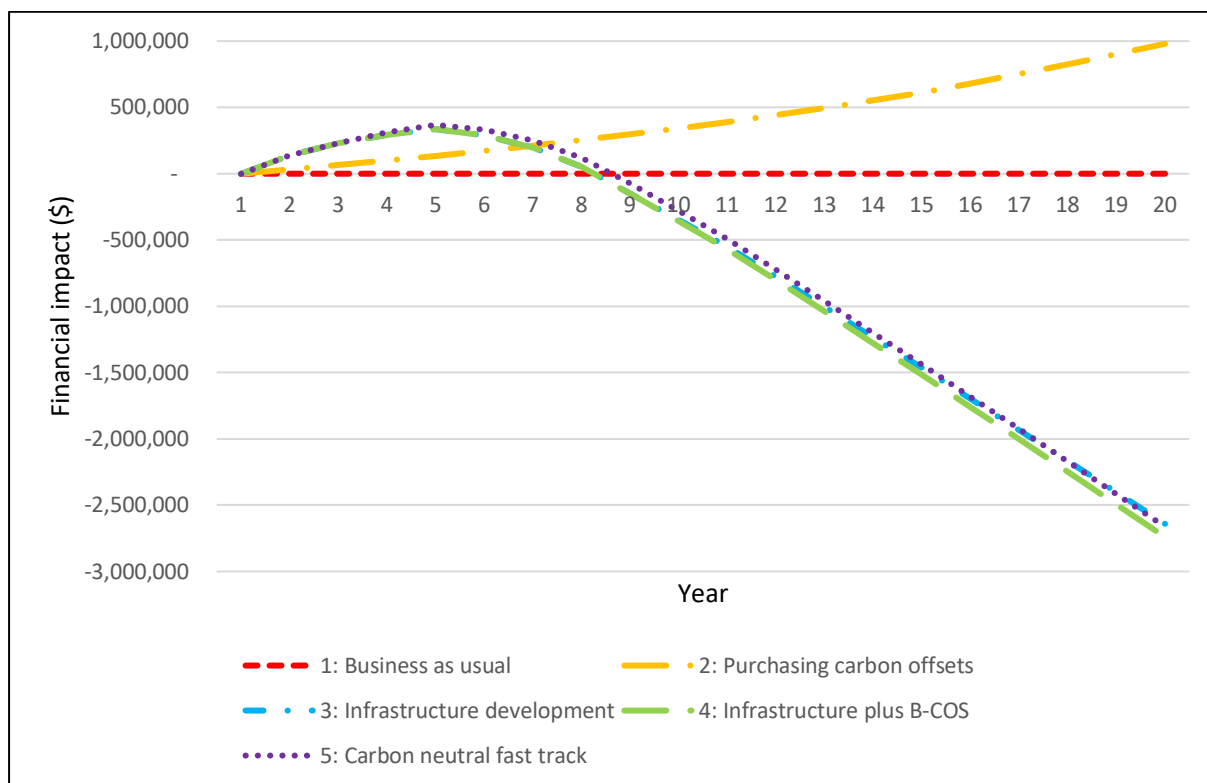


Figure 8. Cumulative investment balance of five action scenarios (negative financial impacts on this graph indicate a financial saving; Scenario 1 is horizontal along the zero line, while scenarios 3, 4 and 5 are closely aligned and difficult to differentiate on this scale).

