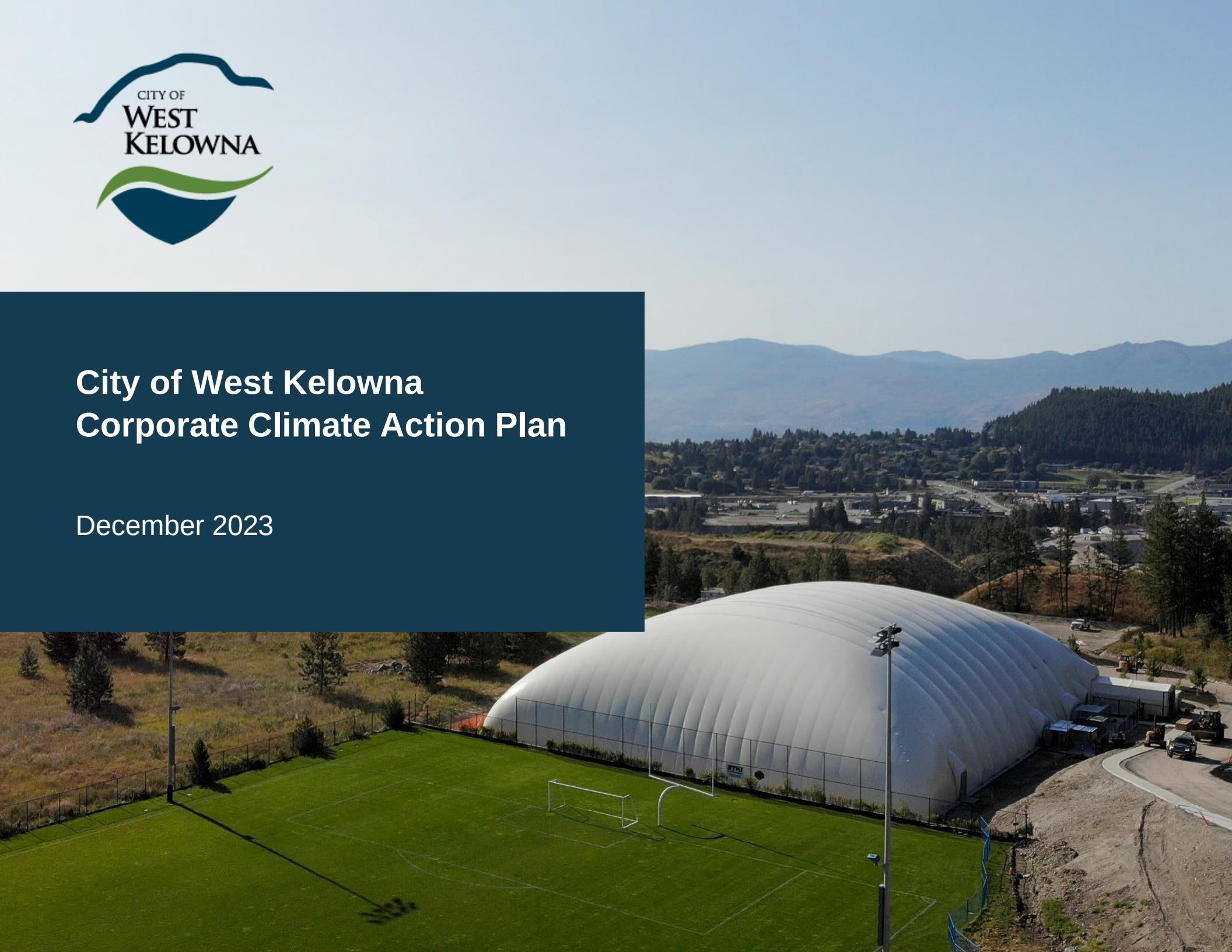
City of West Kelowna
Corporate Climate Action Plan

December 2023



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EXECUTIVE SUMMARY

Context

The climate is changing in British Columbia (BC) as it is around the world. The average global temperature has already increased by 1 degree Celsius (°C) above pre-industrial levels. The United Nations Intergovernmental Panel on Climate Change (IPCC) is urging a limit of 1.5°C warming, which would require global emissions to be net-zero by 2050. A key part of a local government's role in dealing with climate action is to reduce emissions caused by its own assets; this helps meet its requirements as a signatory of the BC Climate Action Charter. The City of West Kelowna became a signatory to the BC Climate Action Charter shortly following incorporation in 2007.

The main purpose of this report is to compile an energy and emissions inventory on all corporate assets, and to develop a plan that identifies the best opportunities to reduce emissions and costs from corporate operations. The City of West Kelowna has signed the Climate Action Charter, committing the City to work towards being carbon-neutral in its own operations. Developing a Climate Action Plan was set as a priority in the City of West Kelowna's 2022 – 2026 Council Strategic Priorities. This Corporate Climate Action Plan was developed in consultation with the City staff and input from the Council and will provide Council and staff with the background information to implement key climate actions in the next five to seven years. Reducing corporate GHG emissions has several co-benefits including long-term cost savings, improved climate change resilience, and potential to improve services.
The corporate inventory in this Executive Summary and the body of this report is defined according to the Local Government Climate Action Program (LGCAP). Reporting on City of West Kelowna's total corporate emissions, as shown in the adjacent table, will be necessary for obtaining LGCAP funding.

The City of West Kelowna is not currently a member of Federation of Canadian Municipalities – International Council for Local Environmental Initiatives (FCM-ICLEI) Partners for Climate Protection (PCP) program. The main benefits of the PCP program are capacity building activities to support members in reducing local GHG emissions, and empowerment to take action against climate change through a five-milestone process. The City can use the PCP inventory and projections, which are included in Appendix B, to apply for PCP membership and meet 3 out of 5 milestones of the PCP program for corporate greenhouse gas management.

City of West Kelowna's 2022 GHG Emissions	
City Operations	2,064 tCO_2e
Contracted Services	437 tCO_2e
Total Emissions	2,501 tCO_2e

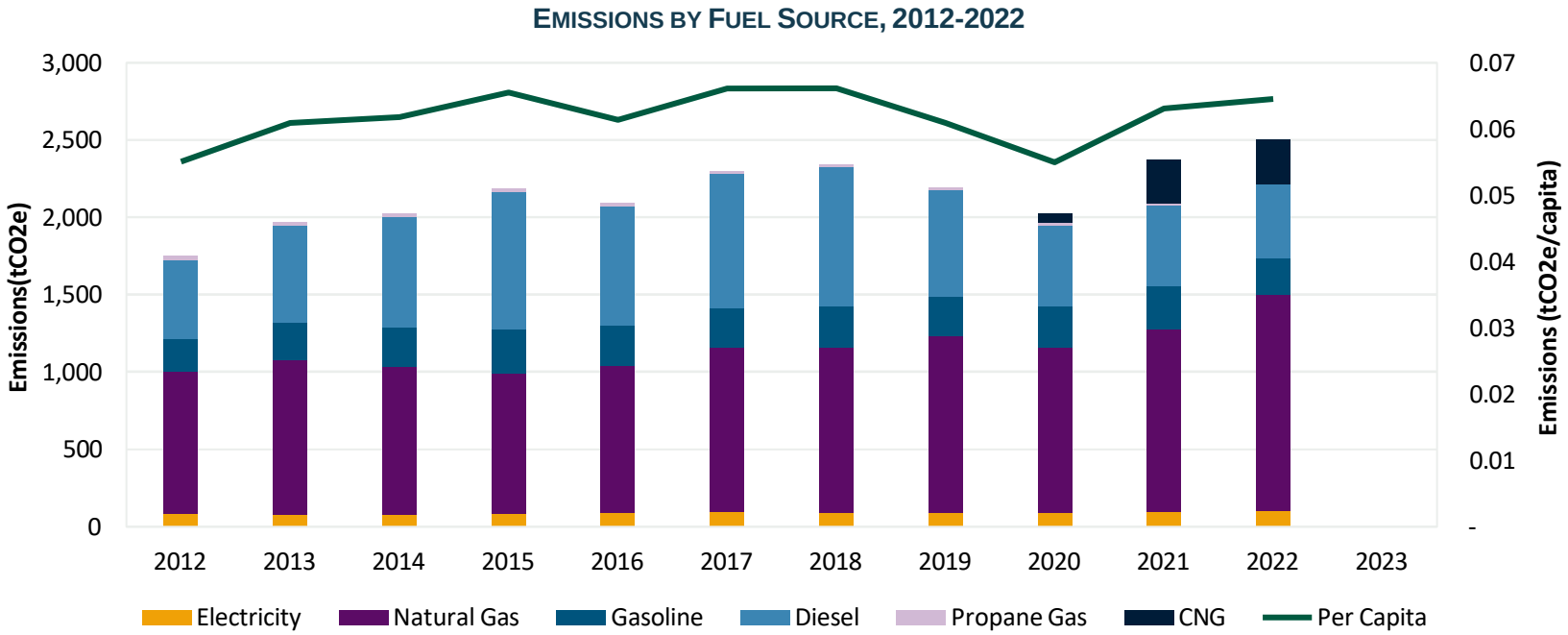
City of West Kelowna's Progress So Far

As detailed in the City's annual CARIP and LGCAP reporting, assessment reports, many energy efficiency and GHG reduction measures such as improvements in building energy efficiency, and acquisition planning to convert fleet to electric and hybrid as well as the climate resiliency actions have been implemented over the years by the City. Various actions have been outlined in Table 1.

City of West Kelowna's Current Emissions and Energy Expenditure

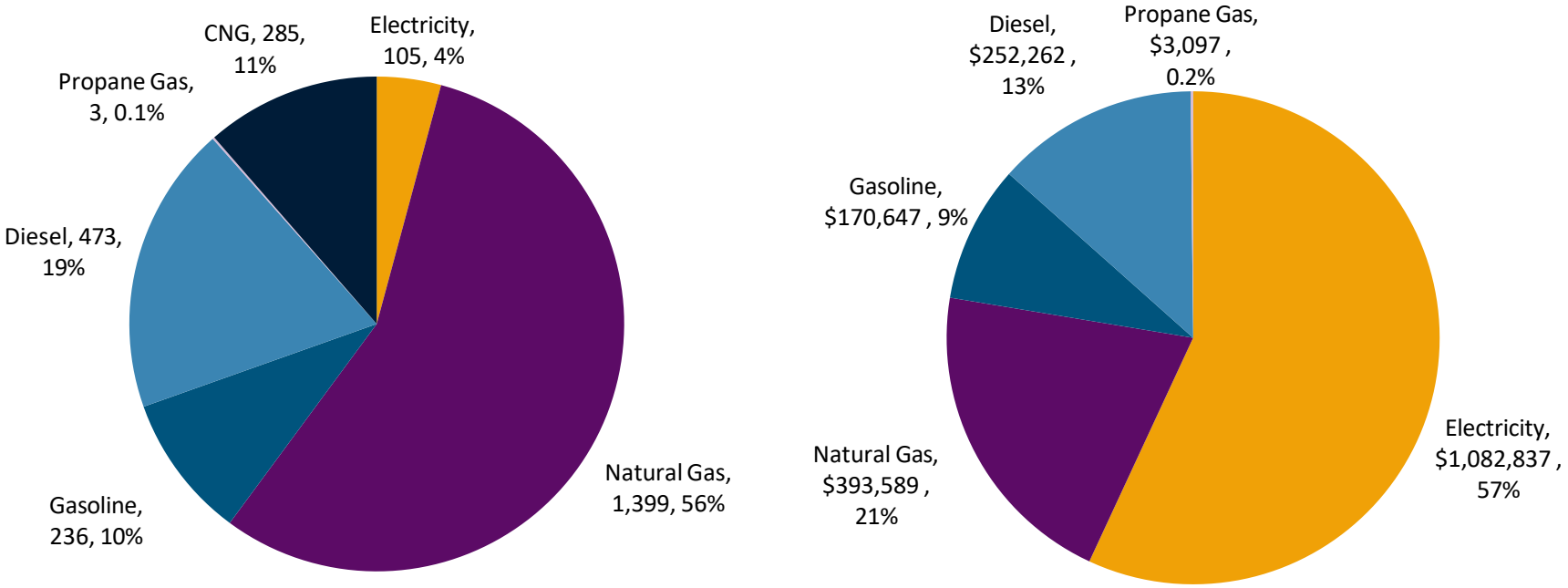
The City of West Kelowna's corporate emissions for 2012-2022 are shown below, sorted by fuel type.

The City of West Kelowna's natural gas usage contributes the most to their GHG emissions for every year. Diesel also contributed a significant portion of emissions. Overall, emissions have increased by 43% between 2012 and 2022. However, since the City of West Kelowna has experienced high population growth (22% increase from 2012), it is important to also consider per capita emissions. Since 2012, the per capita emissions have increased by 17%.

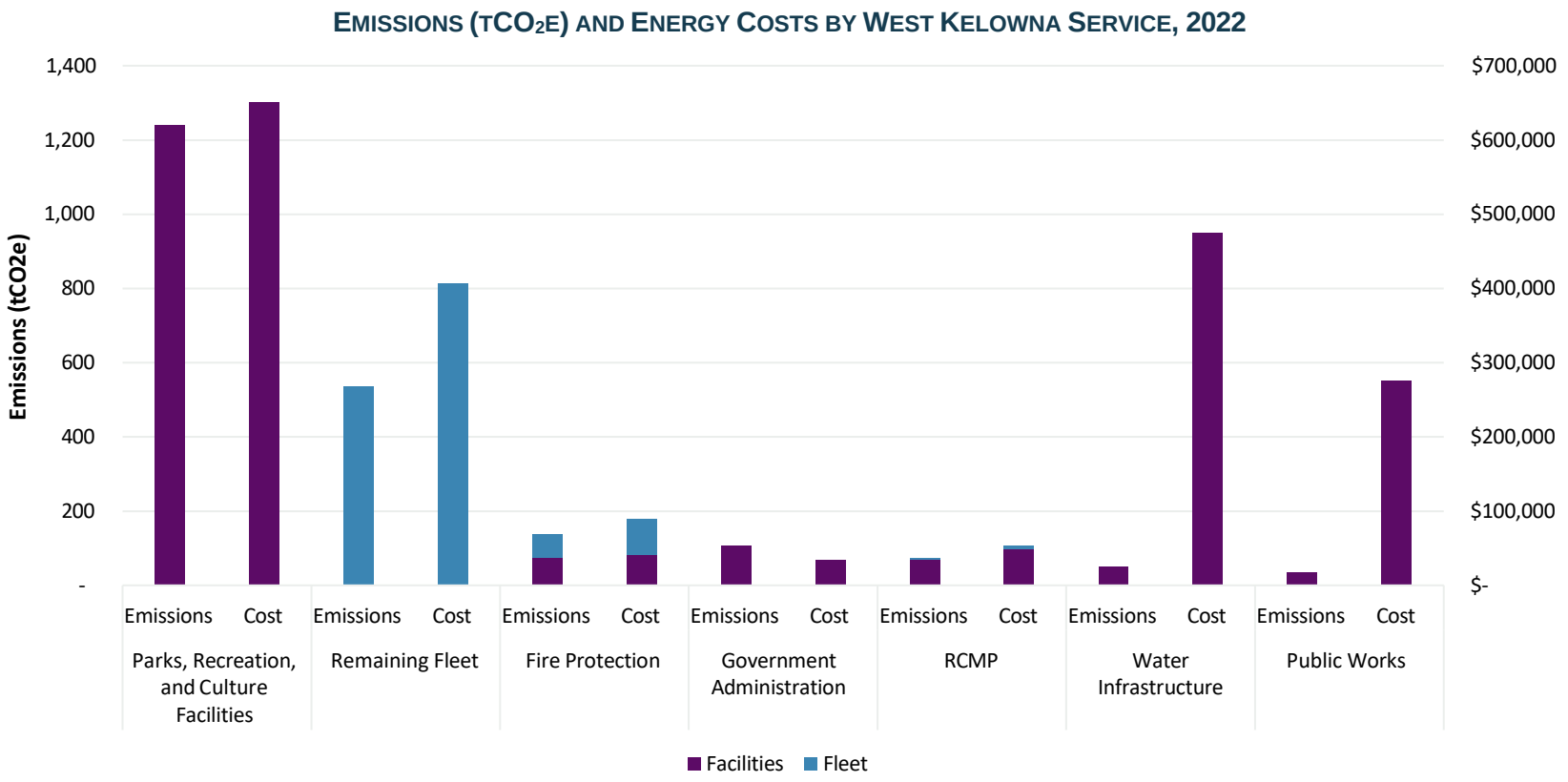


The charts below show the emissions and expenditures for 2022. Natural gas accounts for just over half of emissions while diesel produces the second highest portion at 19%. These two fuels combine for three-quarters of emissions but only a third of expenditures. Electricity is responsible for over half the costs, costing the City over a million dollars annually. It should be noted that contracted services are included as part of the emissions, but not expenditures as the City doesn't directly pay those fuel costs.

EMISSIONS (tCO_2E) AND ENERGY COSTS BY FUEL SOURCE, 2022



The inventory is also presented according to the City of West Kelowna Service categories, as shown below. Parks, Recreation, and Culture Facilities are the largest source of emissions (1,240 tCO2e), which is largely due to the three large recreation centres: Johnson Bentley Memorial Aquatic Centre, Royal LePage Place Arena & Jim Lind Arena, and West Kelowna Multi-Sport Centre. Parks, Recreation, and Culture Facilities are also responsible for the most energy expenditures ($651,000), followed by Water Infrastructure ($475,000) and the Fleet ($407,000). The high expenditures in the Water Infrastructure service are due to high electricity usage, a few large users being the Powers Creek Treatment Plant and pump stations at Lindley and Sunnyside.



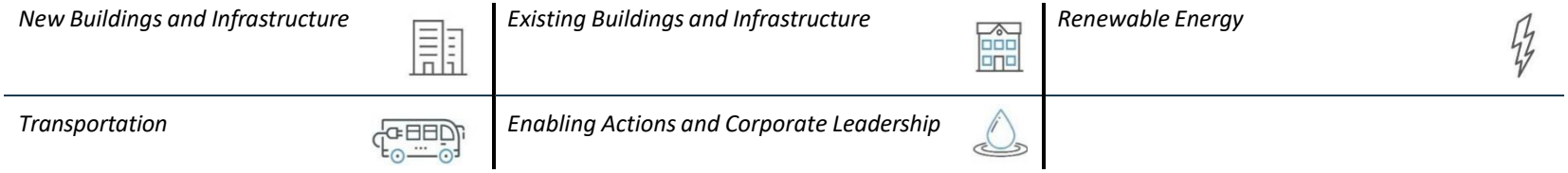
City of West Kelowna's Corporate GHG Target

Based on the emission projections and potential actions modelled as part of the plan development, it is advisable that the City considers adopting a short-term target of 30% reduction from 2022 level of emissions by 2030. It is also advisable to consider 80% reduction from 2022 level of emissions by 2050 as a long-term target.

What We Can Do: Recommended Climate Actions

Based on staff consultation and best practices, actions were identified to be implemented over the next five years. Actions fall under the following five categories.

1. ***New Buildings and Infrastructure:*** Improve energy performance and lower GHG emissions in ***new*** City buildings and infrastructure
2. ***Existing Buildings and Infrastructure****:* Improve energy performance and lower GHG emissions in ***existing*** City buildings and infrastructure
3. ***Renewable Energy****:* Increase the use of renewable energy
4. ***Transportation:*** Improve energy efficiency and reduce GHG emissions in the City's fleet
5. ***Enabling Actions and Corporate Leadership****:* Institutionalize the plan and demonstrate leadership in managing/reducing solid waste and water use



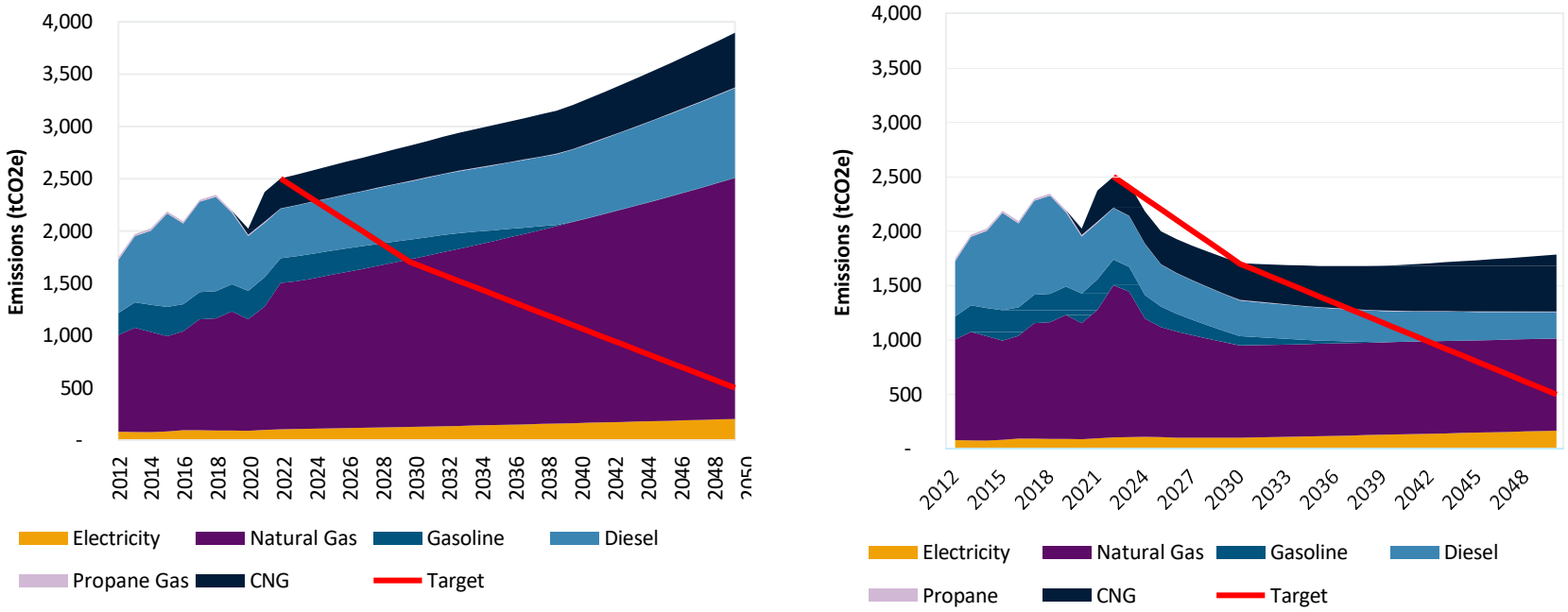
A detailed list of actions for implementation in the next 5 years is featured in this plan in **Appendix A**. The timeframe for implementation, department or position responsible for implementation, and possible partners or funding sources for each action is also noted.

Based on business-as-usual projections, GHG emissions are forecast to increase by 13% in 2030 and 56% in 2050 compared to 2022 levels. Costs are also forecasted to increase 21% by 2030 compared to 2022. Business as usual assumes no additional actions by the City but takes into account growing population (and hence additional assets), policies of higher levels of government, and other factors such as a warming climate.

By implementing the actions identified in this plan, total GHG emissions are expected decrease relative to 2022 by approximately 30% in 2030.

The business-as-usual emissions trajectory can be seen in the chart on the left, whereas the chart on the right shows the emissions trajectory if the actions contained in this Plan are implemented. The red lines on the charts show the City's GHG emissions reduction targets of 80% reduction by 2050 and 30% reduction by 2030, compared to the 2022 baseline. The year 2022 is an inventory year, whereas 2023 onwards are projections.

BUSINESS-AS-USUAL EMISSIONS AND MODELLED EMISSIONS FROM PROPOSED CLIMATE ACTIONS

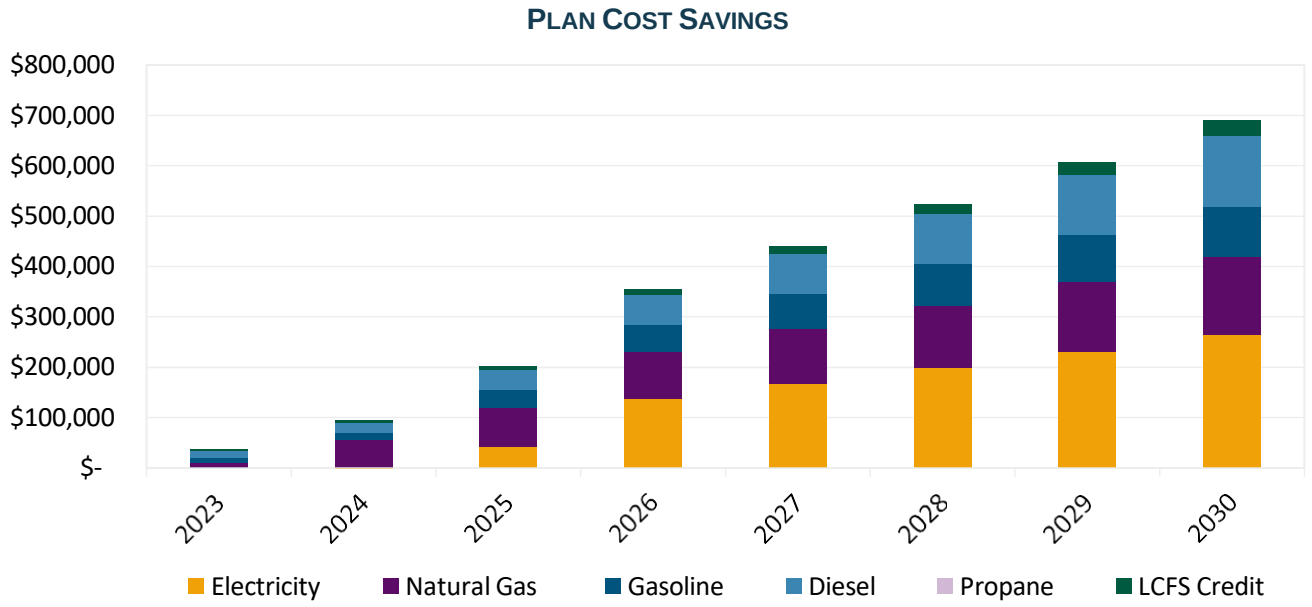


The planned actions are expected to drive the City's emissions below the target line until 2030, more work will need to be done to achieve the long-term goal of 80% reduction by 2050.

The top three actions that will achieve the largest reductions in GHG emissions up to 2030 are:

- Implement building energy retrofits recommended by building energy audits: approximately 350 tCO_2e
- Low carbon heating retrofits for buildings: approximately 200 tCO_2e
- Invest in EV's and EV charging stations: approximately 170 tCO_2e

In addition to GHG emissions savings, this Plan will result in energy cost reductions. The chart below shows that by 2030, the City could reduce its expenditure on energy by nearly $700,000 per year. It should be noted that these energy cost reductions do not necessarily translate into overall savings for the City since the implementation of most actions have costs associated with them.



