Town of CANMORE

Climate Emergency Action Plan

Financial Analysis

April 2024

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Purpose of This Document

This document summarizes the total and action-by-action projected costs, revenues, and savings associated with implementing the Low-Carbon Scenario modelled for Canmore's Climate Emergency Action Plan. It also provides an overview of some of the energy transition's broader economic impacts, such as its effect on jobs and household energy costs.

Disclaimer

Reasonable skill, care, and diligence have been exercised to assess the information acquired during the preparation of this analysis, but no guarantees or warranties are made regarding the accuracy or completeness of this information. This document, the information it contains, the information and basis on which it relies, and the associated factors are subject to changes that are beyond the control of the author. The information provided by others is believed to be accurate but has not been verified.

This analysis includes strategic-level estimates of capital investments and related revenues, energy savings, and avoided costs of carbon represented by the proposed Climate Emergency Action Plan. The intent of this analysis is to help inform project stakeholders about the potential costs and savings represented by Canmore's Climate Emergency Action Plan in relation to the modelled Business-as-Planned Scenario. It should not be relied upon for other purposes without verification. The authors do not accept responsibility for the use of this analysis for any purpose other than that stated above and do not accept responsibility for any third-party use, in whole or in part, of the contents of this document.

This analysis applies to the Town of Canmore and cannot be applied to other jurisdictions without further analysis. Any use by the Town of Canmore, its sub-consultants, or any third party, or any reliance on or decisions based on this document, are the responsibility of the user or third party.

Overview

This analysis describes the projected costs (capital investment), returns (operational and maintenance savings, energy savings, carbon cost savings, and revenues), and job creation opportunities associated with implementing the recommended Low-Carbon Scenario outlined in Canmore's Climate Emergency Action Plan (CEAP). The analysis also calculates marginal abatement costs, which identify the net cost per tonne of greenhouse gas (GHG) emissions reduced.

Five costs and returns categories are included in this financial analysis:

1. Capital costs
2. Maintenance costs and savings
3. Revenues
4. Energy costs and savings
5. Carbon cost savings

This analysis does not include the administrative, education, and marketing costs associated with actions nor does it include the costs or avoided costs associated with adding the central energy infrastructure projected to be required with population growth and business-as-planned energy use. Similarly, any land purchases for renewable energy infrastructure are excluded.

In addition, where defensible cost and returns cannot be identified for particular actions, they are excluded from the financial analysis. As a result, the following actions from the CEAP's Low- Carbon Scenario are not included in this financial analysis:

- Installation of the transit infrastructure required in Canmore to support an increase in the transit mode share and
- Installation of infrastructure and large-scale renewable energy outside the Canmore boundary..

Table 1 highlights the key findings from the financial analysis of the Low- Carbon Scenario recommended in the CEAP. A glossary of terms is included in the summary.

Table 1. Summarized financial reporting.

Financial Metric	Measurement Unit	Key Results
Total Incremental (Additional over BAP) Investment (2024–2050)	2022 dollars, cumulative	$843 million
Total savings (2024–2050)	2022 dollars	$1.219 billion
Total revenues (2024–2050)	2022 dollars	$1.917 billion
Net return of the investments from 2024 to 2050 (3% discounting rate)	2022 dollars	$2.145 billion
Top marginal abatement cost curve (MACC) actions	Marginal abatement cost/savings ($/tonne CO2e)	1. Increasing transit use and car-share use 2. Retrofitting commercial buildings 3. Investing in renewable energy 4. Electrifying transit 5. Adding rooftop solar generation
Employment	Person-years of employment	5,859 person-years of employment (the equivalent of over 217 net new full-time jobs)
Annual savings on household energy expenditures	2022 dollars	$823 in savings annually by 2050 compared to costs in the Business-as-Planned Scenario

Key Financial Concepts

The following key concepts are used to analyze the economic and financial impacts of the CEAP.

Costs Are Relative to the BAP

This financial analysis tracks the projected costs and savings associated with low-carbon measures that are above and beyond the assumed business-as-planned costs. The financial assumptions used to develop the analysis were shared with municipal government staff for input and revision.

Discount Rate

The discount rate is the baseline growth value an investor places on their investment dollar. An investor considers a project financially beneficial if it generates a real rate of return equal to or greater than their discount rate.

An investor's discount rate varies with the type of project, duration of the investment, risk, and scarcity of capital.

Some argue that the evaluation of climate change mitigation investments should be based on the application of a very low or even zero discount rate to reflect the value to society. This approach is referred to as applying a social discount rate. A social discount rate is the discount rate applied for comparing the value to society of investments made for the common good, and as such, it is inherently uncertain and difficult to determine.

In this project, we evaluate investments in a low-carbon future with a 3% discount rate.[1]

Net Present Value

The net present value (NPV) of an investment is the difference between the present value of the capital investment and the present value of the future stream of savings and revenue generated by the investment.