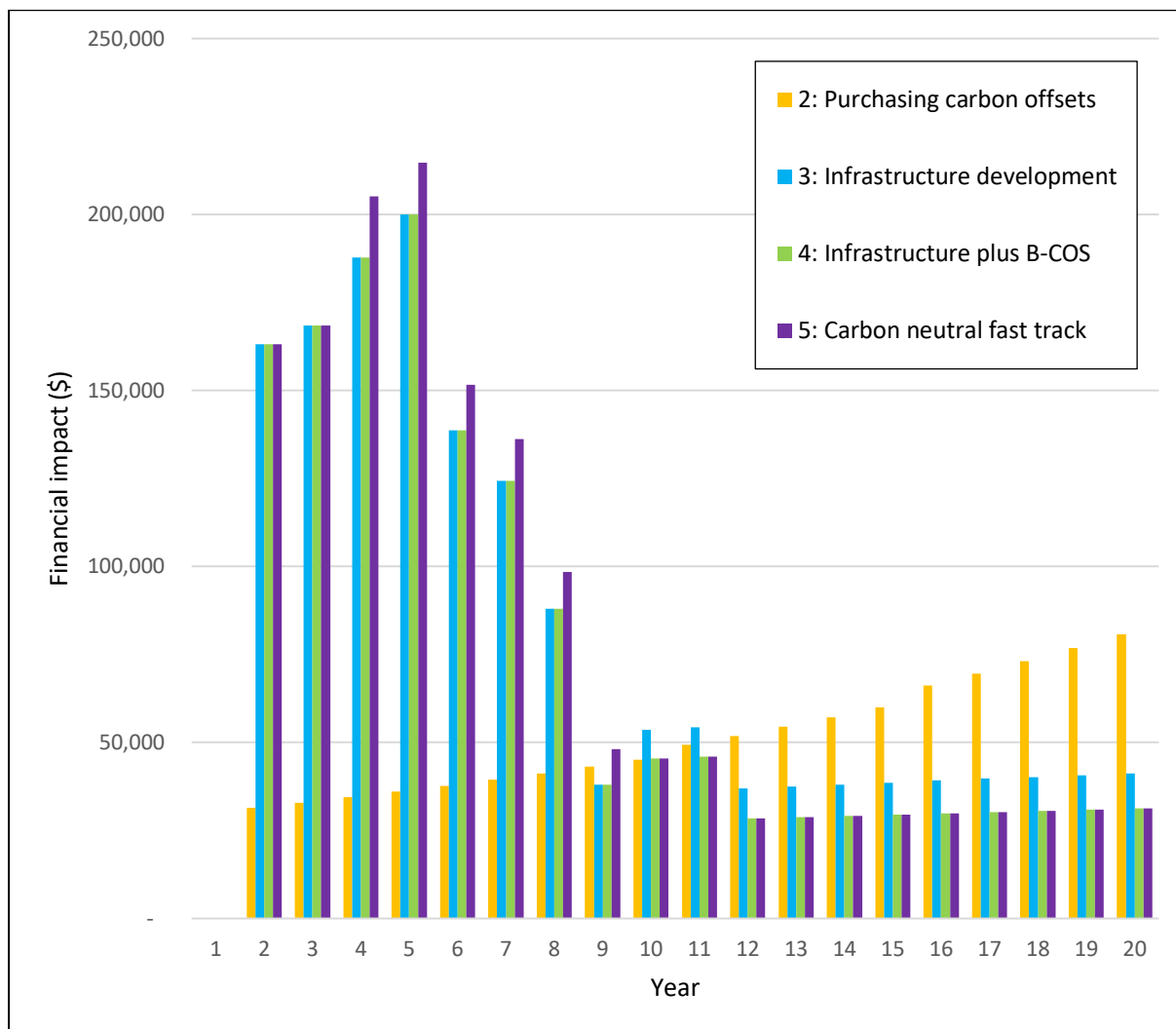


Figure 9. Annual investment required of each of the four action scenarios (costs only, not savings). Scenario 1 not shown as it involves no additional investment.

71. Table 7 includes the environmental impacts, at 10 and 20 years, for each scenario.

Table 7. Cumulative carbon footprint impacts of all five scenarios (tonnes CO₂-e).

Years	Scenario 1: Business as usual	Scenario 2: Purchasing carbon offsets	Scenario 3: Infrastructure development	Scenario 4: Infrastructure plus B-COS	Scenario 5: Carbon neutral in 4 years
10	17,916	0	11,588	8,243	4,541
20	32,606	0	11,588	8,243	4,541

72. Figure 10 depicts the environmental outcomes of all five action scenarios over twenty years, demonstrating that:

- 72.1. Scenario 1 (business as usual) locks in ongoing carbon emissions;
- 72.2. Scenario 2 (purchasing carbon offsets) can immediately bring Council’s carbon footprint to zero (but with ongoing costs that are not balanced by long-term savings);
- 72.3. Scenarios 3, 4 and 5 all achieve carbon neutrality, noting that:

72.3.1. Scenario 5 (carbon neutral fast track) is the fastest route to carbon neutrality, but incurs additional costs and locking in now would not allow for effective consideration of changes to the external environment and market; and

72.3.2. Scenarios 3 and 4 reach carbon neutral in 2029/30, with Scenario 4 achieving a lower cumulative carbon footprint at that point due to the implementation of the B-COS initiative.

