



CITY OF LETHBRIDGE

Partners for Climate Protection

**Corporate Milestone #2:
Setting a GHG Reduction Target**

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INTRODUCTION OF PARTNERS FOR CLIMATE PROTECTION

The Partners for Climate Protection (PCP) is a program administered by the International Council for Local Environmental Initiatives (ICLEI) and the Federation of Canadian Municipalities (FCM). The objective of the PCP is to provide assistance to municipalities in building a greenhouse gas inventory and lowering emissions. This leads to decreased operating costs and a demonstrated commitment to environmentally sustainable practices.

The PCP observes emissions from both the Corporate and Community sectors of a municipality. Corporate emissions come from any asset that is owned and/or operated by the City, while Community emissions account for any other vehicles and buildings operating within the geographical boundary of the City. For both sectors, there are five milestones to complete:

- Milestone #1: Create a baseline emissions inventory and forecast
- Milestone #2: Set emissions reduction targets
- Milestone #3: Develop a local action plan
- Milestone #4: Implement the local action plan
- Milestone #5: Monitor progress and report results



Figure 1: All municipalities that are members of the PCP. A red star indicates that Milestone #5 has been completed for either the Corporate or Community sector.

There are over 350 municipalities across Canada who are members of the PCP. Some have completed all five milestones while others are just getting started.

MILESTONE #1

OVERVIEW

In order to complete Milestone #1 for either sector, a municipality must record emissions originating from that sector's sources. The Corporate sub-sectors are Buildings, Fleet, Streetlights & Traffic Signals, Water & Wastewater Buildings, and Solid Waste. The Community sub-sectors are Industrial, Commercial & Institutional (ICI) Buildings, Residential Buildings, and Transportation. A description of each sub-sector is located on Appendix I.

LETHBRIDGE'S EMISSIONS PROFILE

Lethbridge completed Milestone #1 for both sectors in February 2019, which was the first in-depth look of emissions for all aspects of the municipality. This first inventory submission to the PCP included the years 2014-2017, with 2018 being added in the summer of 2019.

Sector	Sub-sector	2014	2015	2016	2017	2018
Corporate	Buildings	25,926	24,637	26,985	30,248	28,770
	Fleet	8,531	8,375	8,642	9,142	8,587
	Streetlights & Traffic Signals	4,600	4,320	4,029	3,905	4,599
	Water & Wastewater Buildings	24,374	25,740	25,914	27,435	27,140
	Solid Waste	86,303	89,188	91,611	94,014	96,612
Community	ICI Buildings	620,284	591,003	587,529	609,154	620,030
	Residential Buildings	356,833	340,315	335,816	374,194	369,937
	Transportation	289,357	289,408	289,719	296,932	304,751
Total	-	1,416,182	1,372,986	1,370,245	1,445,024	1,460,426

Table 1: Inventory of 2014-2018 in tCO₂e.

The largest emissions producer for Lethbridge is the Community ICI Buildings sub-sector, accounting for an average of 43% of total emissions each year. The Corporate Streetlights & Traffic Signals sub-sector is the lowest producer, averaging about 0.3% of the annual total emissions.

Best practices use emissions per capita rates to effectively demonstrate each region's effects in order to compare emissions to other municipalities or provinces. For Lethbridge, the average emissions per capita over the course of the five years documented is approximately 15.2 tonnes of carbon dioxide equivalent (tCO₂e).

Provinces	(tCO ₂ e per capita)
Quebec	10.1
PEI	12.4
Ontario	12.6
British Columbia	13.7
Lethbridge	15.2
Newfoundland & Labrador	16.4
Manitoba	16.9
Territories	17.6
Nova Scotia	19.4
New Brunswick	20.8
Alberta	66.6
Saskatchewan	67.6

Table 2: *By the Numbers: Canadian GHG Emissions, Western University, 2013*

Cities	(tCO ₂ e per capita)
Montreal	5.1
Vancouver	7.2
Winnipeg	8.1
Toronto	9.6
Lethbridge	15.2
Regina	16.3
Calgary	18.2
Edmonton	20.7

Table 3: *University of British Columbia, 2016*

The type of industry that occurs within the province's borders is a large contributing factor to the provincial emissions per capita. The oil and gas industry is a high-emitter of greenhouse gases, which indicates why Alberta and Saskatchewan have the highest per capita totals. A province's reliance on coal-fired electricity is also a cause for high emissions. Both of these provinces still rely mainly on coal to produce its electricity instead of natural gas, fuel oil, nuclear or renewable sources.