Five aggregate categories are used to track the financial performance of the low-carbon actions in this analysis: capital expenditures, energy savings (or additional costs), carbon

[1] Treasury Board of Canada, 'Policy on Cost-Benefit Analysis', policy effective as of September 2018, online: www.canada.ca/en/government/system/laws/developing-improving-federal-regulations/requirements-developing-managing-reviewing-regulations/guidelines-tools/policy-cost-benefit-analysis.html

cost savings, operation and maintenance savings, and revenue generation associated with renewable energy production facilities and some transit actions. Carbon cost savings assume that the carbon price will increase in line with current federal plans, reaching $170/tonne CO2e in 2030 and holding constant thereafter.

Administrative costs associated with implementing programs, as well as any energy system infrastructure upgrades that may be required, are not included, including associated land purchases. Similarly, the financial analysis does not include the broader social costs that are avoided from mitigating climate change.

Marginal Abatement Cost

The marginal abatement cost of an action is the estimated cost for that action to reduce one tonne of GHG emissions, and it is calculated by dividing the action's net present value by the total GHG emissions it reduces (tCO2e) over its lifetime. For example, if a project has a net present value of $1,000 and generates 10 tCO2e of savings, its abatement cost is $100 per tCO2e reduced. The abatement cost is marginal because it captures the incremental cost above the business-as-planned activity and cost.

Amortization

The costs of major capital investments are typically spread out over a period of time (e.g., a mortgage on a house commonly has a 25-year mortgage period). Amortization refers to the process of paying off capital expenditures (debt) through regular principal and interest payments over time. In this analysis, we have applied a 25-year amortization rate to all investments, where noted.

A Note on CEAP Motivation and Co-Benefits

The direct financial impacts of the CEAP provide important context for local decision-makers; however, it is important to note that these impacts are a secondary motivation for undertaking actions that reduce GHG emissions. First and foremost, GHG emissions reductions are a critical response to the global climate crisis.

Note that most measures included in the CEAP provide additional benefits to the community, such as cleaner air and positive health outcomes. These benefits are not captured in this analysis.

Financial Analysis Results

The investments required to implement the Low-Carbon Scenario outlined in the CEAP yield a positive financial return (net return) of $2 billion across the community. Capital investments of $840 million across various sectors in the community are required between 2024 and 2050 to implement the CEAP and generate the stated return.

The overall returns translate to a weighted average return of $371 per tonne of CO2e reduced.[2] Table 2 summarizes the net present value and the marginal abatement cost by action and for the overall Low-Carbon Scenario recommended in the CEAP. All measures with a positive abatement cost, or net financial loss, are highlighted in purple, and all measures with a negative abatement cost, or net financial return, are highlighted in green.

The most expensive action in comparison to GHG emissions reductions is increasing active mode trips. This is because the cost of installing trails and active transportation infrastructure is high relative to the reduction in GHGs, but the community benefits are a key driver for rationalizing the expansion of active transportation infrastructure. The next most expensive actions are residential retrofits and the conversion to heat pumps for residential heating and cooling. The dispersed nature of these investments makes them labour-intensive, with smaller units needed for residences compared to those needed in commercial buildings.

Investing in large-scale renewable electricity has the largest impact on GHGs and can save $542 per tonne of CO2e avoided.

[2] This average is weighted based on the idea that actions that reduce more tonnes of GHGs influence the average more than actions that reduce less tonnes of GHGs. The net present value of the measures includes credit for the avoided costs of carbon ($170/tonne CO2e by 2050); if that credit were excluded, the net savings per tonne of GHG mitigated would be correspondingly lower.

Table 2. Net present value and marginal abatement costs by action.

Low-Carbon Action	Cumulative Emissions Reduction (kt CO2 eq)	Net Present Value	Marginal Abatement Cost ($/t CO2 eq)
Heat Pumps in New Residential	45.57	$17,559,576	$385
New Residential Building Codes	291.64	-$115,763,168	-$397
ICI Equipment in New Buildings	111.04	$73,126,152	$659
New Commercial and Institutional Building Codes	325.42	-$147,638,532	-$454
Residential Retrofits	222.09	$22,306,385	$100
Residential Equipments in Retrofits	326.74	$125,775,478	$385
Commercial Retrofits	201.74	-$128,359,104	-$636
Commercial Equipment in Retrofits	112.23	-$9,342,586	-$83
Rooftop Solar	138.38	-$73,143,406	-$529
Electrify Transit	18.17	-$10,643,004	-$586
Electrify Municipal Fleet	1.45	$454,697	$314
Zero-Emissions Heavy-Duty Commercial Fleet	265.48	-$49,764,879	-$187
Increase Active Mode Trips	6.32	$27,881,813	$4,409
Increase Transit Trips	189.55	-$221,638,205	-$1,169
Car Share	26.39	-$32,373,907	-$1,227
Waste Actions	294.52	-$4,078,432	-$14
Water Conservation	6.77	-$860,252	-$127
Wastewater Treatment Plant Upgrades	59.99	$11,096,471	$185
Municipal Solar Canopies	23.35	-$8,622,525	-$369
Municipal Green Electricity Procurement	98.79	$9,241,786	$94
Green Aviation	1.29	-$120,775	-$93
Electrify Visitor Transportation Fleet	10.87	-$5,303,775	-$488
Large-Scale Renewable Installations	2,999.54	-$1,624,435,395	-$542