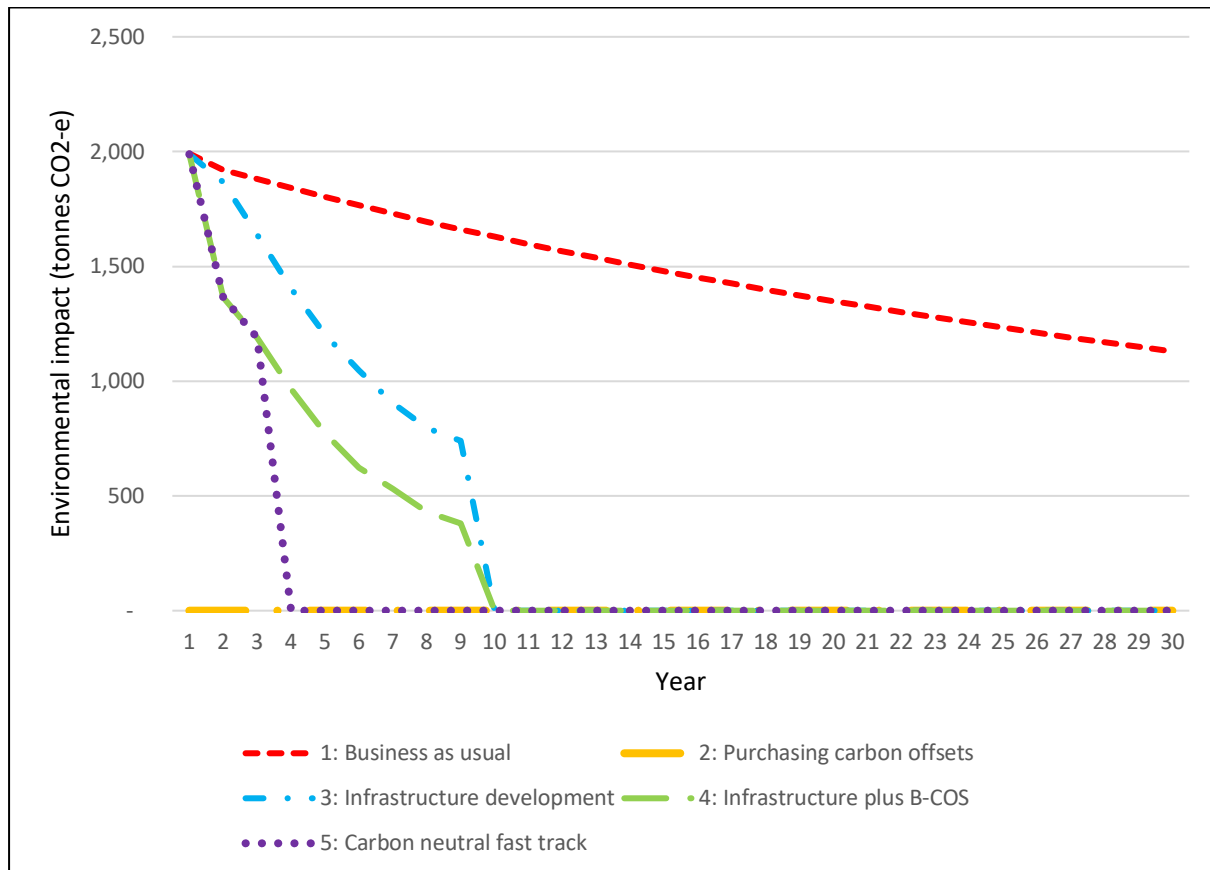


Figure 10. Annual carbon footprint (CO₂-e) of five action scenarios.

73. Attachment E includes further comparative information, with graphs of the annual investment balance of each scenario.

74. Some additional information is presented in Attachment A – answers to questions that may arise while reading this report, including:

- 74.1. What is the plan for investment in vehicles?
- 74.2. Why not purchase more GreenPower?
- 74.3. Are carbon offsets reliable?
- 74.4. Why not invest in more solar?
- 74.5. What about community emissions?
- 74.6. Can we plant trees in the City of Burnside to offset carbon emissions?

Environmental Sustainability Resourcing

75. The increased importance that Council has placed on environmental sustainability, with a growing number of associated initiatives, will progress the organisation towards meeting the strategic goals identified in the Strategic Community Plan, Environmental Sustainability Strategy and Climate Emergency declaration. This additional emphasis on environmental sustainability will need to be adequately resourced to enable delivery.
76. While the City of Burnside is taking an organisational approach to meet its requirements with respect to environmental sustainability, the organisation currently only has one FTE dedicated to progressing the organisation and community's environmental sustainability performance, which also includes managing waste operations and education.
77. Up until this time, a great deal of work has gone into planning, mapping and setting policy and strategy, with many positive outcomes that now require action. An additional 1.0 FTE is required to be allocated to this important area in order to:
- 77.1. Drive significant improvement of the organisation's environmental performance;
 - 77.2. Effectively respond to Council's declaration of a climate emergency;
 - 77.3. Meet the strategic objectives of the Environmental Sustainability Strategy 2019-2023;
 - 77.4. Deliver all of the initiatives outlined in the Environmental report to Council on 22 September 2020; and
 - 77.5. Effectively oversee our waste management and education programs.
78. While this additional FTE would carry a cost (it is anticipated the role would be a level 4, commencing at an annual salary of approximately \$79,000), having an extra FTE to support delivery of the initiatives outlined within this report would help to recognise the savings identified in this Report (\$2,739,920 cumulative net savings over 20 years for option 4). In addition, there is also great potential for additional savings in the waste area that an extra FTE would assist in unlocking (through education and engagement to drive improved residential waste management behaviour). Thus, the financial savings realised would far outweigh the cost of the additional resource. In addition to financial savings, the additional resource would maintain support of Council's leadership and drive excellent environmental outcomes.
79. If Council does not employ an additional FTE, there will be a need to increase funding for external contractors to conduct the work required, which will cost more and will not develop internal capacity, or, could delay some works.