A municipality's emissions per capita rate relies on a variety of factors, stemming from the emissions profile of the province it lies in, but also from the geographical makeup of the city. The larger the physical size of the city, the more emissions are produced because of the amount of buildings, roadways, etc. Cities that are generally more condensed see a lower emissions per capita rate than larger sized cities with the same population. This is why high-density cities such as Montreal, Vancouver and Toronto have lower emissions per capita than Calgary and Edmonton, even though they have a larger population.



CORPORATE GHG REDUCTION TARGET OVERVIEW

RATIONALE

Completing the five PCP milestones demonstrates a municipalities commitment to provide leadership and sustainable municipal services to its residents. Also, milestone progress is incorporated into some FCM funding opportunities.

In Lethbridge, there are numerous projects that are planned to take place in the coming years that will lower both emissions and operating expenses. Including these projects in a greenhouse gas reduction target will highlight the efforts being made by the City and allow for the emissions to be tracked in a structured method. Another benefit to completing the milestones is to support Lethbridge City Council Policy CC51, which focuses on mitigating the environmental impact of City operations.

CORPORATE EMISSIONS

Lethbridge's total Corporate emissions have been steadily increasing over the past five years which can be observed in Table 1. When building a reduction target, a municipality must consider growth in its analysis. A growth rate average was collected for each of the Corporate sub-sectors based off the 2014-2017 inventory years.

The Streetlights & Traffic Signals sub-sector is demonstrating a slight decline over the past five years, which is interesting considering the expansion of the size of Lethbridge. New neighborhoods and various roadways require lighting which would normally increase the emissions of that sub-sector. However, LED bulb improvements that occurred between 2014 and 2017 drastically reduced the emissions, creating an overall decline in growth.

Corporate Sub-sector	Yearly Growth Rate Average
Buildings	2.28%
Fleet	0.06%
Streetlights & Traffic Signals	-0.45%
Water & Wastewater Buildings	2.61%
Solid Waste	2.78%

Table 4: Growth percentages of Corporate sub-sectors.

The Solid Waste category is showing the largest yearly growth, which is tied to the steady increase of Lethbridge's population. As more people settle in the city, more waste is deposited into the landfill which creates an increase in emissions over the years.

METHODOLOGY

When creating a greenhouse gas reduction target, the top-down and bottom-up approaches are the two methods suggested by the PCP.

The top-down approach is where a target is chosen first, then planning on how to achieve the target is performed later. The target is usually based off suggestions from consultants, or meant to follow targets previously established by higher governments.

The bottom-up approach is where a target is selected after conducting assessments of reduction potentials from future planned projects. These projects are analyzed to determine their impact in the future years, then a target is built around the expected reductions stemming from those projects.

Approach	Advantages	Disadvantages
Top-down	<ul style="list-style-type: none"> • Low development cost of creating the target • Alignment with higher governments 	<ul style="list-style-type: none"> • Higher risk of not meeting the target • Uncertainty of implementation costs to achieve target • Poor connection between actions and target
Bottom-up	<ul style="list-style-type: none"> • High understanding of actions required and their costs to meet target • Allows cities to reorganize and align resources to achieve the target 	<ul style="list-style-type: none"> • High development cost of creating the target • Risk that the target may be too conservative to affect climate change

Table 5: Advantages and disadvantages of target-creating methods.



The bottom-up approach was selected for creating a target for the City of Lethbridge.

The following business units were approached to discuss potential projects that will reduce emissions:

- Electric
- Facility Services
- Fleet Services
- Transit
- Waste & Recycling Services
- Water, Wastewater & Stormwater

BASE YEAR

The base year of a reduction target is the year that is chosen to represent the baseline of the municipalities emissions. The PCP recommends that the base year of the target should be fairly current, and have complete, reliable data. It is also recommended that a municipality chooses a year before any major actions were taken to reduce emissions. Using these suggestions, 2018 was chosen as the base year for creating a target. 2018 is the most recent data set collected, indicating that complete and reliable data are available.