Marginal Abatement Cost

Marginal abatement costs are the estimated costs for each action to reduce one tonne of GHG emissions, and they are calculated by dividing each action's net present value by the total GHG emissions it reduces (tCO2e) over its lifetime. For example, if a project has a net present value of $1,000 and generates 10 tCO2e of savings, its abatement cost is $100 per tCO2e reduced.

The marginal abatement cost curve (Figure 1) illustrates the individual marginal abatement cost of each action included in the CEAP. Note that although the presentation of the cost curve implies that each action has a unique marginal abatement cost, individual actions cannot be neglected without impacting the overall financial and GHG reduction outcomes of the broader set of actions. For example, if building retrofits are not completed, the amount of renewables (via power purchase agreements) required to meet the targets laid out in the CEAP will increase drastically, which, among other practical concerns, will change the financial cost of this action. Similarly, delaying actions will impact the savings that households and businesses can achieve through the actions.

The marginal abatement cost curve provided useful insights when developing the CEAP, particularly the recommendations for implementation. For example, it demonstrates which actions will be necessary but costly and may not be financially appealing for the private sector to undertake on its own. This highlights where subsidies and incentives, or in some cases, regulations, from the municipal government or other funders or regulators may be powerful tools to spur action. The cost curve will remain useful as implementation gets underway, which includes planning and launching programs, policies, and initiatives and reviewing and adjusting them over time based on changing conditions and lessons learned. However, note that this analysis is a snapshot of current assumptions, such as carbon tax rates and pricing changes driven by market economics, which are expected to change over time. The financial analysis is particularly sensitive to changes in energy prices given that natural gas is much cheaper relative to electricity at this time. An increase in natural gas prices without a corresponding increase in electricity prices, and vice versa, could drastically change the financials.