Conclusion

80. The Burnside CARES Tool has been developed to compare potential scenarios for reducing Council's organisational carbon footprint. Five scenarios for the reduction of carbon footprint have been developed using the tool.
81. Each scenario has associated costs and benefits. The modelling conducted has demonstrated that both financial and environmental benefits can be derived from a reduction in Council's carbon footprint.
82. Council can choose to go carbon neutral in 4 years and expect a positive return on investment after nine years (Scenario 5). However, the speed of this transition incurs additional costs. Additionally, it is not financially prudent to make decisions on the purchasing of commercially-available offsets in future years, when State and National policy settings may be different, and technology will be more advanced. Therefore, it is recommended that the Council:

- 82.1. Sets a goal of becoming carbon neutral before 2030, within the boundaries outlined in this report (i.e. including only those emissions that are assessed as part of Council's carbon footprint as described in the background section of this report);
 - 82.2. Implements measures to progress towards that goal as outlined in this report as Scenario 4 ('Infrastructure development plus B-COS') and allocates the required capital budget as part of the next annual long term financial plan review, and the required changes to fees and charges from 2021/22 onwards;
 - 82.3. Maintains an adaptive approach to decision-making, with decisions beyond the measures outlined in this report made when required (e.g. that decisions on the purchasing of commercially-available carbon offsets are made when necessary and not before); and
 - 82.4. Reviews progress regularly as part of the environmental sustainability reporting framework (Council Resolution C12673).
83. A decision to progress with Scenario 4 sets Council on a responsible path to reach carbon neutrality by 2030. The addition of an adaptive approach means that Council can speed up the transition to carbon neutrality in the future if there are changes to State or National policy settings or new technologies (or other external factors) that would support a faster transition.
84. An additional FTE is required in order for Council to effectively progress all of these identified environmental sustainability initiatives. The savings made through delivery of these initiatives will far outweigh the cost of this additional resource.

ATTACHMENT A

Additional information and FAQ responses

What is the plan for investment in vehicles?

The investment scenarios presented in this report (Scenarios 3,4, and 5) all include sustained investment in hybrid vehicles over 10 years. These scenarios include \$14,000 a year (increasing with CPI) to support the purchasing of hybrid vehicles. This level of investment is expected to cover the premium that is associated with purchasing hybrid vehicles (i.e. it does not cover the entire cost of the vehicle because vehicles are already accounted for in Council's financial planning). These vehicles will save both money and carbon emissions. After ten years the purchasing of hybrid or electric vehicles is assumed to be business-as-usual.

Investment in Electric Vehicles (EVs) and PHEVs (plug-in hybrid electric vehicles) will make important contributions to lowering Council's carbon emissions. However, there are two reasons to wait on investment in EVs and PHEVs. First, the current levels of greenhouse gas emissions produced by Council's electricity consumption are higher than they will be in the future. While using electricity to power vehicles is relatively inexpensive, greenhouse gas emissions may increase if EVs and PHEVs are introduced too soon. Over time, following any of the investment Scenarios (Scenarios 3,4 or 5), the greenhouse gas emissions associated with electricity consumption by Council will decrease, primarily through investment in the PV solar production of electricity. Further, the greenhouse gas emissions associated with electricity obtained through the grid are also expected to decrease. Second, there is currently a premium paid on EVs and PHEVs. Over time, this premium is expected to decrease, as production increases, as it has with hybrid vehicles and other developing technologies. Investing in EVs and PHEVs while the premium is high represents a transitional risk. Rather than investing in these vehicles while the premium is high, the funds should be channelled into investment in PV solar production. This approach will speed Councils transition to carbon neutrality, rather than slowing it. Thus, for both environmental and financial reasons, investment in EVs and PHEVs should be made once PV solar production of electricity has increased and the premium on these vehicles has decreased. However, there are reasons to invest in some EVs and PHEVs sooner, rather than later. At a societal level, some investment in this space is required to drive an increase research and production, and to help normalise these vehicles in the Australian market. Further, it will be useful for Council to own some EVs and PHEVs in order to model their performance under local conditions and enable accurate modelling that will determine when further investment should be made.

Why not purchase more GreenPower?

GreenPower is a system designed to assist individuals and organisations in buying electricity that is generated by renewables. The GreenPower framework is managed at a National Level. Purchasing GreenPower was considered as scenarios were developed. Purchasing GreenPower does have some good environmental outcomes BUT there are several issues with it, including:

1. **Dead money:** if Council invests in green power there is no return on investment (similar to purchasing carbon offsets as described in Scenario 2). If Council invests the same funds in solar or energy efficiency measures there are good environmental outcomes and a return on investment.