Successful implementation of this Plan depends upon staff capacity and capital investment. Internal and external funding sources are identified in this plan and include the LGCAP funding allocation for climate action, allocation from operating budget, climate action revolving fund, Clean BC incentives, FortisBC incentives, BC Hydro incentives, and FCM's Green Municipal Fund.

It is advisable to renew this plan after five to seven years to evaluate implementation success and identify steps required by the City to continue making progress towards its short- and long-term targets.

Introduction

City's Role in Climate Action, & Benefits

What is a Corporate Climate Action Plan?

A Corporate Climate Action Plan (CCAP) is a corporate-wide plan to reduce energy and emissions from municipal operations and fleets. The CCAP focuses exclusively on energy and greenhouse gas emissions that are directly controlled by the City; it includes direct and indirect greenhouse gas emissions produced by the City as a result of its operations. It does not include GHG emissions that are a consequence of activities from sources not controlled or owned by the City (including third-party contractors, construction activities, businesses, or air travel) or those that occur outside West Kelowna's geographical boundary.

A CCAP is an important first step for a municipality to take when coordinating an approach to lower emissions that contribute to climate change and prepare for the impacts of extreme weather. It allows us to be strategic and effective so we can build co-benefits along the way and set the stage for future work and investment in climate action. Climate action consists of both reducing emissions, or ***mitigation***, and preparing for the impacts of a changing climate, or ***adaptation***. This plan focuses on mitigation, as a key part of the City's role in dealing with climate action to reduce emissions caused by its own assets. This also helps it to meet its requirements as a signatory of the BC Climate Action Charter (CAC).

The BC Climate Action Charter is a voluntary agreement between the Province of BC, the Union of BC Municipalities (UBCM), and each local government signatory. The Charter was launched at the 2007 UBCM Convention. By signing it, local governments acknowledge that they and the Provincial government have an important role in addressing climate change. Local governments make commitments including to measure and report on their corporate emissions, and progress towards becoming carbon neutral in their own operations. The City of West Kelowna is a signatory to this Charter, along with almost every local government in BC.

Reducing greenhouse gas emissions and adapting to the impacts of climate change has been included in Council strategies and City's Official Community Plan since 2011. Developing a CCAP was specifically identified as a priority in the 2021-2022 Council Strategic Priorities and continues to be a priority in Councils 2022-2026 Strategic Priorities, followed by the completion of a Community Climate Action Plan. A Community Climate Action Plan does not have a start date identified.

Reducing corporate GHG emissions has the following co-benefits:

- Fulfill Climate Action Charter Commitments
- Long term cost savings as the City uses less energy in corporate operations
- Reduced exposure to fluctuating energy prices
- Access grants and incentives and community economic development by leveraging external funding
- Position the City as a leader and demonstrating accountability to residents, helping stimulate further GHG emissions reductions in the community
- Improved climate change resilience
- Potential to improve services

Two Types of Inventory

In this report, the City's corporate inventory is defined according to LGCAP (which has the same requirements as the previous CARIP program), and also according to PCP as shown in **Appendix B**. These two methods of corporate inventories are described in more detail in the following text box.

Local Government Climate Action Program (LGCAP) vs. Partners for Climate Protection

Local Government Climate Action Program (LGCAP) Reporting is the reporting conducted by local governments in BC each year to receive their Local Government Climate Action Program (LGCAP) funding. It requires local governments to report emissions from their traditional services including:

- Administration and Governance
- Drinking, Storm and Wastewater
- Solid Waste Collection, Transportation and Diversion
- Roads and Traffic Operations
- Arts, Recreation and Cultural Services
- Fire Protection

Each category includes emissions from stationary sources (buildings and facilities) and mobile sources (vehicles and equipment) used to operate and maintain each service. Note that policing (i.e., RCMP Buildings and Fleet) and emissions from solid waste (i.e. the landfill) are not included in LGCAP reporting. Fuel from contracted services and from staff-owned vehicles on mileage for corporate work are however included in fuel inventories.

FCM's Partners for Climate Protection (PCP) reporting is conducted by local governments if they wish to participate in the program, and can fulfill the completion of PCP corporate milestone 1. It includes anything that is under "operational control" of the local government. The inventory data needs to be organized into the following five "activity sectors":

- Buildings (electricity, natural gas)
- Street Lights (electricity)
- Water and Sewer (electricity, natural gas, propane) – *including treatment plants*
- Vehicle Fleet (gasoline and diesel) – *includes contracted services providing traditional services; includes staff-owned vehicles used for corporate work*
- Solid Waste

Inventories for PCP must include energy consumed by everything a local government owns (e.g. buildings, fleet) and/or operates including leased buildings and contracted services so long as the City has "full authority to introduce and implement operating policies at the operation". Unlike LGCAP reporting, PCP reporting includes emissions from solid waste.

Although the City of West Kelowna's inventory mostly aligns with the LGCAP inventory categories and traditional services provided by the City, some adjustments were made to the reporting categories based on the input from the City staff to reflect operational responsibilities by each department. Please note that although the RCMP services are excluded from LGCAP reporting, the RCMP emissions were included in the revised categories to ensure that the corporate plan addresses emissions from this source as well.

City of West Kelowna – Progress So Far

Table 1 describes the actions undertaken by the City of West Kelowna, as reported in the CARIP and LGCAP reports and shared by departments.

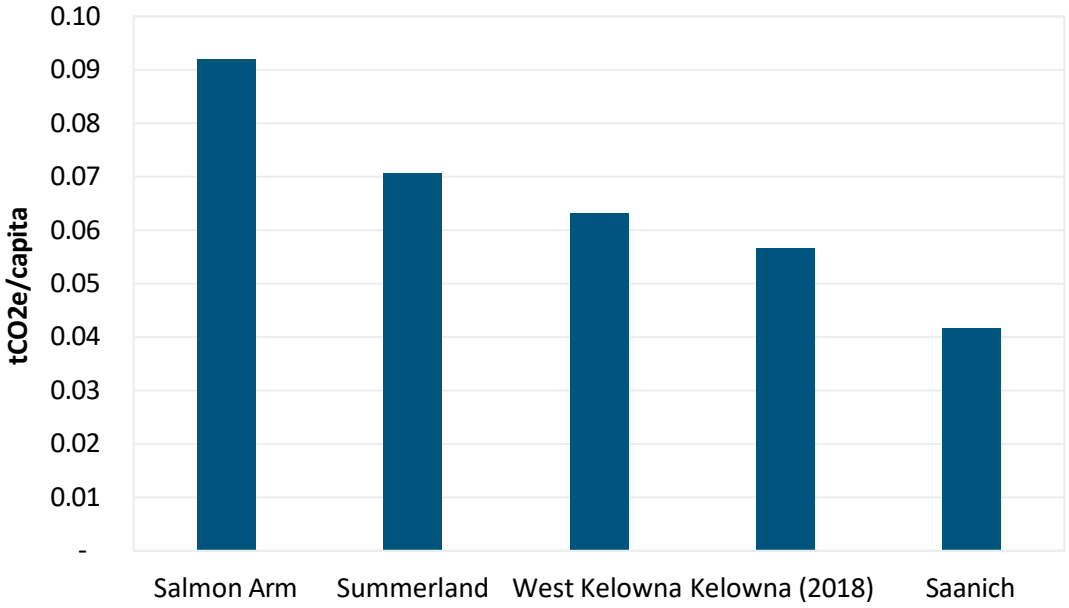
TABLE 1 – HIGHLIGHTED CORPORATE CLIMATE ACTIONS

Facilities and Recreation	Energy assessment completed for major facilities (grant through Fortis BC) Energy efficiency improvements implemented in some buildings (e.g., LED lighting, installation of heat pumps and low flow faucets, variable speed drive motors), and energy reduction measures such as recycling, turning lights and PCs off when not in use, turning down thermostat, etc. LEED RCMP building Electric Zamboni purchased for ice rink
Public Works – Water/Wastewater	Energy optimization for water and wastewater pumps A City-wide streetlight replacement program to LED
Transportation	Acquisition planning to convert fleet to electric or hybrid GeoTab tracking monitoring since summer of 2022 to help with fleet conversion and improve fuel efficiency EV charging stations approved for the new City Hall and Rose Valley Water Treatment Plant Use of Compressed Natural Gas in garbage trucks (contracted service)
Fire Department	Resiliency actions related to fire prevention through mitigation and public education (FireSmart).
Parks	Resiliency measures being implemented (e.g., fire and flood mitigation measures such as foreshore and riparian area restorations, introducing more shade trees and shade infrastructures in the parks, and planting drought tolerant species)
Institutionalization	Climate Related Strategic Priorities Set by the Council (2022 – 2026 Council Strategic Priorities) Adoption of Key Policies such as: • Climate Action Charter Commitment • Emissions Reduction Policy (Nov 2021) • Vehicle and Equipment Acquisition, Replacement and Disposal Policy (Feb 2022) • Community Targets in the Official Community Plan (OCP)

In order to compare the City's progress with other municipalities in the same geographic area of BC, it can be helpful to look at per capita corporate emissions, as presented in **Figure 2**. Data is sourced from LGCAP reporting, which ensures a consistent methodology and a like-for-like comparison. Out of the five communities, West Kelowna falls in the middle (0.06 tCO_2e/capita).

FIGURE 1 - RCMP LEED BUILDING

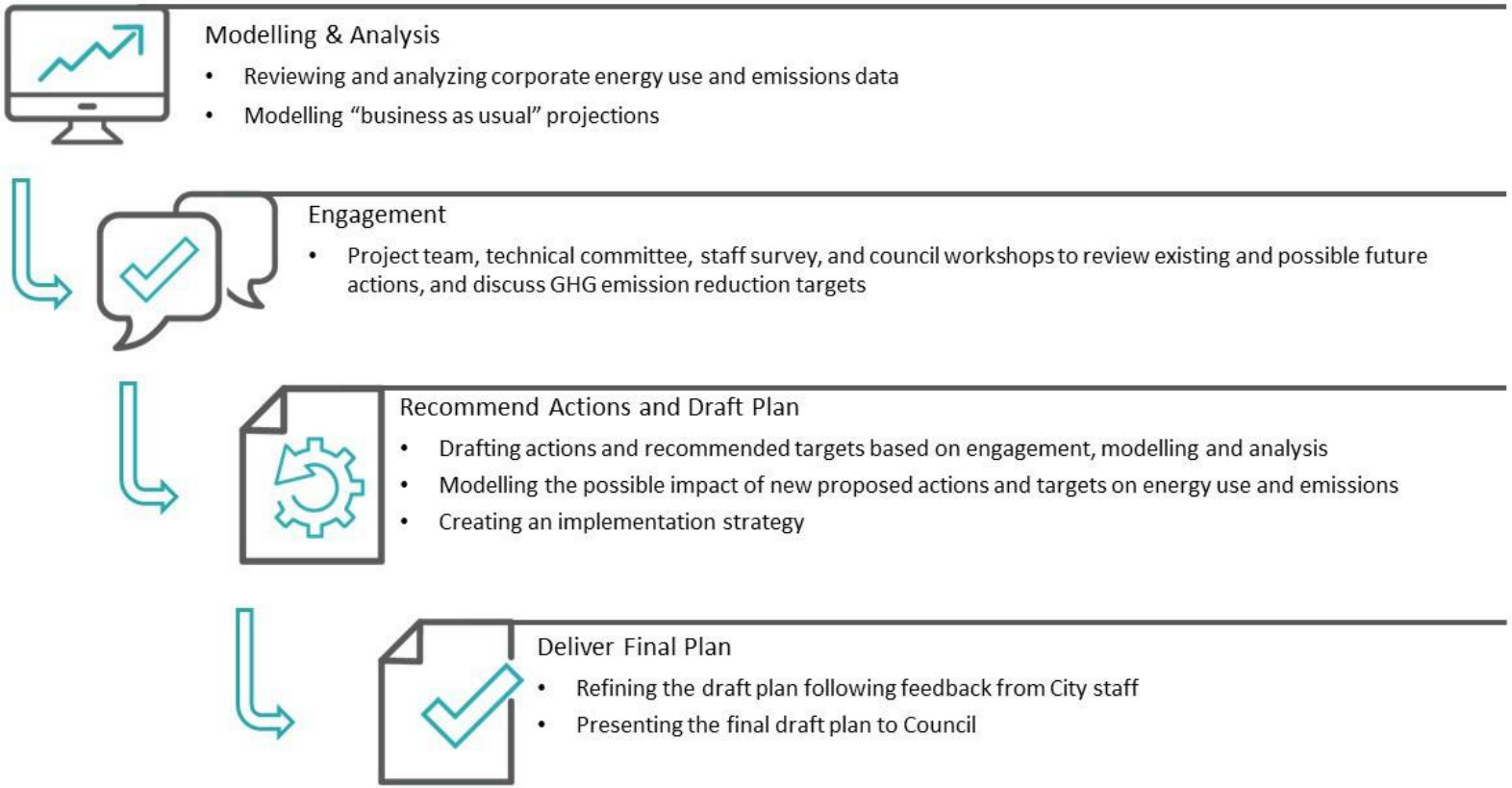
FIGURE 2 – COMPARISON OF PER CAPITA CORPORATE EMISSIONS, 2021



Corporate Climate Action Plan Development

In 2023, the City of West Kelowna, in collaboration with CEA, began the process of creating a Corporate Climate Action Plan. The planning process consisted of four main steps, as illustrated in **Figure 3.**

FIGURE 3 - DEVELOPMENT OF THE CORPORATE ENERGY AND EMISSIONS PLAN



Energy & Emissions – Where We Are Now

Overview

An energy and emissions inventory is a compiled list of all the energy consumed, the money spent on energy, and the associated greenhouse gas emissions created by the local government in their operations. This may identify the best opportunities for cost and emissions reductions.

This inventory describes the GHG emissions, energy consumption, and annual energy expenditures of all corporate assets. In 2022, the City of West Kelowna's emissions were 2,501 tCO_2e.

Assumptions made are described in Appendix C. See the info box below for a description of common units to express energy usage and GHG emissions, and what they mean practically.

What is a GJ?

A gigajoule (one billion joules) is a measure of energy. One GJ is about the same energy as:

- Natural gas for 3-4 days of household use
- 25-30 litres of diesel or gasoline
- Two 20 lb propane tanks
- The electricity used by a typical house in 9 days

What is a tonne (tCO_2e) of GHG?

A tonne of greenhouse gases (GHG's) is the amount created when we consume:

- 385 litres of gasoline (about 10 fill-ups)
- A month of natural gas winter heating
- Enough electricity for 8.5 average homes for a year (93,700 kWh)

Breakdown and Trends

Figure 4 shows the City of West Kelowna's GHG emissions by fuel source and the overall per capita emissions. 2012-2020 data was provided from old CARIP inventories (reviewed and confirmed to use the same methodology) and 2021-2022 data was compiled from utility bills and mobility fuel consumption.

Since 2012, the City of West Kelowna's GHG emissions have increased by 43%. However, since the City has experienced high population growth (22% increase from 2012), it is important to also consider per capita emissions. Since 2012, the per capita emissions have increased by 17%.

The City of West Kelowna's natural gas usage contributes the most to their GHG emissions for every year, varying between 900-1,400 tCO_2e annually (42-56% of total emissions). It has increased by over 50% since 2012 and is the largest contributor to the City's growing emissions. Diesel also contributed a significant portion of emissions, ranging from 473-903 tCO_2e over the years. While natural gas emissions were at their highest in 2022 (1,399 tCO_2e), diesel reached peak emissions in 2018 and declined after 2019. Part of this reduction in diesel emissions can be explained by the contracted waste collection switching from diesel to compressed natural gas (CNG) in 2019. Contracted services contribute to 100% of CNG emissions, about 20% of diesel emissions, and 3% of gasoline emissions.

FIGURE 4 – EMISSIONS BY FUEL SOURCE, 2012-2022

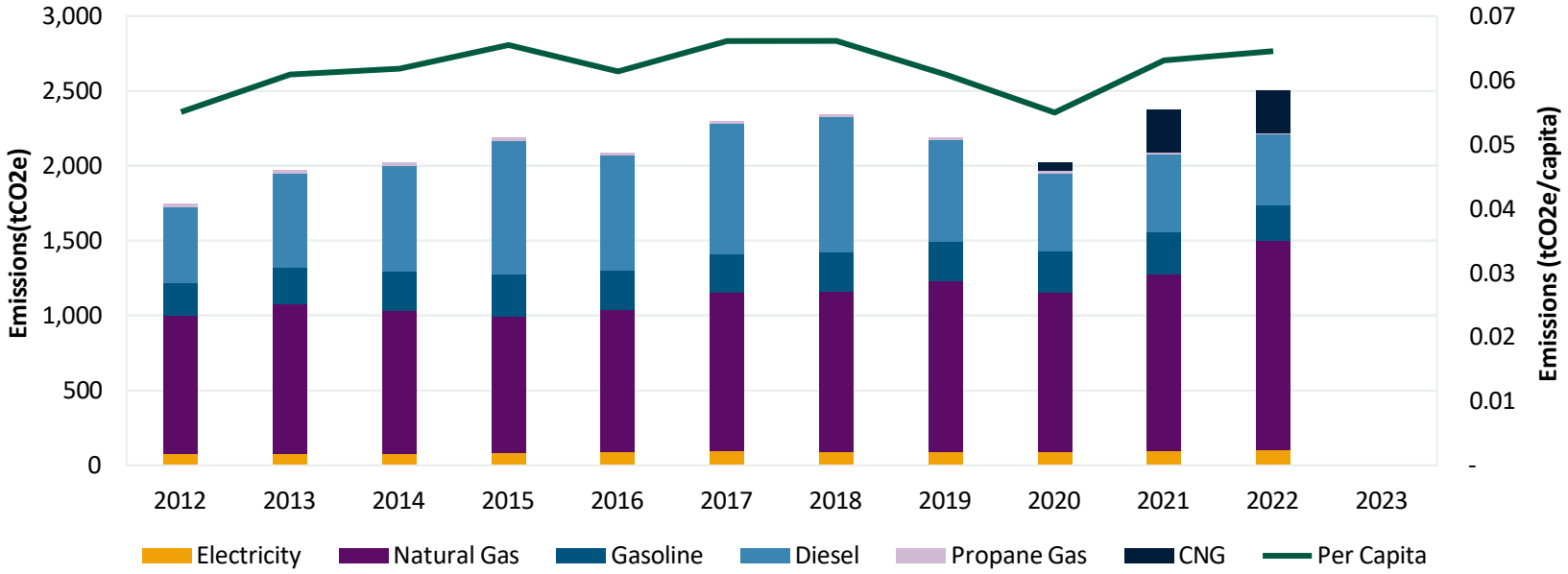


Figure 5 shows the City's energy consumption and expenditures by fuel source. Cost data was only provided for 2021 and 2022.

Energy consumption has increased by 16,866 GJ (28%) since 2012, with natural gas being responsible for over half the growth (9,512 GJ increase). However, per capita energy consumption has only increased by 5%.

When comparing energy and costs, the overall energy consumption had seen nearly no change from 2021 to 2022, but the total cost increased by 7% (nearly $130,000). The largest contributors to the cost increase were natural gas (46%, $123,000 increase) and diesel (67%, $101,000 increase). Gasoline expenditures also increased ($62,000, 58%), while electricity and propane costs decreased (-$151,000 and -$8,000, respectively).

FIGURE 5 – ENERGY CONSUMPTION AND COSTS BY FUEL SOURCE

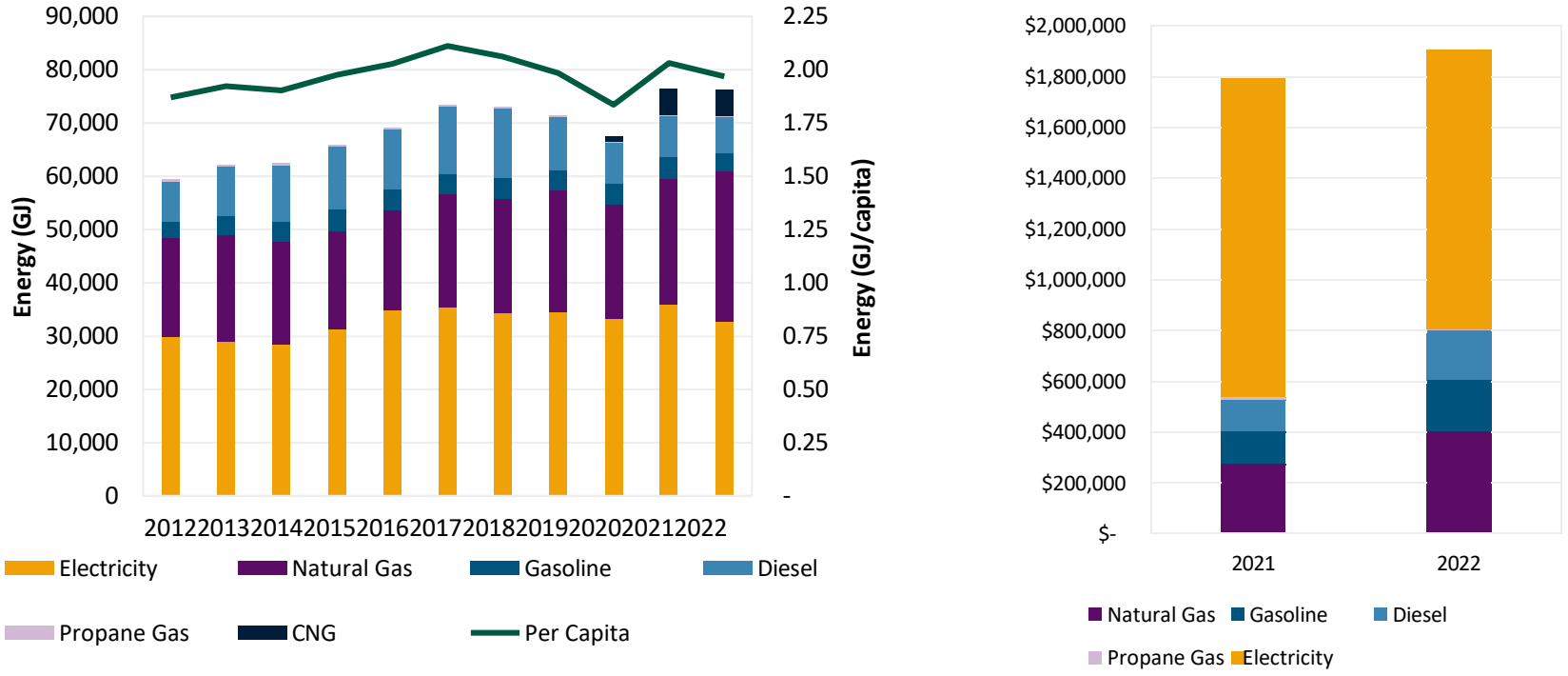


Figure 6 shows the percentage of energy consumption, GHG emissions, and energy expenditure that is attributed to each fuel source.

Electricity contributes to 43% of energy use and 57% of cost, but only 4% of emissions. Natural gas is the second highest contributor to energy use (37%) and expenditures (21%), and the highest source of emissions, contributing over half of total corporate emissions. Among fuel sources, natural gas has high GHG emissions but low cost. This is in stark contrast to electricity which has very low GHG emissions but high cost. Gasoline, diesel, and propane all have high GHG emissions and high cost. Propane was excluded from Figure 6 as it accounted for less than 1% in each category. CNG does not have any cost associated with it for this inventory as it is exclusively used by contracted services.