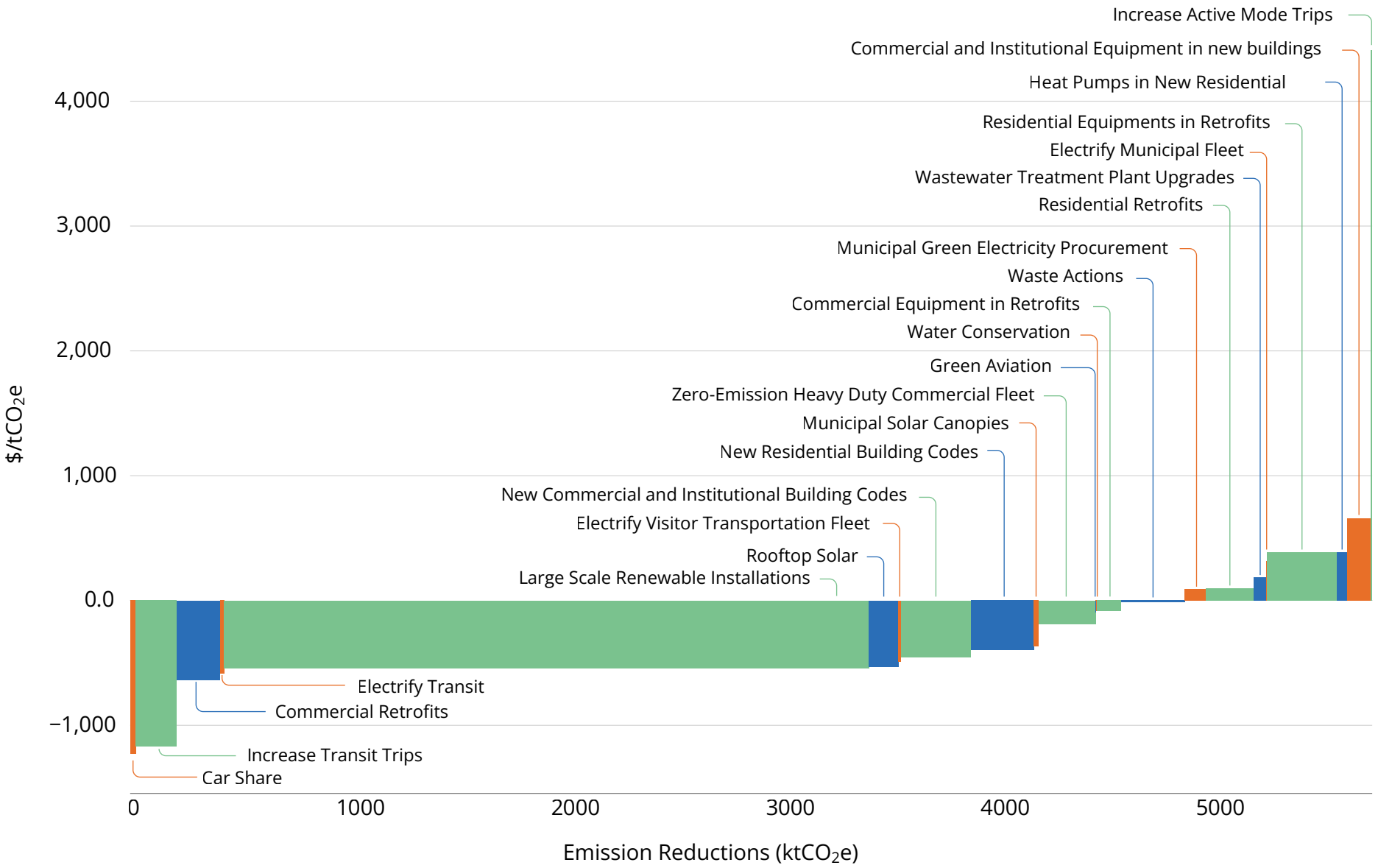

Figure 1. Marginal abatement cost curve for the actions included in the CEAP.

Present and Net Present Value

The majority of the actions recommended in the CEAP have positive net present values, as does the entire program of actions, or the overall Low-Carbon Scenario. Figure 2 shows the present value of the major components of the CEAP, including capital investments, operations and maintenance savings, energy cost savings, avoided costs of carbon, and revenue. After discounting at 3%, the capital investments in the program have a present value of $843 million, and the savings, the avoided cost of carbon, and the revenue have a total return of $1.1 billion by 2050 and a net return of $2.1 billion.