2. **Double counting:** the rules around green power are problematic – these rules are being reviewed but they have not yet been fixed. Double counting is one of the issues. A simplified example can be used to demonstrate this issue. This example involves four houses on a grid, where they are the only users of electricity and there is no input from renewable sources. If one of the houses started producing 100% of its electricity requirements through a solar photovoltaic system, it could rightly claim to have zero emissions through its electricity consumption. However, as the house is on a grid of four houses, an alternative view would be that the entire grid is then using 25% renewables. According to this alternative view, the other three houses could claim to be using 25% renewables. With one house claiming 100% and the other three claiming 25%, the total claim on renewable production is over 43%, but the production is only 25%. This seems ridiculous, but it is what happens with the purchase of green energy.

While the purchasing of green power is currently problematic, it may be beneficial in the future. Thus, this market should be monitored. In the future, purchasing green power may become a better option than purchasing carbon offsets. If that is the case, scenarios can be modified to take advantage of any benefits. For example, under Scenarios 3 and 4, carbon offsets are purchased from 2029/30. If green power becomes a better option, then it would be an easy change from purchasing carbon offsets to purchasing GreenPower. The purchasing of GreenPower may also be considered when Council enters into a new electricity contract in 2023.

Why not invest in more solar?

The generation of solar power can provide good returns on investment, but there are constraints. For example, financial savings are greatest when power is consumed rather than when it is exported to the grid. Thus, sites with variable power usage do not provide return on investment as quickly as sites with steady power usage. The swimming centre is a good example. Power usage at the swimming centre is much lower in winter when the pool is closed. Therefore, during winter, some of the power generated through solar panels would be exported. Investment in solar power generation at this site provides a slower return on investment than the Council Depot (Glynburn Road) or the Civic Centre, where there is less variation in power usage within each year. Other constraints include:

1. Space constraints (how many solar panels can fit on a roof);
2. Orientation constraints (does the roof face the sun);
3. Shading constraints (would solar panels be shaded by trees or buildings); and
4. Heritage constraints (would solar panels adversely impact on the architectural qualities of the building).

These constraints have all been accounted for in the development of the scenarios presented in this report.

Are carbon offsets reliable?

Offsetting carbon emissions refers to actions taken by an organisation to prevent, reduce or remove carbon emissions elsewhere, to compensate for emissions of the organisation. The carbon offsets are used to negate any carbon emissions that the other actions could not efficiently remove.

There are many types of carbon offsets that can be purchased. Carbon offsets can be generated by planting trees, building green infrastructure, or changing farming practices.

Essentially, projects that will reduce the amount of carbon in the atmosphere can create carbon offsets. Projects that offset carbon emissions sell the offsets on Australian and international markets.

If City of Burnside is to purchase carbon offsets on the commercial market, the Council can choose which offsets to purchase. This approach has been adopted by other Councils (as outlined in the background section of this report), with policies put in place to ensure that any offsets purchased are rigorously reviewed before being purchased. There are several international standards that can be utilised to ensure the validity of any offsets purchased.

The recommendations of this report do not include the purchasing of any commercially-available carbon offsets for some time. This time can be used to monitor changes in policy and advances in technology to ensure that purchasing of any carbon offsets is timely and cost-efficient. Further, this time can be used to develop an appropriate policy framework to ensure rigorous processes around the review and purchasing of any commercially-available carbon offsets.

The Burnside Carbon Offset Scheme (B-COS) is part of Scenarios 4 and 5 presented in this report. B-COS does not include the purchasing of commercially-available carbon offsets. Instead, carbon offsetting would be achieved by Council developing a partnership with an organisation that plants trees to offset carbon emissions. Through the partnership, the Council would be involved in selecting suitable land for the tree planting and ensuring that suitable covenants are in place for long-term protection of the trees. Thus, Council is involved in the process and can be confident that trees are planted and protected. As part of the scheme, Council can also decide to be involved in tree planting if desired. This scheme has been specifically developed so that Council can have a high level of confidence in the offsets provided. Further, the scheme provides benefits to local communities and wildlife by providing economic activity (tree planting, maintenance and monitoring) and habitat for wildlife.

What about community emissions?

The focus of the work conducted thus far has been on Council's carbon footprint. Some preliminary work has been conducted to investigate strategies and develop projects to support community to reduce carbon footprint. It is proposed that Council should first tackle its own carbon footprint and then shift focus to the community's carbon footprint. The beauty of this approach is that savings from improvements at Council could be invested in supporting the community to reduce carbon footprint (i.e. there would be no new costs to Council). Investigations in the community space will continue and should engage community and identify projects most likely to succeed; then build business cases (as a council or regionally); projects to investigate include (but are not limited to):

- Virtual Power Plants
- Community Energy Funds (e.g. [Solar Harvest Co-op](#), [CORENA](#))
- Support for investment in domestic energy efficiency, such as efficient heating and cooling infrastructure, improvement of insulation improvement and draft proofing
- Investment in active transport infrastructure

Can we plant trees in the City of Burnside to offset carbon emissions?