FIGURE 6 – ENERGY, EMISSIONS, AND COST BY FUEL SOURCE, 2022

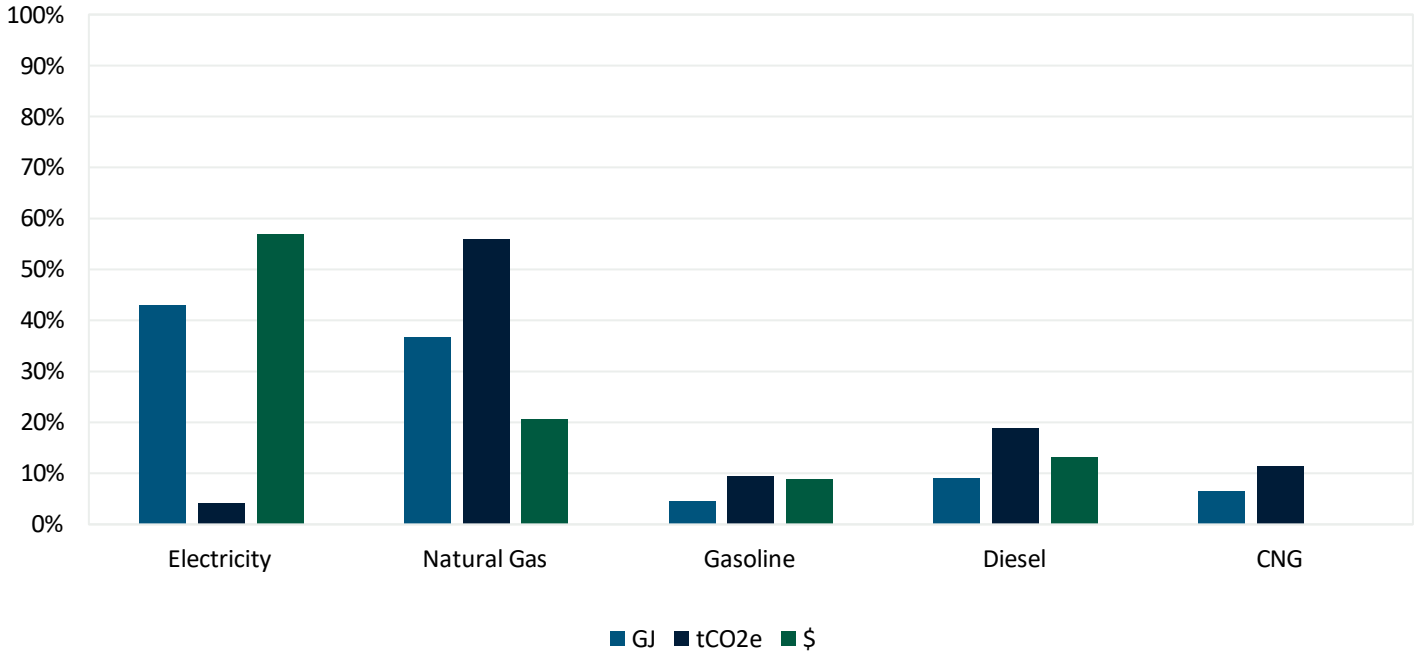
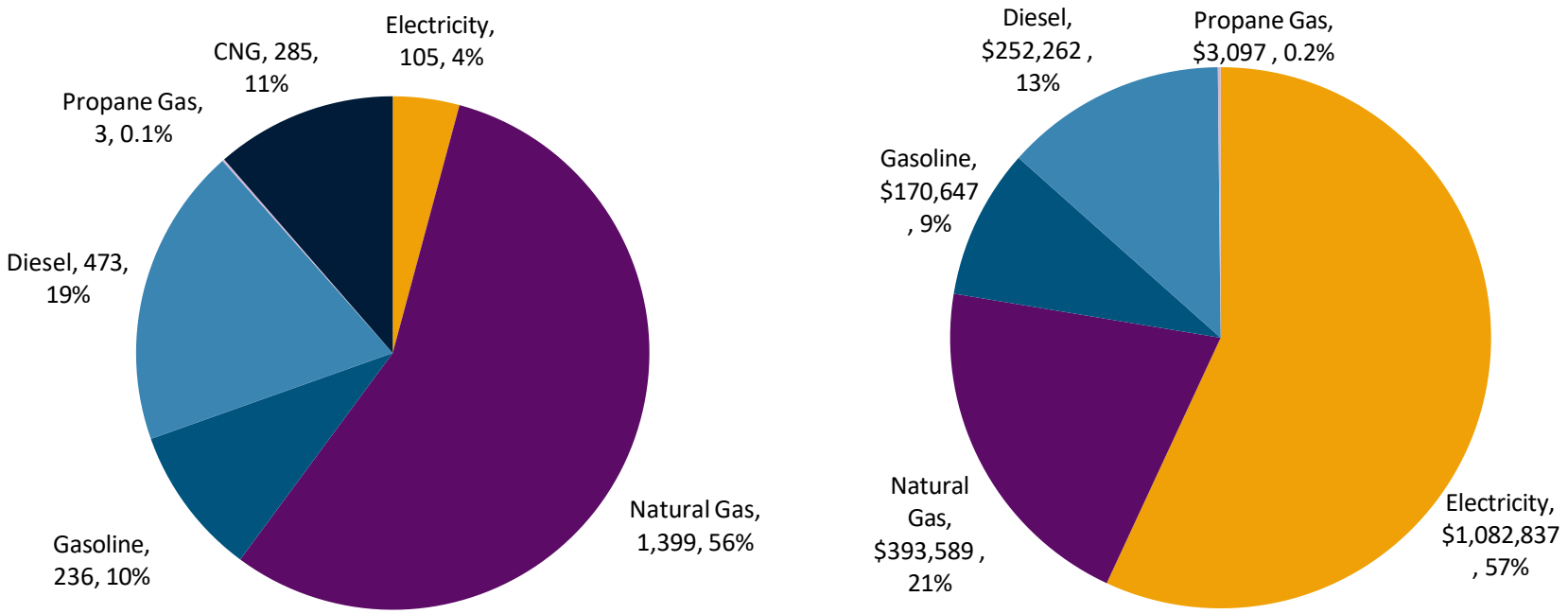


Figure 7 shows the GHG emissions and energy expenditure in 2022 by fuel source. Natural gas is responsible for the largest portion of GHG emissions, 1,399 tCO_2e (56%), followed by diesel with 473 tCO_2e (27%). These two fuels combine for three-quarters of emissions but only a third of expenditures. Electricity is responsible for over half the costs, costing the City over a million dollars annually, but only contributes 4% of total emissions (105 tCO_2e). This is due to a low emission factor and relatively high costs. Another difference between the two charts is that contracted services are included in the emissions, but not in expenditures as the City doesn't directly pay those fuel costs.

FIGURE 7 – EMISSIONS (tCO_2E) AND ENERGY COSTS BY FUEL SOURCE, 2022



The emissions from each City of West Kelowna service are shown in **Figure 8**. Contracted Services are excluded from this chart, but RCMP is included. A table providing the complete data for each category and a list of assets within each category are provided in **Appendix D**.

Parks, Recreation, and Culture Facilities (e.g., the City owned buildings) are the largest source of emissions (1,240 tCO_2e), which is largely due to the three large recreation centres: Johnson Bentley Memorial Aquatic Centre, Mount Boucherie Complex (Royal LePage Place Arena and Jim Lind Arena), and West Kelowna Multi-Sport Centre. Parks, Recreation, and Culture Facilities are also responsible for the most expenditures ($651,000), followed by Water Infrastructure ($475,000) and the *Remaining Fleet* ($407,000). The high expenditures in the Water Infrastructure service are due to high electricity usage, a few large users being the Powers Creek Treatment Plant and pump stations at Lindley and Sunnyside. Although the emissions from Public Works and Water Infrastructure are low, the energy expenditures associated with these services are high and needs to be investigated for energy saving opportunities, along with other service areas that have high contribution to emissions.

FIGURE 8 – EMISSIONS AND EXPENDITURES BY CITY OF WEST KELOWNA SERVICE, 2022

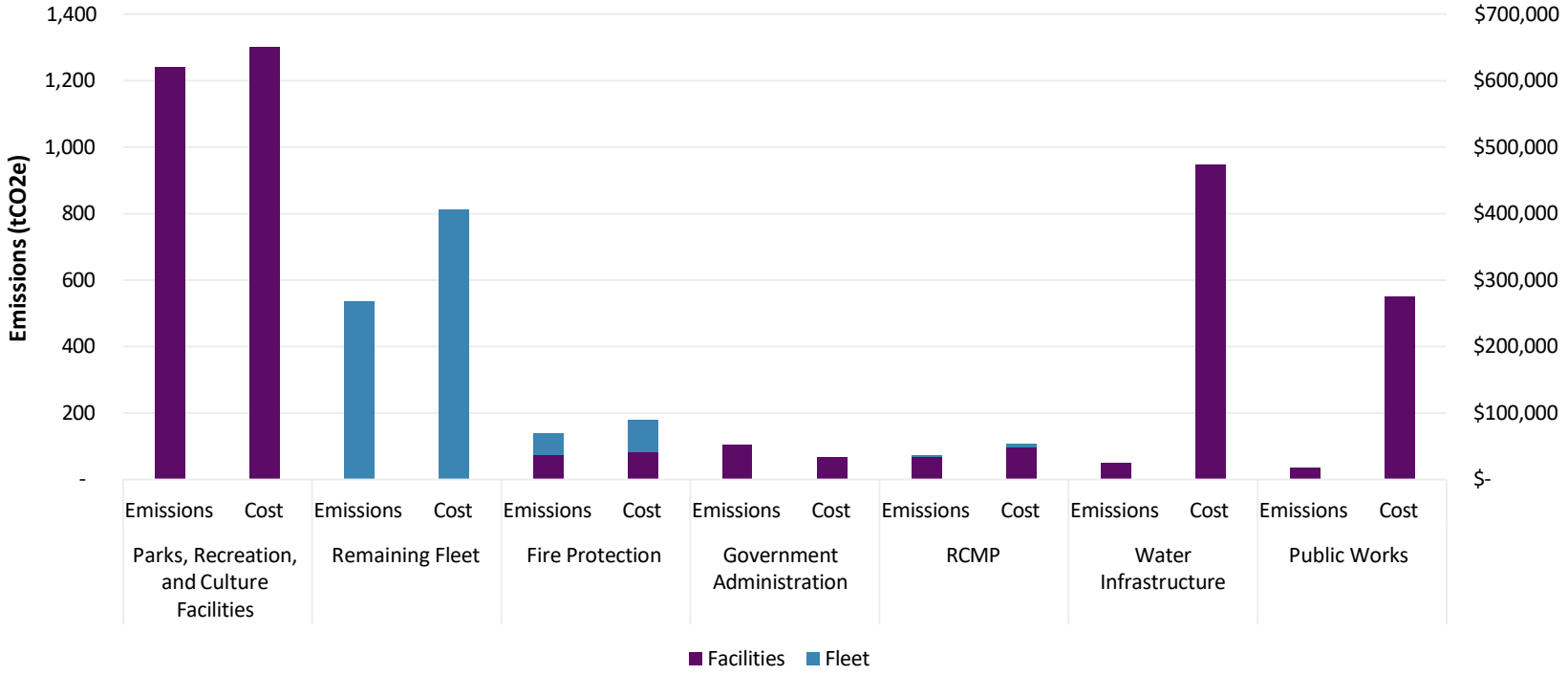
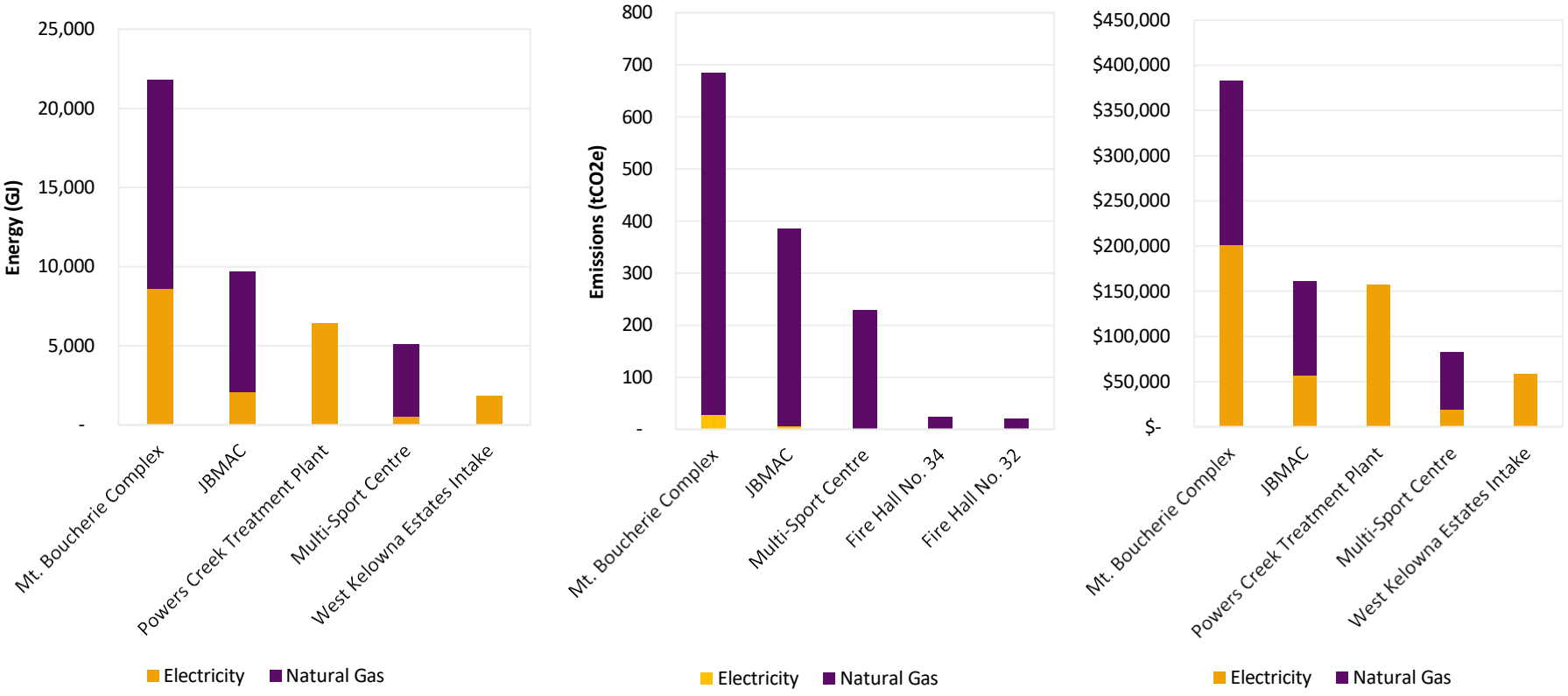


Figure 9 shows the top five buildings and infrastructure in terms of energy consumption, GHG emissions and energy costs. Mount Boucherie Complex used nearly 22,000 GJ which is more than twice the energy used by Johnson Bentley Memorial Aquatic Centre (JBMAC) (9,676 GJ). These two facilities also have the highest emissions (684 tCO_2e and 385 tCO_2e, respectively) and the highest expenditures ($383,000 and $161,000, respectively).

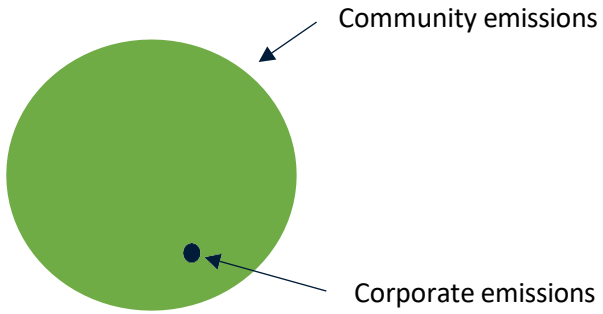
These buildings and infrastructure should be the City's priority to maximize GHG emission and cost reductions, especially Mount Boucherie Complex, JBMAC, and the Multi-Sport Centre as these three facilities account for over half of the City's total emissions.

FIGURE 9 – TOP 5 BUILDINGS & INFRASTRUCTURE FOR ENERGY, EMISSIONS AND COST, 2022



Corporate vs. Community Inventories

In 2019, the City of West Kelowna's community GHG emissions were 336,244 tCO_2e. Corporate GHG emissions in 2019 were about 0.7% of the community total.



Community

- Community-wide energy use
- Use local government levers of infrastructure, policy/regulation and outreach/engagement to impact community energy and emissions
- Transportation, buildings and waste are the areas of focus

Corporate

- Municipal facilities and operations
- Detailed energy information
- More emphasis on immediate actions
- Corporate actions can be anchor community-wide projects

Although the corporate emissions account only for small portion of the community emissions, taking action to reduce corporate emissions is important for the City to demonstrate leadership by committing to take action and reducing its own greenhouse gas emissions.

Business As Usual Projections

Business As Usual (BAU) projections for the City's inventory are shown in this section.

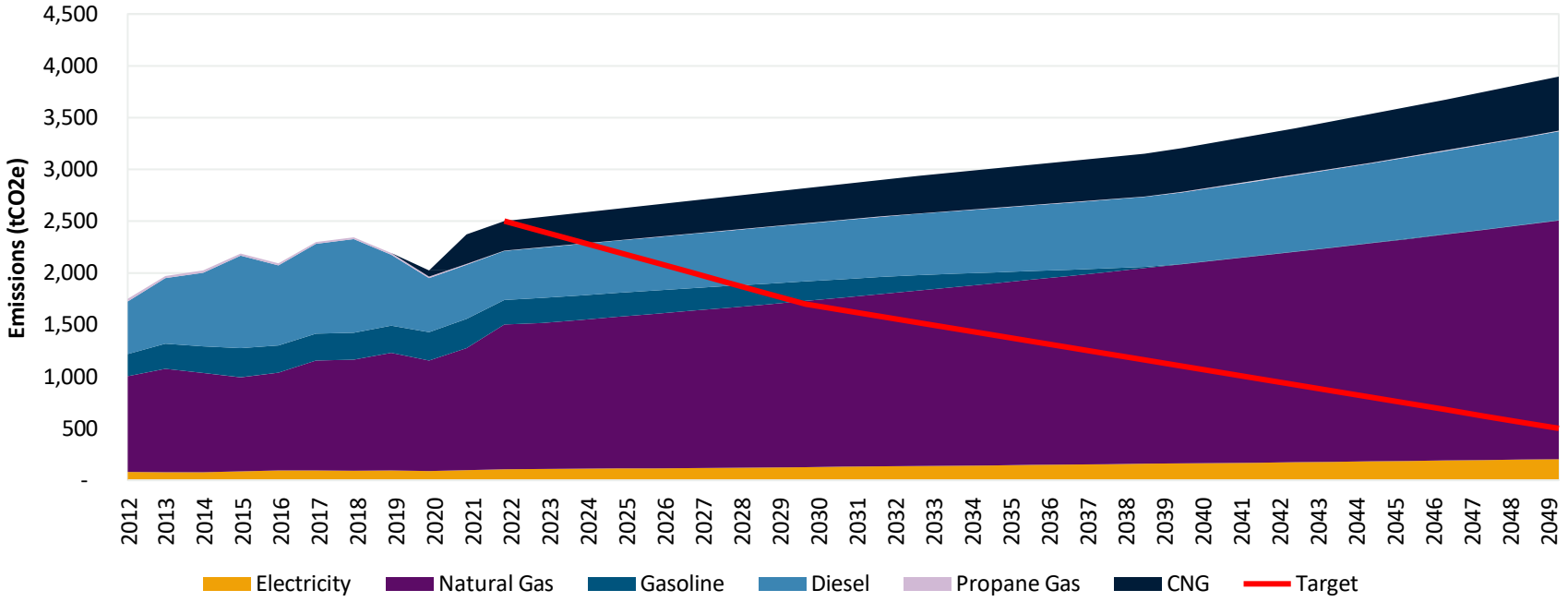
What does Business as Usual mean?

Business as Usual, or BAU, is a way of describing what is estimated to happen if the City does not try to reduce emissions going forward. A number of factors are taken into account, similarly to a Community Climate Action Plan. Population growth and the subsequent growth in corporate assets is a very important consideration. As the number of people increase in a community, more corporate assets are needed to serve them. Other things that are taken into account include:

- Changing climate patterns, as warmer winters and hotter summers change the way that energy is consumed in corporate buildings.
- Impacts of policies already adopted by higher levels of government, such as:
    - Renewable and low carbon fuel standards
    - Vehicle emissions standards
    - That progressive policies on electric vehicles will have an impact on the City's purchases for gasoline vehicles, in particular the Zero Emissions Vehicles mandate.
    - The greening of the BC Building Code (progressive steps towards net zero energy ready buildings by 2032)

If the City of West Kelowna implements no special efficiency or conservation activities, and assuming that future changes are proportional with population increase, then the City's emissions are forecast to increase by 13% in 2030 and 56% in 2050 compared to 2022 levels as shown in **Figure 10.** The redline in **Figure 10** indicates where the emissions should be if the City adopts a new long-term GHG emissions target of 80% reduction by 2050 and a short-term target of 30% reduction by 2030, both compared to the 2022 baseline.

FIGURE 10 – BUSINESS-AS-USUAL EMISSIONS FORECAST TO 2050, BY FUEL SOURCE



It is difficult to predict these future increases, but it is clear that an increasing population will provide upward pressure, while the policies from higher levels of government will help reduce the GHG emissions. It would therefore be prudent for the City to also conduct its own measures (i.e., implement the actions detailed in this Plan) to manage its energy consumption, GHG emissions, and energy expenditures.

What We Can Do: Recommended Climate Actions

Based on staff consultation and best practices, actions were identified to be implemented over the next five years. Actions fall under the following five categories.

1. ***New Buildings and Infrastructure:*** Improve energy performance and lower GHG emissions in ***new*** City buildings and infrastructure
2. ***Existing Buildings and Infrastructure****:* Improve energy performance and lower GHG emissions in ***existing*** City buildings and infrastructure
3. ***Renewable Energy****:* Increase the use of renewable energy
4. ***Transportation:*** Improve energy efficiency and reduce GHG emissions in the City's fleet
5. ***Enabling Actions and Corporate Leadership****:* Institutionalize the plan and demonstrate leadership on waste and water

Table 2 shows the breakdown of actions by category and the potential timing each action will be initiated, with the intent of each action to be continued in following years. Further details on actions, including projected GHG reductions and cost savings are detailed in **Appendix A**

TABLE 2 – CLIMATE ACTIONS SUMMARY

ACTIONS LIST		Already Done	2023	2024	2025	2026	2027
New Buildings and Infrastructure							
1.1	Commit to building energy efficient facilities (including mandatory Step Code implementation)				X		
1.2	Commit to building energy efficient infrastructure (e.g., updating subdivision servicing bylaw)				X		
1.3	Optimize siting and orientation of new buildings				X		
Existing Buildings and Infrastructure							
2.1	Conduct building energy audits	X	X				
2.2	Implement building energy retrofits recommended by building energy audits			X			
2.3	Conduct energy focused operational review of infrastructure			X			
2.4	Implement measures from operational review of infrastructure			X			
2.5	Incorporate energy management into annual building maintenance procedures			X			
Renewable Energy							
3.1	Implement Solar PV installations on buildings					X	
3.2	Low-carbon heating retrofits for buildings			X			
3.3	Conduct corporate renewable energy study					X	
Transportation and Fleet							
4.1	Right-sized vehicles for assigned tasks			X			

ACTIONS LIST		Already Done	2023	2024	2025	2026	2027
4.2	Develop a vehicle purchasing policy	X					
4.3	Invest in EVs and EV Charging Stations (where available and practical)			X			
4.4	Assess options for MHDVs (renewable fuels)				X		
4.5	Fuel efficient driver training			X			
4.6	Energy-focused fleet maintenance (e.g., tire pressure, fuel & air system)			X			
4.7	Encourage employee carpooling where possible			X			
4.8	Provide facilities to help staff reduce the emissions associated with commuting			X			
Enabling Actions and Corporate Leadership							
5.1	Have dedicated staff person or department for plan implementation			X	X		
5.2	Allocate funds for plan implementation (e.g., LGCAP grant, budget allocation, revolving fund)		X				
5.3	Develop KPIs, monitor and track for progress			X	X		
5.4	Demonstrate leadership on corporate waste and water			X			
5.5	Join PCP			X			
5.6	Examine local carbon offset projects for remaining emissions					X	
5.7	Annual reporting on GHGs			X			

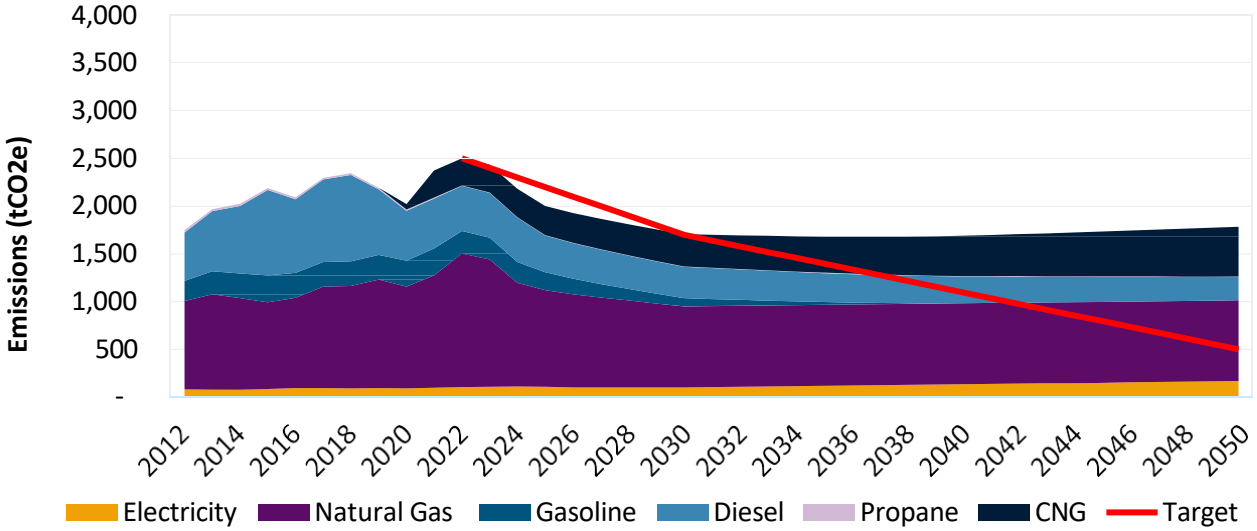
What We Can Achieve

Modelling Climate Actions

Implementation of the actions was modelled to estimate the potential GHG emission reductions and energy expenditure savings. More detail on the modelling is in **Appendix C**.

As shown in **Figure 11**, upon full implementation, total GHG emissions are expected to decrease relative to 2022 by 30% in 2030. GHG emission reduction is expected to decelerate from 2030 unless further actions are implemented. It is important that this Corporate Climate Action Plan be updated in approximately 5 to 7 years to identify new actions to implement to keep the City on track with a potential long-term target of 80% reduction by 2050.

FIGURE 11 – MODELLED EMISSIONS FROM PROPOSED CLIMATE ACTIONS



As depicted in **Figure 12**, the top three actions that will achieve the largest reductions in GHG emissions over the next 5 years, in order of largest GHG reductions first, are:

- Implement building energy retrofits recommended by building energy audits: approximately 350 tCO_2e
- Low carbon heating retrofits for buildings: approximately 200 tCO_2e
- Invest in EV's and EV charging stations: approximately 170 tCO_2e

Implementing building energy retrofits will include measures to improve energy efficiency, such as heat recovery and potentially heat sharing between Royal LePage Arena and nearby buildings, optimization of building controls, low flow plumbing fixture retrofits, while low carbon heating retrofits will consist of fuel switching to low carbon heating systems, such as heat pumps. The financial case for switching from natural gas to electricity will continue to improve as the carbon tax consistently grows.

Investing in EV's and EV charging stations will reduce the City's consumption of diesel and gasoline and therefore result in reduced GHG emissions from fleet vehicles. There will be an increase in the consumption of electricity as a result of this shift, however, EV's are four times more efficient than traditional Internal Combustion Engine (ICE) vehicles, therefore significant cost savings will be realized.