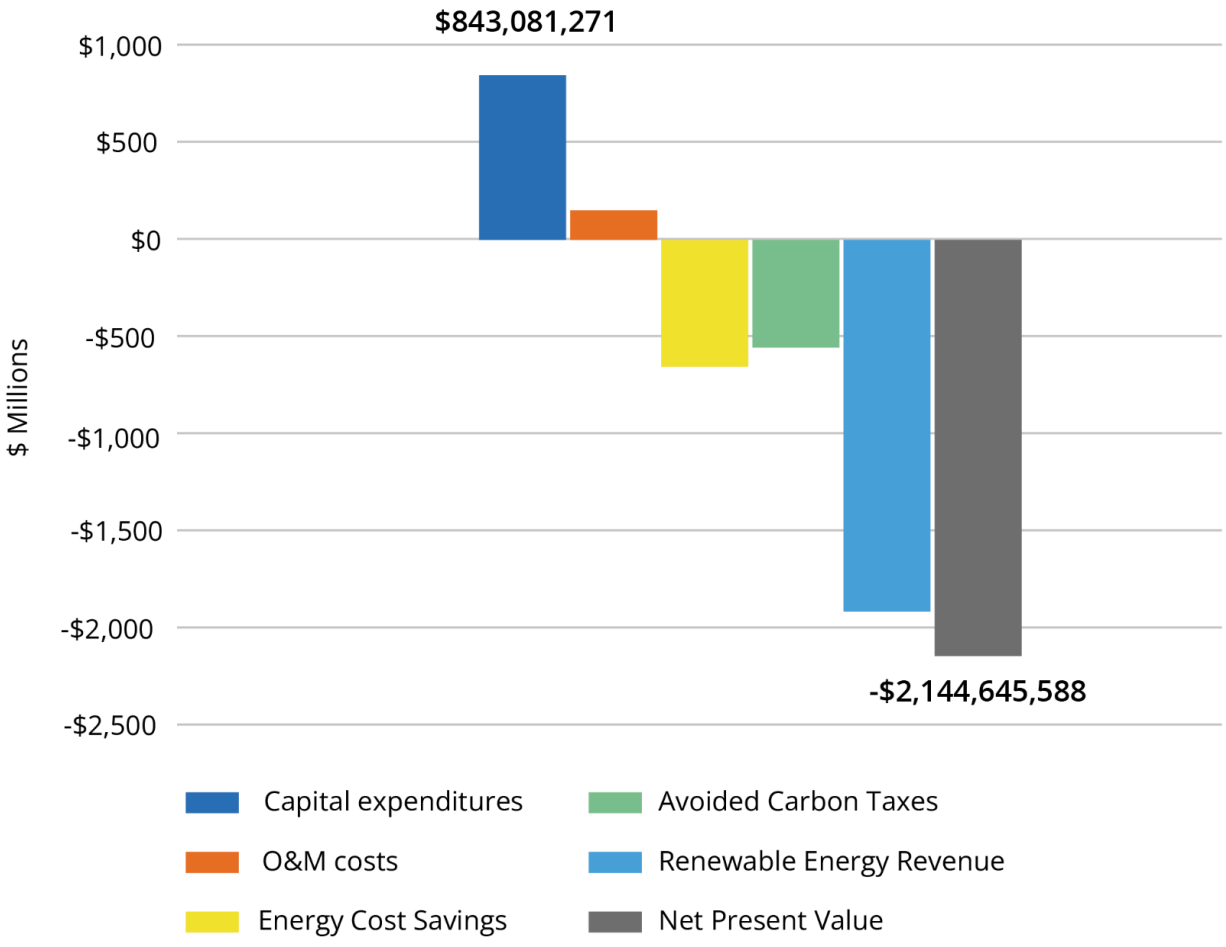

Figure 2. Present values of the Net-Zero Scenario costs and the savings and net present value of the Net-Zero Scenario.

Cash Flow Analysis

The annual costs, savings, and revenue associated with fully implementing the actions in the CEAP are shown in detail in Figure 3, with capital expenditures shown in full in the years in which they are incurred. As is characteristic of net-zero transitions, the capital expenditures in the early years of the transition are significantly greater than the savings and revenues generated, but by 2028, the annual benefits exceed the annual investments and the cumulative benefits are greater than the cumulative costs.

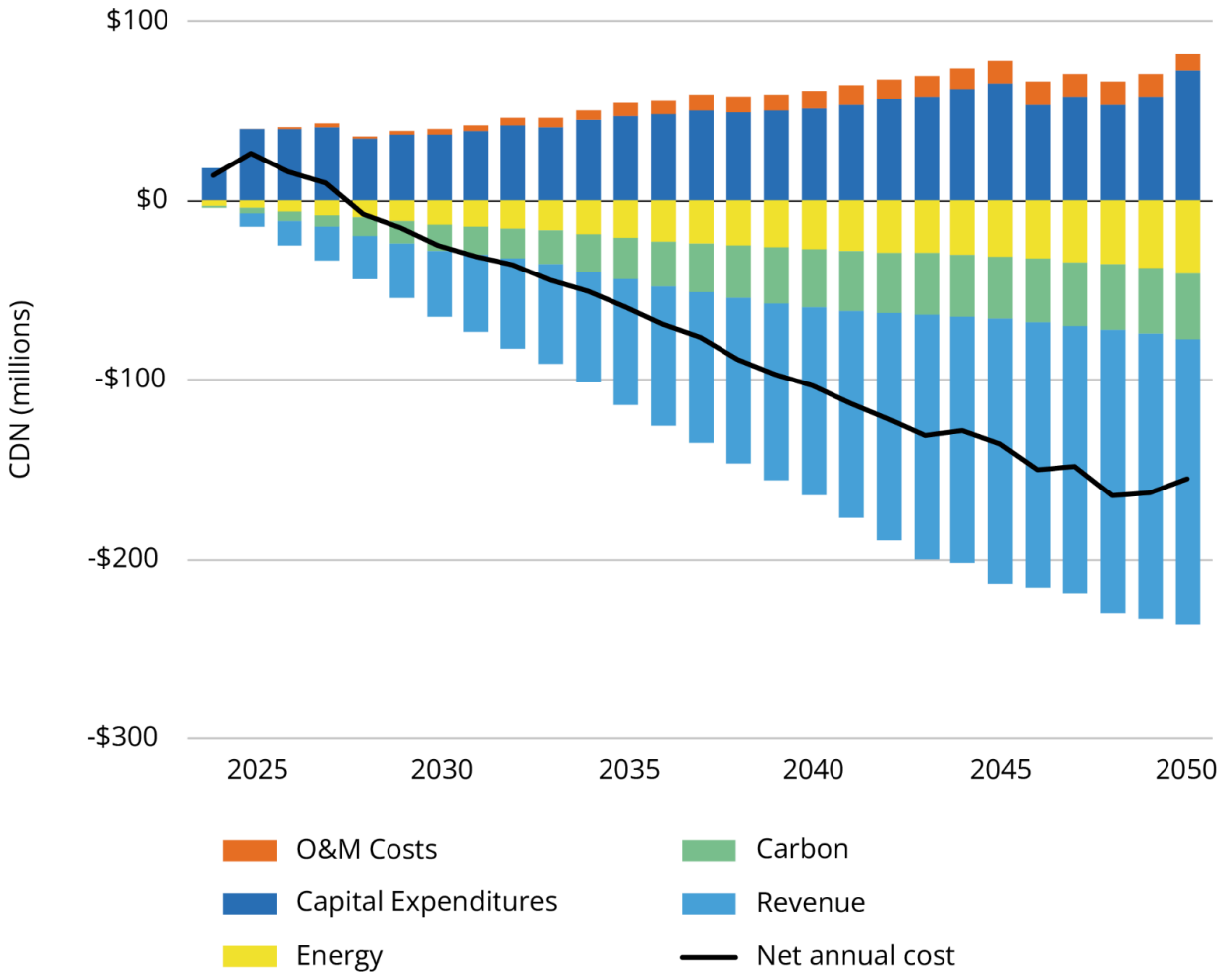

Figure 3. Year-over-year Low-Carbon Scenario investments and returns.