Planting trees is one way to offset carbon emissions. As trees grow they store carbon in woody tissues. Thus, the urban forest in the City of Burnside has locked up a large volume of

carbon dioxide. As more trees are planted, more carbon is locked away. But, there are some very substantial limits to how much more carbon dioxide can be stored by trees in Burnside:

1. Overall, the urban forest is likely to be reducing in volume because trees on private land are being removed. Preliminary data demonstrates the loss of trees (i-tree assessments of canopy) and a more robust analysis will be possible when a second LiDAR analysis of canopy is conducted (further detail on LiDAR canopy assessment was provided in Attachment H of the Annual Environmental Sustainability Scorecard And Review 2020) .
2. If private land is overlooked (which is problematic in itself), there are limits on public land, too:
 - a. The number of trees currently being planted annually would, optimistically, account for around 15% of Council's carbon footprint (considering both tree planting and loss of trees).
 - b. There is not enough public space around Council to plant more trees. The number of trees currently being planted will fill the easily-planted locations around Council within a few years, then planting will need to slow down (so planting around Council is not a long-term solution).
 - c. The cost of planting trees is set to increase as fewer typical tree planting spaces are available and atypical planting locations are needed; for example, Council could explore planting more trees on streets, rather than in verges or parks, but the cost would be greater and therefore fewer trees could be planted.
 - d. Establishing a system to calculate the carbon being stored in Council's trees would require a budget (the estimation above is optimistic)
 - e. If Council wishes to become certified as carbon neutral (by Climate Active), further work would need to be done to ensure that street trees can be included in carbon footprint calculations (considering the adjacent loss of trees on private land)

For these reasons, this approach has not been included in the current approach to a long-term reduction of Council's carbon footprint.

ATTACHMENT B

Summary of audit results

Council engaged specialist consultants, The Energy Project, to audit select major facilities and identify measures that could be implemented to reduce greenhouse gas emissions. Key opportunities that were identified include:

1. Installation of rooftop solar power systems to generate electricity; and
2. Energy efficiency measures to reduce energy consumption.

The results of the audits have informed the Burnside CARES Tool.

Solar power generation

The calculations below are based on site analyses that account for available space, roof shading, the timing of energy consumption, and the site-specific cost of electricity. Typically, sites with minimal shading, consistent electricity consumption during the day and high electricity prices will payback faster than others. These investment options are all included in Scenarios 3,4 and 5.

Site	Solar PV system size (kW)	Annual energy saving (kWh)	Annual cost saving (\$)	Annual Reduction (tonnes CO ₂ -e)	Project cost estimate (\$)	Simple payback (years)
Civic Centre	99	137,900	\$27,800	73	\$123,750	4.5
Swimming Centre	60	75,000	\$14,500	40	\$75,000	5.2
Regal Theatre	90	117,000	\$27,500	63	\$104,000	3.8
Depot (Glynburn Road)	70	86,000	\$30,800	46	\$87,500	2.8

Energy efficiency measures

The consultants noted that electricity consumption has reduced over time at the Civic Centre, evidence that ongoing energy efficiency work has been effective at that site. Council staff have continued the analysis of energy use at the civic centre and determined that there was a 12% reduction in consumption from 2010/11 to 2018/19. Over those eight years, the average annual reduction in electricity use was 1.5 per cent. The most recent financial year saw further reductions but was not included because it was atypical (i.e. affected by COVID-19 restrictions).

Measures that could improve energy efficiency were identified by the consultants and are provided below. Some of these items have already been recognised and will be actioned over time through the Council's Buildings Asset Management Plan. Some of those items need to be implemented because infrastructure needs replacing. For example, the pool heating need replacing and has been scheduled according to when it needs replacing. In these cases, only the costs over-and-above the business-as-usual costs are included in the CARES modelling. Other items are new and may be added to Council's Buildings Asset Management Plan. Some of the items are already funded, including larger items (e.g. the air conditioning upgrade at the Regal Theatre), and smaller items (e.g. lighting and air-conditioner upgrades occur according to Council's Buildings Asset Management Plan). The speed of implementation on additional items will depend on Council investment in building asset management. These investment options are all included in Scenarios 3,4 and 5.