FIGURE 12 – EMISSIONS REDUCTION FOR EACH PROPOSED ACTION, IN 2030

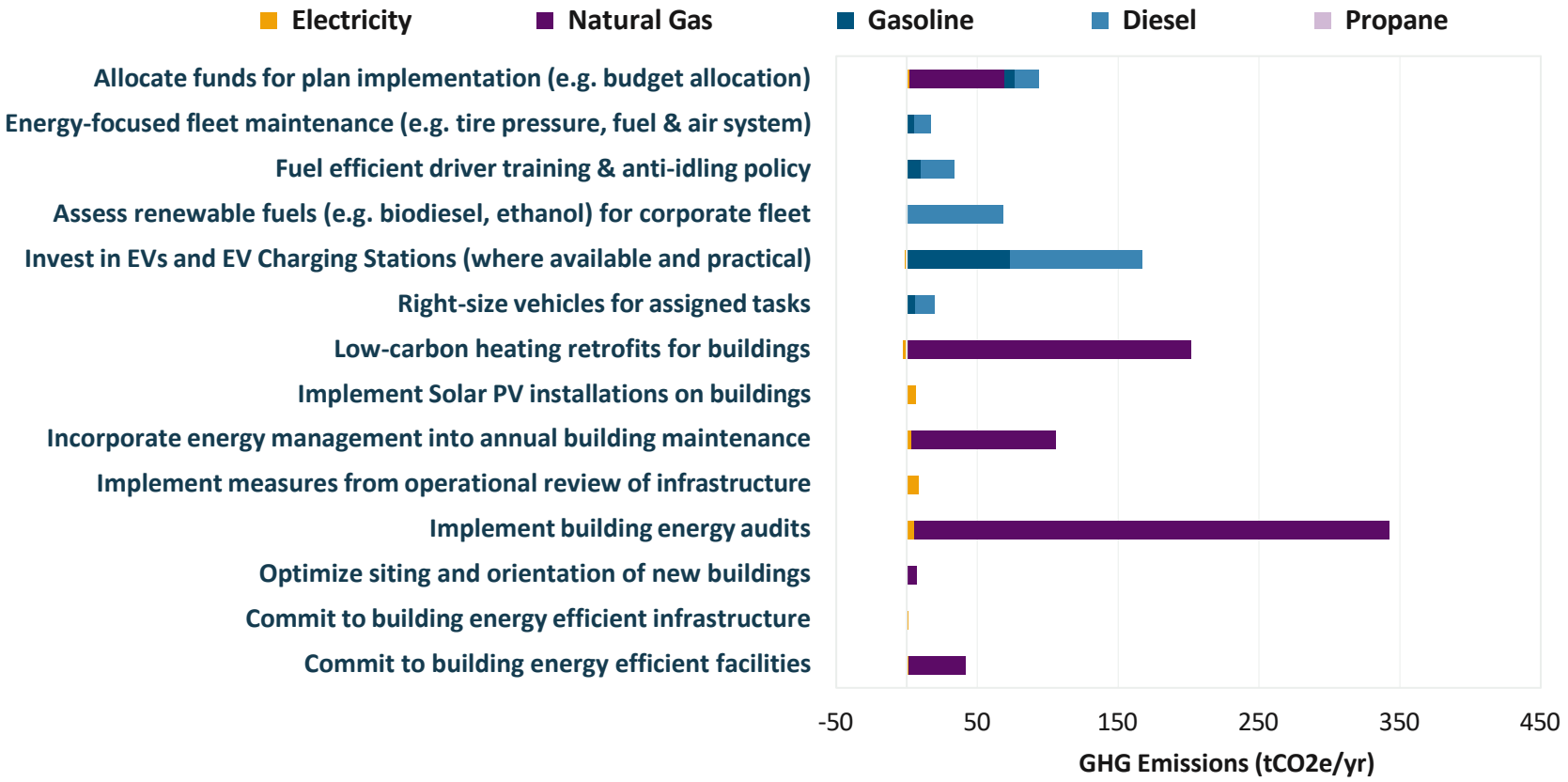


Figure 13 highlights the potential GHG savings resulting from full implementation of this plan. Targeting natural gas use provides the largest opportunity for GHG reduction.

FIGURE 13 – PLAN GHG SAVINGS

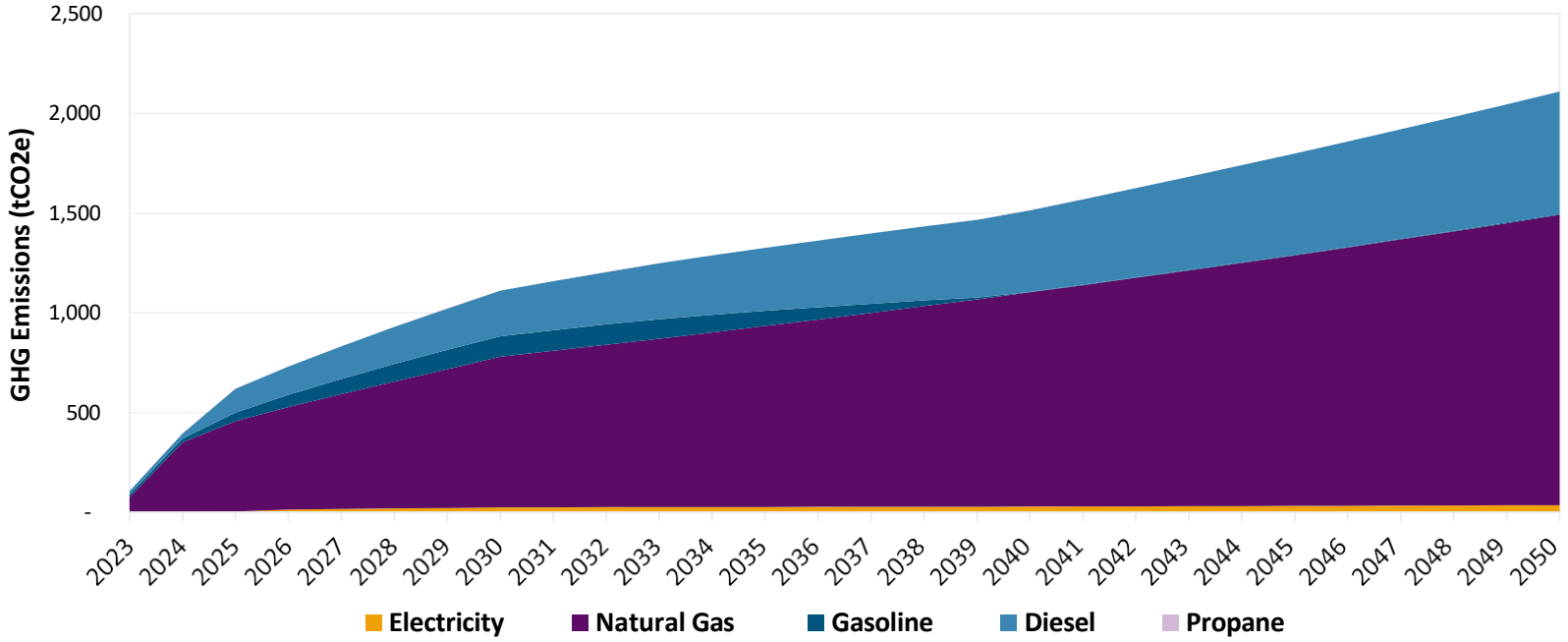
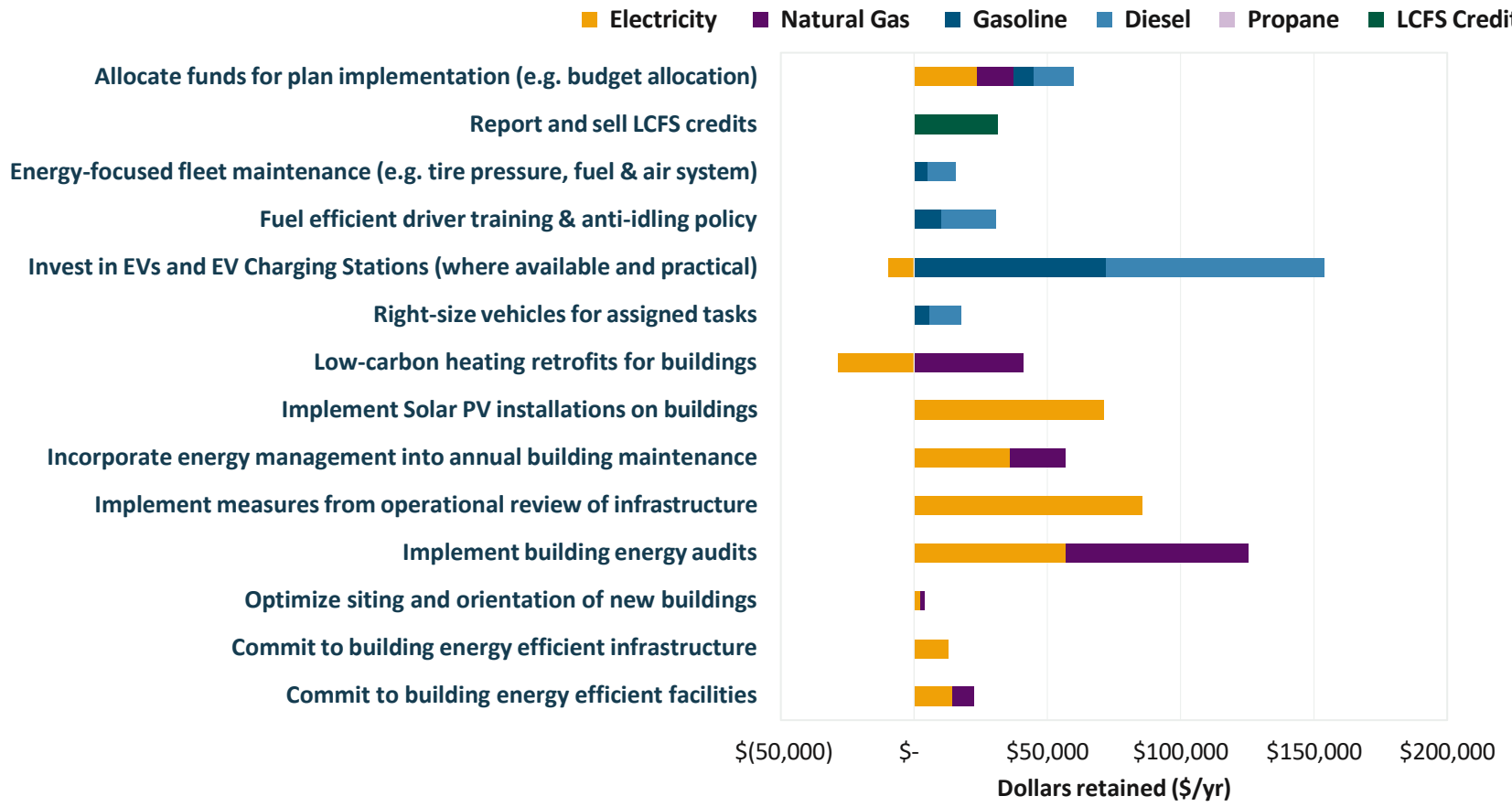


Figure 14 shows the estimated cost savings from each proposed action. Investing in EVs and EV charging stations will result in the highest cost savings ($144k), followed by implementing building energy audits ($125k) and implementing measures from infrastructure review ($86k). In addition to the fuel savings, the City can benefit from EVs and EV charging stations by reporting and selling Provincial and Federal Low Carbon Fuel Standard credits. As part of the standard, City of West Kelowna is already obligated to report EV charging, and can gain financial benefit from selling the credits. In 2030, the potential dollar amount from provincial credits alone is over $31,000.

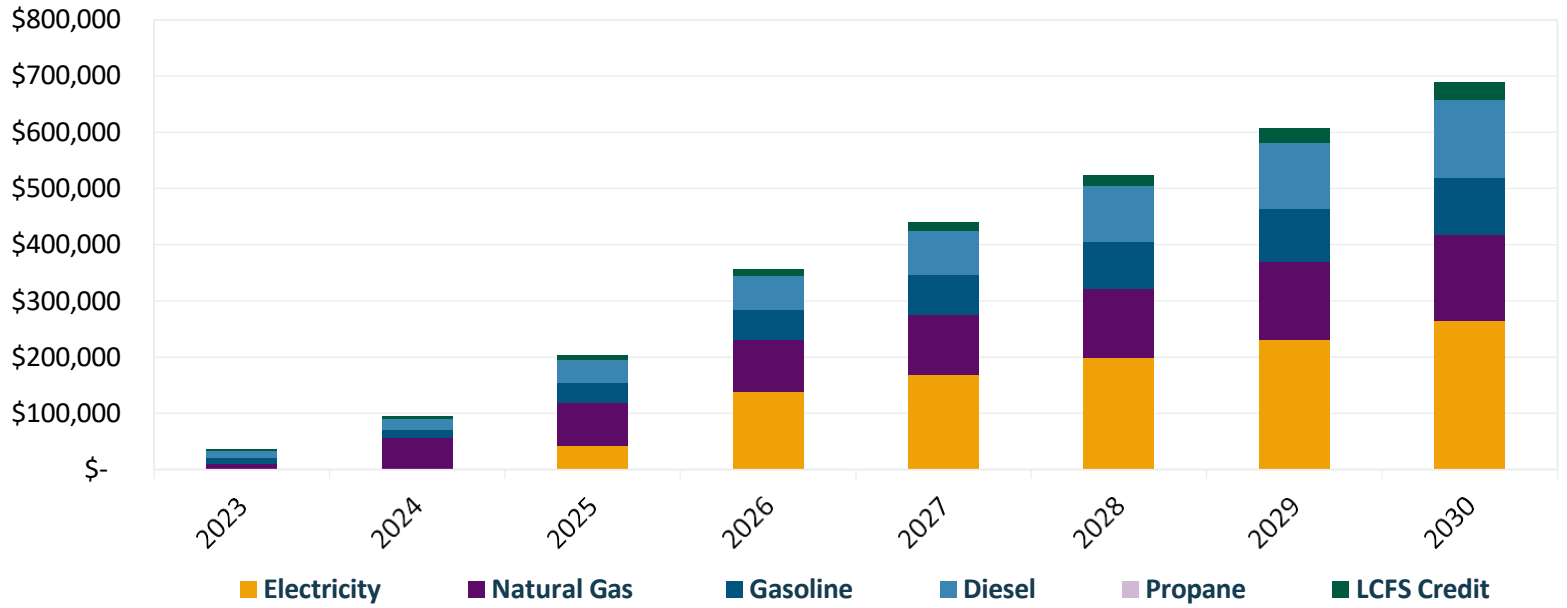
FIGURE 14 – COST REDUCTION FOR EACH PROPOSED ACTION, IN 2030



Substantial energy cost savings could be realized through the implementation of the actions listed. However, this does not reflect the capital cost or payback of each action. More work would be needed to determine the economic impact of each action.

Figure 15 shows the financial savings that could be realized upon implementation of the plan. Actions will be implemented over time, as per **Table 2**, and therefore savings will increase over time. There is potential for substantial cost savings on electricity, estimated at $265,000 per year by 2030. Most of these savings come from implementing measures from infrastructure review, installing solar PV, and implementing building energy audits. There is also large potential for cost savings on natural gas, over $150,000 per year by 2030, because of implementing building energy audits and low-carbon heating retrofits.

FIGURE 15 – PLAN COST SAVINGS



Overall, the Plan is expected to save 1,111 tCO_2e and $690,000 annually by 2030 in corporate GHG emissions and energy costs.

Fleet Assessment

Introduction

Electric and other low carbon-emitting vehicles are becoming increasingly popular as alternatives to conventional internal combustion engine vehicles for both the passenger and commercial sectors, driven by advances in battery and electric motor technology, climate awareness, and provincial/federal government legislation. The City is poised to take the first step towards an electrified fleet with the potential overhaul of fossil-fueled internal combustion engine (ICE) vehicles at the end of their life with fully electric vehicle (EV) equivalents. This section outlines the current fleet, vehicles slated for replacement, lifecycle analyses to determine the financial feasibility of selected EV equivalents, and recommendations for next steps to facilitate fleet transition.

The City's fleet consists of 80 vehicles: 50 light-duty vehicles and 30 medium/heavy-duty vehicles, plus additional equipment. Of the fleet, there are 29 vehicles that are at least ten years old and of these vehicles, six vehicles are being considered for replacement. **Table 3** outlines the vehicles recommended for replacement and will be evaluated on an ongoing basis to determine what replacements are necessary given available resources and operational needs.

A complete fleet list and the lifecycle analysis assumptions are available in **Appendix J**.

TABLE 3 – VEHICLES SLATED FOR REPLACEMENT

Unit #	Year	Make	Model	Department	Class	Annual Distance (km)	Annual Fuel (L)	L/100 km
29303	2009	Ford	Ranger	Bylaw	Class 1	11,663	1,835	15.7
29305	2011	Ford	Escape Hybrid	Bylaw	Class 1	9,735	1,223	12.6
29401	2009	Ford	Ranger	Roads	Class 1	20,127	3,325	16.5
29144	2006	GMC	Yukon	Recreation	Class 2A	5,047	899	17.8
29717	2011	Ford	Econo	Facilities	Class 2B	7,309	1,694	23.2
29719	2011	GMC	Savana	Facilities	Class 2B	7,161	1,627	22.7

Lifecycle Cost Analysis

After performing a high-level payback analysis on the 29 vehicles that were at least ten years old, six vehicles were found to have a payback of eight years or less and have available EV replacements. Eight years was chosen to align with the EV replacement timeline outlined in the City's Vehicle Replacement Policy. Lifecycle cost analyses were complete for these six vehicles and their equivalent EV replacements to demonstrate financial and environmental viability, as presented in **Table 4**. The analysis completed will need to be evaluated by the City on an ongoing basis to determine what replacements are feasible given available resources and operational needs.

TABLE 4 – LIFECYCLE COST AND GHG ANALYSIS

Vehicle	Replacement Vehicle	Lifetime GHG Savings (tCO_2e)	NPV	Discounted Payback (Years)	IRR	ROI
29401 Ford Ranger	2023 Ford F-150 Lightning XLT	46.1	$22,825	4.0	19.5%	26.7%
29719 GMC Savana (2)	2023 Hyundai Kona Electric	16.5	$10,141	4.8	14.7%	22.6%
29719 GMC Savana (1)	2023 E-Transit Cargo Van	16.8	$5,903	6.4	6.3%	6.8%
29305 Ford Escape Hybrid	2023 Hyundai Kona Electric	22.4	$4,640	6.4	6.7%	10.3%
29303 Ford Ranger	2023 Ford F-150 Lightning XLT	26.7	$3,008	6.9	2.6%	3.6%
29717 Ford Econo	2023 Ford F-150 Lightning XLT	16.7	$1,558	7.3	1.3%	1.9%
29144 GMC Yukon	2023 Hyundai Kona Electric	11.6	$181	7.8	0.3%	0.4%

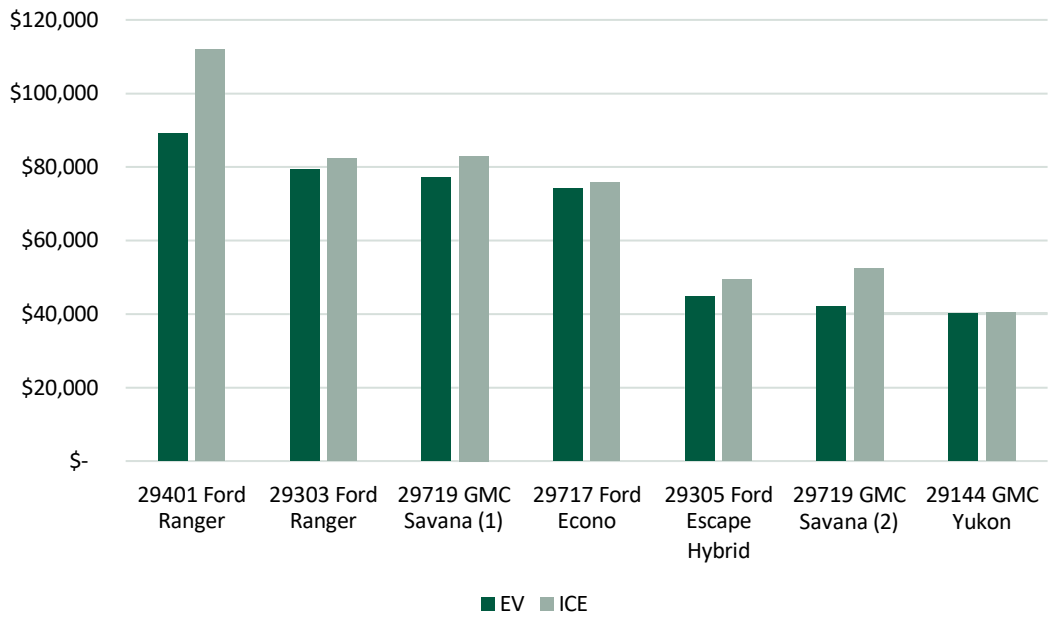
NPV: Net Present Value
IRR: Internal Rate of Return
ROI: Return on Investment

Figure 16 shows the lifecycle costs for each ICE and electric vehicle, while **Figure 17** shows the lifecycle emissions.

Replacing the Ford Ranger (unit #29401) with a 2023 Ford F-150 Lightning XLT has the highest lifetime cost ($89k) but provides the best payback (four years). The main reason that this unit has an attractive payback period is the high usage (20,000 km in 2022). This unit also provides the largest opportunity for GHG reduction with estimated lifetime savings of 46 tCO_2e.

The second-best payback potential is replacing unit #29719 GMC Savana (2) with a 2023 Hyundai Kona Electric (4.8 years), which also has a more modest lifetime cost ($42k). However, this replacement would be from a van to an SUV, which may not be possible depending on the vehicle uses. A replacement with the Ford E-Transit Van is also an option, as shown for #29719 GMC Savana (1). The third option is to replace the van with a truck, which was explored for unit #29717 Ford Econo. Again, this depends on the vehicle use and carrying requirements.

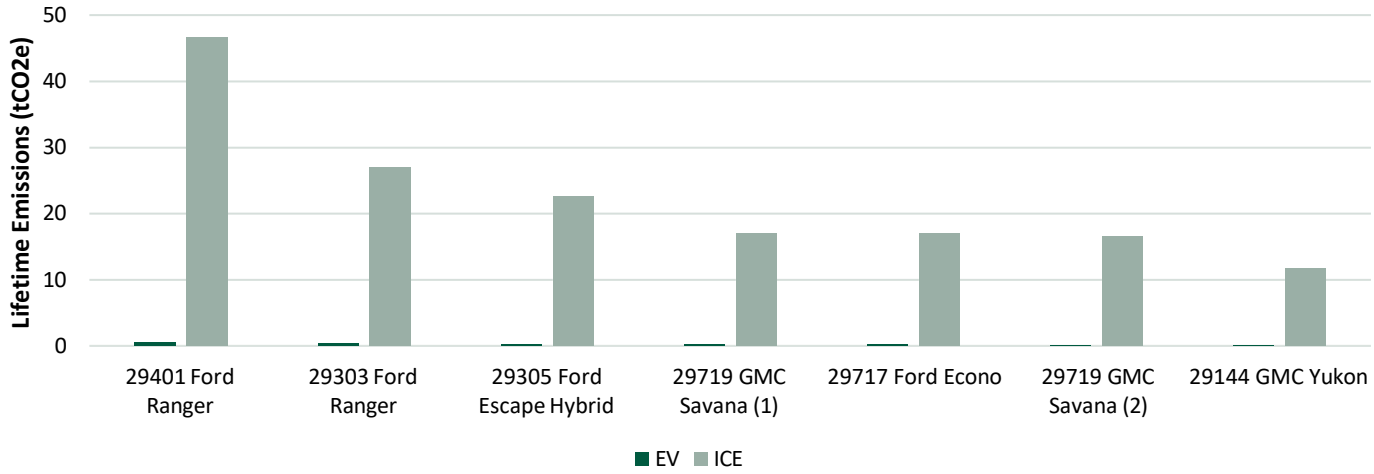
FIGURE 16 – LIFECYCLE COSTS, EV VS ICE



Even though the GMC Yukon (unit #29144) has a less impressive financial case, it is 17 years old and is likely to be replaced soon. Therefore, if there is a suitable EV replacement, such as the Hyundai Kona Electric, it is a good opportunity to switch and support the City's efforts in reaching their GHG reduction targets.

Each replacement option provides an opportunity for considerable GHG reductions, the largest being the Ford Ranger (unit #29401) to 2023 Ford F-150 Lightning XLT (46 tCO_2e). If all six vehicles were to be replaced, the expected lifetime GHG reductions would be 140 tCO_2e.

FIGURE 17 – LIFETIME EMISSIONS, EV VS ICE



For each of the six replacement options, the electric vehicle results in a lower lifetime cost vs. the current ICE vehicle, ranging from 0.5% (29144 GMC Yukon) to 23% lower (29401 Ford Ranger). Breaking down by net capital costs, they comprise 78 – 91% of lifecycle costs in EVs, vs. 45 – 67% in ICEs. This is expected given EV technology is newer, and the high cost of lithium-ion batteries. However, the EV excels with operational and maintenance costs, owing to the mechanical efficiency of EVs being approximately four times[1] higher than that of conventional ICEs, significantly reducing operating costs. This also means that the more an EV is used, the better the business case.

With respect to emissions, the selected ICE vehicles will output between 12-47 tCO_2e over an eight-year lifespan. EVs on the other hand, produce negligible emissions due to the near-zero emission factor of BC's electricity grid.

Overall, directly replacing ICEs with EVs can be cost effective for Class 1 and Class 2, pending a more thorough analysis of the duty cycles, towing, and carrying payload requirements for existing vehicles, and whether Class 2 EVs are capable of meeting these demands.

The key takeaways from this analysis with respect to developing an EV fleet are:

- **Minimize** capital cost
- **Maximize** the usage of the vehicle (by using the same vehicle for non-overlapping tasks, or for several infrequent tasks, and for high mileage/low load trips like passenger transport)

[1] Province of BC, 2022. 2021 BC Best Practices Methodology for Quantifying Greenhouse Gas Emissions

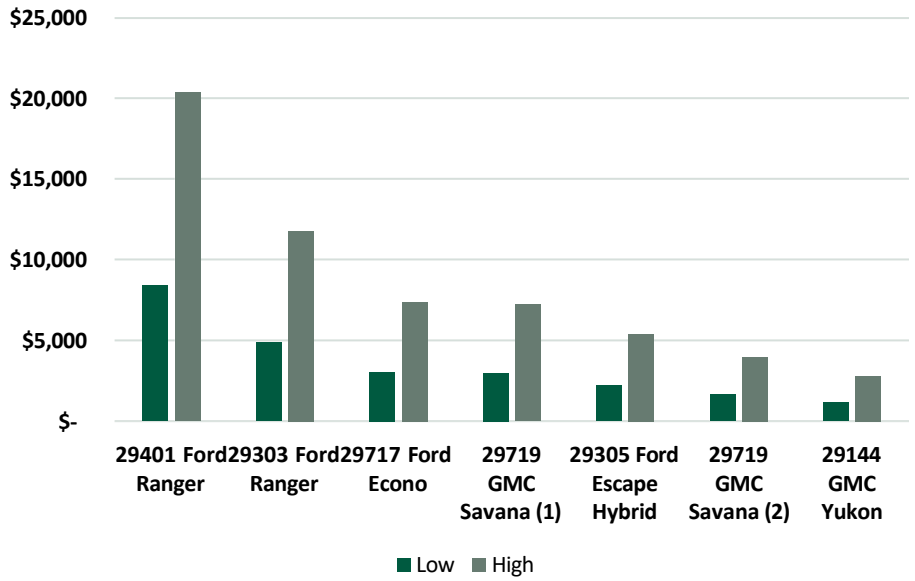
LCFS Analysis

Low Carbon Fuel Standard (LCFS) Credits can be claimed as part of both the BC Low Carbon Fuel Standard and Federal Clean Fuel Standard for electricity used to charge EVs. These credits are bought and sold on a credit market and can significantly improve the business case for purchasing an EV. To claim this credit, the amount of electricity discharged by charging stations must be quantifiable, meaning that a networked charger[2] is required.