Figure 4 presents the same costs and benefits, but with the capital expenditures amortized over 25 years at 3%. With this approach, which presumably better reflects actual approaches for financing the transition, the savings and revenue generation throughout the scenario are greater than the annualized capital payments. After 2050, the benefits and revenues continue, resulting in continuous growth in the net annual benefit.

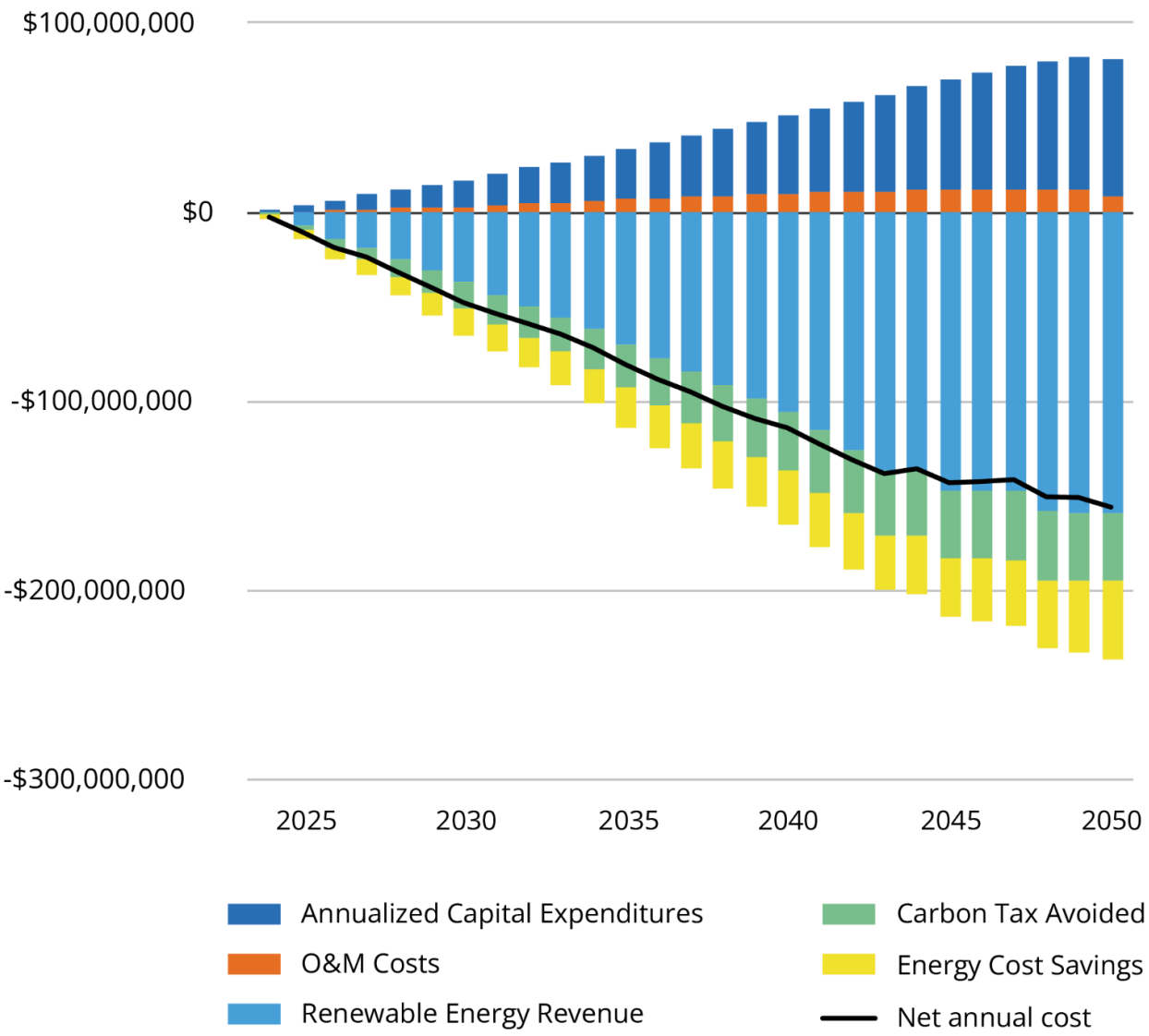

Figure 4. Year-over-year Low-Carbon Scenario investments and returns, with capital investments annualized.