Measures	Annual energy saving (kWh)	Annual cost saving (\$)	Annual CO ₂ -e Reduction (tonnes)	Project cost estimate (\$)	Simple payback (years)
Civic Centre					
Air conditioning measures	81,000	\$14,000	43	\$116,000	8.3
Lighting upgrade	41,600	\$15,000	22	\$81,000	5.4
Electrification of gas appliances	-	\$500	-	\$5,000	10.5
Replace storage electric hot water systems	5,500	\$1,000	-	\$8,000	8.0
George Bolton Swimming Centre					
Reduce night pump flow rates	32,500	\$4,500	17	\$10,000	2.2
Replace boiler with electric heat pump	-	\$40,000	75	\$300,000	7.5
Update domestic hot water pump control	10,000	\$1,500	5	Staff time only	0
Regal Theatre					
Air conditioning upgrade	35,000	\$12,000	19	\$175,000	14.6
Lighting upgrade	12,700	\$4,700	7	\$10,000	2.1
Refrigeration upgrade	2,200	\$700	1	\$3,000	4.3
Replacement of hot water service	1,600	\$500	1	\$4,000	8.0
Council Depot (Glynburn Road)					
Lighting upgrade	8,300	\$4,200	4	\$21,000	5.0
Hot water systems management	1,100	\$300	1	\$250	0.8

Modifications to the audit recommendations

In fine-tuning the Burnside CARES Tool and scenario modelling, several adjustments were made to the recommendations of the energy audit. For example:

1. The size of the solar PV system recommended for the Regal Theatre was reduced from a 90kW system to a 40kW system following consultation with a heritage consultant at Department for Environment and Water - placing panels on the front half of the roof would "adversely impact on the architectural qualities of the building"
2. The cost of the air conditioning upgrade at the Regal Theatre was removed because the project already has funds committed.
3. The cost of the upgrade to the pool heating at the George Bolton Swimming Centre was reduced because the system was due to be replaced as business-as-usual within two years. The cost of like-for-like replacement has been taken out of the cost of the upgrade. Thus, this modelling only includes the cost of upgrading from a gas-based system to a heat-pump-based system. This cost is still substantial, at \$145,000.
4. A ten per cent premium was added to the air conditioning measures recommended for the Burnside Civic Centre based on previous quotations for a new Building Management System (which is the key action in that space).
5. A five per cent premium was added to the cost of solar power generation on the Burnside Civic Centre as the roof is known to be a complex workspace due to its architectural design.

6. Lighting and gas system upgrades were modified as some were already programmed as business-as-usual, while others were known to have additional complexities.

ATTACHMENT C

Assumptions in the Burnside CARES Tool

The CARES Tool is dynamic and can be updated regularly as there are changes in Federal or State policies, external investment in renewable energy, realisation of grants or subsidies, improvements in technologies, or other external influences that cannot be predicted. The current assumptions have been made based on available evidence, including past trends and expert analysis and commentary. **Each assumption is applied equally to every scenario**, including:

- 1. Consumer Price Index (CPI)**

CPI has been accounted for in all relevant purchases. For example, all energy efficiency measures and solar power generation have CPI increases applied, based on the year they are installed. Further, CPI increases have been applied to the cost of purchasing carbon offsets and the ongoing costs of maintaining solar arrays (all these costs are expected to rise over time). CPI assumptions are based on Council's Long-Term Financial Plan.
- 2. Interest Rates**

The cost of interest is factored into the scenarios (i.e. all investment would be funded through borrowings). Savings are used to repay borrowings, except for scenario 2. Interest rate assumptions are based on Council's Long-Term Financial Plan.
- 3. Electricity prices**

The price of electricity is impossible to predict and is dependent on public and private investment plus the policy settings at State and Federal levels. Assumptions are based on current policy settings and a review of available commentary. Prices are expected to increase marginally in the short term before steadying and then increasing in the long term. If prices increase faster than assumed, then greater financial savings will be achieved through Scenarios 3, 4 and 5. Thus, these scenarios are conservative in their estimates of savings.
- 4. Grid improvements to emissions factors**

As presented in Scenario 1, even if Council takes no action there will be small reductions in carbon emissions over time. Emissions become slightly lower each year for two reasons. First, the electricity purchased from the grid is becoming cleaner as more renewable electricity is produced in Australia. Second, there are ongoing improvements in energy efficiency at Council facilities as part of typical office and building upgrades.
- 5. Cost of offsetting carbon emissions per tonne**

Like other assumptions, this cost is impossible to predict. However, recent trends and available commentary have been reviewed to construct reasonable assumptions. If the cost of offsets does not increase as fast as assumed, Scenarios 2,3,4 and 5 will all become less costly. Conversely, if the cost of offsets increases faster than assumed, Scenarios 2,3,4 and 5 will all become more costly. Scenario 2 has by far the most exposure to the cost of offsets.
- 6. Reductions in efficiencies in solar power generation**

Over time, solar panels become less effective. This loss of efficiency has been built into all scenarios with solar power generation. Solar panels lose around 3% efficiency in their first year and then 0.7% per additional year. This loss of efficiency has been accounted for in both power generation capacity and cost savings.
- 7. Costs of maintenance of solar arrays (per kW)**

Two costs have been assumed and included in all scenarios with solar power generation. First, the cost of replacing inverters after ten years. Second, the cost of cleaning panels each year.