Figure 18 illustrates the additional lifetime cost savings for each suggested replacement from BC LCFS credits only; BC credits provide a simpler selling method compared to the federal standard credits. The "Low" value shown on the chart was calculated using the minimum credit value in 2023 Q1-Q3 ($200), while the "High" value used the maximum ($485)[3]. The credit values are assumed to stay the same for the 8-year lifetime, which is a very conservative estimate considering that average credit values have increased by 169% from 2015-2023. These values were not included in the lifecycle cost analysis presented above.

The unit replacing #29401 has the highest potential LCFS revenue ($8,400-$20,300) as it has the highest annual distance travelled and therefore the highest charging demands, followed by unit #29303 ($4,900-$11,800). The sale of these LCFS credits can significantly improve the business case for transitioning to EVs. It should be noted that if the City chooses to sell these credits it cannot claim the associated GHG reductions towards meeting corporate targets as it would be considered double counting of emission reduction credits.

FIGURE 18 – LIFETIME LCFS CREDIT POTENTIAL REVENUE



[2] Networked stations are connected to a cloud network service (e.g. Flo, Chargepoint), and include metering to track usage per charging event for the purpose of charging a usage fee or for data tracking purposes.

[3] https://www2.gov.bc.ca/gov/content/industry/electricity-alternative-energy/transportation-energies/renewable-low-carbon-fuels/credits-market

Replacement Thresholds

The City will need to identify ICE vehicles to be replaced on an annual basis in order to meet GHG reduction targets, which are discussed further in **Table 7**. To assist with this process, **Table 5** provides reference values that can be used to identify potential replacements. The values were determined using the same modelling as the lifecycle cost analysis section and are based on a discounted payback of eight years or less.

For example, if the City had a light duty truck that travelled 8,000 km annually and had a fuel economy of 24L/100km, it would be a good candidate for further analysis and potential replacement. Another factor to consider is the EV range which can be cross-checked with the daily total km travelled by the vehicle up for consideration; this value can be provided by Geotab.

TABLE 5 – REPLACEMENT THRESHOLDS

Vehicle Type	Light Duty Truck	Light Duty SUV	Light Duty Car
Reference Vehicle	2023 Ford F-150 Lightning XLT	2023 Hyundai Kona Electric	2023 Chevrolet Bolt
Annual Distance (km)		**L/100km***	
5000	32	23	15
7500	22	15	10
10000	17	12	8
>12500	13	9	7
EV Standard Range (km)	370	415	417

* These are the minimum l/100km thresholds for each annual distance category, before triggering an analysis for potential EV replacement

Range Considerations

Table 6 shows the daily maximum distance travelled by each fleet vehicle compared to the standard range of the recommended EVs. In each case, the EV provides sufficient range for the daily activities. The only vehicle that comes within 100km of the maximum range is the GMC Savana replaced with an E-Transit Cargo Van, but it still has 90km to spare in comparison to the greatest distance travelled all year.

TABLE 6 – DAILY MAXIMUM DISTANCE TRAVELLED VERSUS EV RANGE

Vehicle	Replacement Vehicle	Daily Maximum Distance (km)	Standard EV Range (km)
29144 GMC Yukon	2023 Hyundai Kona Electric	89	415
29303 Ford Ranger	2023 Ford F-150 Lightning XLT	144	370
29305 Ford Escape Hybrid	2023 Hyundai Kona Electric	123	415
29401 Ford Ranger	2023 Ford F-150 Lightning XLT	165	370
29717 Ford Econo	2023 Ford F-150 Lightning XLT	98	370
29719 GMC Savana (1)	2023 E-Transit Cargo Van	113	203
29719 GMC Savana (2)	2023 Hyundai Kona Electric	113	415

Recommendations and Next Steps

With the aforementioned information in tow, recommendations and next steps to designing, building out, and optimizing a future EV fleet become clearer. Some of these steps are:

- Replacement schedule
- Site selection and future proofing
- Right-sizing vehicles and optimizing charging logistics
- Electrification of parks' equipment
- EV Education for staff

Fleet Replacement schedule

The replacement schedule in **Table 7** has been created to align with the gasoline and diesel reduction targets outlined in this Climate Action Plan[4] and exceed the targets outlined in the City's Emission Reduction Policy[5] The replacement years for Medium & Heavy-Duty Vehicles (MHDV) are subject to change because the availability of MHDVs is limited and uncertain. The replacement of light duty vehicles versus MHDV could also vary depending on the replacement needs of the City's fleet.

As outlined below, the City is recommended to invest in six EVs in 2024, which are stated in **Table 3**. For the following years, the City should continue to review their Geotab data on an annual basis and reference the replacement thresholds in **Table 5** to determine candidates for replacement.

TABLE 7 – REPLACEMENT SCHEDULE, NUMBER OF EVS TO ADD PER YEAR

Year	Target		Recommended Schedule	
	Corporate Climate Action Plan	Emission Reduction Policy	Light Duty Vehicles	Medium & Heavy-Duty Vehicles
2024	0	5	6	-
2025	12	2	6	-
2026	12	2	10	2
2027	12	2	10	2
2028	12	2	8	4
2029	12	2	6	6
2030	12	-	4	8
2031	8	-	-	8

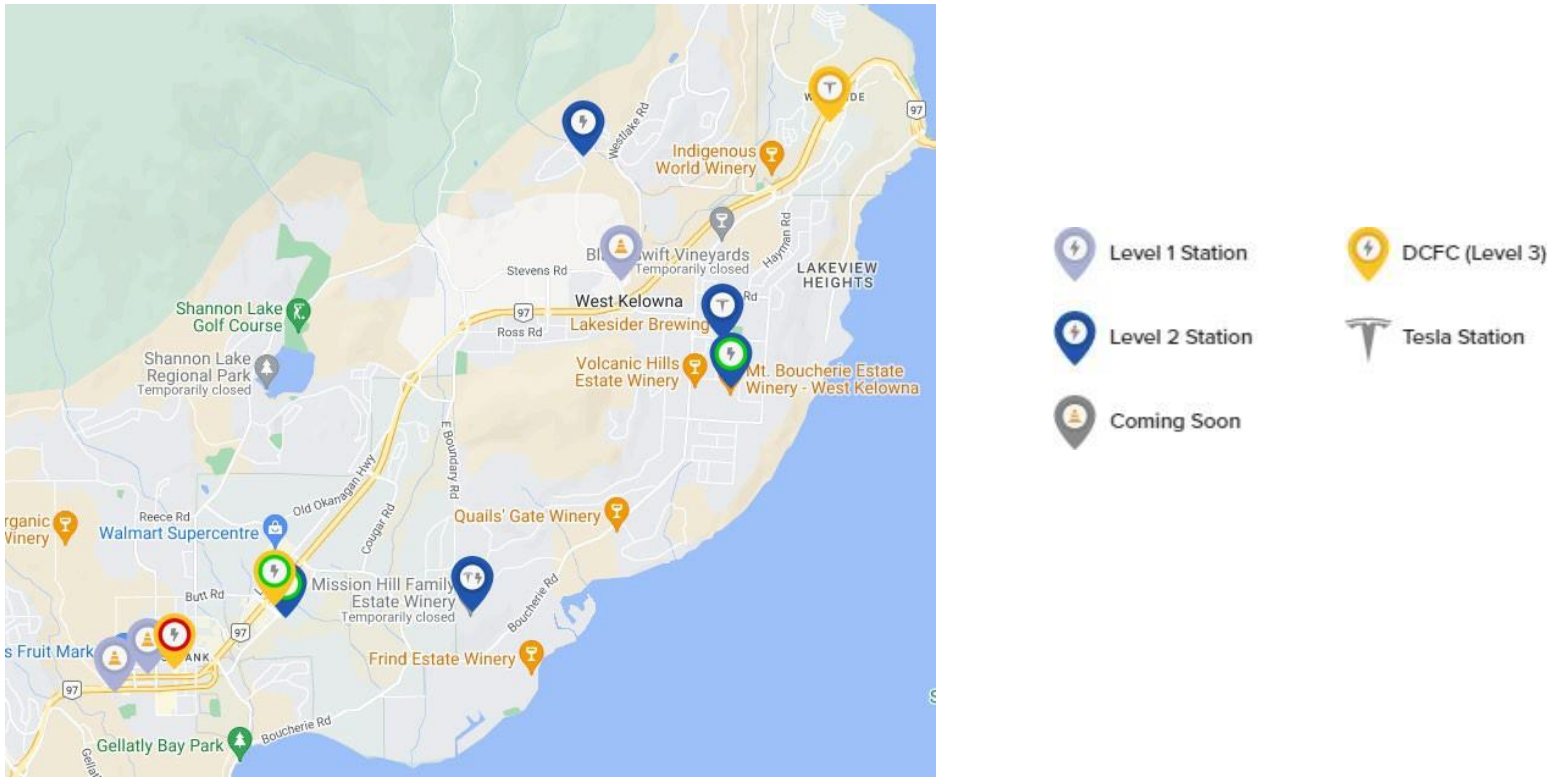
Site Selection and Future Proofing

At present there are five Level 2 and three fast charging stations in West Kelowna and Westbank First Nation (**Figure 19**). However, all of these stations are for public use, and cannot be relied upon to energize the City of West Kelowna's future fleet.

[4] Convert 15% of mobility fuels to electric every year, beginning in 2025

[5] Replace 10% or better of all light duty vehicles in the CWK fleet with zero-emission vehicles by 2025 and 30% by 2030

FIGURE 19 – CURRENT EV STATIONS IN WEST KELOWNA[6]



Without dedicated charging, it will be very difficult for fleet EVs to recharge consistently and on demand. Therefore, the City will need to invest in dedicated charging stations. Each charger runs on a 240 V/30-50 A dedicated outlet, can have multiple heads (e.g. 2 charging heads per station), intelligent charging (e.g. controlling charging of multiple vehicles by prioritizing those of low charge), and is generally inexpensive to install by an electrician if no panel upgrades or additional cabling are necessary.

[6] https://chargehub.com/en/charging-stations-map.html

Electrical Panel Considerations

A common concern with the installation of Level 2 chargers, particularly for multiple chargers, is the load it will add to the existing electrical panel. It is highly advisable that when selecting a site, to consider the capacity of its electrical panel, the number of charging stations to be added, and whether the panel is capable of adding the extra current. With three Level 2 charging stations at 30-50 A per charger recommended in each community location, an additional 90 – 150 A could be necessary per panel. Alternatively, this situation could be mitigated by using dual or tri-head chargers with load management software.[7] In any case, each potential future charger site will need to be able to accommodate the additional current. If not, then either another location should be selected, or the panel will need to be upgraded. Depending on the size of the panel upgrade, this may cost thousands or tens of thousands of dollars. Having said that, if the building in question is due for a retrofit that would necessitate increased electrical load (e.g. converting from natural gas to heat pump heating), the panel upgrade may be necessary soon anyways.

Other Site Considerations

- **Security**: To prevent unwanted usage of stations by the public, and to protect infrastructure from vandalism or theft, chargers should be in a contained environment, whether with fencing, or inside a garage/building.
- **Proximity to hubs or high usage areas**: Stations shall be located where fleet vehicles are commonly parked, or near high usage areas away from the community.
- **Parking space**: There must be parking available for the EVs to charge. One parking spot per station at the least.

Right-Sizing Vehicles and Optimizing Charging Logistics

It is vital that EVs purchased are sized to match the tasks for which the vehicle will perform. For example, a large Class 2B truck should be used predominantly for hauling or towing equipment or other large payload; they should not serve mostly to transport passengers. Conversely, a low-range vehicle should not be used for long distance commutes.

Tasks with similar payload requirements and non-overlapping schedules could also share one vehicle, provided all departments involved have agreed to it. An example of this could be forestry in spring and summer and snow plowing during the winter and sharing one vehicle between two departments with different shifts (one operating during day, other during night). 1-2 general use Class 1 vehicles for all staff to be available on a sign-in/sign-out basis may be useful too, particularly for longer duration or intercommunity trips.

Table 8 highlights the 16 vehicles in the City's fleet that are at least ten years old and travelled less than 5,000 kilometres in 2022. Engineering, Parks, and Utilities each have at least three vehicles on the list and may provide opportunities for vehicle sharing.

[7] Load management software involves chargers that communicate with each other to manage the current allocated to each vehicle. For example, a vehicle with lower charge would be allocated a higher portion of current vs. a vehicle with higher charge.

TABLE 8 – LOW-USE VEHICLES BY DEPARTMENT, 10-YEARS-OLD OR GREATER

Department	Vehicle	Annual Distance (km)
City Hall	29332 Chevy Sonic	2,417
COP	30000 Dodge Gcaravan	3,815
Engineering	29406 Ford Ranger	1,555
Engineering	29607 Mazda B4000 4X4	2,820
Engineering	29407 Ford Escape Hybrid	3,236
Mechanic	29712 Ford F350	788
Parks	29130 Gmc Suburban	194
Parks	29716 Ford Ranger	695
Parks	29702 Ford F250	2,924
Parks	29703 Ford Crcab	4,356
Parks	29410 Freightliner M2 106	4,854
Sewer	29718 Dodge 5500	4,663
Utilities	29705 Ford F150	1,166
Utilities	29409 Ford F350	4,405
Utilities	29709 Ford F250	620
Water	29713 Ford F150	3,466

Electrification of Parks' Equipment

In addition to the opportunities to replace internal combustion engine vehicles with electric vehicles, there is an opportunity to replace number of parks equipment with electric alternatives. It is highly recommended that the City explores electric alternatives for Parks' equipment such as mowers, blowers, trimmers, chainsaws, and edgers.

EV Education for Staff

Even though EVs are making strides in popularity and technology, there still remains lingering concerns over range anxiety, and how differently EVs need to be maintained and operated. Alleviating range anxiety and understanding the effect of winter weather on range may be amongst the most pertinent topics of discussion.

Implementation for Success

Several key factors are important for the successful implementation of corporate climate action plans based on research conducted by CEA, QUEST, and Smart Prosperity.[8] Among others, they include establishing broad support for implementation, building staff and financial capacity for implementation, and institutionalizing the plan in order to withstand political and staff turnover.

The City of West Kelowna has already taken some action, and climate change is one of the priorities for the Council. The City does not, however, have a policy on funding GHG emissions reductions, nor does it have a staff position focused on climate action.

Funding sources that communities typically use for climate action are shown below. External funding sources should be pursued where available to accelerate action. The internal funding sources that the City sets aside can be used to leverage external funding to great effect.

Internal Funding Sources

- LGCAP rebate allocated for climate action
- Allocation from operating budget (e.g., 0.1% annually)
- Climate action revolving fund
- Forgone revenue (e.g., offer scaled discounts on building permits for "greener" buildings)
- General revenue (e.g., property taxes)
- Recycling and solid waste user fees
- Building permit fees and other service fees charged by Development Services
- Water user fees

What is a Climate Action Revolving Fund?

Climate action revolving funds invest in energy efficiency projects to reduce energy consumption and hence energy expenditures. Energy cost savings are then reinvested in future projects. They are called "revolving funds" because all or a portion of the savings from previous projects are used to fund new projects, and fund "revolves" in this way. Two local governments in BC have implemented such a fund, Summerland and Vernon. BC Crown Corporations have also implemented these, e.g. Health Authorities.

External Funding Sources

- Canada Community-Building Fund (formerly the federal Gas Tax fund)
- Federal government programs such as the Low Carbon Economy Challenge and Energy Innovation Program

[8] Community Energy Implementation Framework, https://questcanada.org/project/getting-to-implementation-in-canada/?dc=framework

Buildings

Funding	Target	Amount
FCM GHG Reduction Pathway Feasibility and Capital Project	Access the feasibility of energy and GHG reducing projects, capital project to achieve near-net zero	Study: Single building: Grant up to $65k, up to 80% of eligible costs. Study: Portfolio of buildings: Grant up to $200k, up to 80% of eligible costs. Capital: Maximum $5 million. Up to 25% as a grant and the remainder as a loan. Combined loan and grant for up to 80% of eligible project costs.
FCM GHG Impact Retrofit ★	Capital project of a community building to achieve at least 30% GHG reduction	Maximum $5 million. Up to 25% as a grant and the remainder as a loan. Combined loan and grant for up to 80% of eligible project costs.
FortisBC Custom Efficiency Program ★	Funding for energy studies, implementation incentives and efficiency bonuses	Energy study: Up to $37.5k, 75% of costs Implementation incentives: the lesser of $3 per lifetime GJs reduced, $0.02/ per lifetime kWh reduced, 75% project costs, or $500k Implementation bonus: up to $12.5k, 25% of the energy study cost
FortisBC Commercial Product Rebates ★	Various rebates, includes variable speed drives, lighting, boilers, heat pumps, & more	Varies
FCM Retrofit of Municipal Facilities	Funding to improve energy efficiency by at least 30% in municipal facilities	Low-interest loan up to $5 million and a grant up to 15% of the loan; cover up to 80% of eligible costs
Clean BC Custom Program ★	Energy study funding and incentives for fuel switching and other electrification measures	Study: up to 50% of an energy study's cost, up to a maximum of $20,000 Capital: $40/ tCO_2e of lifetime greenhouse gas savings
BC Hydro Business energy-saving incentives ★	Funding for energy-efficient equipment upgrades	Up to 25% of the upfront costs of energy-efficient equipment (lighting, HVAC, refrigeration, and mechanical technologies)

★ It is recommended the City pursue one or more of these funding opportunities.

Fleets

Funding	Target	Amount
FCM Fleet Fossil Fuel Reduction	Study, pilot, and capital projects that reduce or avoid fossil fuel use in municipal vehicles.	Study: up to 175k, 50% of costs Pilot: up to 500k, 50% of costs Capital: loan up to $5 million, grant up to 15% of the loan; up to 80% of eligible costs
Commercial Vehicle Pilot Program ★	Funding for on and off-road electric vehicles and supporting infrastructure. Minimum requirements that must be deployed: • Class 3 and 4: six ZEVs • Class 5 and 6: three ZEVs • Class 7 and 8, and off-road: no minimum	Up to 100k, 33% of eligible project costs
Specialty Use Vehicle Incentive ★	Rebates on zero-emission motorcycles, low-speed vehicles, on road Medium- and Heavy-Duty vehicles, airport and port specialty vehicles and utility vehicles.	Varies. MHDV: Up to $100,000 or 33% of the purchase price, whichever is lower
Go Electric Fleets Program	Rebates for fleet assessments and EV infrastructure.	Free advisory services. Fleet assessments: $5,000 (50%) Electrical infrastructure: $20k (33%) Charging infrastructure: $5k/L2 (75%), $75k/ 50kW DCFC (75%)
BC Hydro Incentives	Funding for EV ready fleet plan and infrastructure	50% of planning costs up to $10,000. Up to 50% of infrastructure costs, not including charging equipment.

★ It is recommended the City pursue one or more of these funding opportunities.

Additional Funding

BC Hydro Commercial Energy Manager Program offers partial funding (50% of energy managers salary funding up to $60,000 annually) to monitor and improve energy efficiency over the long term.

FCM Municipal Asset Management Program offers up to $50k towards funding, training and resources to help strengthen asset management practices.

UBCM Asset Management Planning Program offers up to $25k for up to 50% of project costs for asset management training, planning, and development.

Infrastructure Planning Grant Program offers up to $10k to help local governments develop or improve plans such as asset management, integrated stormwater management, liquid waste management, and water master plans.

FCM Green Municipal Fund – Wastewater, stormwater offers funding for studies, pilots, and capital projects related to stormwater quality improvement, water conservation, and wastewater and septic systems.

The City already has incorporated climate action into some documents like the OCP. In addition to these actions, the City should consider:

- Discussing climate action implications in all reports to Council.
- Dedicating funds to climate action annually as part of the operating budget and maintaining a reserve fund for larger climate action projects.
- Incorporating climate action into job descriptions of other City staff. Climate action is the responsibility of all departments, and there is greater chance of success if responsibility is formally shared.
- Embed climate action into the budgeting process.
- Monitoring indicators that are easy to track to help ensure that progress is being made.
- Host regular meetings to discuss implementation with internal and/or external stakeholders.
- Reporting on indicators as part of an annual report to Council.
- Join PCP and progress through PCP milestones.
- Renewing this plan in five years.

Monitoring and Evaluation

Monitoring and evaluating the implementation of the plan is critical for its success. Key Performance Indicators (KPIs) enable a community to measure the outcomes of a plan's implementation. When KPIs are monitored regularly, the City can determine how to best allocate resources to support implementation, and the level of success of different actions.

Suggested indicators are shown in the template in **Table 9**. Two types of indicators are recommended. Primary indicators measure corporate GHG emissions, energy consumption and energy expenditure, while secondary indicators can quantify the indirect success of various actions.

Unlike a Community Climate Action Plan, the primary indicators of energy consumption, emissions, and energy expenditures can be easily and accurately tracked. Whilst these are the determinants of success, secondary indicators can still play a useful role in monitoring progress on climate action. Annual progress reporting should be planned by the City.

TABLE 9 – PRIMARY AND SECONDARY INDICATORS FOR MONITORING AND EVALUATION

INDICATOR	2023	2024	2025	2026	2027
Primary					
Corporate GHG emissions (tonnes CO2e)					
- Per capita GHG emissions (tonnes of CO2e/capita)	-				
Corporate energy consumption (GJ)					
Corporate energy expenditure ($)					
Secondary - New Buildings and Infrastructure					
Number of new buildings or infrastructure projects conducted to higher energy efficiency projects					
Secondary - Existing Buildings and Infrastructure					
Number of energy assessments conducted on corporate buildings					
Number of energy efficiency upgrades installed on corporate buildings					
- Annual GHG savings (tonnes CO2e/year)					
- Annual cost savings ($/year)					
Secondary - Renewable Energy					
Installed capacity of solar PV on corporate buildings (kW)					
Solar energy production (kWh/year)					
Secondary - Transportation					
Number of fleet vehicles that are electric, hybrid, or use other alternative fuels					
Number of employees that have completed fuel efficient driver training					
Secondary - Enabling Actions and Corporate Leadership					
Water consumption at specific corporate buildings (litres)					
Volume of waste at specific corporate buildings (cubic yards)					
Expenditures by Climate Action Revolving Fund (should one be created) ($)					
Total value of incentives received (e.g., grants) for Plan implementation ($)					
Current PCP Milestone (1 to 5)					

Climate Change Risks and Adaptation Considerations

West Kelowna is expected to see changes in its climate, which will be experienced by residents as extreme weather and shifting seasons. Temperatures are expected to rise in each season and precipitation levels are expected to decline in summer and increase in other seasons. Thus, more extreme temperatures, wildfires, and droughts could occur in summer months. Storms, flooding, landslides and storm surges may also happen more frequently, and with greater severity. The City of West Kelowna has recently been affected by climate change, particularly extreme weather events that resulted in wildfires, extreme heat and deteriorated air quality.

Increasing Resiliency to Climate Change Impacts

While the City of West Kelowna is doing its best to reduce its emissions, the City is also planning to increase its resilience to climate change impacts in order to adapt. A number of initiatives are already underway. :

Fire Protection – Fire and Parks departments have ongoing efforts to minimize the impacts of wildfires. These efforts include forest fuel removal in several parks and City-owned forested areas in the wildland-urban interface across the City (e.g., Mt. Boucherie, Powers Creek, Rose Ridge Park) to mitigate forest fire potential and intensity.

Flood Protection – Restoration of the riparian areas and foreshore in several parks along Okanagan Lake to adapt to climate change by improving resiliency to flooding events and improve habitat for species at risk.

Weather Resistant Species – Planting drought tolerant species which attracts pollinator species, improves habitat value, reduces and/or eliminates water and electricity use for irrigation, and also reduces maintenance requirements.

Shade Structures and Trees - Incorporating shade structures in some of the parks to provide a respite from the heat. Also, planting additional shade trees in several parks, and along City trails, sidewalks, and roads which helps mitigate storm runoff and heat, while also offsetting carbon dioxide.

Irrigation Measures – Upgrading all of the City's irrigation systems to a remote operated system which improved efficiency of the irrigation system leading to reduced water and electricity use, and maintenance requirements. The City also established a new xeriscape demonstration garden which showcases native drought tolerant species for ornamental landscapes and eliminates the need for irrigation.