Cost Savings for Households

Household energy expenditures are projected to decline in both the Business-as-Planned Scenario and the Low-Carbon Scenario. The baseline financial modelling and assumptions record an average household energy cost of over $3,987 in 2022. In the Business-as-Planned Scenario, household energy costs are expected to decline to $3,400 by 2050. Expenditure decreases can be partly attributed to vehicles becoming more efficient due to national fuel efficiency standards and the transition to electric vehicles that will happen in the Business-as-Planned Scenario, and because of decreased heating requirements as the climate becomes milder due to climate change. These factors outweigh the increasing carbon tax being levied on fossil-fuel-derived sources of energy.

The Low-Carbon Scenario involves shifting away from natural gas, diesel, and gasoline to electricity, which is currently more expensive than natural gas in Canmore. The increased cost of electricity is offset by the increased efficiency of homes and electric vehicles, as well as the avoided carbon price for fossil fuels.

In the Low-Carbon Scenario, an average household in Canmore is expected to spend just over $2,500 on household energy costs by 2050. This is 25% less per household than the 2050 cost in the Business-as-Planned Scenario and 36% lower than 2022 energy costs.

Between 2022 and 2050, the Low-Carbon Scenario will save the average Canmore household over $14,000 in gross cumulative household energy expenditures, not including the cost to undertake efficiency improvements.

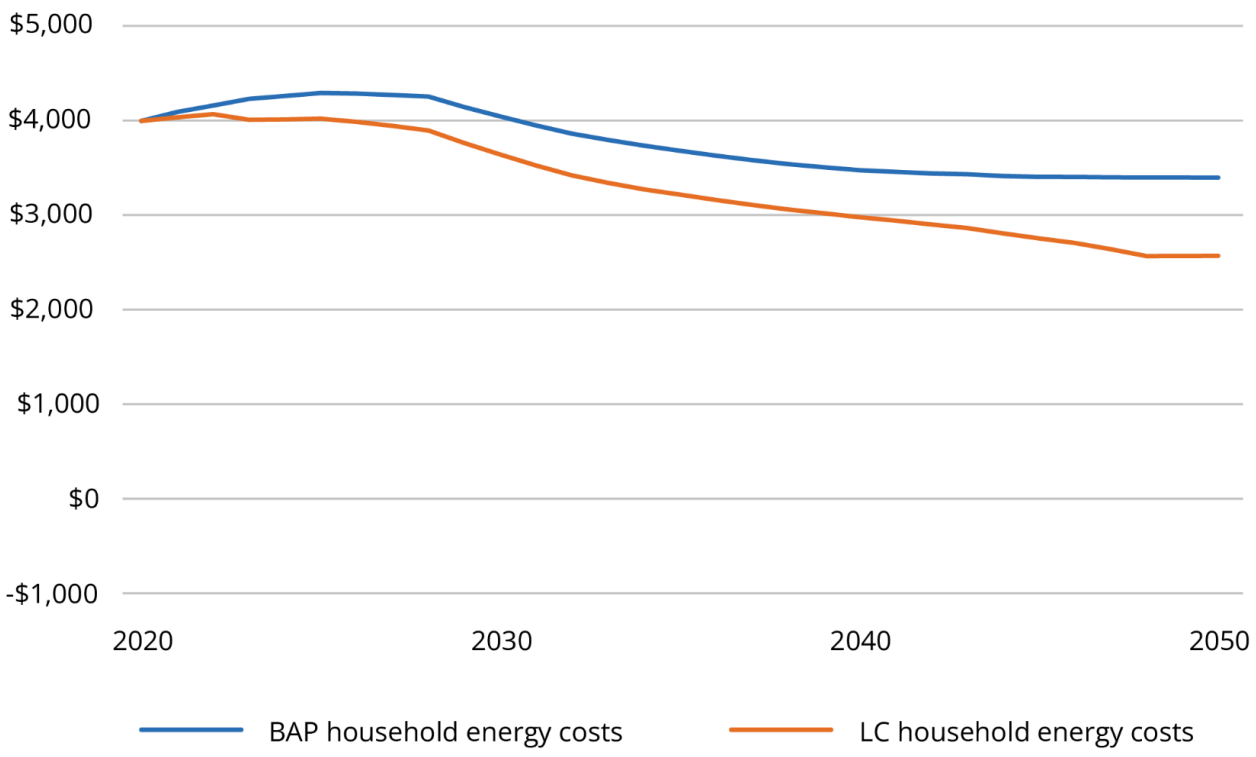

Figure 5. Household energy costs in the BAP and LC scenarios.