TARGET YEAR

The target year is when all of the actions listed in the target's implementation plan are expected to be completed. The PCP recommends that the year should be near enough to be relevant, yet distant enough to allow for the actions to take place. It's also recommended to align with Provincial or Federal target years. After meeting with the business units and researching reduction targets and actions promised by higher governments, 2030 was chosen as the target year.

BASELINE EMISSIONS AND BUSINESS-AS-USUAL FORECAST

After the characteristics of the reduction target were chosen, the analysis of baseline emissions and business-as-usual (BAU) forecast began. The idea of the BAU forecast is to project what a municipality's emissions will be at some year in the future, if no actions were taken to reduce emissions. Growth of each subsector were found by using the average yearly growth percentage and expanding it over the course of the target period.

	2018 (tCO₂e)	% growth	2030 BAU (tCO₂e)
Buildings	28,770	31%	37,708
Fleet	8,587	1%	8,649
Streetlights & Traffic Signals	4,599	-5%	4,357
Water & Wastewater Buildings	27,140	36%	36,973
Solids Waste	96,612	39%	164,256
Total	165,708	34%	221,943

Table 6: Projected Corporate emissions

ACTION PLAN

During the meetings with the business units, the following projects were selected to be included in the reduction target's action plan.

ELECTRIC

CONSERVATION VOLTAGE REDUCTION (CVR)

This project analyzes the effect of CVR technology at each of the Lethbridge electric sub-stations. This technology safely lowers the operating voltage of the electric distribution system, while ensuring that electricity is still supplied to all customers within national standards. The lowering of the operating voltage is estimated to reduce electricity usage in all buildings by 2.5%.

FACILITY SERVICES

BUILDING EFFICIENCY RETROFITS

An energy audit was completed on 17 City buildings in 2019, highlighting various improvements to reduce emissions and operating expenses. Facility Services used these suggestions and selected the improvements that are possible with current resources. The selections include LED lighting retrofits, domestic water retrofits, heat recovery, demand controlled ventilation, and sealing of building envelopes.

FLEET SERVICES

ELECTRIC/COMPRESSED NATURAL GAS VEHICLE CONVERSION

Following recommendations from the Alternative Fuels Feasibility Study completed in 2019, Fleet Services was able to identify a list of vehicles that are expected to convert to be powered by either electricity or compressed natural gas by 2030. The timeline of these conversions is unique to each vehicle, and is expected to occur when the vehicle is due for replacement. Emissions associated with the added electricity consumption of the electric vehicles were considered in the analysis of this project.

FUEL EFFICIENT EMERGENCY VEHICLES

This project involves vehicles used by Lethbridge Fire and Police Services. Two firetrucks are expected to replace current units that possess advanced engine technology to reduce tailpipe emissions. Police Services are also testing hybrid patrol vehicles in 2020, with the expectation that 30% of patrol vehicles will be electric by 2030.

GREEN FLEET POLICY

This document is currently in production, but is expected to introduce four actions that will reduce emissions stemming from vehicle usage.

1. ECO DRIVER TRAINING

Introductory course for drivers explaining how to reduce emissions with various simple driving techniques.

2. VEHICLE SHARING

Encouragement of vehicles being shared by employees for different tasks when the opportunity presents itself. This will reduce the amount of City vehicles operating during working hours.

3. ANTI-IDLING TECHNOLOGY

Built-in engine technology for City vehicles to shut down the engine while the vehicle is parked for a prescribed amount of time.

4. VEHICLE RIGHT SIZING

Construction of a matrix to identify the suitable vehicle to be used for a particular project. This will reduce the amount of larger vehicles being selected for simple tasks where a smaller automobile would be sufficient.

After consulting with the PCP and researching other municipalities who've included these actions in their reduction targets, it was determined that the Green Fleet Policy would reduce vehicle emissions by 10%.

ELECTRIC BUSES WITH RENEWABLE ELECTRICITY GENERATION

This project analyzes the emission savings for the purchase of seven electric buses to replace current units. Fully electric vehicles have no tailpipe emissions, but the electricity required to power them needs to be considered when analyzing the reductions. Fortunately, the electricity needed for these buses is expected to be generated by a renewable method, indicating that there will be no emissions coming from electricity generation for this project.

ONDEMAND SERVICE

This type of transit service is currently being implemented across various cities in Canada. The objective of this service is to reduce the amount of buses operating during low-ridership hours, while still being able to provide the service to the residents in those areas. There are multiple methods to how this service will operate which are still in discussion. On average, this project is estimated to reduce fuel usage of Transit buses by 5%.



WASTE & RECYCLING SERVICES

LANDFILL GAS CAPTURE SYSTEM

Emissions produced from a landfill come from organic material decomposing in an anaerobic environment, which produces a powerful greenhouse gas called methane, which is 25 times more harmful to the atmosphere than carbon dioxide. The project will capture a portion of the methane created and flare it, converting it to carbon dioxide. This is projected to lower landfill emissions by 55% in 2030.

RESIDENTIAL ORGANICS COLLECTION

As mentioned in the Landfill Gas Capture System project description, organic material produces methane when it decomposes in a landfill. This creates an unnatural occurrence of greenhouse gas, as organic material naturally creates carbon dioxide when it decomposes in an aerobic environment. The carbon dioxide produced from decomposing material is considered as biogenic, which indicates that it should not be included in any greenhouse gas inventory. Therefore, collecting organic material and composting it naturally will reduce emissions, since no methane will be created. The emissions reductions for this project is based on the projected tonnage of organic material that is expected to be collected in 2030.

WATER, WASTEWATER & STORMWATER

WASTEWATER TREATMENT PLANT (WWTP) COGENERATION SYSTEM

The WWTP is equipped with a cogeneration system that uses the methane produced from the treatment of sewage to generate electricity. It is expected that the system will be 50% operational by 2030, effectively reducing the plant's electricity usage by half.

CURED-IN-PLACE PIPING

This is a method of replacing or repairing underground pipes without having to dig trenches to access the pipe. It involves inserting a felt pipe lining into an existing pipe, which is then exposed to a curing element which molds the liner to the inner walls of the pipe, effectively

creating a pipe within a pipe. The emission reductions that come from this project revolve around the emissions coming from the vehicles that are no longer needed to dig trenches.

PROJECT SUMMARY

Business Unit	Potential Project	Implementation Year	Source Reduced	tCO_{2e} Reduced
Electric	Conservation Voltage Reduction	2019	Electricity (kWh)	1,859
Facility Services	Building Efficiency Retrofits	Ongoing	Electricity (kWh) Natural gas (GJ)	1,300
Fleet Services	Electric/CNG Vehicle Conversion	2023-2030	Gasoline (L) Diesel (L)	924
	Fuel Efficient Emergency Vehicles	2020-2030	Gasoline (L) Diesel (L)	39
	Green Fleet Policy	2020	Gasoline (L) Diesel (L)	865
Transit	7 Electric Buses w/ Infrastructure	2020-2030	Diesel (L)	917
	OnDemand Service	2020-2023	Diesel (L)	178
Waste & Recycling Services	Landfill Gas Capture System	2020-2021	Methane (t)	67,418
	Residential Organics Collection	2023	Methane (t)	4,887
Water, Wastewater & Stormwater	WWTP Cogeneration System	2020-2030	Electricity (kWh)	11,374
	Cured-in-Place Piping	2019	Gasoline (L) Diesel (L)	1,500

Table 7: Project summary.

PROJECTED OVERALL GHG REDUCTIONS

Overall, the projects listed above are expected to reduce emissions by 91,260 tCO₂e. Reducing emissions by 20% below the 2018 emissions total.

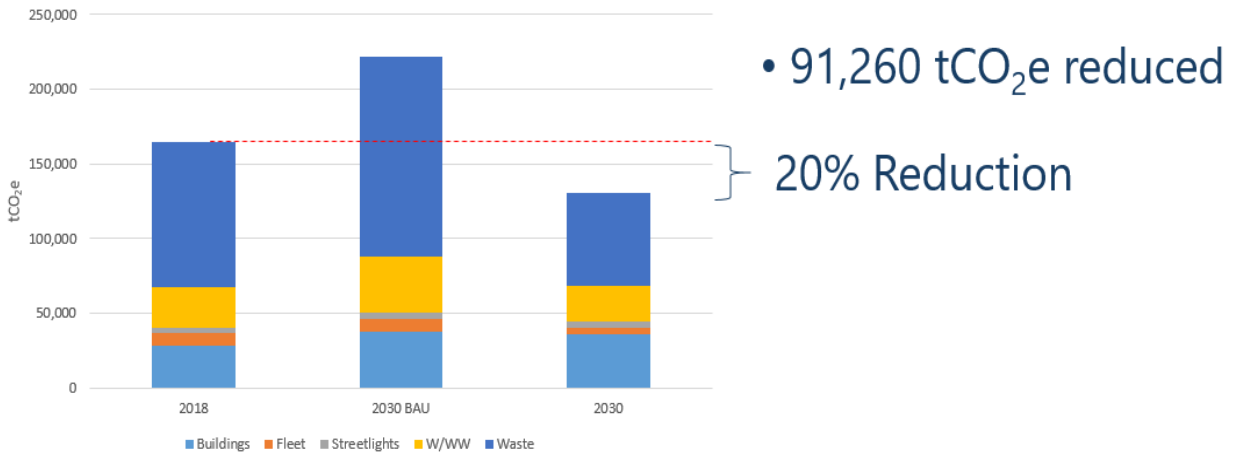


Figure 2: Visualization of the reduction as a result of City actions.

A 20% reduction would suffice as a reduction target for a municipality, but actions taken by Provincial and Federal governments also need to be considered, as they may have an effect on a municipality's emissions.

FEDERAL ACTIONS

COAL-FIRED ELECTRICITY GENERATION PHASE OUT

The phase out of coal-fired electricity generation began as a provincial action imposed by the NDP government in 2016. In 2017, the Federal government joined the Powering Past Coal Alliance and announced the transition of coal-fired electricity to natural gas-fired electricity by 2030. Calculating emissions from electricity involves using consumption intensity values established by Environment and Climate Change Canada. These values are unique to each province and are dependent on how the electricity is generated. Since Alberta relies heavily on coal-fired electricity, its consumption intensity is 800 g CO₂e per kWh. To compare to another province, Quebec's consumption intensity sits at 1.5 g CO₂e per kWh, due to 95% of its electricity being generated through renewable sources.

Converting from coal-fired electricity to natural-gas fired electricity is estimated to reduce Alberta’s consumption intensity to 460 g CO₂e per kWh, resulting in a 43% reduction in emissions coming from electricity production.

Project	Implementation Year	Source Reduced	tCO₂e Reduced
Coal-fired Electricity Generation Phase Out	2020-2030	Coal plant emissions	23,393

Table 8: Projected reduction from Federal actions.



RECOMMENDED TARGET

Traditionally, a reduction target should only consider actions that are controlled by the entity making the target. For Lethbridge, that would mean only including the City projects listed in this report. However, the Federal action to phase out coal-fired electricity will account for an additional 15% reduction to our 2030 BAU emissions total, meaning that if the target were to be set at a 20% reduction, the City of Lethbridge would only be responsible for 5% of the emissions.

To avoid this scenario, it is recommended that both City and Federal actions be included in the reduction target, totaling a 35% reduction with the City being responsible for 20% and the coal-fired electricity phase out being responsible for the other 15%. Should the coal-fired electricity phase out be delayed or not be as effective as promised, the reduction target will be adjusted to reflect the changes.

Figure 3 describes visualizes the recommended target, which includes both the City and Federal actions. Further breakdown of all actions included in this target is available in Appendix II.

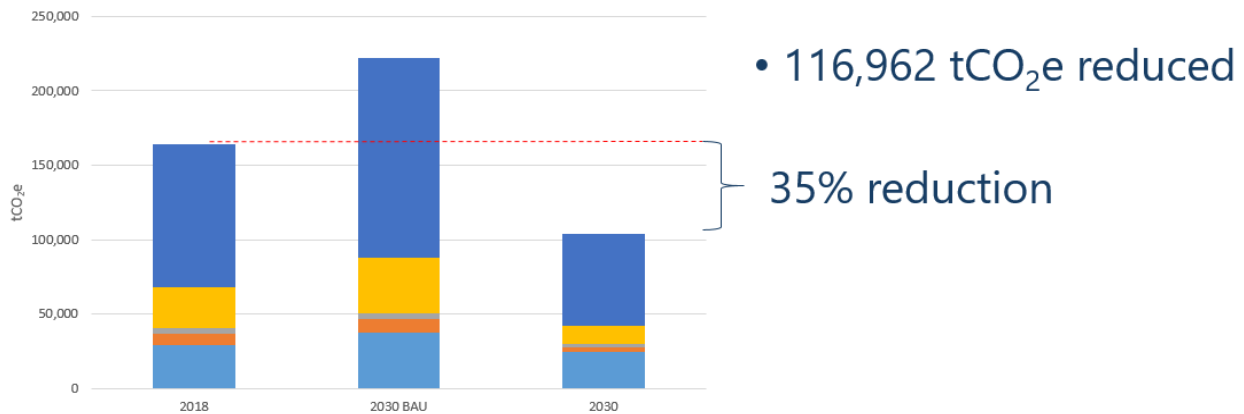


Figure 3: Visualization of reduction target that reflects both City and Federal actions.

Lethbridge's reduction target would be officially stated as "35% below 2018 emissions by 2030." In order to officially complete Corporate Milestone #2, the reduction target must be adopted by a council resolution.

NEXT STEPS

CORPORATE

Once a reduction target is set and finalized, Lethbridge will move on Corporate Milestone #3, which, the submission of an official implementation plan of the actions needed to meet the target. This should be completed quickly, as the bottom-up approach to setting target already identifies the projects that will reduce emissions. This is expected to be completed in the Spring of 2020.

Milestone #4 will require some more input from business unit managers and likely the senior management team, as a detailed schedule will need to be created for each project listed in the implementation plan.

Milestone #5 requires the municipality to measure the effects of the projects, and create new inventories for at least two more years. This is expected to be completed by 2022.

COMMUNITY

It is expected that once Milestone #4 is completed for the corporate sector, analysis on the community will begin. It is currently unknown what most effective method is for working on the community sector. Plenty of research and consulting with other municipalities will be done prior to the start of the Community milestones to ensure efficiency and competence.



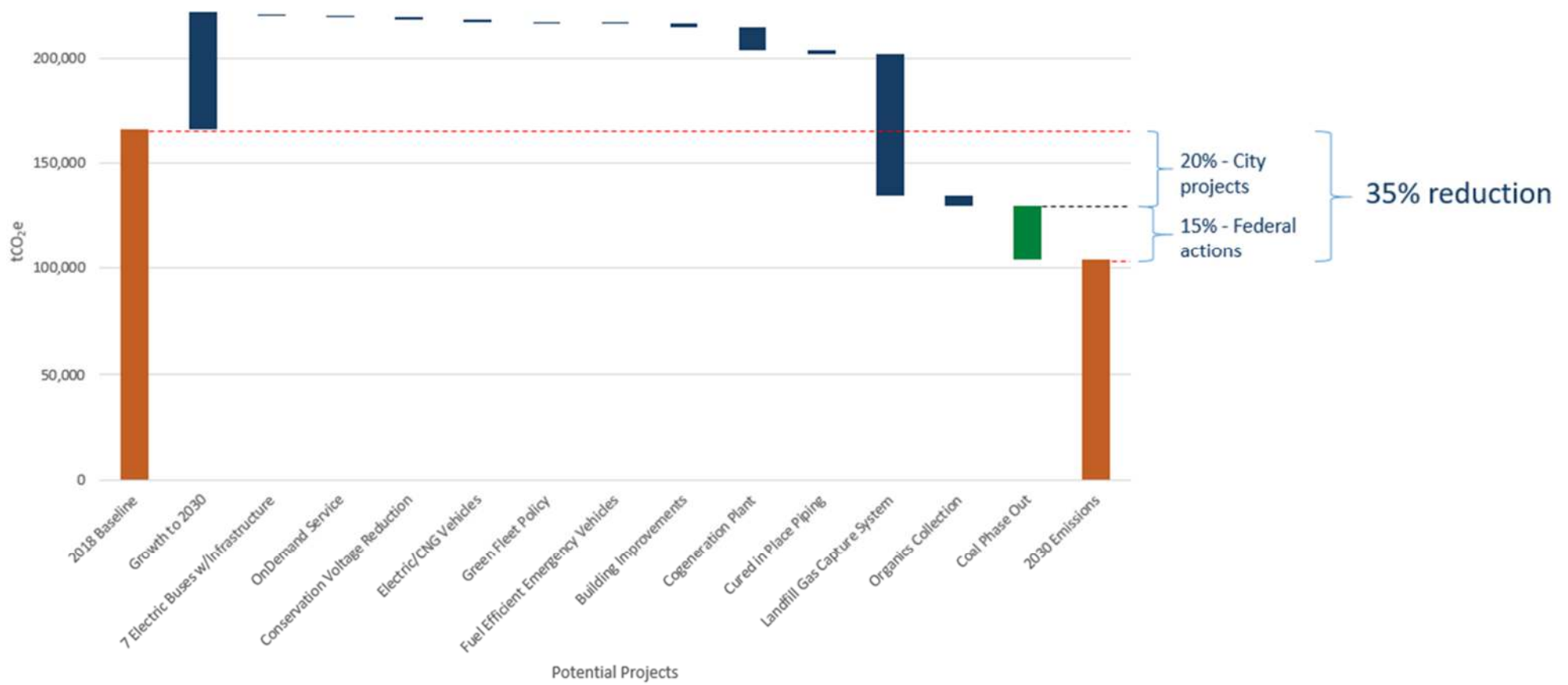
APPENDIX I

Sector	Sub-sector	Description	Energy source measured
Corporate	Buildings	All buildings owned and/or operated by the municipal government (excl. water & wastewater buildings)	Electricity (kWh) Natural gas (GJ)
	Fleet	All vehicles owned and/or operated by the municipal government	Gasoline (l) Diesel (l) Propane (l)
	Streetlights & Traffic Signals	Outdoor lighting owned by the municipal government	Electricity (kWh)
	Water & Wastewater Buildings	All buildings associated with municipal water and wastewater infrastructure (incl. lift stations, pump houses, etc.)	Electricity (kWh) Natural gas (GJ)
	Solid Waste	For municipally-owned landfills, all emissions as a result of landfilled waste must be reported	Landfill Waste (t)
Community	Industrial, Commercial and Institutional (ICI) Buildings	All buildings designed for industrial, commercial and institutional uses (excl. any municipal buildings)	Electricity (kWh) Natural gas (GJ)
	Residential Buildings	All buildings meant for living purposes	Electricity (kWh) Natural gas (GJ)
	Transportation	All vehicles operating within geographical boundary of the municipality (excl. Corporate –Fleet emissions)	Gasoline (l) Diesel (l)

Table 9: PCP Protocol: Canadian Supplement to the International Emissions Analysis Protocol

APPENDIX II

Action Plan



GLOSSARY

Aerobic – relating to, involving, or requiring free oxygen.

Anaerobic – relating to, involving or requiring the absence of free oxygen.

BAU – business as usual, describing a path where no actions are taken to change behavior.

Biogenic – produced or brought about by living organisms.

Compressed Natural Gas – used as a possible fuel source for vehicles. Omits less emissions than standard gasoline and diesel fuels.

Consumption Intensity Value – also known as emissions factor, used to calculate emissions from an energy source.

FCM – Federation of Canadian Municipalities, advocacy group representing over 2000 Canadian municipalities.

ICI – Industrial, Commercial and Institutional, used to describe the business sector of a municipality.

ICLEI Canada – International Council for Local Environmental Initiatives, organization of international governments that have made a commitment to sustainable development.

PCP – Partners for Climate Protection, program administered by the FCM and ICLEI Canada to assist municipalities in reducing emissions.

Powering Past Coal Alliance - international group aiming to accelerate the phase out of coal-fired electricity.

CO₂e – carbon dioxide equivalent, standard unit for measuring emissions, expresses each greenhouse gas in terms of the amount of carbon dioxide that would have the same effect on the atmosphere.

tCO₂e – tonnage of carbon dioxide equivalent.