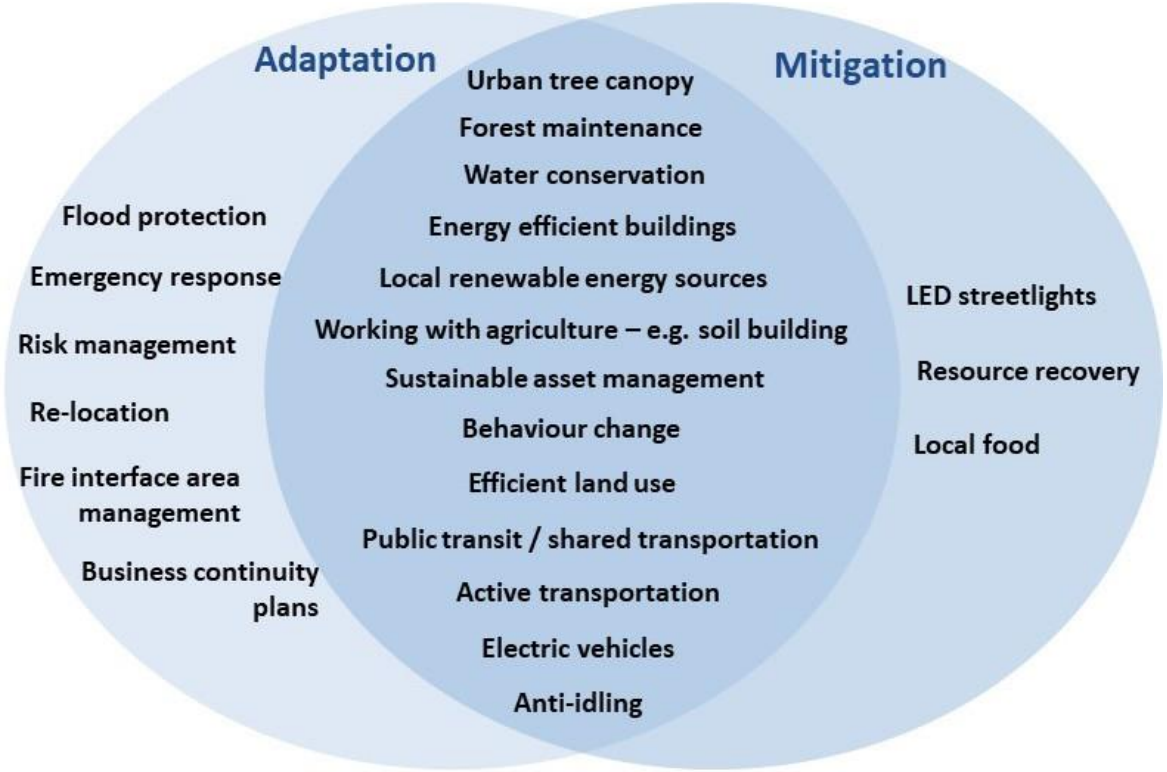
Although the primary focus of this Corporate Climate Action Plan is to mitigate greenhouse gas emissions from the City's corporate operations, it is equally critical to properly prepare for climate impacts that are already happening. The City may conduct risk and vulnerability assessments for City owned infrastructure and assets, and develop a corporate adaptation plan to minimize the impacts of climate change. The City may also consider undertaking the following:

- Develop/Update the City's Hazard, Risk and Vulnerability Analysis and embed climate change projections, complying with renewed EmergencyBC requirements (2021), assessing climate vulnerabilities and risks across infrastructure and services, ecosystems, and vulnerable residents and groups. Identify streamlined actions and partnership opportunities (e.g., education, deployment capacity, facilities as shelters, evacuation routes, key partner roles

- Develop programs to perform extreme weather checks on vulnerable people and educate residents about climate resilience. This may include emergency planning, and response procedures (including early warning/alert systems), increasing community livability, etc. Early warning systems and emergency response plans alert residents to extreme heat, poor air quality, wildfires, and floods in advance in order to move them to safer locations. This also helps to minimize stress and anxiety and possible injuries or illnesses.
- Diversify or upgrade community infrastructure like drinking water, storm water and wastewater systems to withstand heavy precipitation and extreme weather events. Natural assets like wetland restoration can also minimize storm water run-off. Storing excess water during heavy precipitation and instituting water conservation or water efficient technologies can address increased water stress.
- The addition of more and strategically planned natural vegetation can help to cool communities.
- Develop low carbon resiliency policy and procedures that are integrated with all planning, procurement, and capital investment decision processes to encourage resilient and sustainable decisions and investments over time.

Fortunately, many actions can accomplish both mitigation and adaptation, as shown in **Figure 20**. Evaluating adaptation strategies now and, where possible, complementary low emissions strategies, will help advance the City's overall resiliency and ability to respond and thrive over the short and long-term.

FIGURE 20 – INTERSECTION BETWEEN CLIMATE CHANGE MITIGATION AND ADAPTATION ACTIONS



A National Roundtable on the Environment and the Economy report* explains that the climate change costs for Canada could rise from $5 billion/year in 2020 to $21-43 billion/year by the 2050s, or higher. Finding ways to adapt to climate change will help to reduce these costs.

Paying the Price: The Economic Impacts of Climate Change for Canada, http://nrt-trn.ca/climate/climate-prosperity/the-economic-impacts-of-climate-change-for-canada/paying-the-price

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Abbreviations

BAU	Business as Usual
CAC	Climate Action Charter
CARIP	Climate Action Revenue Incentive Program (administered through the Province of BC)
CDD	Cooling Degree Day
CEA	Community Energy Association
CNG	Compressed Natural Gas
CO_2	Carbon Dioxide
CO_2e	Carbon Dioxide equivalent
EV	Electric Vehicle
FCM	Federation of Canadian Municipalities
GHG	Greenhouse Gas (there are several different anthropogenic GHGs and they have different relative impacts. When tonnes of GHGs are stated in the document the standard practice of stating this in equivalent of tonnes of carbon dioxide is followed.)
GJ	Gigajoules (one of the standard measures of energy)
GMF	Green Municipal Fund
HDD	Heating Degree Day
HVAC	Heating Ventilation and Air Conditioning
ICE	Internal Combustion Engine
ICLEI	International Council for Local Environmental Initiatives
IPCC	Intergovernmental Panel on Climate Change (an intergovernmental body of the United Nations dedicated to providing the world with an objective science-based view of climate change, its possible impacts, risks, and response options)
IRR	Internal Rate of Return
km	Kilometer
KPI	Key Performance Indicator

kWh	kilowatt hours (standard measure of energy, typically used with electricity)
L	Litre
LCFS	Low Carbon Fuel Standard
LDV	Light-Duty Vehicles
LGCAP	Local Government Climate Action Program
LED	Light Emitting Diode
MHDV	Medium and Heavy-Duty Vehicles
NPV	Net Present Value
OCP	Official Community Plan
PCP	FCM-ICLEI's Partners for Climate Protection
PV	Photovoltaics (solar panels that generate electricity)
RCP	Representative Concentration Pathway (four RCPs were adopted by the IPCC as scenarios for the 2014 Fifth Assessment Report, depending on how much GHGs are emitted in future years)
ROI	Return on investment

Appendix A. Climate Actions in Detail

This section provides some details regarding the potential timing, estimated greenhouse gas reductions, and savings resulting from the reduction of energy use for each action in 2030, on an annual basis. It also attempts to give an indication about incremental effort and incremental cost for the implementation of the action.

What do the terms and colour coding mean in the action tables?

In **Table 10** below, the terms refer to the following:

- Effort = staff time
- Costs = municipal costs
- GHG & economic impacts = GHG emission savings & financial savings in the year 2030
- Adaptation / resilience linkages = capacity for increased efficiency and enhanced outcomes through linkages to climate adaptation / resilience. An example of a high resilience linkage is energy independence, and an example of a mild linkage is air quality.

And where there are no numbers, there is colour coding to help communicate expected impacts and implications:

- **Green = high adaptation / resilience linkages, low effort, costs estimated to be $0 - $500.**
- **Blue = medium for all attributes. Costs estimated to be in $500-5,000 range.**
- **Red = no adaptation / resilience linkages, high effort, costs estimated to be $5,000 or more.**

New Buildings and Infrastructure

Action	Potential Timing	GHG Impacts	Economic Impacts	Adaptation/ Resilience Linkages	Incremental Effort	Incremental Cost	Possible Partner/ Funder	Staff Responsibility
1.1 Build energy efficient buildings	**2025**	**42 tCO_2e**	**$22k**	**High**	**Low**	**Medium**	**FCM**	**All**

It is recommended that the City commits to build new buildings that are energy efficient and have low GHG emissions. **Appendix I** contains "Guiding Principles for Climate Ready Municipal Buildings" The benefits of doing so are:

- Reducing risk by ensuring that the City owns assets that are "future proofed", i.e., that will have low energy costs, low GHG emissions (and hence low carbon tax payments / low offset requirements), and will be resilient to a changing climate (e.g., hotter and smokier summers).
- Reducing the need for buildings to be retrofit later.
- Ensuring that the City owns and operates high quality, low maintenance assets.
- Leading by example in the community on energy efficient building practices and ensuring that energy efficient best practices are disseminated throughout the community.

Action	Potential Timing	GHG Impacts	Economic Impacts	Adaptation/ Resilience Linkages	Incremental Effort	Incremental Cost	Possible Partner/ Funder	Staff Responsibility
1.2 Build energy efficient infrastructure	**2025**	**1.2 tCO_2e**	**$13k**	**High**	**Low**	**Medium**	**n/a**	**Public Works/Engineering**

It is recommended that the City commits to building the most energy efficient and low emission infrastructure that it reasonably can. There are multiple benefits to doing this:

- Reducing risk by ensuring that the City owns assets that are "future proofed", i.e., that will have low energy costs, low GHG emissions (and hence low carbon tax payments / low offset requirements) and will be resilient to a changing climate (e.g., hotter and smokier summers).
- Reducing the need for infrastructure to be retrofit later.
- Ensuring that the City owns and operates high quality, low maintenance assets.
- Leading by example in the community by demonstrating best practices.

Action	Potential Timing	GHG Impacts	Economic Impacts	Adaptation/ Resilience Linkages	Incremental Effort	Incremental Cost	Possible Partner/ Funder	Staff Responsibility
1.3: Optimise siting and orientation of new buildings	**2025**	**6.9 tCO_2e**	**$3.7k**	**High**	**Low**	**Low**	**n/a**	**All, Project Manager**

It is recommended that the City commits to optimizing the siting and orientation of new buildings where possible. This includes optimizing orientation to benefit from passive solar gain and siting a building adjacent to a waste heat source if available. This action has the following benefits:

- Reducing risk by ensuring that the City owns assets that are "future proofed". I.e., that will have low energy costs, low GHG emissions (and hence low carbon tax payments / low offset requirements) and will be resilient to a changing climate (e.g., hotter and smokier summers).
- Reducing the need for buildings to be retrofit later.
- Ensuring that the City owns and operates high quality, low maintenance assets.
- Leading by example in the community on building best practices.

Many of these benefits are similar to 1.1 but can in some cases be realized for a lower cost and effort. For example, orientation of a building can ensure passive heat gain at cooler times of the year, while installing passive solar design features that will also reduce the summer heat gain.

Existing Buildings & Infrastructure

Action	Potential Timing	GHG Impacts	Economic Impacts	Adaptation/ Resilience Linkages	Incremental Effort	Incremental Cost	Possible Partner/ Funder	Staff Responsibility
2.1: Conduct building energy audits	**2023**	**n/a**	**n/a**	**High**	**Medium**	**Low**	**Clean BC, FCM, BC Hydro, FortisBC**	**Facilities**

It is recommended that the City conducts additional/unbiased energy audits of its buildings, beginning with those that consume the most energy. As the audits are completed, the City can then prioritize measures based on audit results.

The City may choose to prioritize projects based on energy cost savings or GHG emissions savings. The former is most likely to come from reduced electricity consumption whereas the latter is most likely to come from reduced natural gas consumption.

Action	Potential Timing	GHG Impacts	Economic Impacts	Adaptation/ Resilience Linkages	Incremental Effort	Incremental Cost	Possible Partner/ Funder	Staff Responsibility
2.2: Implement energy retrofits recommended by building energy audits	**2024**	**325 tCO_2e**	**$125k**	**High**	**High**	**High**	**Clean BC, FCM, BC Hydro, FortisBC**	**Facilities**

Upon completion of action 2.1, energy retrofits recommended by the energy audit reports should be prioritized and implemented. A prioritization process will identify which projects to be completed first, based on business case (considering life cycle costs, incentives/grants, simple payback period, etc.), energy cost savings and/or GHG emissions savings. Typically, energy retrofits that reduce electricity consumption will result in energy cost savings and energy retrofits that reduce natural gas consumption will result in GHG emissions savings. A project prioritization matrix can be found in **Appendix E**.

Measures with higher GHG reduction potential and reasonable payback periods include but not limited to:

- Optimization of building automation system (BAS) controls (some of these can be built into annual building maintenance procedures)
- Implementation of low-flow plumbing fixture (all buildings)
- Installation of heat recovery chiller at the (aquatic centre)
- Heat recovery at Royal LePage Arena and heat sharing with nearby buildings such as the community centre and Mount Boucherie Secondary School. The heat recovery and sharing at this location has a significantly high GHG reduction potential that is worth exploring further. Similar projects implemented by other local governments such as the Regional District of Mount Waddington (Chilton Arena Heat Loop) and the City of Langford (District energy system within City Centre Park) achieved significant GHG reductions and cost savings.

Action	Potential Timing	GHG Impacts	Economic Impacts	Adaptation/ Resilience Linkages	Incrementa Effort	Incrementa Cost	Possible Partner/ Funder	Staff Responsibility
2.3: Conduct energy-focused operational review of infrastructure	**2023**	**n/a**	**n/a**	**High**	**Medium**	**Low**	**FortisBC, FCM/UBCM Asset Management**	**Engineering, Facilities, Public Works**
It is recommended that the City conducts an energy-focused operational review of its infrastructure, which includes drinking, storm and waste-water systems as well as streetlights. It may be possible to identify areas of energy efficiency improvements, which would be planned and implemented after the review.								

Action	Potential Timing	GHG Impacts	Economic Impacts	Adaptation/ Resilience Linkages	Incremental Effort	Incremental Cost	Possible Partner/ Funder	Staff Responsibility
2.4: Implement measures from operational review of infrastructure	**2024**	**8 tCO_2e**	**$86k**	**High**	**High**	**Medium**	**BC Hydro, FCM**	**Engineering, Facilities, Public Works**
The energy-focused operational review of infrastructure (specifically water) will have identified areas of potential energy savings in the form of electricity. Due to the relatively high cost of electricity (compared with natural gas), there is the potential for significant energy cost savings. This action also includes implementing leak detection in water infrastructure.								

Action	Potential Timing	GHG Impacts	Economic Impacts	Adaptation/ Resilience Linkages	Incremental Effort	Incremental Cost	Possible Partner/ Funder	Staff Responsibility
2.5: Incorporate energy management into annual building maintenance procedures	**2024**	**106 tCO_2e**	**$57k**	**Medium**	**Low**	**Low**	**n/a**	**Facilities**

Annual maintenance and safety inspections provide a convenient opportunity to incorporate energy management objectives. Specific actions include:

- Check programming of thermostats and lighting controls
- Check and replace weather stripping on doors and windows as necessary
- Monitor annual energy consumption to identify abnormal energy use
- Assess condition and maintenance dates of HVAC and hot water equipment

Two sample checklists are provided in **Appendix F.**

Renewable Energy

Action	Potential Timing	GHG Impacts	Economic Impacts	Adaptation/ Resilience Linkages	Incremental Effort	Incremental Cost	Possible Partner/ Funder	Staff Responsibility
3.1: Install solar PV on corporate buildings	**2026**	**6.6 tCO_2e**	**$71k**	**High**	**Medium**	**High**	**FCM**	**Facilities**

Consider the potential for solar PV installation on all new corporate buildings and look for potential on existing buildings. Solar PV is often more cost effective when installed on new buildings or when roof replacement is necessary on an existing building. This action has the following benefits:

- Reducing risk by ensuring that the City owns assets that are "future proofed". I.e. that will have low energy costs, low GHG emissions (and hence low carbon tax payments / low offset requirements), and will be resilient to a changing climate (e.g. hotter and smokier summers).
- Reducing the need for buildings to be retrofit later.
- Ensuring that the City owns and operates high quality, low maintenance assets.
- Leading by example in the community on building best practices.

At minimum, when a building is re-roofed, it should be made solar-ready. This is low cost but can significantly reduce the cost of a solar installation later.

Action	Potential Timing	GHG Impacts	Economic Impacts	Adaptation/ Resilience Linkages	Incremental Effort	Incremental Cost	Possible Partner/ Funder	Staff Responsibility
3.2: Low-carbon heating systems for buildings	**2024**	**199 tCO_2e**	**$13k**	**High**	**Medium**	**High**	**Clean BC, FCM**	**Facilities**

Building energy audits as described in action 2.1 may identify opportunities to retrofit low-carbon heating systems. Similarly, low carbon heating systems should be considered for all new corporate buildings. Low-carbon heating systems may include air-source heat pumps and waste heat recovery. This action could lead to substantial GHG emissions reductions, but may result in higher electricity bills in the case of air-source heat pumps, due to the higher cost of electricity than natural gas. This action will tie-in with asset management and building maintenance/inspection programs at the City.

Action	Potential Timing	GHG Impacts	Economic Impacts	Adaptation/ Resilience Linkages	Incremental Effort	Incremental Cost	Possible Partner/ Funder	Staff Responsibility
3.3: Conduct corporate renewable energy study	**2026**	**n/a**	**n/a**	**High**	**Medium**	**Medium**	**FCM**	**Engineering**

Renewable energy opportunities include both electricity generation such as solar, and renewable gas from waste such as RNG from landfills, anaerobic digestion of household organics and manure. Solar PV is very straightforward and was already discussed in action 3.1. Other opportunities such as RNG generation and use can require more investigation, working closely with nearby municipalities and the Regional District of Central Okanagan.

- Opportunities for electricity generation will depend on BC Hydro's willingness to purchase and associated requirements. Smaller electricity generating systems such as solar PV are net metered, and easier in this regard.
- Generation and local use of RNG would provide several benefits including investment locally, job creation, transparency and accountability in association with GHG reductions and offsets.

Transportation and Fleet

Action	Potential Timing	GHG Impacts	Economic Impacts	Adaptation/ Resilience Linkages	Incremental Effort	Incremental Cost	Possible Partner/ Funder	Staff Responsibility
4.1: Right-size vehicles for assigned tasks	**2024**	**20 tCO_2e**	**$18k**	**Low**	**Low**	**Low**	**n/a**	**All, Fleet Operations**

A municipal fleet contains a wide array of vehicle types and sizes. Vehicle fuel economy (litres/100km) varies widely between vehicle types. An appropriately sized vehicle should be used for each task to reduce fuel consumption.

It is recommended that the City creates a vehicle use policy and institutionalize it.

Action	Potential Timing	GHG Impacts	Economic Impacts	Adaptation/ Resilience Linkages	Incremental Effort	Incremental Cost	Possible Partner/ Funder	Staff Responsibility
4.2: Develop a vehicle purchasing policy	**Done**	**n/a**	**n/a**	**Low**	**Low**	**Low**	**n/a**	**Fleet Operations, Finance**
A vehicle purchasing policy and Emission Reduction Policy have already been created and implemented.								

Action	Potential Timing	GHG Impacts	Economic Impacts	Adaptation/ Resilience Linkages	Incremental Effort	Incremental Cost	Possible Partner/ Funder	Staff Responsibility
4.3: Invest in EVs and EV Charging Stations	**2025**	**166 tCO_2e**	**$144k**	**Low**	**Medium**	**High**	**CEA, FCM, SUVI, Go Electric Fleets, BC Hydro**	**Fleet Operations, Facilities, Finance**
When light-duty vehicles are due for replacement, the City should consider purchasing an EV rather than a traditional ICE vehicle. The City should consider the full life-cycle costs including fuel and maintenance when comparing the two vehicle types for purchase. The City should complete an annual scan of electric vehicles available on the market. The City should report annual charging amounts (kWh) to the province and sell LCFS credits. Further information on LCFS credits and how to sell can be obtained from the Province of BC's dedicated LCFS webpages, and also from CEA.								

Action	Potential Timing	GHG Impacts	Economic Impacts	Adaptation/ Resilience Linkages	Incremental Effort	Incremental Cost	Possible Partner/ Funder	Staff Responsibility
4.4: Assess options for MHDVs (renewable fuels)	**2025**	**69 tCO_2e**	**n/a**	**Low**	**Medium**	**Medium**	**FCM**	**Fleet Operations**
The City should assess the potential of renewable fuels such as biodiesel and ethanol for its corporate fleet. The City should request a quote for renewable fuels when tendering for fuel contracts annually.								

Action	Potential Timing	GHG Impacts	Economic Impacts	Adaptation/ Resilience Linkages	Incremental Effort	Incremental Cost	Possible Partner/ Funder	Staff Responsibility
4.5: Fuel efficient driver training & anti-idling policy	**2024**	**34 tCO_2e**	**$31k**	**Low**	**Low**	**Low**	**n/a**	**Fleet Operations**
The most cost-effective way to reduce fleet emissions is through operator behaviour. The costs to implement an efficient vehicle use program will likely be more than offset by the direct savings on fuel purchases. The City should include this action as part of yearly training, general staff training plans and included as part of new employee training. Training will be tracked in the employee's personal folder. An anti-idling policy will continue to be implemented and should be updated as necessary by the City.								

Action	Potential Timing	GHG Impacts	Economic Impacts	Adaptation/ Resilience Linkages	Incremental Effort	Incremental Cost	Possible Partner/ Funder	Staff Responsibility
4.6: Energy-focused fleet maintenance	**2024**	**17 tCO_2e**	**$16k**	**Low**	**Low**	**Low**	**n/a**	**Public Works, Fleet Operations**
Routine checks of vehicle systems (e.g., tire pressures, engine tuning), is a very low-cost way to improve on emissions and reduce costs. This could b e combined with regular safety inspections of vehicles (e.g., brakes). An example vehicle maintenance checklist is provided in **Appendix G.**								

Action	Potential Timing	GHG Impacts	Economic Impacts	Adaptation/ Resilience Linkages	Incremental Effort	Incremental Cost	Possible Partner/ Funder	Staff Responsibility
4.7: Encourage carpooling and active transportation where possible	**2023**	**n/a**	**n/a**	**Low**	**Low**	**Low**	**n/a**	**All**
This action encourages staff to carpool for travel to work and for work-related travel. Furthermore, travel needs can be reduced through attending off-site meetings virtually. Encouraging walking and cycling to work can take place through incentives and competitions. The City already suggests that employees carpool when travelling out of town for conferences and meetings.								

Action	Potential Timing	GHG Impacts	Economic Impacts	Adaptation/ Resilience Linkages	Incremental Effort	Incremental Cost	Possible Partner/ Funder	Staff Responsibility
4.8: Improve/expand facilities to help staff reduce the emissions associated with commuting to work	**Done/ Ongoing**	**n/a**	**n/a**	**Low**	**Medium**	**Medium**	**n/a**	**Facilities, Human Resources, Senior Management**
Providing amenities like covered / secured bicycle racks and showering facilities can help enable staff to leave their vehicles at home and commute to work by foot or bike. EV charging stations and plug-ins can help staff who have electric vehicles, including e-bikes and e-scooters. Emissions from staff commuting are not included within a corporate inventory, but in many cases represent a significant opportunity to demonstrate leadership in reducing overall community emissions. This explains why emissions and economic impacts are given as zero.								

Enabling Actions and Corporate Leadership

Action	Potential Timing	GHG Impacts	Economic Impacts	Adaptation/ Resilience Linkages	Incremental Effort	Incremental Cost	Possible Partner/ Funder	Staff Responsibility
5.1: Have dedicated staff person or department for plan implementation	**2023**	**n/a**	**n/a**	**High**	**Medium**	**Medium**	**n/a**	**Senior Management**
A Corporate Climate Action Plan details actions that can be taken to reduce energy and emissions. The plan itself does not result in savings - it is the implementation of the actions listed in the plan that does. Limited staff capacity can be a barrier to successful implementation of the plan. Having a dedicated staff person or department is critical for successful plan implementation. BC Hydro's *Energy Manager Program* offers an opportunity to cover 50 % of the salary of a new hire that would develop a strategic energy management plan, secure budgets and business cases for energy efficiency projects, and identify other grants/incentives offered to local governments by FCM and senior levels of government.								

Action	Potential Timing	GHG Impacts	Economic Impacts	Adaptation/ Resilience Linkages	Incremental Effort	Incremental Cost	Possible Partner/ Funder	Staff Responsibility
5.2: Allocate funds for plan implementation	**2023**	**94 tCO_2e**	**$60k**	**High**	**Low**	**Low**	**n/a**	**Finance, All, Senior Management**
There are a variety of mechanisms through which funds could be allocated to corporate climate action. LGCAP funds are one example. A revolving fund can be created whereby cost savings resulting from energy savings from project implementation go back into the climate action fund. Another option is an annual allocation of funds from the budget.								

Action	Potential Timing	GHG Impacts	Economic Impacts	Adaptation/ Resilience Linkages	Incremental Effort	Incremental Cost	Possible Partner/ Funder	Staff Responsibility
5.3: Develop KPIs, monitor and track for progress	**2023**	**n/a**	**n/a**	**High**	**Low**	**Low**	**n/a**	**All, Potential New Position**
It is important to track energy consumption, energy expenditure and GHG emissions year over year to evaluate overall progress. However, some secondary indicators may also be helpful to monitor progress. A full list of primary and secondary performance indicators are provided in **Table 9**.								

Action	Potential Timing	GHG Impacts	Economic Impacts	Adaptation/ Resilience Linkages	Incremental Effort	Incremental Cost	Possible Partner/ Funder	Staff Responsibility
5.4: Demonstrate leadership on corporate waste and water	**2024**	**n/a**	**n/a**	**High**	**Medium**	**Low**	**n/a**	**All**
Actions should be taken to reduce waste creation and water consumption at the corporate level. Demonstrating leadership at the corporate level may help to guide reductions at the community level. Examples include: • Zero-waste target for corporate operations • Best practices in water efficient landscaping • Policies that discourage printing • Planning purchases to minimize deliveries Reduction in water consumption and waste creation will have minimal impact on corporate GHGs and energy expenditures.								

Action	Potential Timing	GHG Impacts	Economic Impacts	Adaptation/ Resilience Linkages	Incremental Effort	Incremental Cost	Possible Partner/ Funder	Staff Responsibility
5.5: Join Partners for Climate Protection (PCP)	**2023**	**n/a**	**n/a**	**Low**	**Low**	**Low**	**CEA, FCM**	**Senior Management**
PCP is a network of Canadian municipal governments that have committed to reducing GHGs and to acting on climate change. The program empowers municipalities to take action against climate change through a five-milestone process that guides members in creating GHG inventories, setting GHG reduction targets, developing local action plans, implementing actions to reduce emissions, and monitoring and reporting on results. It is free to join. The City can use this report to gain milestones 1-3, and then begin to work towards milestones 4 and 5.								

Action	Potential Timing	GHG Impacts	Economic Impacts	Adaptation/ Resilience Linkages	Incremental Effort	Incremental Cost	Possible Partner/ Funder	Staff Responsibility
5.6: Examine local carbon offset projects for remaining emissions	**2024**	**n/a**	**n/a**	**High**	**Medium/ High**	**Medium**	**n/a**	**All**
To achieve carbon neutrality, local governments must find a way to make up for, or balance, their ongoing corporate emissions. The Green Communities Carbon Neutral Framework provides guidance on how municipalities can become carbon neutral in their corporate operations. The following options can be explored by the City: 1. Investing in a Green Communities Committee (GCC) supported project allows local governments to invest locally while also ensuring that projects are credible and result in measurable GHG reductions. 2. Investing in alternate GHG reduction projects within the community that are outside the corporate emissions boundary, but do not fall under the definition of option 1. Protection of natural assets such as forested land from development, sequestration of carbon by planting trees and/or increasing urban tree canopy, or local generation and use of renewable energy (e.g., RNG from landfills, anaerobic digestion of organic waste) are some of the opportunities that may offer local carbon offsets. More information about becoming carbon neutral can be found in this report https://toolkit.bc.ca/wp-content/uploads/2022/05/BecomingCarbonNeutralGuideV3.pdf								

Action	Potential Timing	GHG Impacts	Economic Impacts	Adaptation/ Resilience Linkages	Incremental Effort	Incremental Cost	Possible Partner/ Funder	Staff Responsibility
5.7: Annual reporting on GHGs	**2023**	**n/a**	**n/a**	**Low**	**Medium**	**Low**	**n/a**	**Grant Coordinator/Planning (interim), new position (long term)**
Track annual emissions from buildings, transportation, waste, and contracted services (waste collection), as already required for LGCAP. This is anticipated to be completed as per the standard process identified in previous years in the interim until staff capacity increases and workload is evaluated.								

How are action impact numbers calculated?

Action impact numbers are calculated through a number of assumptions and educated estimates based on CEA's experience. The impacts of individual actions on energy consumption are calculated for the year 2030. From this, GHG impacts and economic impacts are calculated using GHG intensity values and energy costs.

Actions may have further reaching impacts than the values stated here. Specifically, they demonstrate leadership and therefore may lead to GHG reductions and energy cost savings in the community.

Appendix B. PCP Information and Inventory

PCP Information

The Federation of Canadian Municipalities - International Council for Local Environmental Initiatives (FCM-ICLEI) Partners for Climate Protection (PCP) is a network of Canadian municipal governments that have committed to reducing GHG emissions and to acting on climate change. Since the program's inception in 1994, over 500 municipalities have joined PCP, making a public commitment to reduce GHG emissions. PCP membership covers all provinces and territories and accounts for more than 70 percent of the Canadian population.

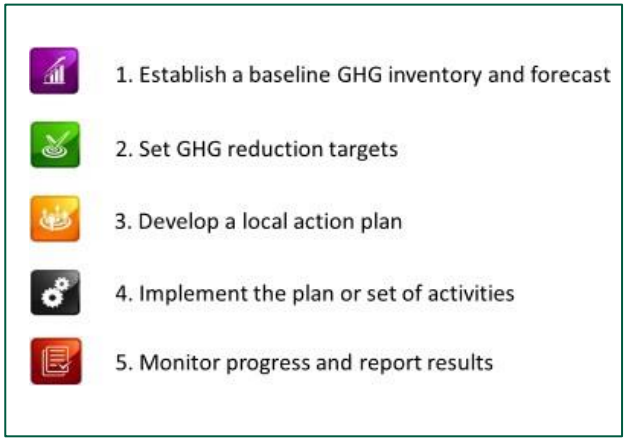
The PCP program is managed and delivered by FCM and ICLEI Canada. They form the PCP Secretariat, which provides administrative and technical support, develops tools and resources, and delivers capacity building activities to support members in reducing local GHG emissions. The Secretariat also provides national recognition for member achievements.

The program empowers municipalities to take action against climate change through a five-milestone process, as shown in **Figure 21**.

- For Milestone 1-3, this report can be used to submit the inventory, projections, targets, and action plan to PCP.
- For Milestone 4, the City will need to implement actions in this Corporate Plan and submit these reports to FCM-ICLEI.
- For Milestone 5, the City will need to create a document with an updated corporate inventory and recorded impacts of individual actions that have been conducted.

FIGURE 21 – PCP PROGRAM MILESTONES

Source: PCP



Inventory

The following table breaks down the City's GHG emissions by the PCP categories in 2022.

TABLE 11 – PCP INVENTORY: EMISSIONS (tCO_2E)

PCP Category	tCO_2e
Buildings	1,509
Corporate Solid Waste	44
Fleet	1,041
Streetlights and Traffic Signals	14
Water and Wastewater	50
Total	**2,658**

Figure 22 shows the percentage of energy consumption, GHG emissions, and energy expenditures that can be attributed to each PCP classification and each fuel source. Buildings are responsible for over half of the City's energy consumption and emissions, and 40% of expenditures. The Fleet has the second highest emissions, accounting for 39%. As for expenditures, Water and Wastewater are responsible for the second highest portion (24%), followed closely by the Fleet (23%). Corporate solid waste has no energy or cost associated with it since it uses no fuel source, but it does have GHG emissions due to its decomposition in the landfill. Electricity has the highest energy usage (43%) and cost (55%), while natural gas is responsible for the greatest portion of emissions (55%).

FIGURE 22 – PCP INVENTORY: ENERGY, EMISSIONS AND COST BY CATEGORY AND FUEL SOURCE, 2022

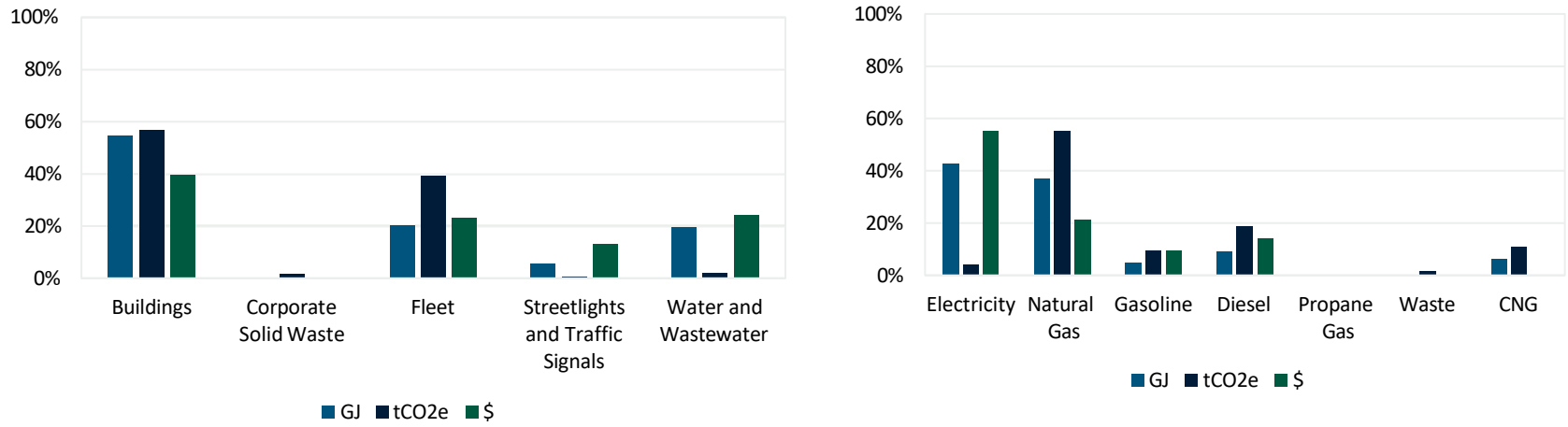
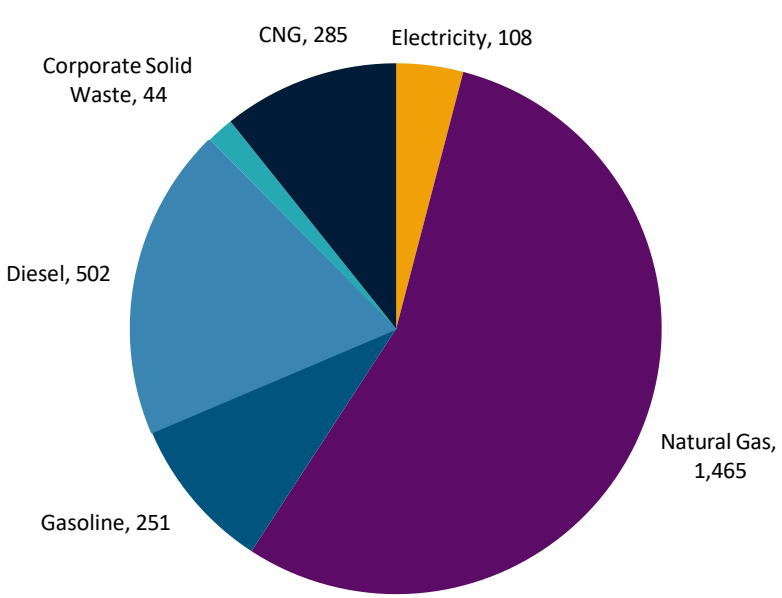
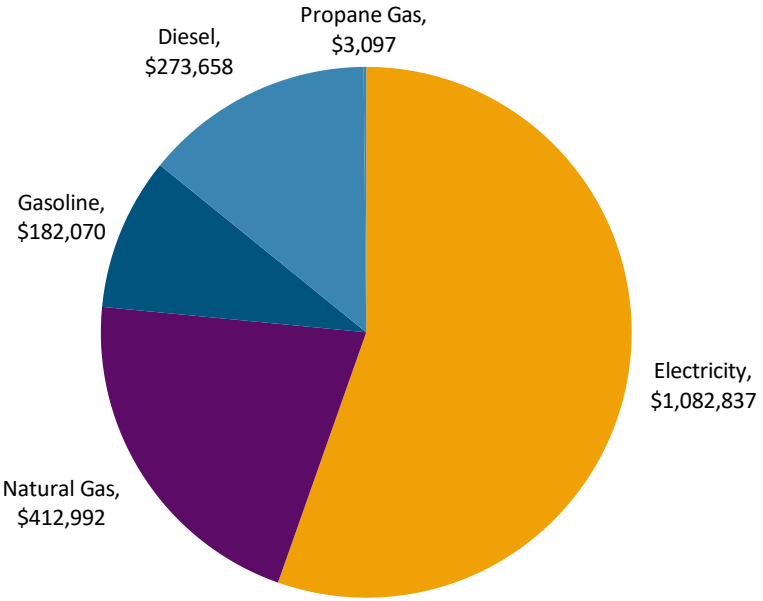


Figure 23 shows the GHG emissions and energy cost by fuel source in 2022. Natural gas accounts for just over half of the City's emissions (1,465 tCO_2e), while electricity accounts for just over half the expenditures ($1,082,837).

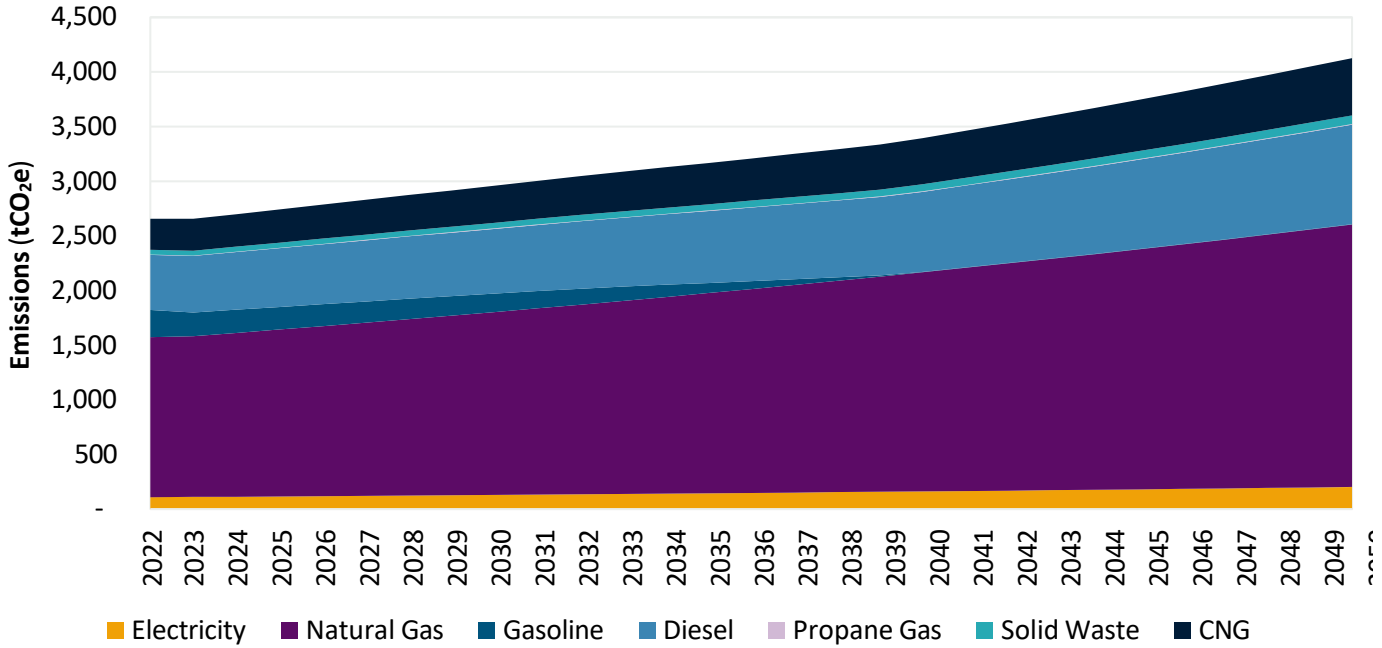
FIGURE 23 – PCP INVENTORY: EMISSIONS (tCO_2E) AND COST BY FUEL SOURCE, 2022





If the City of West Kelowna implements no special efficiency or conservation activities, and assuming that future changes are proportional with population increase, then the City's emissions are forecast to increase by 11% in 2030 and 55% in 2050 compared to 2022 levels as shown in Figure 24.

FIGURE 24 – BUSINESS-AS-USUAL EMISSIONS FORECAST TO 2050, BY FUEL SOURCE



Appendix C. Inventory and Modelling Assumptions

This appendix contains details on the corporate energy & emissions inventory and projections for the City of West Kelowna.

Inventories

Building and transportation inventories were created using energy and cost data provided by the City. Based on the data compiled, full inventory years for energy consumption and emissions are 2012-2022, while energy costs are 2021-2022.

- 2012-2022 data was sourced from existing Pinna CARIP inventories
- 2021-2022 data was sourced from fleet records, Fortis Natural Gas bills, and BC Hydro electricity bills
    a. Contracted services data sources are described in the table below

TABLE 12 – CONTRACTED SERVICES DATA SOURCES

Contracted Service	Data Source
Street Sweeping	Contractor provided an estimated amount of diesel used
Roads Maintenance	Contractor provided a tracked amount of diesel and gasoline used
Facilities Janitorial	Contractor provided a tracked distance travelled for both routes
Waste Collection	Contractor provided an estimated amount of CNG usage based on total CNG consumption and the percent of runs dedicated to West Kelowna (contractor serves five communities)
Parks Mowing & Security	Contractor was not able to provide data, estimate was based on data provided in previous years

Waste emissions were determined based on the size of bins and frequency of pick-ups at the following locations: RCMP, Museum, Parks/Operations, Westbank Lion's, Mt Boucherie Rec, Special Events Bin, Lakeview Heights, Bartley Rd Utilities, Fire Hall 31, Fire Hall 32, Fire Hall 33, Fire Hall 34, and PCWTP. An emissions factor of 0.8 tCO_2e/ tonne of waste was used and these emissions are only included in the PCP inventory.

Emissions factors for inventory years are shown in Table 12, are sourced from the Province of BC[9]. The electricity emissions factors were adjusted in 2021 and 2022[10] to include net electricity imports, which was back cast in this inventory to 2012.

[9] https://www2.gov.bc.ca/assets/gov/environment/climate-change/cng/methodology/2020-pso-methodology.pdf
[10] https://www2.gov.bc.ca/gov/content/environment/climate-change/industry/reporting/quantify/electricity

TABLE 13 – EMISSIONS FACTORS

tCO_2e/GJ	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Electricity	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003
Natural gas	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050
Gasoline	0.067	0.067	0.067	0.067	0.068	0.068	0.068	0.066	0.064	0.063	0.063
Diesel	0.068	0.068	0.068	0.075	0.070	0.070	0.071	0.070	0.069	0.069	0.069
Propane	0.061	0.061	0.061	0.061	0.061	0.061	0.061	0.061	0.061	0.061	0.061

Projections

CEA's Corporate model was used both to calculate the BAU trajectory, and to estimate the potential GHG reductions that could be achieved. Developed in 2019, the model builds on the City's inventory data using population and assumptions. The model uses formulas both to calculate the BAU trajectory, and to estimate the impacts of each action.

The BAU trajectory was calculated by using available inventory data, and then projecting forwards using a population increase of 2.2% per year (the average annual increase between 2016 and 2021).

From 2023 onwards, all of the data is an estimate as a BAU projection.

For the BAU projection modelling, the assumption is that energy consumption and emissions will increase proportionally with increases to population, although the impact of policies from higher levels of government are also incorporated, and other assumptions. Only policies that have already been adopted and that will have quantifiable impacts are incorporated. Assumptions are:

- The Province's incremental steps to net zero energy ready buildings by 2032.
- Tailpipe emissions standards.
- Renewable & low carbon transportation fuel standards.
- How the impacts of a changing climate will affect building energy consumption, as outlined below.
    - Climate change data for the region obtained from ClimateData.ca.
    - Projected global emissions to 2030 currently places the world in the range for the IPCC's Fifth Assessment Report's Representative Concentration Pathway (RCP) 6.0 scenario.
    - RCP 6.0 scenario not available on ClimateData.ca, therefore RCP 4.5 (high impact scenario) used as a conservative proxy.
    - Decreases in commercial / institutional natural gas consumption assumed to be proportional to decreases in HDDs and the proportions of natural gas consumed for space heating for the sector, and that proportion obtained from the Navigant 2017 Conservation Potential Review for FortisBC Gas.

- Decreases in commercial / institutional electricity consumption assumed to be proportional to decreases in HDDs and the proportions of electricity consumed for space heating for the sector. This proportion obtained from the Navigant 2016 Conservation Potential Review for FortisBC Electric.

Annual variability affecting projections

Although CEA's model assumes that projections will be linear, there will be annual variability, primarily due to climatic variations (particularly on building energy consumption). These variations mean that it may often be necessary to collect several years of data before one can see the success or lack of it in implementation of an action, in the primary indicators. An exception to this will be streetlights, which have a remarkably similar consumption in each year, and so the impacts of actions taken should be immediately apparent.

Action impacts

To take into account the impact of implementing a climate action plan, the modelling tool estimates the impacts of actions compared to the BAU trajectory. It calculates the individual and combined impact of actions.

The impacts of individual actions depend on the assumptions made. CEA made educated estimates of the impacts that other actions can have.

Details on the impacts of individual actions on GHGs are described in the main body of this report, in **Figure 12**.

Appendix D. City of West Kelowna Inventory by Service

The following tables provide the energy, emissions, and cost by the City of West Kelowna Service and the assets that fall within each category.

TABLE 14 – ENERGY, EMISSIONS, AND COST BY CITY OF WEST KELOWNA SERVICE

	Facilities			Fleet		
	Energy (GJ)	Emissions (tCO_2e)	Cost	Energy (GJ)	Emissions (tCO_2e)	Cost
Government Administration	2,245	106	$34,301			
Parks, Recreation, and Culture Facilities	36,234	1,240	$650,735			
Fire Protection	1,917	74	$41,327	923	63	$47,901
Public Works	4,995	35	$275,522			
Water Treatment	15,559	50	$474,541			
RCMP	2,284	69	$49,637	80	5	$4,273
Remaining Fleet				7,831	535	$406,651
Total	**63,234**	**1,573**	**$1,526,063**	**8,834**	**604**	**$458,825**

TABLE 15 – ASSETS WITHIN CITY OF WEST KELOWNA SERVICES

West Kelowna Service	Assets Included
Parks, Recreation, and Culture Facilities	• Johnson Bentley Memorial Aquatic Centre (JBMAC) • Mt Boucherie Complex (excluding City Hall) • Lakeview Heights Community Hall • West Kelowna Seniors' Centre • Community Centre - 2466 Main St • West Kelowna Multi-Sport Centre • Parks: lighting and facilities
Fire Protection	• Fire House 30 • Fire Hall 31, 32, 33, 34
Fire Protection - Fleet	• Fire Department Fleet Vehicles

West Kelowna Service	Assets Included
RCMP	• RCMP Building
RCMP - Fleet	• RCMP and COP fleet vehicles
Public Works	• Public Works Buildings (Bartley and Elliott) • Streetlighting
Water Treatment	• Water Treatment Plant Building(s) • Lift Stations
Government Administration	• City Hall • Satellite Municipal Offices
Remaining Fleet	• Fleet vehicles and equipment from all West Kelowna services except for Fire Protection and RCMP

Appendix E. Sample Project Scoring Matrix

Project #	Date Reviewed

Reviewed By: _____

I. Project Overview	
Project Title	**Analysed By:**
	Name:
	Dept:
Project Lead:	**Supporting Staff (if applicable):**
Name:	**Name(s):**
Dept:	**Dept(s):**

II. Project Metrics		
	Annual Average	**Life of Project**
Emissions Avoided (tCO_2e)		
Financial Savings ($)		
Simple Payback (yrs) after external funds:	**Annual ROI (%) after external funds:**	**Cost per tCO_2e avoided ($):**
Project References / Success Examples:		

Category	Point Value	Poor 0.0	Fair 0.25	Acceptable 0.5	Good 0.75	Excellent 1.0	Total
Potential to Reduce GHG Emissions (50)							
Total GHG Reductions per $ (Community funds only, after external funds)	20						
Annual GHG Reductions	10						
Lifespan of Project	10						
Replicability of Project within community	10						
Ease of Implementation / Business Case (30)							
Ease of implementation (staff time)	10						
Business case (simple payback or ROI)	10						
External funding sources likelihood	10						
Other Considerations (20)							
Impacts to Health and Safety	5						
Project Visibility/Innovation	5						
Benefits to Community	5						
Other Resources Conserved	5						
Total Points Available	**100**	**Total Points This Application**					

Other Key Criteria:

- Staff capacity
  - Project leads and project supports should each determine their capacity to take on projects.
  - Limit projects they take on to their capacity.
  - Select most effective projects first, to maximize effectiveness of staff capacity.

- City funds – budgeting
  - Departments should each determine the ability of their funds to pay for projects.
  - Limit projects based on available funds.
  - Select most effective projects first, to maximize effectiveness of departmental funds.

Appendix F. Sample Building Maintenance Checklists

Sample 1

Building System Optimization – Simple Energy Efficiency Retrofit Measures

Space Heating and Cooling

☐ Building envelope sealing – caulk and draught proof around windows and doors, and other gaps on exterior walls.

Lighting, Appliances and Equipment

☐ Replace any remaining incandescent bulbs with LEDs.

☐ Improve safety and energy efficiency by converting Exit signs to LED. For Exit signs use LED products that maintain their brightness.

☐ Put vending machines on a vending miser – a device with a motion sensor so that it only switches on when people are present.

☐ Plug certain appliances into intelligent power bars with master/slave functions or motion sensors. These can be used for TVs, bench tools, compressors, task lighting, auxiliary heating, printers, coffee makers, microwaves, beverage coolers, or similar devices. (Appliances that need a controlled shutdown sequence, e.g. computers or many ink-jet printers, should not be plugged into such a power bar.)

☐ Unplug or remove unused or rarely used equipment (equipment that is not "on" may still use electricity).

Water – hot and cold

☐ Install aerators on taps in bathrooms and kitchens.

☐ Install low flow shower heads.

☐ Install timers, motion detectors, or flushes to save water with urinals.

☐ Install insulation on hot water pipes where accessible.

☐ Insulate domestic hot water tanks installed before 2005 (if they are not due for replacement).

☐ Turn down domestic hot water tank to lowest acceptable setting, e.g. 55°C (131 F).

Occupant engagement

☐ Dedicate a staff member on energy efficiency for each building, tasked with ensuring lights and equipment are off at the end of each day, and thermostats are correctly set.

Put up signs to:

☐ Remind people to switch off lights.

☐ Remind people to switch off equipment when not in use, including computers, monitors, printers, and photocopiers.

☐ Where there are programmable thermostats, explain how to use these without permanently overriding the settings (install lockable boxes around them if necessary).

☐ Encourage people to close window blinds when leaving a room.

☐ Encourage employees to participate in residential energy efficiency programs. If energy efficiency practices are adopted at home, they are more likely to be adopted in the work place.

Sample 2

MONITORING	
Each billing period	Ensure the energy consumption for bills of each facility is monitored by the local government as each bill arrives (recording of energy consumption needs to be conducted for the LGCAP reporting anyway). Monitor the consumption for any obvious changes, comparing it especially with billing periods with similar weather, e.g. the same billing period in previous years. Large changes in consumption should be investigated as well as the appearance of any special charges, e.g. demand charges or power factor charges.
SPACE HEATING / COOLING	
Monthly	Check settings of Building Automation Systems / thermostats.
Monthly	Inspect, clean, and change HVAC air filters once a month (or according to equipment specifications).
Twice a year	Ensure building temperatures are adequate for building occupants.
Annually	Check weather stripping and caulking around doors and windows. Fix any problems.
Annually	Check HVAC equipment for any obvious signs of problems, e.g., vents/blowers not operating correctly.
Annually	Clean evaporator and condenser air conditioning coils – dirty coils can increase energy costs and reduce equipment life
Annually	Check air conditioner refrigerant levels – too much or too little refrigerant can increase energy costs and reduce equipment life.
LIGHTING, APPLIANCES, EQUIPMENT	
Twice a year	Ensure lights are still working. Ensure no incandescent lightbulbs are installed.
Twice a year	Ensure light sensors are working correctly, e.g., motion sensors for interior lights, and photosensors for exterior lights.
Twice a year	Ensure intelligent power bars and vending misers, where they are being used, are working correctly.
WATER – HOT & COLD	
Annually	Ensure low flow devices working correctly, e.g., timers for urinals.
Annually	Check hot water temperature. If water is too hot or cold, adjust the tank's settings.

OCCUPANT ENGAGEMENT	
Monthly	Check-in with dedicated staff member on energy efficiency for that building.
Twice a year	Ensure signs to encourage energy efficient behaviour (like switching off lights) are still in place.
Twice a year	Ensure posters and leaflets encouraging occupant participation in residential energy efficiency programs are still in the facility, and current. (If energy efficient practices are adopted at home, they are more likely to be adopted by occupants in the workplace.)
VEHICLES	
Each winter	Ensure engine block heaters are on a suitable schedule. Experiment to find the optimum schedule for employee comfort and energy efficiency. E.g., on/off for 20 minutes, every 20 minutes, during the coldest months of the year.
SKILLS	
Annually, or every 2 years	Consider going on an energy efficiency course or sending a member of staff on one. Training and workshops may be available through FortisBC, or through professional associations.
SERVICE CONTRACTS	
At contract renewal	Ensure service contracts (where applicable) support energy efficient operations. Energy efficiency can be written into contract terms during renewal.

Appendix G. Sample Vehicle Inspection Report

CLIMATE ENGINEERS

SERVICE VEHICLE WEEKLY SAFETY INSPECTION CHECKLIST

SERVICE TECH: _____ **DATE OF INSPECTION:** _____

VAN #: _____ **DATE CORRECTIONS WILL BE COMPLETED BY:** _____

PERSON PERFORMING INSPECTION: _____

Evaluation Summary: ☐ **Acceptable, No Follow Up Needed** ☐ **Follow Up, Corrective Actions Needed**

Instructions:
EHS issues and conditions, both on this checklist and not on this checklist, should be corrected or eliminated as soon as possible. Please explain any "In Violation" response in the "Comments" section. Once inspection is completed, review findings with foreman. Foreman must list what actions they will take to correct all findings and come up with a date to have all corrections done by. This date must be listed above. All paperwork and follow up from findings must be reported back to the Safety Manager.

INSPECTION AREAS	OK	IN VIOLATION	N/A	INSPECTION AREAS	OK	IN VIOLATION	N/A
1. Visually inspect around van				**8. Tanks: Refrigerant, Acetylene, Nitrogen, Oxygen**			
–Fluid leaks?				–Are all tanks Tied off & stored in an upright			
–Loose parts?				position prior to transport?			
2. Check for damage				–Have all regulators been removed prior to transport?			
–Windshield & windows				**9. Inspect interior**			
–Exterior body				–Is the interior lighting operational?			
–Side mirrors				–Are the seats secure and in good condition?			
–Wiper blades				–Are seats and floor clean?			
–Do all doors open, close & lock properly?				–Are safety restraints present & operable?			
3. Check the tires				–Floor clear of loose items & debris?			
–Uneven wear, cracks or damage?				–Is there a secure spot for additional materials			
–Inflated properly?				or tools needed at jobsite to be transported?			
4. Check all exterior lights				**10. Check equipment and safety items**			
–Headlights				–Dashboard indicator lights & gauges			
–Tail lights				–Horn			
–Brake lights				–Windshield wipers & washer fluid			
–Reverse lights				–Backup alarm			
–Turn signals				–Parking brake			
–Emergency Flashers				–Fire extinguisher - stocked & within service date			
5. Ladders				–First Aid kit - stocked and no outdated items			
–Any loose rungs?				–Insurance liability card in glove compartment?			
–Any broken pieces/parts?				–Are gloves, earplugs, safety glasses, hard hat, and			
–Are ladder racks in good condition?				other required ppe readily available to employees?			
–Are ladders tied off w/ proper tie down straps?				–Do employees have appropriate equipment to			
–Are tie down straps in good condition?				protect themselves from falls when exposed?			
6. Ropes				–Is fall protection harnesses being inspected two times			
–Any ropes frayed?				a year by designated company equipment inspector?			
–Any ropes that need to be replaced?				–Is a loto kit stored in the van?			
7. Power Tools				–Is the loto kit stocked with all necessary supplies?			
–Using GFI & Circuit tester in the field?				–Are all shelves secure to prevent tipping over?			

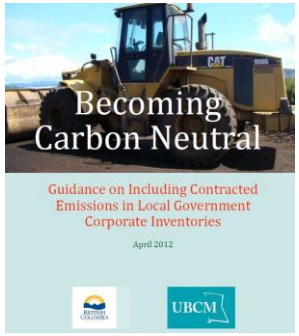
Comments/Corrective Action to be taken:

Corrective Actions to be completed by (Service Member Name)_____by (Date):_____

OUR GOAL IS ZERO INJURIES IN THE WORKPLACE

Revised 8/9/17

Appendix H. Service Contract Language



Source: *Becoming Carbon Neutral: Guidance on Including Contracted Emissions in Local Government Corporate Inventories, April 2012* found at www.toolkit.bc.ca
A sample contracted Emissions Template is available online at http://www.toolkit.bc.ca/carbon-neutral-government
Sample Contract Language:

Vehicle and Fuel Data

Requirement for Fuel Consumption Data Provision

Commencing on [start date] the [name of local government] will require [name of contractor] to communicate the quantity of fuel used to operate vehicles, equipment and machinery as part of the delivery of the services described in this contract on a [frequency of reporting] basis. Fuel consumption associated with the provision of these services must be provided to the [name of local government] within thirty (30) days of the following dates: [dates on which fuel consumption data will be required by the local government].

Data provided should include the following information:

- Number of vehicles, by vehicle class, used to deliver the contracted service (heavy duty, light duty, off road);
- Type of fuel consumed by each vehicle class (e.g. diesel/gasoline/natural gas/ethanol blend/biodiesel blend); and
- Litres of fossil fuels consumed in relation to the service delivered under the contract in each vehicle class, up to the dates specified above.

Appendix I. Sample Policies

Green Fleet Policy Template

Adopted {insert date}

POLICY NUMBER:

CHAPTER:

SECTION: CORPORATE SERVICES / GREENHOUSE GAS EMISSIONS REDUCTION

SUBJECT: LOCAL GOVERNMENT GREEN FLEET POLICY

RESOLUTION:

EFFECTIVE DATE: **REVISION DATE:**

1. RESOLUTION

THAT the Green Fleet Policy for the replacement and maintenance vehicles utilized by the Local Government be adopted.

2. OBJECTIVE

To formalize and clarify fleet replacement policies and practices and to support climate action policies to reduce GHG emissions and related pollutants by acquiring the most appropriate vehicle and equipment, minimizing fuel consumption, improving driver satisfaction and equipment life and reducing operating costs.

3. INTRODUCTION

- The Local Government shall utilize a green vehicle purchasing strategy in the replacement of vehicles.
- The Local Government utilizes a fleet of vehicles to support both general operations and service delivery.

- The Local Government will ensure that vehicles under its control are acquired, assigned, utilized, replaced and maintained in the most efficient and effective manner possible.

4. DEFINITIONS

Local Government vehicle - means any licensed motor vehicle owned, rented, borrowed, or leased by the Local Government and used primarily to transport people or property over roads, highways or Local Government property. Rental vehicles are considered Local Government vehicles when rented by a duly authorized employee and while used for official Local Government business.

Operator - means any authorized Local Government employee, or other individual approved by the Chief Administrative Officer (CAO), who is in control of a Local Government vehicle and who possesses a valid driver's license for the type of vehicle operated.

Fleet manager - means the individual designated by the CAO to manage the Local Government vehicles.

Specialty use vehicle - means Local Government fleet vehicles especially equipped for specific function or purpose.

5. RESPONSIBILITY FOR IMPLEMENTATION

There will be one fleet manager, appointed by the CAO, who will be responsible for overall fleet management. He/she will work with department managers to meet their department's fleet vehicle needs within approved financial plans.

6. GREEN FLEET VEHICLE POLICY

a) As per the Local Government's goal to achieve carbon neutrality in part by reducing corporate greenhouse gas emissions from fleet vehicles, the Local Government is committed to:

- Reducing GHG emissions;
- Reducing emissions of other pollutants;
- Reducing vehicle idling;
- Reducing single occupancy trips;
- Purchasing more efficient vehicles and fuels;
- Right-sizing vehicles;
- Considering life cycle costs of fleet vehicle operations when purchasing vehicles;
- Maximizing vehicle efficiency.

b) Vehicle Attributes: Local Government vehicles shall have the following minimum attributes:

- Be right-sized for its intended purpose(s).
- The ability to securely haul materials and equipment required for intended purpose.
- Air conditioning and all wheel drive/four wheel drive features, are optional and only where appropriate.
- Colour = _____
- Acceptable fuel mileage for the anticipated use. The use of electric vehicles, plug-in hybrids, hybrids, vehicles that use other zero / low GHG fuels, and fuel efficient vehicles, with the intent of reducing the Local Government's carbon footprint, are required wherever operational requirements allow.
- Acceptable crash/safety ratings.

c) Right-Sizing Purchasing: Local Government vehicles should be purchased according to the average or usual anticipated use of the vehicle. Occasional vehicle needs that exceed the capacity of the vehicle purchased should be met through vehicle sharing or renting. The following use requirements should be considered when purchasing a vehicle:

- Engine size;
- Vehicle weight;
- Average carrying capacity;
- Average passenger capacity;
- Average terrain.

d) Life Cycle Cost: Life cycle costs should be considered for all vehicle purchases. Life cycle costs should include: capital costs, maintenance costs, fuel costs and resale costs.

e) Fuel Choice: The lowest GHG emission fuel possible should be purchased for all vehicles in the fleet. Consideration of fuels should include:

- Purchasing vehicles that run on zero / low GHG fuels, e.g. electricity, hydrogen, biodiesel, bioethanol, natural gas. The focus should be on electric, plug-in hybrid, and hydrogen vehicles.
- Purchasing low emission fuel for fleet vehicles that cannot be electric or plug-in electric (i.e. renewable natural gas, gasoline with a high percentage of bioethanol and diesel with a high percentage of biodiesel);
- Purchasing vehicles with an acceptable fuel consumption mileage for the anticipated use. The use of electric vehicles, hybrids and fuel efficient vehicles, with the intent of reducing the Local Government's carbon footprint, is required wherever operational requirements allow.

f) Operating: Fleet vehicles shall be operated with the following considerations:

- Idling shall be reduced among all fleet vehicles and the following guidelines shall be followed by all fleet vehicle operators:
    a. Reduce warm-up idling (no more than 30 seconds as long as windows are clear);
    b. Vehicles are to be turned off when stopped for more than 10 seconds except in the following circumstances: in traffic; in the course of performing a specific duty that requires the vehicle be left running; if the outside temperature is below -10°C; or if doing so would compromise human safety or the mechanical integrity of the vehicle.
  - Vehicle sharing shall be encouraged. Single occupancy vehicle trips will be minimized. Vehicles should be shared between departments to ensure maximum efficiency for vehicle use.
  - Driver education and driving procedures to increase the efficiency of vehicle operations, including anti-idling, should be included in driver training programs for Local Government staff.

g) Vehicle Maintenance and Monitoring: Fleet vehicles shall be operated with the following considerations:
  - All Local Government vehicles shall be kept in good mechanical condition and shall be inspected at required intervals.
  - Maintenance on fleet vehicles should continue to ensure that preventative maintenance continues to maximize the efficiency of all vehicle operations.
  - All vehicles shall be monitored to track fuel consumption, fuel costs, mileage and maintenance costs.

h) Vehicle Replacement and Acquisition:
  - In general Local Government vehicles will be considered for replacement when they have at least 5 years of service and 150,000 kilometres. Vehicles may be retained beyond this point if they are in good working order and are meeting the needs of the Local Government. Alternatively, vehicles that have excessive maintenance, carbon emissions, other air pollutant emissions, or operating costs may be replaced sooner.
  - All vehicle replacements are to be identified in the approved Financial Plan.
  - All Local Government vehicles shall be purchased in accordance with the Local Government purchasing policy.
  - All vehicles shall be acquired in a manner consistent with budgetary intent.

i) Consider joining programs to assist with reducing fleet GHG emissions

Green Purchasing Policy Template

Adopted {insert date}

POLICY NUMBER:

CHAPTER: FINANCE

SECTION: EXPENDITURES

SUBJECT: GREEN PURCHASING POLICY

RESOLUTION:

EFFECTIVE DATE: **REVISION DATE:**

1. RESOLUTION

THAT the Green Purchasing Policy to require energy considerations of product selection, life cycle costing in operational decision making and encourage green procurement be adopted.

2. OBJECTIVE

To support Local Government corporate initiatives with respect to sustainability and environmental stewardship, including the Local Government's corporate GHG reduction targets.

3. INTRODUCTION

The Green Purchasing Policy requires that energy considerations and life cycle costing inform product selection and purchasing decisions and encourages green procurement. Products are chosen based on best overall value, not just the lowest price.

4. POLICY

a) The Local Government will buy in the open market and will seek the best value and service for its purchasing dollars. The placement of orders and awarding of contracts will be based on best value to the Local Government.

b) Purchasing decisions are to be based on the life cycle cost of the acquisition rather than just the initial purchase price. Life cycle costs include operation, repair, staff, and disposition costs as well as the invoice price.

c) In order to minimize the Local Government's environmental impact and carbon footprint, staff will review their requirements to ensure that specifications are amended to provide for use of goods and services with lower environmental impact and specifically to follow the steps to sustainable purchasing, life cycle costing and energy efficient equipment purchasing.

5. STEPS TO SUSTAINABLE PURCHASING

In considering future purchases, the Local Government will follow the steps to sustainable purchasing in product selection and decision-making:

a) Rethink purchase – is it necessary?

b) Rent, lease or buy it second hand.

c) Choose a durable or longer-life product and compare cost to disposable product.

d) Choose products or services designed to address specific environmental or social concerns.

e) Choose suppliers committed to sustainability.

f) Calculate the total cost (i.e., storage, maintenance, need to buy additional equipment, energy use, waste disposal, administration).

g) Reduce the transportation impacts.

6. LIFE CYCLE COSTING PURCHASING

In considering future purchases, the Local Government will undertake life-cycle costing in determining the full cost of a product or service. Steps in life cycle costing include:

a) Compare the costs of different products and different purchasing choices.

b) List and compare the accessory activities and costs associated with owning a particular product, such as: storage, maintenance, accessory equipment, operating costs, energy and water use, environmental hazards, waste disposal, training and administration.

c) Purchase based on total costs. Total cost = acquisition + use + disposal and post-disposal costs.

7. ENERGY EFFICIENT EQUIPMENT PURCHASING

The Local Government shall purchase energy efficient equipment, supplies and appliances whenever possible. This requires that product specifications be compliant with ENERGY STAR® guidelines and recommendations and/or Natural Resources Canada guidelines and recommendations.

Energy efficient equipment includes but is not limited to: appliances, HVAC equipment, electric motors, office equipment, lighting and signage, transformers, consumer electronics, vending machines, etc.

The Local Government purchase of energy efficient equipment has the following potential benefits:

- Reduced energy costs and electricity demand;
- Reduced impact on the environment;
- Reduced life cycle cost;
- Extended life and reduced operation and maintenance costs; and
- Manufacturer, government or utility company purchase incentives.

Green Event Policy Template

Adopted {insert date}

POLICY NUMBER:

CHAPTER:

SECTION:

SUBJECT: LOCAL GOVERNMENT GREEN EVENT POLICY

RESOLUTION:

EFFECTIVE DATE: **REVISION DATE:**

1. RESOLUTION

THAT the Green Event Policy to reduce the environmental impact of events hosted by the Local Government be adopted.

2. OBJECTIVE

To support climate action policies to reduce GHG emissions, waste, and other environmental impacts by reducing the impacts of Local Government hosted events.

3. INTRODUCTION

The Green Event Policy requires that GHG and environmental considerations inform how events are conducted, not just the lowest price.

4. POLICY

a) The following are discouraged and encouraged:

Discouraged	Encouraged
Disposable items, including plates, cutlery, cups, single-use water bottles	Reusable dinnerware, and water jugs of local tap water with glasses
Disposable give-away items / prizes	Service-based prizes
Bleached paper napkins	Paper napkins with recycled content
Single-use condiment packets	Reusable containers/squeeze bottles
Garbage-only receptacles	Labeled garbage, recycling, compost receptacles
Food and drink with non-recyclable packaging	Minimal packaging or recyclable packaging
Disposable shipping boxes	Reusable shipping containers
Cellophane wrap and polystyrene	Reusable serving trays/platters
Disposed extra food	Composted or donated
Imported produce	Seasonal, regional produce (where available)
Non-edible garnishes	No garnishes or edible garnishes

Guidelines are meant as guidelines only and all applicable food, health and safety regulations must be met.

Guiding Principles for Climate Ready Municipal Buildings

Adopted {insert date}

POLICY NUMBER:

CHAPTER:

SECTION: GREENHOUSE GAS EMISSIONS REDUCTION / CLIMATE CHANGE ADAPTATION

SUBJECT: GUIDING PRINCIPLES FOR CLIMATE READY MUNICIPAL BUILDINGS

RESOLUTION:

EFFECTIVE DATE: **REVISION DATE:**

1. RESOLUTION

THAT the Policy on Guiding Principles for Climate Ready Municipal Buildings, to evaluate GHG emission reduction and climate adaptation potential in Municipal buildings, be adopted.

2. OBJECTIVE

To ensure that all new Local Government buildings are built to have as low GHG emissions as possible, and are built to be resilient to forthcoming climatic changes. Also to ensure that all existing Local Government buildings have their GHG emissions reduced on an ongoing basis, and are able to be resilient to forthcoming climatic changes.

3. INTRODUCTION

The Local Government is committed to corporate and community energy and GHG reductions, and to being resilient to climatic changes. Therefore it will establish a procedure to build and operate all Local Government buildings with the lowest GHGs possible, and ensure that they will be able to continue to operate effectively when considering predictions of coming climatic changes that will likely take place over their lifespan.

4. POLICY

New Civic Buildings:

a) Aim to construct carbon neutral corporate buildings, e.g. by following Canada Green Building Council's Zero Carbon Building Standard.
b) Incorporate high performance attributes into new civic buildings so that they meet the highest level of the BC Energy Step Code and strongest requirements of the Zero Carbon Step Code for its building type. If the building type is not included in the Energy Step Code, choose the appropriate alternative energy standard:
    - Meeting or exceeding ASHRAE 90.1-2022 (for all other building types)
    - National Energy Code for Buildings (NECB) 2020
    - LEEDv4 or v4.1 Energy Performance requirements
c) Aim to build with materials with low embodied carbon emissions, e.g. favouring sustainably sourced wood, or low GHG concrete over conventional concrete.
d) Consider forthcoming climatic changes that are likely to occur over the lifespan of the asset in its design and construction.

Existing Civic Buildings:

e) Follow sustainable operation and maintenance best practices guidelines for new and existing buildings, which emphasize conservation, optimized building performance, and continued improvement in energy use, water efficiency, and indoor environmental quality.
f) Maximize energy and operational efficiency through the selective re-commissioning of civic facilities on an on-going basis. Re-commissioning is a form of quality assurance testing that is carried out to ensure that building physical plant systems operate as effectively as possible given occupancy patterns and building function.
g) Strive for GHG emission reductions at all existing civic facilities on an ongoing basis through conducting energy assessments and implementing the recommended measures.
h) Strive for continual decreases in corporate building greenhouse gas emissions through the above measures to help meet municipal GHG reduction targets.
i) Strive to ensure that buildings are equipped to be resilient and effective over the course of forthcoming climatic changes that are likely to occur over their remaining lifespan.

Climate Ready Infrastructure

Adopted {insert date}

POLICY NUMBER:

CHAPTER:

SECTION: GREENHOUSE GAS EMISSIONS REDUCTION / CLIMATE CHANGE ADAPTATION

SUBJECT: ENERGY RECOVERY OPPORTUNITIES POLICY

RESOLUTION:

EFFECTIVE DATE: **REVISION DATE:**

1. RESOLUTION

THAT the Climate Ready Infrastructure Policy to evaluate GHG emission reduction and climate adaptation potential in the planning of Local Government infrastructure assets be adopted.

2. OBJECTIVE

To operate and manage Local Government infrastructure assets, including natural ones, in a manner that conserves energy, reduces greenhouse gas emissions, and is resilient to climatic changes.

3. INTRODUCTION

The Local Government is committed to corporate and community energy and GHG reductions, and to being resilient to climatic changes. Therefore it will establish a procedure to build and operate all Local Government infrastructure assets with the lowest GHGs possible, consider natural assets, and ensure that infrastructure will be able to continue to operate effectively when considering predictions of coming climatic changes that will likely take place over the lifespan of those assets.

4. POLICY

On an ongoing basis, the Local Government shall evaluate opportunities to ensure that infrastructure assets have the lowest GHGs possible, and are resilient to climatic changes. The Local Government will also evaluate natural assets as part of its infrastructure assets, with the benefits these bring.

5. PROCEDURE

a) The Local Government shall conduct energy studies for its existing grey infrastructure assets, and implement recommendations to reduce GHG emissions by as much as possible;

b) Develop a natural asset inventory and expand the evaluation of nature-based solutions for infrastructure projects, including consideration of co-benefits such as carbon sequestration and wildlife;

c) Build new grey infrastructure assets so that they have zero (or as low as possible) GHG emissions, and have as low operational energy costs as possible;

d) Incorporate life-cycle costing into both the infrastructure capital and operational decision-making process;

e) Consider embodied / life-cycle carbon emissions as part of all new infrastructure decisions.

Appendix J. Fleet Assessment Details

Current Fleet

Unit #	Make	Model	Department	Year	Unit #	Make	Model	Department	Year
29130	Gmc	Suburban	Parks	1998	**29704**	Ford	F150	Parks	2012
29144	GMC	Yukon	Recreation	2006	**29705**	Ford	F150	Utilities	2008
29303	Ford	Ranger	Bylaw	2009	**29709**	Ford	F250	Utilities	2009
29305	Ford	Escape Hybrid	Bylaw	2011	**29712**	Ford	F350	Mechanic	2004
29307	Hyundai	Tuscon	Bylaw	2018	**29713**	Ford	F150	Water	2005
29320	Nissan	Rogue AWD	IS	2018	**29715**	GMC	SIERRA 2500	Utilities	2018
29332	Chevy	Sonic	City Hall	2012	**29716**	Ford	Ranger	Parks	2011
29335	Hyundai	Tuscon	City Hall	2018	**29717**	Ford	Econo	Facilities	2011
29401	Ford	Ranger	Roads	2009	**29718**	Dodge	5500	Sewer	2012
29404	GMC	Sierra	Utilities - PC	2006	**29719**	GMC	Savana	Facilities	2011
29405	Sterling	Utility	Mechanic	2009	**29720**	Ford	F350	Utilities - PC	2016
29406	Ford	Ranger	Engineering	2010	**29724**	Ford	F150	Roads	2013
29407	Ford	Escape Hybrid	Engineering	2011	**29725**	Ford	F350	Utilities	2013
29408	Ford	F150	Parks	2011	**29726**	Ford	Escape Hybrid	Engineering	2013
29409	Ford	F350	Utilities	2011	**29727**	Ford	F150 4 wdr	Parks	2014
29410	Freightliner	M2 106	Parks	2011	**29728**	Kenworth	T880 - Dump	Utilities	2015
29601	Chevy	Silverado	Parks	2017	**29729**	Nissan	Rogue AWD	Inspections	2015
29605	GMC	Sierra	Parks	2018	**29730**	Ford	F550	Roads	2016
29607	Mazda	B4000 4X4	Engineering	2005	**29732**	Freightliner		Parks	2016
29608	Ford	F550 Dump	Parks	2016	**29733**	Chevrolet	Silverado	Facilities	2015
29683	Ford	F150	Parks	2007	**29734**	Ford/GTL	F350/Service Body Pkg	Mechanic	2016
29702	Ford	F250	Parks	2004	**29735**	Nissan	Sentra	Inspections	2017
29703	Ford	Crcab	Parks	2010	**29736**	Ford	F150	Utilities	2017

Unit #	Make	Model	Department	Year	Unit #	Make	Model	Department	Year
29738	Ford	F350	Utilities	2017	**29770**	F550	11' Henderson dump box	Parks	2021
29740	Kia	Sportage	Bylaw	2019	**29772**	F150	8' box supercab	Utilities	2020
29742	Kia	Sportage	Inspections	2019	**29778**	Ford	Cube Truck	Utilities	2021
29744	Kia	Sportage	Engineering	2019	**29784**	Freightliner	Dump Truck	Cap Crew	2021
29746	Ford	F150 4x4 Extended Cab 8'	Utilities	2019	**29786**	F350	3/4 ton	Cap Crew	2021
29748	Ford	F150 4x4 Extended Cab 8'	Utilities- PC	2019				Cap Crew - Tank	
29750	Ford	F150 4x4 Extended Cab 8'	Utilities	2019	**29788**	Ford	F150	Utilities	2021
29752	Ford	F150 4x4 Crew Cab 6.5'	Utilities	2019	**29790**	Ford	F150	Utilities	2021
29754	Ford	F250 4x4 Extended Cab 6.5'	Utilities	2019	**29792**	Ford	Escape Hybrid	Engineering	2022
29756	Ford	F550 4x4	Roads	2019	**29793**	Volvo	Tank/Water Truck	Utilities	2014
29758	Ford	Hightop Cargo Van	Facilities	2019	**29794**	Ford	F350	Parks	2022
29760	Freightliner	Vac Truck	Storm Drainage	2020	**29795**	Freightliner	Dump Truck	Roads	2022
29762	Ford	F450	Parks	2020	**L29796**	Ford	F150	Utilities	2022
29764	Ford	F450	Parks	2020	**L29797**	Ford	F150	Utilities	2022
29766	Chevrolet	Silverado 1500 Double Cab	Parks	2020	**COP**	-	-		
29768	Chevrolet	Silverado Crew Cab	Parks	2020	**30000**	Dodge	Gcaravan	COP	2010
29770	F550	11' Henderson dump box	Parks	2021	**30010**	GMC	Terrain	RCMP	2019
29772	F150	8' box supercab	Utilities	2020	**30020**	Dodge	Caravan	COP	2016

Lifecycle Analysis Assumptions

Vehicle Lifetime	8 years
Inflation rate	6%
2023 Gasoline cost ($/L)	$1.70
Carbon tax ($/tonne)	$65 (2023), $170 (2030)
2023 Electricity rate ($/kWh)	0.999
Net Capital Costs	Hyundai Kona: $43,921 Ford Lightning: $82,105 Ford E-Transit Van: $85,727
Rebate applied (Kona only)	$9,000 (Federal + Provincial)
Resale value	20% of original Capital Cost
Fuel economy	Hyundai Kona: 0.17 kWh/km Ford Lightning: 0.31 kWh/km Ford E-Transit Van: 0.30 kWh/km ICE: As stated in Table 3
Operation/Maintenance Cost ($/km)	ICE SUV: 0.14 ICE Van/Truck: 0.15 EV SUV: 0.12 EV Van/Truck: 0.13

Additional analysis notes:

- Geotab provided the annual kilometers travelled and fuel used for each vehicle
- Net Capital incorporates both upfront capital cost, EV rebates where applicable, and a 20% resale value at end of life (eight years)
- All dollar values expressed are in 2023 dollars
- For all EV options, a Level 2 charger is included in cost; EV charging options are described in the following section

EV Charger Options

All BEVs and PHEVs can plug into a standard wall outlet. With just 120V, it is the slowest form of charging but is a convenient at-home solution and may be sufficient overnight charging for most people's day-to-day driving.

This is the what the plug of a Level 2 charger looks like. All BEVs and PHEVs can plug into Level 2 chargers. They are the most common public charger. This would be the type of charger you'd install at home. They require 240V, similar to your washing machine. Most public Level 2 stations are free to use.

Fast chargers, or "DCFCs", are the quickest charge, are found near major travel routes and are usually pay-per-use. They have one or both of the following types of plugs:

CCS

Companies that use the CCS system:

Kia
Chevrolet
BMW
Volkswagen

CHAdeMO

Companies that use the CHAdeMo system:

Nissan
Hyundai
Mitsubishi
Tesla with adapter*