New Job Opportunities

Transitioning to a low- or zero-carbon economy is expected to impact labour markets in the following ways:

1. Additional jobs will be created in emerging sectors.
2. Some employment will be shifted (e.g., from fossil fuels to renewables).
3. Certain jobs will be reduced or eliminated.
4. Many existing jobs will be transformed and redefined.

According to the direct job multipliers from Census Canada, implementing the CEAP will create 5,800 person-years of employment between 2024 and 2050. That is equal to an average of 217 full-time equivalent jobs per year above the jobs that would be created in the Business-as-Planned Scenario. These jobs are primarily related to renewable energy installations, investments in residential retrofits, and investments in commercial retrofits.

There is a larger increase in jobs per year above the Business-as-Planned Scenario between 2022 and 2035 than in the later years of the Low-Carbon Scenario. This is due to Canmore's ambitious greenhouse gas emissions target and the resulting Low-Carbon Scenario that requires many actions to be completed by 2035. The actions happening early on in the scenario require infrastructure and renovations that will create jobs.

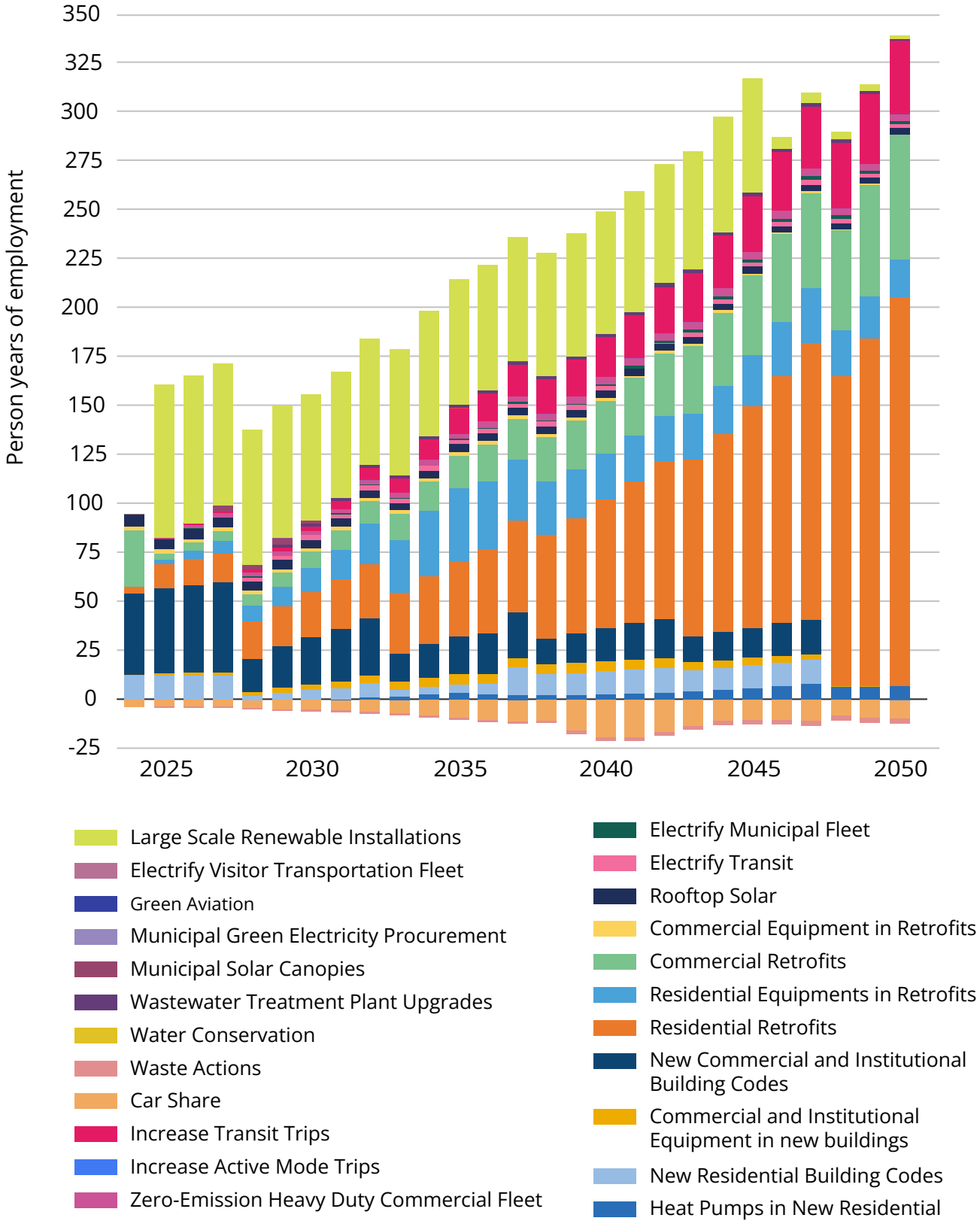

Figure 6. Additional person-years of employment associated with CEAP actions.


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