8. **Lag in installation of new measures**

While investment in infrastructure may be planned for a specific year, it is impossible for that infrastructure to become active on the first day of the financial year. There is always a lag while the infrastructure is installed. This lag has been accounted for in all relevant scenarios. For example, new infrastructure has only half of its potential impact in the year it is installed.

ATTACHMENT D

Measures undertaken under Scenarios 3 and 4

*The costs and savings presented in this table are current (2020/21) costs and savings. These costs and savings are adjusted each year in the modelling of each scenario in the Burnside CARES Tool (based on CPI, electricity prices and other assumptions presented in Attachment C).

Year	Site/Measure/quantity	Annual energy saving (kWh)	Annual cost saving (\$)	Annual Reduction (tonnes CO ₂ -e)	Project cost estimate (\$)	Simple payback (years)	Solar PV system size (kW)
1	Regal Theatre: air conditioning upgrade (already funded as a building upgrade)	35,000	\$12,000	19	Already budgeted	14.6	
1	Swimming Centre: update domestic hot water pump control	10,000	\$1,500	5	No cost	0.0	
2	Implementation of the Burnside Carbon Offset Scheme (B-COS) – carbon footprint reductions are adjusted within the scenario modelling as other measures are implemented (Scenario 4 only)						
2	Swimming Centre: replace boiler with electric heat pump	-	\$40,000	75	\$145,000	7.5	
2	Council Depot: hot water systems management	1,100	\$300	1	\$250	0.8	
2	7 fleet vehicles (covers the premium cost on hybrid vehicles)		\$6,172	12	\$14,000	2.3	
3	Solar array at Depot (Glynburn Road)	86,000	\$30,800	46	\$87,500	2.8	70
3	Solar array at Regal Theatre	52,000	\$12,222	28	\$46,222	3.8	40
3	Swimming Centre: reduce night pump flow rates	32,500	\$4,500	17	\$10,000	2.2	
3	7 fleet vehicles (covers the premium cost on hybrid vehicles)		\$6,172	12	\$14,000	2.3	
4	Solar array at Civic Centre	137,900	\$27,800	73	\$129,938	4.5	99
4	Council Depot: lighting upgrade	4,150	\$2,100	2	\$10,500	5.0	
4	Solar array at Regal Theatre house	3,911	\$1,401	2	\$3,750	2.7	3
4	Solar array at Dulwich Community Centre	3,911	\$1,401	2	\$3,750	2.7	3
4	Regal Theatre: refrigeration upgrade	2,200	\$700	1	\$3,000	4.3	
4	7 fleet vehicles (covers the premium cost on hybrid vehicles)		\$6,172	12	\$14,000	2.3	
5	Civic Centre: new Building Management System (air-conditioning management)	81,000	\$14,000	43	\$127,600	9.1	
5	Solar array at Depot (Conyngham Street)	13,038	\$4,669	7	\$12,500	2.7	10
5	Civic Centre replace storage electric hot water systems	5,500	\$1,000	-	Business as usual at this point	8.0	
5	Additional energy efficiency measures: Pepper Street Gallery	3,412	\$1,249	3	\$9,264	7.4	
5	Additional energy efficiency measures: Regal Theatre House	943	\$345	1	\$2,560	7.4	
5	7 fleet vehicles (covers the premium cost on hybrid vehicles)		\$6,172	12	\$14,000	2.3	
6	Solar array at Glenunga Hub	52,150	\$18,677	28	\$50,000	2.7	40
6	Solar array at Pepper Street	26,075	\$9,339	14	\$25,000	2.7	20
6	Additional energy efficiency measures: Swimming Centre	3,465	\$1,269	3	\$9,408	7.4	
6	Additional energy efficiency measures: Glenunga Hub	2,036	\$746	2	\$5,527	7.4	
6	Additional energy efficiency measures: Dulwich Centre	760	\$278	1	\$2,062	7.4	
6	7 fleet vehicles (covers the premium cost on hybrid vehicles)		\$6,172	12	\$14,000	2.3	
7	Solar array at Swimming Centre	75,000	\$14,500	40	\$75,000	5.2	60
7	7 fleet vehicles (covers the premium cost on hybrid vehicles)		\$6,172	12	\$14,000	2.3	
8	Civic Centre lighting upgrade	10,400	\$3,750	6	\$40,500	5.4	
8	7 fleet vehicles (covers the premium cost on hybrid vehicles)		\$6,172	12	\$14,000	2.3	
9	7 fleet vehicles (covers the premium cost on hybrid vehicles)		\$6,172	12	\$14,000	2.3	
10	7 fleet vehicles (covers the premium cost on hybrid vehicles)		\$6,172	12	\$14,000	2.3	
10	Purchase offsets for all remaining emissions						

ATTACHMENT E

Comparison of scenarios (annual investment balances)

The Figures below present the annual impacts of each Scenario for comparison. The Figures are all formatted on the same scales so that they can be readily compared.

Legend for all following Figures:

