

# Corporate Energy & Emissions Plan (CEEP): Update for 2022

City of Fredericton

Report Date

Prepared for:

City of Fredericton

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**Fredericton**

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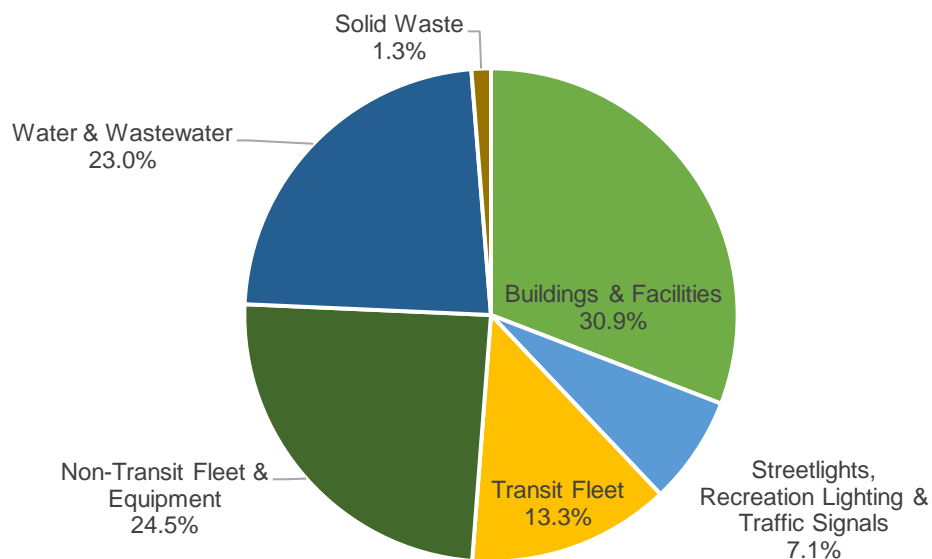
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## Executive Summary

An understanding of climate change and a focus on reduction of greenhouse gas (GHG) emissions has long been a priority for the City of Fredericton (the City) having reported on corporate GHG emissions since 2004. Energy consumption and associated GHG emissions arise as a result of the provision of key services by the City, which include the operation of buildings, fleet, transit, equipment, wastewater treatment, outdoor lighting, and the disposal of solid waste. In 2021, the City's corporate energy consumption and GHG emissions amounted to 163,574 Gigajoules (GJ) and 11,662 tonnes of carbon dioxide equivalent (tCO<sub>2</sub>e) – a reduction of 34 percent from the 2004 base reporting year.<sup>1</sup> For the 2021 reporting year, approximately 31 percent of the City's corporate GHG emissions came from buildings and other facilities like recreation centers and pools; 38 percent came from transportation related activities which includes corporate service vehicles as well as transit fleet; 23 percent came from the operation of water and wastewater pumping and treatment systems; 7 percent came from the operation of streetlights and traffic signals; and just over 1 percent came from the decomposition of waste at landfills (Figure E-1).



**Figure E-1. GHG Emissions by Source**

While the City's progress towards reducing GHG reduction is a notable achievement, it is not enough to combat the effect that the estimated 3 to 4°C global warming trajectory and the associated impacts that global GHG emissions may have on our global climate system. To substantially reduce the risks and effects of climate change, scientists and policy makers have come to the agreement that global society must stabilize and reduce GHG emissions to levels

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<sup>1</sup> Details on the 2019 GHG inventory and forecast assumptions are included in the 2019 GHG Emissions Inventory Report.

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to limit global temperatures from rising beyond 1.5°C over the next 30 years. This translates to reducing GHG emissions 50–60 percent by 2030, 80 percent by 2040, more than 90 percent by 2050 with the remaining emissions being offset or neutralized (e.g., direct air capture, reforestation, etc.) and be net negative in the second half of the century. If the current global GHG emissions trajectory continues, scientists estimate that global temperatures could rise by 4 to 6°C this century, resulting in irreversible environmental, social, and climatic changes, and economic losses ranging from 5 to 20 percent of global Gross Domestic Product (GDP) annually.<sup>2</sup>

As centers of communication, commerce, and culture, cities organizations play an important role in the reduction of GHG emissions and the impacts that climate change can have on a community. They have a leadership role that influences their communities beyond their organization’s carbon footprint. On this basis, the City is undertaking additional efforts to align with Federal GHG reduction targets. In 2020, the City prepared a Corporate Energy and Emissions Plan (CEEP) which proposed actions to put the City on a path towards reducing GHG emissions 80 percent by 2050. To align with Canada’s new GHG targets, in February 2022, City Council has adopted new GHG reduction targets of 50 percent by 2030, and net zero operations by 2050 (reductions from 2004 levels). Achieving a net-zero claim means that little to no GHG emissions are being emitted from operations; this is different from carbon neutrality where the intent is to allow GHG emissions to be released to the atmosphere and “balance” them out by procuring carbon offsets. This means that no organization can wait until 2050 to achieve its GHG reduction target – actions to reduce operational GHG emissions must begin to be implemented immediately. Figure E-2 presents the City’s pathway towards net zero operations.

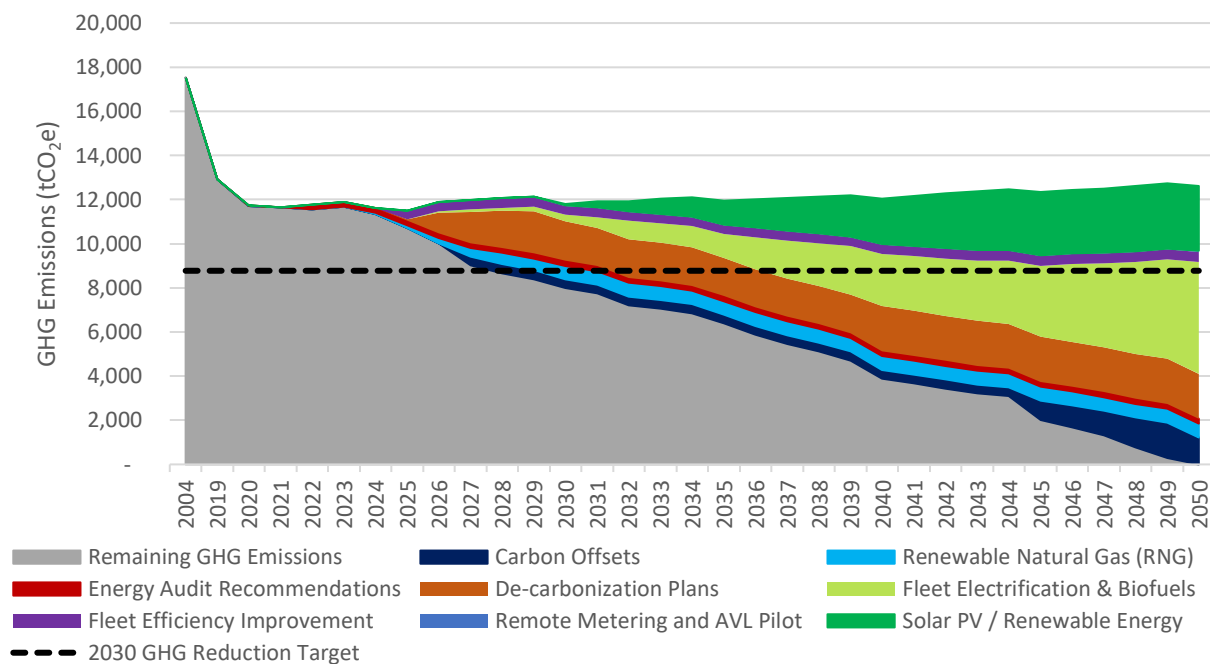


Figure E-2. Example Pathway to Net Zero

<sup>2</sup> [http://mudancasclimaticas.cptec.inpe.br/~rmclima/pdfs/destaques/sternreview\\_report\\_complete.pdf](http://mudancasclimaticas.cptec.inpe.br/~rmclima/pdfs/destaques/sternreview_report_complete.pdf)

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This CEEP update reflects these new GHG targets and has been updated to reflect the City's 2021 operational GHG emissions and additional energy and GHG reduction initiatives. The CEEP's energy and GHG emission forecasting was based on corporate energy and GHG emissions available for the most representative year, 2021 and trends from 2018-2021 as well as anticipated growth to 2050. The identification of initiatives for incorporation into the CEEP was done through a combination of staff engagement, a best-in-class review of other local government and regional districts, and input from internal and external subject matter experts. The CEEP covers a time-year horizon from 2022 to 2030, but also considers longer-term actions that will be needed to achieve the proposed GHG targets.

To achieve the 2030 GHG reduction target, before 2030, the City will need to focus on the following actions:

- Prepare and implement building decarbonization plans to achieve at least a 50 percent reduction in GHG emissions for its high emitting facilities, which include:
  - Grant Harvey Centre (Arena)
  - Willie O'Ree Place
  - Barker ST WWTP - Blower Building
  - Fredericton Police Station
  - City Hall
  - Two Nations Fire/EOC
  - Lady Beaverbrook Arena
  - Barker ST WWTP - Operation Building
  - York Arena
  - St Mary's Depot
  - Fredericton Public Library
  - St Mary's New Transit
  - York Fire Station
  - Transit Garage
  - Parks & Trees Depot
- For other facilities or infrastructure, seek out energy projects to reduce energy and GHG emissions when there is new construction, renovations, and/or mechanical system and equipment replacements.
- Implement a building commissioning and monitoring program to maintain energy conservation and GHG emissions reductions.
- Implement technological and behavioral energy efficiency reduction programs and monitor progress using EnergyStar Portfolio Manager.
- Reduce fleet size by at least 10 percent by 2025.
- Accelerate the conversion to electric and low-carbon fuels using the cost of carbon to support the life cycle replacement cost and by developing a fleet electrification strategy.
- Explicitly define and recognize natural assets as an asset class in the financial accounting systems and establish obligations to operate, maintain, and replace natural assets alongside traditional capital assets.
- Seek opportunities to invest in local nature-based solutions / projects (e.g., reforestation) to be able to recognize the future carbon benefit.
- Utilize renewable natural gas (RNG) to reduce building GHG emissions to meet the required 2030 GHG target.



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To meet the net-zero target, the City will need to eliminate 90 percent of its GHG emissions through the full electrification of buildings and light duty fleet, the installation and use of renewable power sources (e.g., PV solar), the use of biofuels in all fleet and equipment that cannot be converted to electric, the investment in nature-based solutions, and likely adjusting various business models and service levels. The residual emissions that remain (10 percent) will need to be *neutralized* via offsets or investments in technological removals (e.g., direct air capture) and / or neutralization projects like conservation / reforestation projects.

Table E-1 presents the CEEP 2021, 2025 and 2030 GHG emissions required to transition towards and reach the 2030 GHG reduction target. The forecasted GHG emissions are based on the estimated potential of the initiatives proposed. As these values can be used as interim targets to track progress against, the reductions for each reporting sector are presented in Table E-1.

**Table E-1. Reporting Year (2021) and Estimated 2025 and 2030 GHG Emissions By Sector**

Reporting Sector	2021	2025	2030
Buildings & Facilities Emissions (tCO <sub>2</sub> e)	3,598	2,836	1,250
Lighting & Traffic Signals Emissions (tCO <sub>2</sub> e)	827	800	803
Transit, Fleet & Equipment Emissions (tCO <sub>2</sub> e)	4,403	4,296	3,638
Water & Wastewater Emissions (tCO <sub>2</sub> e)	2,685	2,743	2,827
Solid Waste Emissions (tCO <sub>2</sub> e)	149	152	155
<b>Total GHG Emissions (tCO<sub>2</sub>e)</b>	<b>11,662</b>	<b>10,828</b>	<b>8,674</b>
<b>Change from 2004 Base Year</b>	<b>-34%</b>	<b>-38%</b>	<b>-51%</b>

*Notes to Table: 2004 Base Year = 17,549 tCO<sub>2</sub>e*

The proposed initiatives included in the CEEP support the completion of the actions listed above and ultimately the 2030 and 2050 GHG reduction targets. The initiatives have been organized into five key categories: Buildings and Facilities, Transit, Fleet and Equipment, Solid Waste, Water and Wastewater, and Corporate Leadership and are summarized in Table E-2 below.

**Table E-2. CEEP Initiatives Summary**

Category	Initiative	Description	Implementation Status
Buildings & Facilities	B1: Develop a Green Building Policy	Develop Green Building Policy and technical standards that establishes operational energy performance requirements for when existing facilities undergo major renovations and when new facilities are constructed.	Underway
	B2: Implement Energy Audit Recommendations	Complete recommendations from comprehensive energy audits already recommended by MCW, implement the recommendations, and track the progress of energy audits and projects. Leverage external funding opportunities to implement energy reduction initiatives with longer payback periods.	Underway

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Category	Initiative	Description	Implementation Status
	B3: Develop De-Carbonization Plans for Buildings & Facilities	Develop a unifying de-carbonization plan for each major City building and facility. De-carbonizing existing buildings will require deep energy retrofits that upgrade or replace equipment and building envelopes (e.g., roof, walls, windows) to achieve large energy and greenhouse gas emission reductions. A decarbonization plan for City Hall has been established, but plans for Regent Depot, St. Mary's Depot, and the Transit Depot Admin Office are required in the short-term.	Underway
	B4: Implement a Building Commissioning Program	Prepare and implement an ongoing building commissioning and retro commissioning plan.	Underway
	B5: Complete Buildings Utilization Assessments	Review service delivery requirements and needs with consideration to facility operational demands with the objectives of identifying operational and service delivery efficiencies. Establish KPIs that relate building / facility energy consumption to operational parameters (e.g., energy consumption (GJ) / operating hour, # of community programs per day by facility, etc.) to better understand what energy and GHG drivers and to identify related reduction / conservation opportunities	Underway
	B6: Provide Net-Zero and Renewable Energy System Training to City Staff	Support the training of City staff to gain skills unique to net-zero emission buildings, and renewable energy systems.	Proposed
	B7: Implement an Energy Performance Monitoring & Benchmarking Program	Utilize Energy Star Portfolio Manager to track and assess energy and water consumption. Report annually on building energy ratings. Provide City staff resources with training.	Proposed
	B8: Implement Technological and Behavioral Energy Efficiency (BEE) Reduction Programs	Implement energy saving changes in buildings and facilities through behavioral improvements, and through changes to the software of buildings.	Proposed
<b>Transit, Fleet and Equipment</b>	F1: Implement Review of Fleet	Complete asset management report for fleet assets including a review of capital and operating costs	Underway
	F2: Optimize and Right-Size Fleet	Implement the results of the fleet asset management report with a focus on optimizing and rightsizing the fleet for the City's needs	Proposed
	F3: Opportunistically Switch Light Duty Fleet to Hybrid / Electric	Monitor hybrid vehicle trial that is underway and apply learnings to other departments with light duty vehicles and trucks when the opportunity arises.	Underway
	F4: Monitor Renewable Energy and Fuel Technologies	Monitor the development and implementation of practical research, technologies, and investment in the area of renewable energy and fuels (e.g., B100, hydrogen, RNG).	Underway

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Category	Initiative	Description	Implementation Status
	F5: Opportunistically Switch Off-Road and Hand-Held Equipment to Electric	Continue to opportunistically switch off-road and hand-held equipment to electric powered where health and safety and performance is not compromised.	Underway
	F6: Develop an EV Strategy	Develop an EV strategy so that EVs can be incorporated into the light duty non-transit fleet as part of the City's vehicle replacement lifecycle.	Underway
	F7: Develop a Fleet Electrification Financing Strategy	Develop a three-tiered approach to finance investment in fleet electrification using an internal cost of carbon, a levy and vehicle electrification fund.	Proposed
	F8: Develop Anti-Idling Policy	Develop an appropriate anti-idling policy applicable to all staff while recognizing the needs of emergency and essential services. Educate staff on an ongoing basis about the vehicle anti-idling systems, policies and the importance of not idling vehicles unnecessarily.	Proposed
	F9: Expand Automatic Vehicle Location (AVL) Telematics Program Across Fleet	Expand telematics program to all City owned fleet to optimize and reduce fleet size, maximize vehicle use, and adjust fleet composition which will result in reduced fuel consumption and GHG emissions.	Proposed
	F10: Implement a Sustainable Commuting Program	Expand active transportation programs and facilities for City staff by providing employee transit programs, access to electric bikes, access to vehicles for sharing, secure bike racks, end of trip facilities, etc.	Proposed
	T1: Monitor Cold-Weather City EV Bus Programs	Monitor other cold weather City electric and hybrid bus initiatives (e.g., the City of Edmonton) to gain insights into the resources required and the lessons learned in order to inform future pilot hybrid / EV transit projects that could be implemented as City buses are replaced.	Underway
	T2: Complete an On-Demand Transit Feasibility Study & Implement the Recommendations.	Complete an on-demand transit feasibility study to understand how shared, on-demand transit (micro-transit) can successfully complement the fixed-route bus transit system currently in place and result in operational and energy efficiencies.	Underway
	T3: Complete an Alternative Propulsion Study for the Transit Fleet	Explore alternative propulsion systems for the transit fleet including electric, CNG, hydrogen, hybrid-diesel, etc. considering the impacts to operation, maintenance, and costs.	Underway
	T4: Implement an Alternative Fuel-Powered Bus Pilot Project.	Based on the outcome of Initiative T3, implement a pilot alternative fuel-powered bus project.	Proposed
<b>Solid Waste</b>	SW1: Develop Solid Waste Management Plan	Develop a corporate and community solid waste management plan that aligns with the 7R's of zero waste.	Proposed

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Category	Initiative	Description	Implementation Status
<b>Water &amp; Wastewater</b>	P1: Complete a City-Wide Sewer-shed Study	Complete a City-wide sewer-shed study to find opportunities to reduce infiltration and reduce energy	Underway
	P2: Assess the Feasibility of a Large Solar PV Array	Complete a more detailed analysis of large solar array to reduce the GHG intensity of energy consumption at the WWTP. Financial viability can be improved by accessing external funding sources (i.e., FCM).	Underway
	P3: Implement Energy Audit Recommendations	Excluding the solar PV recommendations, complete recommendations identified in the comprehensive MCW energy audits, and track the progress of energy audits and projects.	Underway
	P4: Assess the Energy and Revenue Potential of the Bio-Materials Generated at the Barker Street PCC	Engage a Subject Matter Expert (SME) to quantify the potential of bio-material use as fuel and income generating potential from organic material discharged from the Barker Street Pollution Control Centre.	Underway
	W1: Expand Pilot Remote Water Metering Program	Based on the results of the remote / electronic water metering pilot program, implement the learnings and expand the program to the rest of the City.	Underway
	W2: Implement Pilot GPS AVL Study on Vehicle Fleet	Implement a pilot AVL project on the water department fleet with the objective of monitoring the fuel reduction benefit from the Remote Water Metering Program and from changing driver habit programs.	Underway
<b>Corporate Leadership</b>	C1: Establish Energy and GHG Reduction Targets	Establish corporate energy and GHG emission reduction targets for 2030 and 2050.	Complete
	C2: Continue to Enhance FTE Capabilities and Increase Staff Capacity for Implementing CEEP	Expand staff capability and capacity to implement and maintain the initiatives presented within the CEEP Update. The expansion should be focused on developing a cross functional team.	Underway
	C3: Update Asset Management Plan and Policy	Update Asset Management Policy and associated Plan to include the objective of investing in assets to mitigate and adapt to climate change, as part of asset management planning. An update to the Municipal Plan should also be considered after the update to the Asset Management Plan as they need to be consistent.	Underway

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Category	Initiative	Description	Implementation Status
	C4: Pilot the Use of LCA Tools When Making Capital Purchases	Pilot the use of publicly available or low cost LCA tools (e.g., RETScreen) to account for energy and GHG emissions in budget and capital planning and asset management. For example, when considering the need for new municipal facilities or retrofits to existing facilities, a lifecycle analysis will provide information about the amount of energy used over the entire span of a building's life – from planning and design, to construction, through operation, to decommissioning. The LCA should include all of the energy inputs, including those used to create building materials at the outset, and to dispose of them at the end of the building's life.	Underway
	C5: Develop A Corporate Energy Savings Policy and Terms of Reference (ToR)	Formalize an energy savings policy and terms of reference that recognizes and makes available any operational budgets saved, as a result of energy conservation and demand initiatives. Savings in budget would be available to any department with an energy reduction opportunity that meets the requirements of the ToR.	Proposed
	C6: Create Sustainable Purchasing Policy	Update Sustainable Purchasing Policy to clearly prioritize products and services that reduce / conserve operational energy use and GHG emissions.	Underway
	C7: Establish Departmental GHG Accounting & Reporting Program	Develop a methodology to assign energy consumption and GHG emissions to each department.	Underway
	C8: Develop Alternative Work Strategies and Supportive Policies	A cost-effective energy and GHG measure that can be deployed is to implement policies that allow for more flexible work environments and disincentivize travel.	Underway
	C9: Explore Meeting the Taskforce for Climate Related Disclosures (TFCDD) Reporting Requirements.	Explore the evolution and efficacy of TFCDD reporting (e.g., review and engage with other cities such as Edmonton, Vancouver, Ottawa) to understand pros and cons and to prepare for what eventually may become a mandatory reporting framework.	Proposed
	C10: Advocate to NB Power to Change Net Metering Rules	Advocate to NB Power to change net metering rules (i.e., to allow electricity generation in one area to offset consumption in another).	Proposed
	C11: Complete a Review Of City Services	Complete a review of City services and associated service levels to determine where there could be a modification to service levels (e.g., frequency of mowing, changes to fleet and bus services, etc.) resulting in reduced energy / fuel use and GHG emissions.	Proposed

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Category	Initiative	Description	Implementation Status
	C12: Develop an Internal Cost of Carbon (ICC) Policy	Establish an ICC which would be used to calculate the value (expressed as a cost) of GHG emissions associated with decision-making in respect to all City assets and infrastructure. It is recommended that the policy require that City departments internalize the cost of corporate GHG emissions in their respective budgets and pay into an internal carbon reserve fund that can be used to support climate mitigation and adaptation projects at both the corporate and community level. It is also recommended that the ICC start at \$170/tCO <sub>2</sub> e.	Proposed
	C13: Recognize Natural Assets as an Asset Class	Explore means and methods to define and recognize natural assets as an asset class in the City's financial accounting systems (follow trends on best practice, examples from other communities). This will also require the establishment of obligations to operate, maintain, and replace natural assets alongside traditional capital assets.	Proposed
	C14: Seek Opportunities To Develop Nature Based Solutions / Carbon Offsets On City Lands.	Assess the carbon stored and sequestered by city lands in order to establish policies to maximize carbon stored, and possibly generated carbon offsets, from city-owned land by converting, acquiring, protecting, and restoring lands.	Proposed
	C15: Investigate Sustainable Infrastructure Rating System Policy	Investigate a policy that requires all City infrastructure or building / facility capital projects over \$100,000 be assessed under the Envision ISI Framework.	Proposed
	C16: Incorporate Contracted Emissions Into Corporate GHG Emissions Inventory	Incorporate fuel use reporting requirements in all new and renewed City service contracts post 2022.	Proposed

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### Abbreviations

Abbreviation	Full Name
BAS	Building Automation System
BAU	Business as Usual
BCA	Building Conditions Assessment
CAFE	Corporate Average Fuel Economy
CEEP	Corporate Energy and Emissions Plan
CO <sub>2</sub> e	Carbon Dioxide Equivalent
DHW	Domestic Hot Water
EV	Electric Vehicle
FCM	Federation of Canadian Municipalities
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GJ	Gigajoule
HDV	Heavy Duty Vehicle
HVAC	Heating, Ventilation and Air Conditioning
ICC	Internal Cost of Carbon
I&I	Infiltration & Inundation
LCA	Life Cycle Analysis
LDT	Light Duty Truck
LDV	Light Duty Vehicle
MDV	Medium Duty Vehicle
NRCAN	Natural Resources Canada
PCC	Pollution Control Center
PV	Photovoltaic
TFFCD	Task Force For Climate Related Disclosures
VFD	Variable Frequency Drive

## 1.0 INTRODUCTION

### 1.1 CLIMATE CHANGE IS A PRIORITY

Climate change has emerged as an unprecedented social, economic, and environmental challenge facing our society today. It poses a serious threat to our quality of life, jobs, and our physical and natural assets. Scientists believe that the human-production of greenhouse gas (GHG) emissions since pre-industrial times has already surpassed the Earth's "carrying capacity" of natural systems and poses significant future risks to human well-being. Based on the current GHG emissions trajectory, we can expect to be impacted by more severe floods, wind-storms, heat waves, and wildfires which can drag down our economy, erode our social systems, impact our natural resources, and limit our ability to respond and recover. To substantially reduce the risks and effects of climate change, scientists and policy makers have come to the agreement that global society must stabilize and reduce GHG emissions to levels to limit global temperatures from rising beyond 1.5°C over the next 30 years. This translates to reducing GHG emissions 50–60 percent by 2030, 80 percent by 2040, more than 90 percent by 2050 with the remaining emissions being offset or neutralized (e.g., direct air capture, reforestation, etc.) and be net negative in the second half of the century. If the current global GHG emissions trajectory continues, scientists estimate that global temperatures could rise by 4 to 6°C this century, resulting in irreversible environmental, social, and climatic changes, and economic losses ranging from 5 to 20 percent of global Gross Domestic Product (GDP) annually.<sup>3</sup>

In recognition of this concerning trend, the City is undertaking additional efforts to align with Federal GHG reduction targets. In 2019, the City prepared a Corporate Energy and Emissions Plan (CEEP) which proposed actions to put the City on a path towards reducing GHG emissions 80 percent by 2050. To align with Canada's new GHG targets, in February 2022, City Council adopted new GHG reduction targets of 50 percent by 2030, and net zero operations by 2050 (reductions from 2004 levels). Achieving a net-zero claim means that little to no GHG emissions are being emitted from operations and those remaining GHG emissions (<10 percent) are neutralized through technology or nature based solution projects. This means that no organization can wait until 2050 to achieve its GHG reduction target – actions to reduce operational GHG emissions must begin to be implemented immediately.

This CEEP Update reflects these new GHG targets and has been updated to reflect the City's 2021 operational GHG emissions and additional energy and GHG reduction initiatives.

### 1.2 PARTNERS FOR CLIMATE PROTECTION (PCP) PROGRAM

Addressing climate change and reducing GHG emissions has long been a priority for the City of Fredericton (the City) which it has demonstrated by reporting on corporate GHG emissions since through the Federation of Canadian Municipalities' (FCM) Partners for Climate Protection (PCP) Program. The PCP Program is a joint voluntary program between ICLEI-Local Governments for Sustainability (ICLEI) and FCM. It has been designed to

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<sup>3</sup> [http://mudancasclimaticas.cptec.inpe.br/~rmclima/pdfs/destaques/sternreview\\_report\\_complete.pdf](http://mudancasclimaticas.cptec.inpe.br/~rmclima/pdfs/destaques/sternreview_report_complete.pdf)



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empower and support municipalities in their efforts to reduce GHG emissions and take action against climate change. The PCP uses a five-milestone framework to guide municipalities in their efforts to reduce GHG emissions – these milestones are:

- Milestone 1: Create a GHG emissions inventory and forecast
- Milestone 2: Set GHG emission reduction targets
- Milestone 3: Develop a Local Action Plan
- Milestone 4: Implement the Local Action Plan
- Milestone 5: Monitor progress and report results

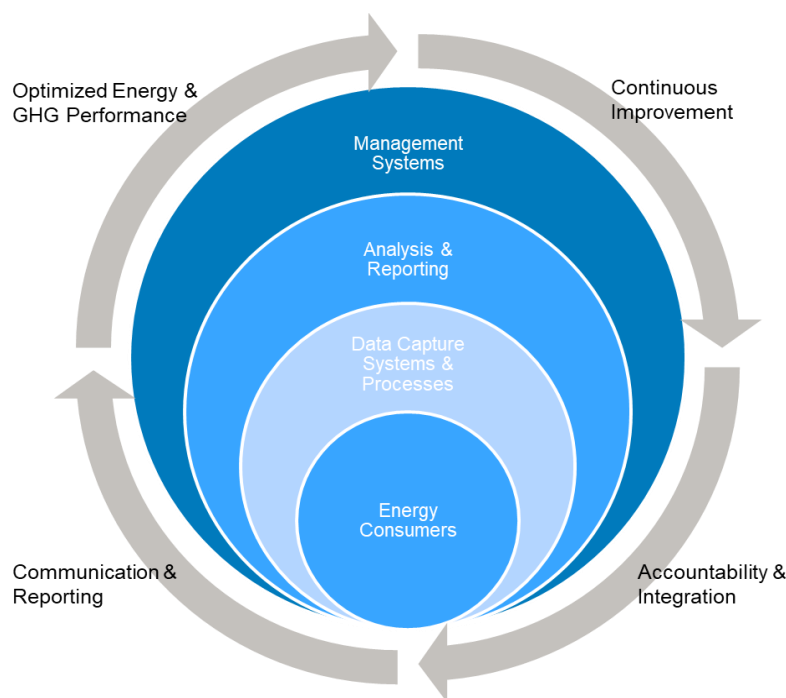
This CEEP Update meets the requirements of PCP Milestones 1 through 3. Milestones 4 and 5 call for municipalities to implement the Local Action Plan (LAP) and continue to monitor progress and report on results. The City intends to implement the details set forth in this CEEP Update and monitor and report on progress over time. Separate reporting submissions for Milestones 4 and 5 will be prepared and filed with the PCP Program as required.

## 2.0 CEEP OBJECTIVE & SCOPE

### 2.1 OBJECTIVE

The development of the CEEP is intended to support the provision of relevant information that makes energy and GHG emissions performance visible to various levels of the City, enabling individuals and departments to plan, prioritize and manage energy and GHG reduction programs in an integrated fashion that aligns with City policies, programs, procedures, standards, practices, regulations, and information. Implementation of the CEEP can lead to long-term financial and productivity improvements through the ongoing monitoring, management, and control of energy and GHG emissions.

Figure 1 presents the elements of the CEEP and the various processes that it can support. It shows that an effective CEEP requires communication, integration, and a commitment to continuous improvement to achieve rapid reductions in energy and GHG emissions and maintain that performance over time.



**Figure 1. CEEP Operational Profile**

This CEEP is a corporate-wide 5-year plan and system that focuses exclusively on energy and GHG emissions resulting from the City’s service delivery to Fredericton residents. It does not include community generated energy or GHG emissions that are outside the geographic boundary of the City.

## 2.2 CORPORATE BOUNDARIES AND SCOPE

The City owns and/or operates over \$600 million in assets in the form of buildings, fleet and transit vehicles, equipment and wastewater facilities as well as all supporting infrastructure. The operation of these corporate assets collectively contributes to GHG emissions in the City and provides opportunities for energy conservation and GHG emissions reductions.

Calculating corporate municipal GHG emissions can be complicated because of how City services are delivered and who delivers them (e.g., contractors). To be relevant, GHG inventories must reflect the operations of a City and the way in which it interacts with the community. At the same time, it is important that the GHG inventory conform to international standards for reporting to ensure consistency and comparability with other cities. To this end, the City’s energy and GHG boundary has been set following an “operational control” approach where the City should track energy and GHG emissions of an asset when:

- The City owns or operates the asset, and
- The City is responsible for maintenance and capital upgrades.

Only emissions over which the City has operational control – i.e., the City owns and is responsible for maintenance and capital upgrades of the asset – are included in this CEEP. These assets are summarized in the table below, and do not include GHG emissions from third-party contractors or construction activities. Third party activities could be included in future plans as data availability and tracking improves.

**Table 2. List of Assets Included in the CEEP**

Buildings & Facilities	Transit and Non-Transit Fleet & Equipment	Pollution Control Facilities	Streetlights & Traffic Signals
Administrative Offices, Service Buildings, & Storage Facilities	Light Duty Vehicles	Pumping Stations	Streetlights
Cultural, Arts, Entertainment & Heritage Facilities	Heavy Duty Vehicles	Wastewater Treatment Facilities	Traffic Signals
Indoor / Outdoor Recreational Centers, Pools, Arenas & Sports Facilities	Off Road Vehicles	Water Treatment Facilities	Recreation Lighting
Fire Stations	Other Equipment (Hand-Held)		
Libraries	Transit Fleet		
Parks & Cemeteries			

While the CEEP Update focuses on actions to be implemented within the next 8 years, the energy and GHG emissions forecast considers a longer time horizon from 2021 to 2050. The recommendations made for the first five years integrate relevant planned initiatives and are based on actions identified by City staff using existing and proven technologies. Actions in the medium-term planning horizon (2027-2037), shift momentum towards more

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aspirational targets. These program components provide the City with an opportunity to slow GHG emissions growth. Initiatives identified in the long-term (2037 and beyond) are of a more transformational nature. These initiatives are based on best available technology to date but recognize that the business case for selecting specific solutions will need to be identified in the coming years. Potential changes to federal and provincial legislation, funding opportunities, as well as technological advances over future decades will help reduce the City's GHG emissions.



### 3.0 METHODS

This CEEP Update was based on corporate energy and GHG emissions available for the most current year, 2021, and trends since 2004 as well as anticipated growth to 2050. The identification of initiatives for incorporation into the original CEEP was accomplished through a combination of best-in-class review of other municipalities, staff engagement, and input from internal and external subject matter experts. The CEEP Update involved meetings with City staff organized around buildings and facilities, fleet and equipment, pollution control, and transit. The purpose of the meetings was to collect information on initiatives underway, to identify follow up initiatives, and identify new initiatives. These meetings were completed in April 2022. A review of energy conservation and GHG policies, programs, and initiatives from peer cities and municipalities was also conducted. Topics which were covered during the reviews included:

- Actions for energy conservation and GHG emissions
- Energy and GHG reduction targets and performance against targets
- Financing approaches
- Barriers and challenges
- Recommendations

The City reviewed 1 draft of the CEEP Update prior to it being finalized.

## 4.0 CORPORATE ENERGY & GHG EMISSIONS

With GHG emissions contributing to climate change at the forefront of public awareness and policy development, municipal governments are incorporating strategies to both manage the anticipated impacts and reduce their energy consumption and GHG emissions footprint. Many of these efforts have focused on reducing building energy and fleet fuel consumption as these sources are the largest contributors to an organizations' GHG emissions profile.

### 4.1 CURRENT ENERGY & GHG EMISSIONS

The City owns 40 major facilities, which cover a total area of over 1.38 million square feet (ft<sup>2</sup>). The City is also responsible for traffic and streetlights, transit, water and wastewater systems, and a fleet of approximately 400 vehicles and equipment to provide public services. These service areas make up the City's corporate energy consumption and GHG emissions and contribute to serving the residents, businesses, and visitors.

In 2021, the City's corporate energy consumption was 163,574 GJ. In terms of GHG emissions, the consumption of fossil fuel powered energy resulted in the estimated release of 11,662 tonnes of carbon dioxide equivalent (tCO<sub>2</sub>e). The consumption of energy and associated GHG emissions were the direct result of the provision of key services by the City, which are organized into the following categories.

- **Buildings & Facilities:** The City's building and facilities consume electricity and natural gas to heat, cool, ventilate, and illuminate administrative, police, and fire buildings, park facilities, and community and recreation centers.
- **Transit Buildings & Fleet:** The City owns and operates transit facilities, 28 conventional buses and 5 dial-a-buses. The vehicles consume gasoline and diesel.
- **Water & Wastewater Facilities:** The treatment and movement of water and wastewater is accomplished largely by electrically driven pumps and processes. Diesel fuel is used for backup electricity generation.
- **Non-transit Fleet & Equipment:** The City's fleet includes light, medium and heavy-duty vehicles and hand-held equipment that consume gasoline and diesel.
- **Solid Waste:** Although the City does not own and operate a landfill, the corporate operations generate waste which is sent to the landfill. This waste decomposes in the landfill and results in the release of fugitive methane (CH<sub>4</sub>) which is a potent greenhouse gas. The associated landfill has CH<sub>4</sub> collection and utilization which greatly reduces GHGs from solid waste.

Table 3 presents the breakdown of the 2021 energy and GHG emissions by reporting category.

**Table 3. 2021 Corporate Energy and GHG Emissions by Category**

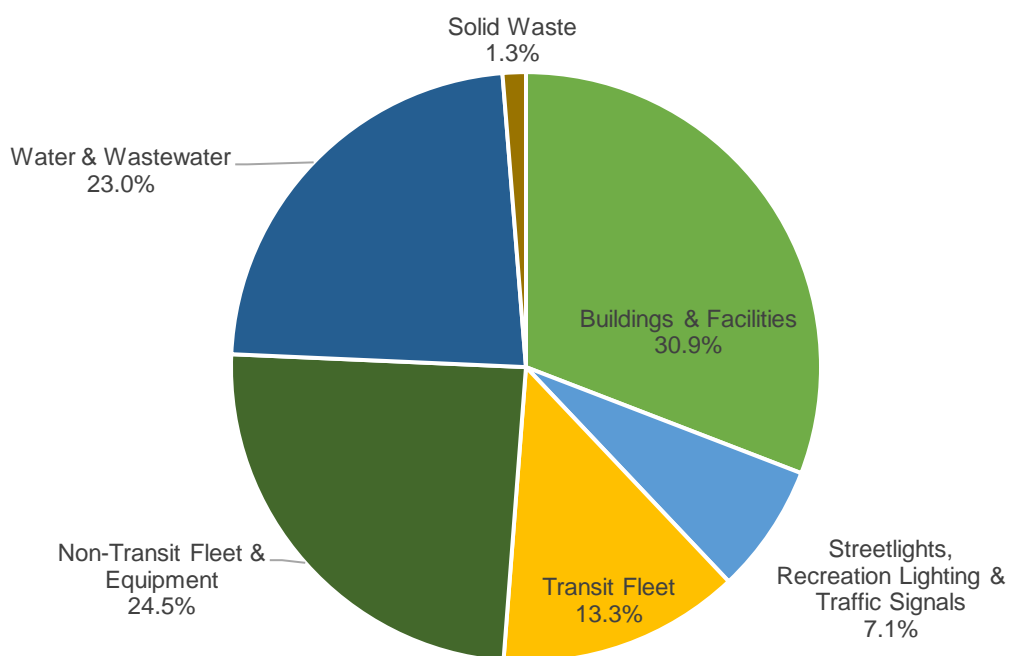
Reporting Category	Energy (GJ)		GHG Emissions (tCO <sub>2</sub> e)	
Buildings & Facilities	54,277	33.2%	3,598	30.9%
Streetlighting & Traffic Signals	11,023	6.7%	827	7.1%
Transit Buildings & Fleet	21,974	13.4%	1,548	13.3%
Non-Transit Fleet & Equipment	40,240	24.6%	2,855	24.5%

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Reporting Category	Energy (GJ)		GHG Emissions (tCO <sub>2</sub> e)	
Water & Wastewater	36,060	22.0%	2,685	23.0%
Solid Waste	-	0.0%	149	1.3%
<b>Total</b>	<b>163,574</b>	<b>100.0%</b>	<b>11,662</b>	<b>100.0%</b>

For the 2021 reporting year, approximately 31 percent of the City’s corporate GHG emissions came from buildings and other facilities like recreation centers and pools; 38 percent came from transportation related activities which includes corporate service vehicles as well as transit fleet; 23 percent came from the operation of water and wastewater pumping and treatment systems; 7 percent came from the operation of streetlights and traffic signals; and just over 1 percent came from the decomposition of waste at landfills (Figure 2).



**Figure 2. GHG Emissions by Source**

More than 50 percent of the City’s corporate GHG emissions come from electricity use in buildings and to power streetlights and vehicles. Natural gas used to heat buildings contributed nearly 9 percent to the total GHG inventory. Diesel, gasoline and propane used in the operation of fleet and equipment accounted for 38 percent of the GHG inventory with diesel contributing the most to the fleet emissions (71 percent) (



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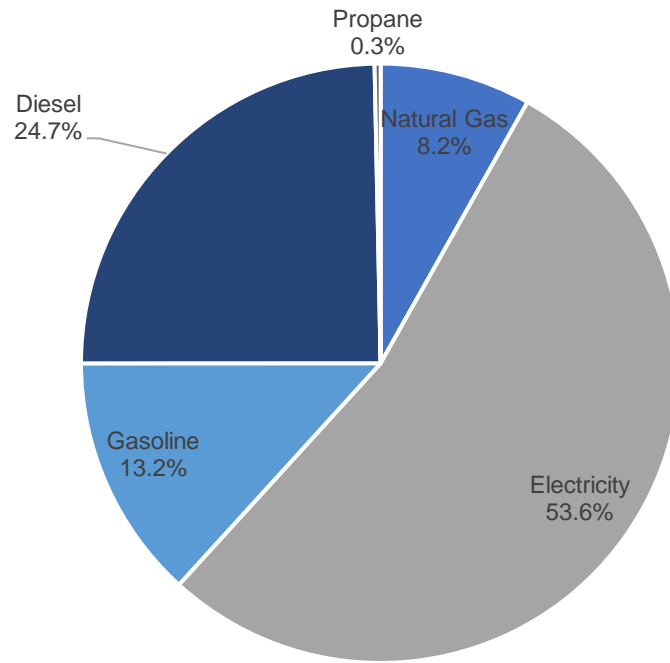
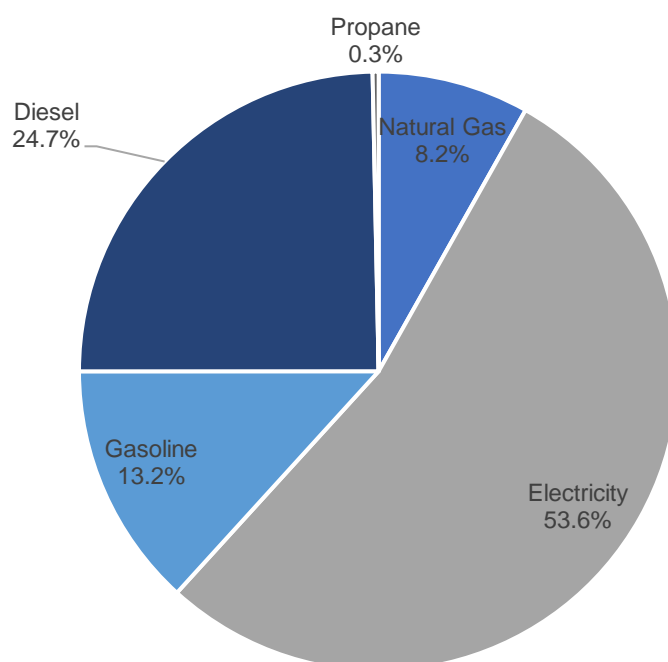


Figure 3).

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**Figure 3. GHG Emissions by Fuel Type**

### 4.2 DEPARTMENTAL ENERGY & GHG EMISSIONS

In terms of department and function, in 2021, the top energy consumers and GHG emitters include Water And Sewer, Recreation, Engineering and Operations, the Transit Department. These departments account for nearly 80 percent of corporate emissions. This is presented in Table 4.

**Table 4. 2021 Energy and GHG Emissions by Department / Function**

Department	Energy (GJ)		GHG Emissions (tCO <sub>2</sub> e)	
	Energy (GJ)	Percentage	GHG Emissions (tCO <sub>2</sub> e)	Percentage
Building Inspection (Planning & Development)	180	0.1%	12	0.1%
Building Services Division	2,971	1.8%	192	1.6%
By-Law Enforcement (Safety Dept)	102	0.1%	7	0.1%
Fire Department	7,397	4.5%	452	3.9%
Fleet Division	326	0.2%	22	0.2%
Fredericton Convention Centre	7	0.0%	0	0.0%
Parking Services	1,084	0.7%	79	0.7%
Parks & Trees	6,854	4.2%	472	4.0%

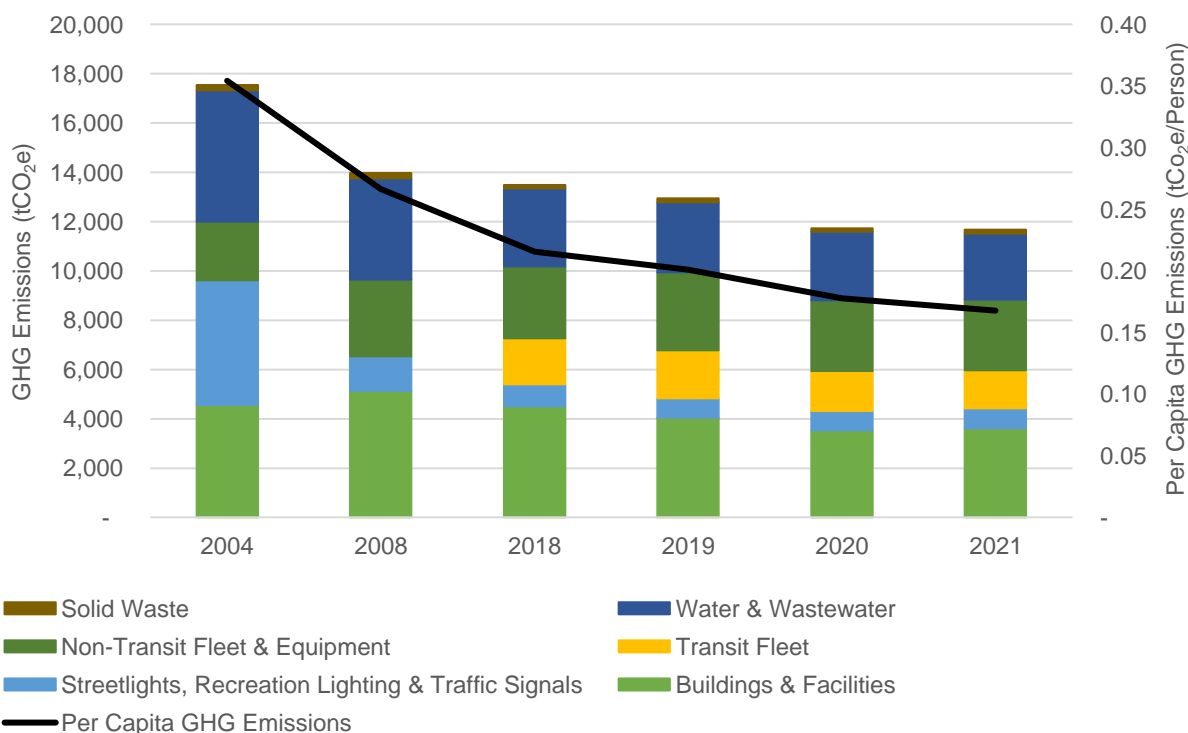
## CORPORATE ENERGY & EMISSIONS PLAN (CEEP): 2021 UPDATE

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Department	Energy (GJ)		GHG Emissions (tCO <sub>2</sub> e)	
Police Department	7,999	4.9%	556	4.8%
Pollution Control	1,105	0.7%	77	0.7%
Engineering & Operations	31,410	19.2%	2,257	19.3%
Recreation	33,860	20.7%	2,374	20.4%
Safety Services	29	0.0%	2	0.0%
Tourism Department	2,396	1.5%	142	1.2%
Transit Department	26,666	16.3%	1,824	15.6%
Water & Sewer Department	41,188	25.2%	3,044	26.1%
CAO's Office	-	0.0%	-	0.0%
Corporate Services	-	0.0%	149	1.3%
HR, Legal & City Clerk	-	0.0%	-	0.0%
<b>Total</b>	<b>163,574</b>	<b>100.0%</b>	<b>11,662</b>	<b>100.0%</b>

### 4.3 HISTORICAL TRENDS

The City chose 2004 as its base year. Since 2004, the City's population has increased over 30 percent while GHG emissions have declined 34 percent. The relationship between absolute and per capita GHG emissions is illustrated in Figure 4 below.

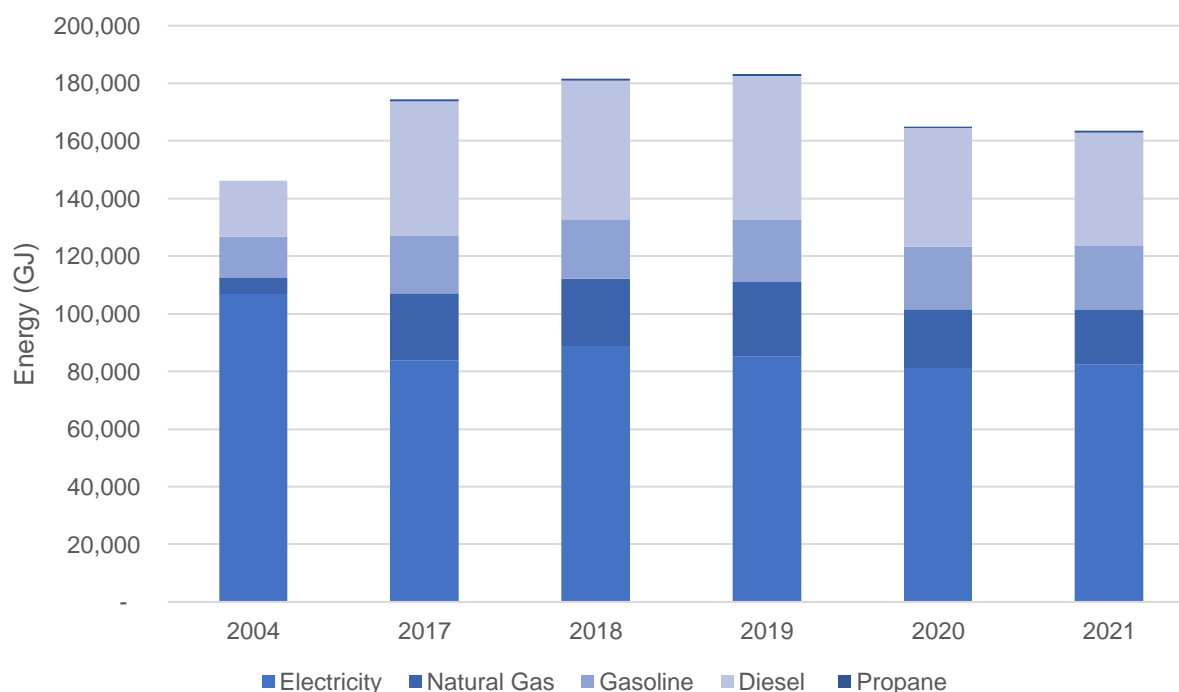


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**Figure 4. 2004 - 2021 Absolute and Per Capita GHG Emissions Trends**

Total energy use for the reporting year was over 163,000 gigajoules (GJ) - a 12 percent increase over the 2004 base year and a 1 percent decrease over the 2020 reporting year. COVID-19 related closures and capacity limitations have resulted in a decline in energy during 2020 and 2021 (Figure 5).



**Figure 5. Historical Corporate Energy Consumption (GJ) By Fuel Type**

### 4.4 CORPORATE ENERGY AND GHG FORECAST

#### 4.4.1 Business as Usual (BAU) Energy and GHG Emissions Forecast

A business as usual (BAU) energy and GHG emissions forecast was developed for the CEEP to understand what the City's footprint could look like in 2030 and 2050 as well as examine the potential magnitude of energy and GHG reduction opportunities relative to best practice GHG reduction targets (Figure 6). Assuming the City does not implement any further energy saving and GHG emissions reduction initiatives, the City's GHG corporate energy and emissions are expected to increase upwards of 8 percent by 2050 as a result of increased service levels and demands as the community grows. Accordingly, corporate energy costs in 2021 were \$5.8 million and are expected to nearly double by 2050 should no further conservation and demand reduction actions take place.

The business-as-usual forecast assumes that the City can continue servicing the growing community with existing building assets but will require additional fleet vehicles and equipment. The following assumptions are applied in the business-as-usual forecast:

- Real energy consumption data was available from the City from 2017 to 2021.

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- Community population forecast data was available from the City for the years 2016 to 2041. The population was extrapolated out to 2050.
- There will be a 10 percent increase expansion in existing buildings + 3 new major buildings before 2030:
  - Performing Arts Centre (~50,000 ft<sup>2</sup>)
  - Pool (~35,000 ft<sup>2</sup>)
  - Fieldhouse (~50,000 ft<sup>2</sup>)
- Due to resident demand, by 2030 the City will see a 10 percent increase in energy because of increased use of sports fields, trails and more trails being plowed in the winter.
- Buildings at the following locations will be sold or decommissioned within the next 5 years:
  - Sutton House
  - Whittingham Hall
  - Fredericton Playhouse
  - Building Services Main Building
- Current solar PV systems continue to operate as intended through 2050.
- The City vehicle population would turn-over at a similar rate to the average rate for Canada (every 10 years)
- City diesel and gasoline fuel consumption would increase 1.7 percent and 1.3 percent annually, respectively. This is based on historical trends.
- The City opportunistically converts light duty vehicles and trucks to electric.
- The Transit department will continue to use and purchase diesel buses through to 2050.
- Future wastewater processing, future water storage, and pumping energy usage will increase proportionally to the population growth rate.
- Planned Federal light-duty vehicle, light duty truck, and heavy-duty vehicle fuel efficiency standards will be implemented and fully adopted in vehicles by 2027.
- Through the adoption of clean fuel sources, electricity in New Brunswick declines in GHG emissions intensity by 18 percent by 2050.
- Coal power will be phased out by 2030.

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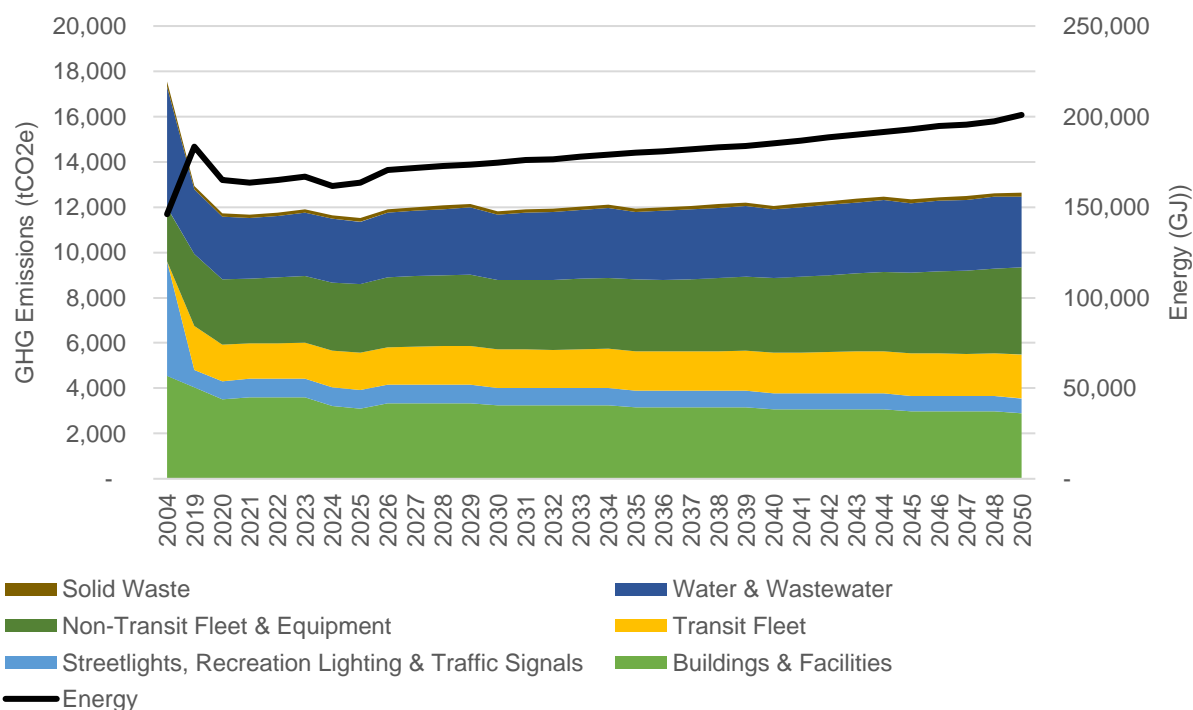


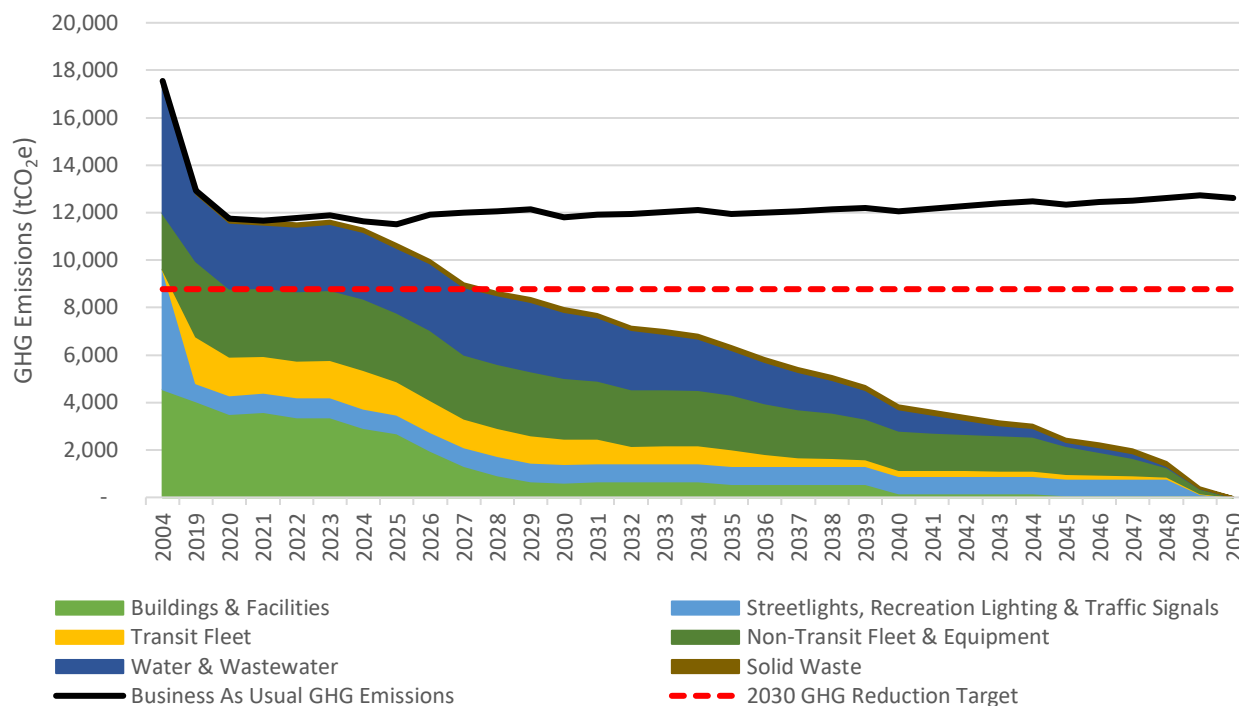
Figure 6. Business as Usual Energy and GHG Emissions Forecast

## 4.4.2 Progress Towards 2030 and 2050 Targets

To understand the effect of future energy and GHG savings initiatives as it relates to the 2030 and 2050 GHG reduction targets, the business as usual future scenario was adjusted to reflect the estimated energy and GHG emissions savings if the City were to implement the initiatives proposed in the CEEP. The recommended list of initiatives presented in the following sections could result in a 50 percent reduction of GHG emissions by 2030, or a decrease of nearly 8,800 tCO<sub>2</sub>e as compared to the 2004 levels. This is presented in Figure 7.

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**Figure 7. Forecasted GHG Emission Reductions by CEEP Initiative Category**

Based on the CEEP forecast, in addition to successfully implementing the initiatives presented herein, the City will have to utilize renewable natural gas (RNG) to achieve and maintain the 2030 GHG reduction target using today's technologies.

**To meet the net-zero target, the City will need to eliminate 90 percent of its GHG emissions through the full electrification of buildings and light duty fleet, the installation and use of renewable power sources (e., PV solar), the use of biofuels in all fleet and equipment that cannot be converted to electric, the investment in nature-based solutions, and likely adjusting various business models and service levels. The residual emissions that remain (10 percent) will need to be *neutralized* via offsets or investments in technological removals (e.g., direct air capture)**

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and / or neutralization projects like conservation / reforestation projects.

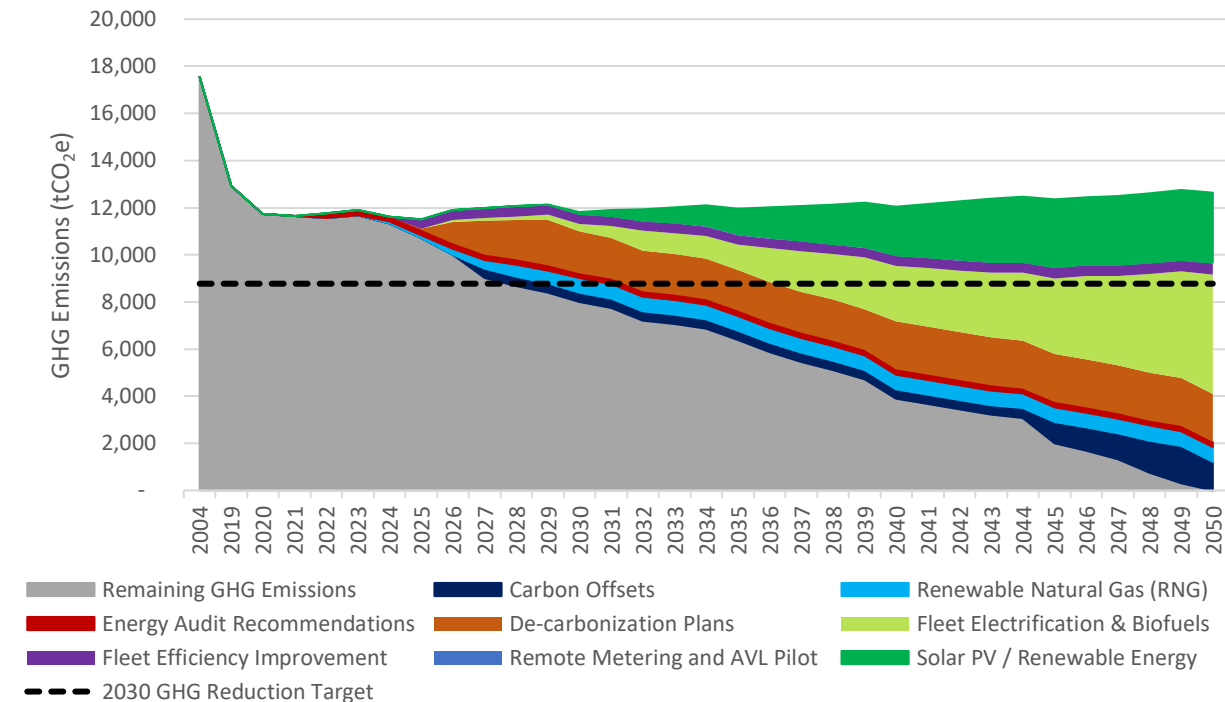
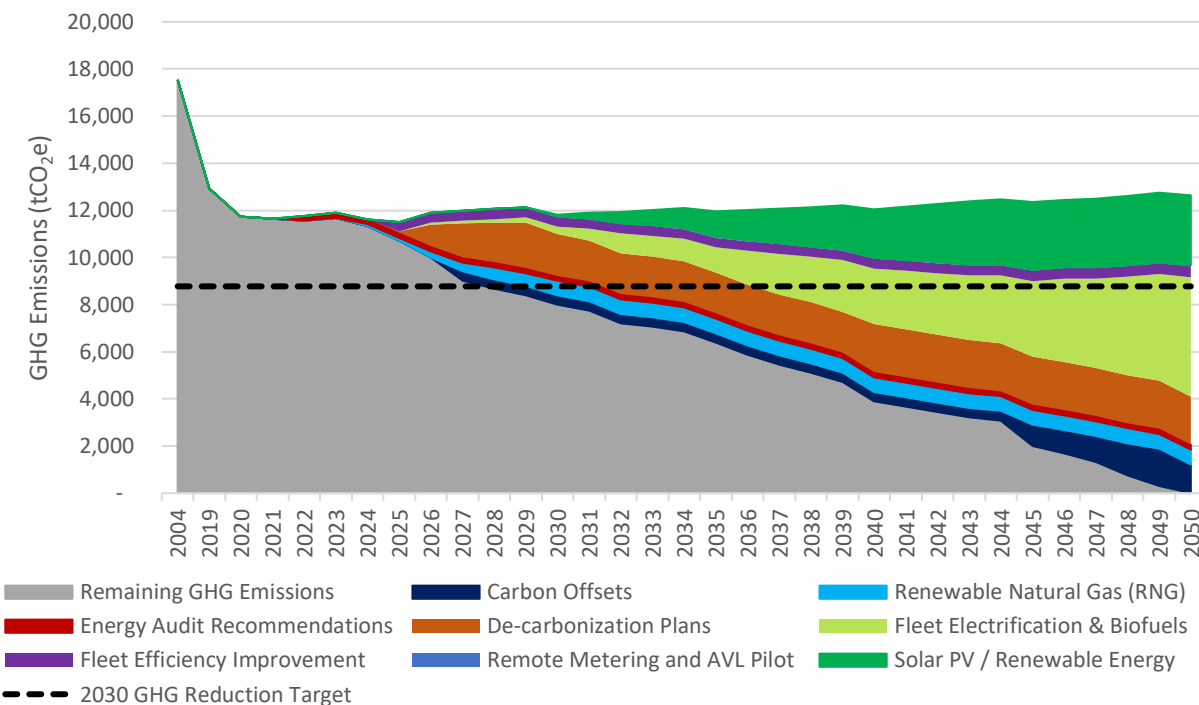


Figure 8 presents a pathway towards net zero operations.





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**Figure 8. Pathway to Net Zero**

To achieve this end goal, it is recommended that the City establish carbon offset procurement standards that align with The Oxford Principles for Net Zero Aligned Carbon Offsetting<sup>4</sup> and that consider the following criteria:

- **Additional.** The carbon offsets would not have occurred without the carbon finance.
- **Audited.** The carbon offsets have been validated and verified by third-party assessors using independent, recognized, standard quantification methodologies to ensure GHG emission removals were actually achieved.
- **Not Double Counted.** The carbon offsets are serialized on a carbon registry and ownership can be traced back to the developer.
- **Local.** The carbon offsets are Canada-based and local (preference to those based in British Columbia).
- **Socially & Environmentally Positive.** There are no negative environmental or social impacts as a result of the generation of the carbon offsets and the project provides social and community co-benefits, such as those that directly support/engage communities, local/small business, and/or projects with First Nation’s ownership.
- **Certified.** The carbon offsets have been generated under a recognized offset standard (e.g., Gold Standard, VCS, CAR, ACR).

**Error! Reference source not found.** presents the CEEP 2021, 2025 and 2030 GHG emissions required to transition towards and reach the 2030 GHG reduction target. The forecasted GHG emissions are based on the estimated potential of the initiatives proposed. As these values can be used as interim targets to track progress against, the reductions for each reporting sector are presented in **Error! Reference source not found.**

**Table 5. Reporting Year (2021) and Estimated 2025 and 2030 GHG Emissions By Sector**

Reporting Sector	2021	2025	2030
Buildings & Facilities Emissions (tCO <sub>2</sub> e)	3,598	2,836	1,250
Lighting & Traffic Signals Emissions (tCO <sub>2</sub> e)	827	800	803
Transit, Fleet & Equipment Emissions (tCO <sub>2</sub> e)	4,403	4,296	3,638
Water & Wastewater Emissions (tCO <sub>2</sub> e)	2,685	2,743	2,827
Solid Waste Emissions (tCO <sub>2</sub> e)	149	152	155
<b>Total GHG Emissions (tCO<sub>2</sub>e)</b>	<b>11,662</b>	<b>10,828</b>	<b>8,674</b>
<b>Change from 2004 Base Year</b>	<b>-34%</b>	<b>-38%</b>	<b>-51%</b>

*Notes to Table: 2004 Base Year = 17,549 tCO<sub>2</sub>e*

**4.4.3 Energy Forecast**

It is assumed that electricity and natural gas rates will increase by about 1 percent per year with other fuels like gasoline and diesel increasing by about 2 percent per year. Rising energy costs will negatively impact ongoing operating costs, making energy conservation and demand management even more important to help mitigate these rising costs. Without a dedicated focus on reducing and conserving energy, corporate energy costs are

<sup>4</sup> <https://www.smithschool.ox.ac.uk/publications/reports/Oxford-Offsetting-Principles-2020.pdf>

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expected to climb to over \$7.1 million by 2030, over \$8.8 million by 2040, and to \$11.3 million by 2050. If CEEP initiatives are implemented, the energy forecast shows that the City can reduce total corporate energy consumption by 8 percent, below 2004 levels, by 2050 (Figure 9).

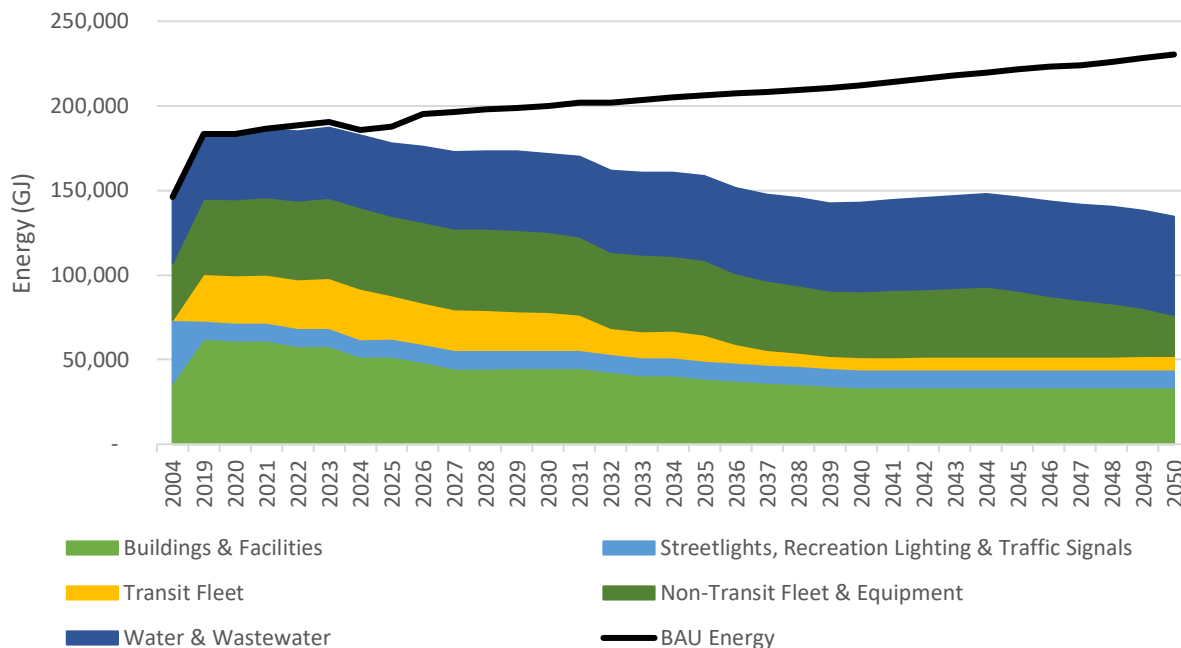


Figure 9. Forecasted Energy Consumption

### 4.5 CURRENT & PROPOSED CEEP UPDATE INITIATIVES

To build momentum and lay the groundwork for deeper energy and GHG reduction actions to be implemented, a series of short- and medium-term initiatives have been identified in this CEEP Update and are listed at the end of each sectors section. The initiatives represent best-practice information collected from similar local governments as well as input from staff and experts.

## 5.0 BUILDINGS & FACILITIES

The City owns or leases over 68 buildings and facilities including administrative and community centers, park facilities, police and fire stations, arenas, garages, and vehicle storage facilities. In 2021, the City's buildings and facility portfolio accounted for 33 and 31 percent of its energy use and GHG emissions, respectively.

Many of the City's buildings and facilities are reaching their end of life which presents an opportunity for the City to drastically reduce energy and GHG emissions over the next 50+ years, but also presents a challenge in that going beyond like-for-like replacements will have a significant cost premium that must be planned for.

To achieve the City's GHG reduction targets, new buildings will need to be 'net-zero' which means they will be highly efficient buildings that incorporate renewable energy systems, such as rooftop solar panels, that will enable them to produce at least as much energy as they consume. Existing buildings and facilities that remain will require deep energy retrofits that radically overhaul the building envelope to significantly reduce energy needs, the electrification of mechanical systems (i.e., HVAC) to utilize lower carbon intensive energy sources, and where possible, the incorporation of renewable energy systems to power, or at least supplement, building systems. As part of each building and facility decarbonization plan, a decision will have to be made regarding whether to redevelop, revitalize, or remove the asset. Along with considering the needs of the City, health and safety, and its residents, the decision must also consider the current and future energy performance, costs, GHG emissions and impact to the City's GHG emissions base year and forecast. Taking a more holistic and life cycle view of the asset being reviewed, will ensure that the City considers the long-term impacts of each building addition, removal, and replacement option. Having de-carbonization plans will align the end-of-life rehabilitation initiatives for individual building components (e.g. roof, windows, mechanical equipment, etc.) with the buildings and facilities Capital Asset Management Plan (CAMP) that is currently being updated.

To move towards the 2030 target, the City will need to immediately minimize energy and GHG emissions from its largest GHG contributors over the next 8 years. These top ten facilities accounted for 30 percent of total corporate energy and GHG emissions and are presented in Table 6.

**Table 6. Top GHG Emitting Facilities in 2021**

Building / Facility	2021 Energy (GJ)	Percentage of Total Energy	2021 GHG Emissions (tCO <sub>2</sub> e)	Percentage of Total GHG Emissions
Grant Harvey Centre (Arena)	10,873	6.6%	816	7.0%
Willie O'Ree Place	9,169	5.6%	583	5.0%
Barker Street WWTP - Blower Building	6,521	4.0%	489	4.2%
Fredericton Police Station	3,949	2.4%	252	2.2%
City Hall	2,458	1.5%	184	1.6%
Two Nations Fire/EOC	3,005	1.8%	184	1.6%
Lady Beaverbrook Arena	2,575	1.6%	170	1.5%

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Building / Facility	2021 Energy (GJ)	Percentage of Total Energy	2021 GHG Emissions (tCO <sub>2</sub> e)	Percentage of Total GHG Emissions
Barker Street WWTP - Operation Building	2,119	1.3%	159	1.4%
York Arena	1,721	1.1%	129	1.1%
St Mary's Depot	2,160	1.3%	124	1.1%
Fredericton Public Library	1,567	1.0%	118	1.0%
St Mary's New Transit	1,687	1.0%	92	0.8%
York Fire Station	1,486	0.9%	91	0.8%
Transit Garage	934	0.6%	53	0.5%
Parks & Trees Depot	882	0.5%	50	0.4%
<b>Total</b>	<b>51,105</b>	<b>31.2%</b>	<b>3,493</b>	<b>30.0%</b>

Notes to table: Fredericton Playhouse is a top emitter but was removed from this list on the basis that it will be divested from the City portfolio over the next few years.

Maintenance and ongoing-commissioning programs - a process of ongoing monitoring, adjustment, and retrofitting with new technologies like building automation systems upgrades, and energy sub-metering will be key to maintaining energy and GHG reductions. Building Condition Assessments (BCA) and behavioral change programs are also important initiatives that will complement retrofit and building monitoring programs. One of the most cost-effective GHG emissions avoidance measures is to improve existing building utilization rates; therefore, reducing the number of new buildings requiring construction in the future. This will require the development of programs and policies that allow staff to work from home, staff hoteling, and improved space layouts (Initiative B6).

The following initiatives were proposed in the original CEEP. For each of these initiatives, a status update and next step recommendation is provided.

- B1: Develop a Green Building Sustainability Policy
- B2: Implement Energy Audit Recommendations
- B3: Develop De-Carbonization Plans for Buildings & Facilities
- B4: Implement a Building Commissioning Program
- B5: Complete Buildings Utilization Assessments

The following new initiatives are being included in the CEEP Update:

- B6: Provide Net-Zero and Renewable Energy System Training to City Staff
- B7: Implement an Energy Performance Monitoring & Benchmarking Program
- B8: Implement Technological and Behavioral Energy Efficiency (BEE) Reduction Programs

With the proposed initiatives, it is estimated that the City could reduce building and facility related GHG emissions by 57 percent and 62 percent by 2030 when compared to 2004 and 2021 levels, respectively (Table 7).

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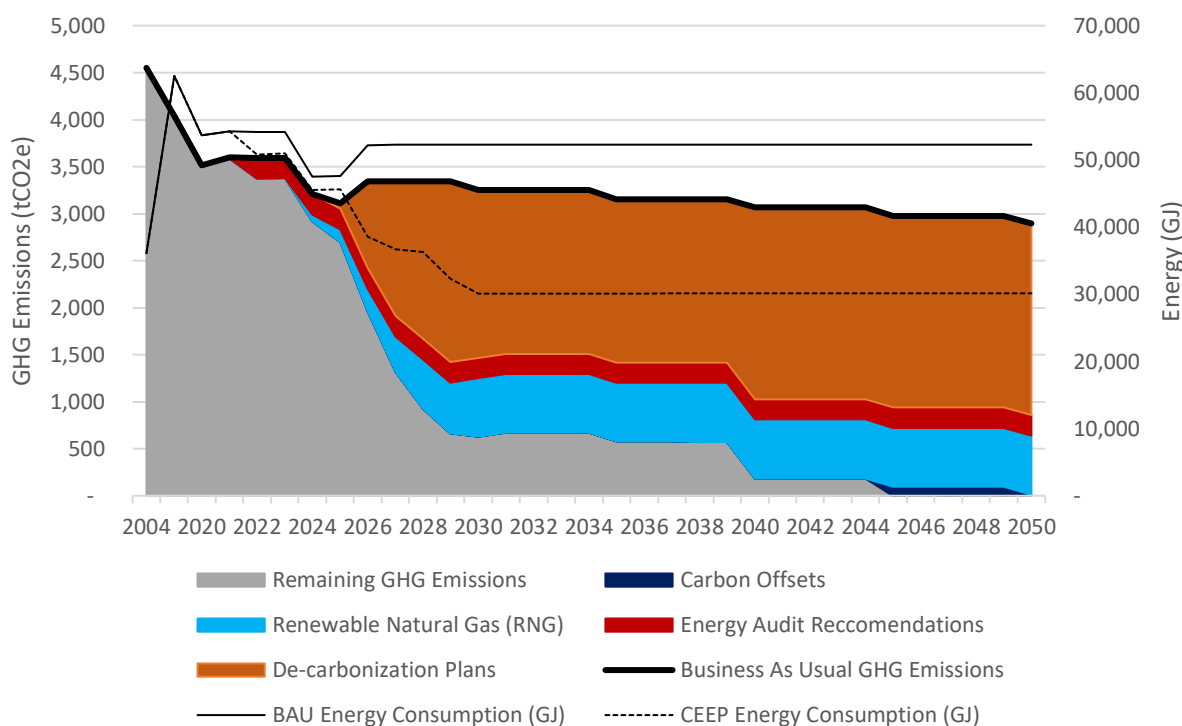
**Table 7. Estimated GHG Emission Reductions From Buildings & Facilities**

Year Ended	2025	2030
Business as Usual Forecasted GHG Emissions (tCO <sub>2</sub> e)	3,112	3,249
Emissions Reductions (tCO <sub>2</sub> e)	275	1,999
<b>Remaining GHG Emissions (tCO<sub>2</sub>e)</b>	<b>2,836</b>	<b>1,250</b>
<b>Change from 2004 Base Year</b>	<b>-38%</b>	<b>-73%</b>
<b>Change from 2021 Reporting Year</b>	<b>-36%</b>	<b>-72%</b>

Notes to Table:

Base Year GHG emissions: 4,328 tCO<sub>2</sub>e. Reduction values and percentages do not include the procurement of offsets.

Figure 10 illustrates the progression of GHG emissions reductions over time compared to the forecasted business as usual scenario. It presents the level of magnitude that decarbonization plans can have on energy and GHG reductions. The implementation of the decarbonization plans will require a culture spending shift to move away from ‘like-for-like’ replacements and towards recognizing energy and GHG reduction opportunities on a lifecycle basis. Upfront this will require paying a premium for low- and zero-carbon technologies. Using high level cost estimates and building/facility square footages, the cost premium to decarbonize all of the City’s buildings and facilities could cost between \$40 - \$60 million depending on the scale and depth of the retrofits. The benefits in terms of GHG reductions will also range between 30 percent to 100 percent which will be related to the level of investment. The step down in the BAU GHG emission line post 2030 is directly related to the greening of the electrical grid.



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**Figure 10. Forecast of Buildings Energy & GHG Emissions**

At an estimated cost premium of \$40 to 60/ft<sup>2</sup>, the estimated premium to implement deep carbon reductions in these facilities decarbonization plans will likely cost between \$20 - \$30 million for the top 10 facilities.

The following sections present each of the initiatives.

**5.1 BUILDINGS & FACILITIES INITIATIVES**

**5.1.1 B1: Develop a Green Building Sustainability Policy**

In the original CEEP, it was recommended that the City develop a Green Building Policy to require that all newly constructed and deeply renovated buildings undergo a net-zero and alternative energy evaluation as part of the design process and require that the life cycle cost and return considerations for reducing GHG emissions be presented to Council. A zero-carbon building is a highly energy efficient building that produces renewable energy onsite, or procures, carbon-free renewable energy or high-quality carbon offsets to neutralize the annual carbon emissions associated with building materials and operations.<sup>5</sup> This initiative is in progress and a draft is expected in June 2022.

Once the Green Building Policy is approved, it is recommended that the explore the development of technical standards that direct contractors and project staff to focus on specific areas of performance that are important to the City (e.g., energy and water efficiency, waste diversion, sub-metering, etc.). Strong enforcement of technical standards and accountability would limit the number of future retrofits and change orders and would provide clear lines of accountability for all parties involved with the design, construction, operational management, and major renovation of City buildings.

**5.1.2 B2: Implement Energy Audit Recommendations**

Several building energy audits have been completed. The scope of the audits included reviewing building thermal performance, load distribution, existing equipment and controls schedules, occupancy patterns, lighting, and efficiency systems to identify energy and emission reduction opportunities. The recommendations ranged from lighting system upgrades, Building Automation Systems (BAS) upgrades, the use of insulation and weather-stripping to installing variable speed motors, and the installation of heat recovery systems. The estimated cost, economic savings, simple payback and estimated GHG emissions reductions opportunities by facility are presented in Table 8.

**Table 8. Summary of Energy Audit Recommendations**

Asset	Estimated Cost	Estimated Annual Energy Savings (GJ)	Estimated Annual Savings	Simple Payback (Years)
Fredericton Convention Centre	\$220,247	1,058	\$40,207	5.5
Garrison Washrooms	\$2,192	2	\$74	29.5

<sup>5</sup> <https://www.cagbc.org/zerocarbon>

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Asset	Estimated Cost	Estimated Annual Energy Savings (GJ)	Estimated Annual Savings	Simple Payback (Years)
Botanical Gardens Building	\$1,064	11	\$302	3.5
Grant Harvey Centre	\$84,129	1,136	\$33,749	2.5
Kimble Fire Station	\$28,172	55	\$1,289	21.9
Fredericton Public Library	\$259,148	146	\$4,602	56.3
Lady Beaverbrook Rink	\$13,231	19	\$827	16.0
Two Nations Fire Station/EOC	\$49,358	95	\$3,100	15.9
Royal Road Fire Station	\$7,450	-	\$-	0.0
Odell Park Lodge	\$3,088	13	\$452	6.8
Fredericton Police Station	\$147,434	302	\$8,779	16.8
Regent Street Depot	\$10,803	10	\$212	51.0
St Mary's Depot	\$48,798	129	\$2,670	18.3
St Mary's New Transit	\$38,005	292	\$7,374	5.2
Transit Garage	\$21,152	163	\$3,564	5.9
Small Craft Aquatic Centre	\$4,681	21	\$563	8.3
Trail Patrol Building	\$24,245	21	\$557	43.5
Parks & Trees Depot	\$222,979	480	\$4,617	48.3
Willie O'Ree Place	\$73,286	286	\$5,484	13.4
York Arena	\$145,019	382	\$11,732	12.4
York Fire Station	\$18,625	16	\$357	52.2
Fredericton Indoor Pool	\$21,066	49	\$2,337	9.0
St. Mary's Cold Storage	\$12,058	32	\$1,368	8.8
Frederick Square Parking Garage	\$86,025	271	\$10,367	8.3
East End Parking Garage	\$150,742	316	\$15,344	9.8
<b>Total</b>	<b>\$1,692,993</b>	<b>5,306</b>	<b>\$159,925</b>	<b>10.6</b>

The implementation of the energy audit recommendations is estimated to result in both energy cost savings and reasonable payback periods for most. To date, the City has implemented most of the lighting upgrades, but has not completed any mechanical system upgrades. The City has plans to review what energy and GHG reductions have been realized in August 2022 with its energy consultant, MCW.

It is recommended the City prioritize the efforts to be undertaken based on energy and GHG reduction potential with consideration to upcoming deep retrofit opportunities. There are likely to be cases where the timing of deep retrofits can be accelerated to achieve significant energy and GHG reductions. To support this measure, it is recommended that City continue to seek out funding opportunities and incentives to improve the business case for high GHG reduction actions that have a longer or lower financial return on investment. Possible funding sources are included in Table 9.

**Table 9. Possible External Funding Sources**

Funding Source	Funding Snapshot
Disaster Mitigation and Adaptation Fund (Government of Canada)  <a href="https://www.infrastructure.gc.ca/dmaf-faac/index-eng.html">https://www.infrastructure.gc.ca/dmaf-faac/index-eng.html</a>	Community funding (for small-scale and large-scale project streams) to invest in structural and natural infrastructure projects that increase the resilience of communities that are impacted by natural disasters triggered by climate change.
Municipalities for Climate Innovation Program (Federation of Canadian Municipalities)  <a href="https://fcm.ca/en/programs/municipalities-climate-innovation-program">https://fcm.ca/en/programs/municipalities-climate-innovation-program</a>	This five-year, \$75-million Federation of Canadian Municipalities program is supporting more than 600 municipalities in updating infrastructure and addressing climate change.
Natural Infrastructure Program  <a href="mailto:ec.adaptation-adaptation.ec@canada.ca">ec.adaptation-adaptation.ec@canada.ca</a>	Natural infrastructure, such as wetlands or urban forests, play a critical role in building resilience to the impacts of climate change in Canada. The federal government is delivering a number of programs that are supporting the uptake of natural infrastructure across Canada.
Transportation Assets Risk Assessment Program (Transport Canada)  <a href="https://tc.canada.ca/en/programs/transportation-assets-risk-assessment-tara-program">https://tc.canada.ca/en/programs/transportation-assets-risk-assessment-tara-program</a>	Provides funding to assess impacts of changing climate on federally-owned transportation assets such as bridges, ports and airports. The program provides information for integration into asset management and infrastructure investment plans.
Green Municipal Fund (Federation of Canadian Municipalities)  <a href="https://www.fcm.ca/en/programs/green-municipal-fund">https://www.fcm.ca/en/programs/green-municipal-fund</a>	Grants for sustainable municipal environmental projects including plans, studies, pilot projects, and capital projects, and municipal asset management. Loans are also available to municipalities at competitive rates.

**5.1.3 B3: Develop De-Carbonization Plan for Buildings & Facilities**

Making significant progress towards the City’s GHG targets will require a unifying de-carbonization plan for each City building and facility. De-carbonizing most of the existing buildings will require deep energy retrofits that upgrades or replaces equipment and building envelopes (e.g., roof, walls, windows) to achieve the required large energy and greenhouse gas emission reductions. The objective of deep energy retrofits is to create a building that can be heated and cooled with very little energy. Deep energy retrofits involve at a minimum:

- Replacing the building envelope to improve efficiency and airtightness
- Replacing the roof with a high solar reflectance alternative, and where possible, adding insulation
- Replacing doors, windows, louvers, etc. with higher efficiency alternatives
- Harnessing sunlight for heat and illumination
- Replacing the heating, ventilation, and air conditioning (HVAC) systems with electric powered counterparts and renewable technologies like ground-source heat pumps



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A study conducted by Natural Resources Canada (NRCAN) estimates that deep energy retrofits can achieve upwards of a 60 percent reduction in energy consumption and a similar reduction in GHG emissions.<sup>6</sup> The building decarbonization plans will require re-thinking of building operations as well as HVAC systems. A significantly reduced building energy demand means smaller mechanical systems and options for cleaner fuel sources. Electrically driven heat-pumps generate significantly fewer GHG emissions than a natural gas boiler or furnace but may cost more to operate. The assessment and use of solar Photovoltaic (PV) can reduce / eliminate the consumption of grid-based power and could be used to opportunistically support other GHG reductions in the community (e.g., solar PV to power nearby Electric Vehicle (EV) charging station). The final step to de-carbonize City buildings will be to offset any remaining electricity consumption through the procurement of carbon offsets.

The implementation of the decarbonization plans will require a significant capital investment with the deep energy retrofits expected to have upwards of a 40-60 percent premium on existing renovation costs and that these costs have not been planned for. Over the next 5-years, the City must develop long-term de-carbonization plans for at least the top ten emitting facilities (Table 6).

Having de-carbonization plans will align the end-of-life rehabilitation initiatives for individual building components (e.g., roof, windows, mechanical equipment, etc.) with the City's GHG reduction targets. It is recommended that the de-carbonization plans be based off of up to date building condition assessments, include asset specific GHG intensity (GHGI) targets, and a lifecycle business case assessment that clearly defines capital budget requirements and the offsetting energy cost savings that will be reflected in future operating budgets. In collaboration with finance, a timeline that targets 2040 for all existing buildings and facilities to have had a deep energy retrofit completed is necessary if the City is to achieve its 2050 target. Initiatives equal to Pollution Control 'P2' Large Solar Array should also be considered for arena properties as the mechanical systems will continue to be energy intensive, 100 percent electric and can only be optimized so much.

The City's current work on the building and facility asset management plan and current MCW work (initiative B2) will inform the decarbonization plans.

### 5.1.4 B4: Implement a Building Commissioning Program

Commissioning verifies that a building has been constructed to its designed specifications. The best time to commission a building is during construction, with special attention being paid to the building envelope. The building envelope influences most aspects of building performance such as energy consumption, occupant comfort and durability over the life of the entire building (50+ years).

Ongoing recommissioning, or retro-commissioning, is the continuous commissioning of a building's various systems over a specified period of time to verify continuous peak performance over its useful life. Ongoing-commissioning and re-commissioning are important because they reduce operating costs, reduce the risk of failures, and inform retrofit opportunities and deep energy retrofit plans. Various pre-and post-implementation commissioning case studies have showed efficiency improvements on the order of 5 percent to 30 percent

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<sup>6</sup> Natural Resources Canada, 2018. *Retrofitting*, [www.nrcan.gc.ca/energy/efficiency/buildings/20707](http://www.nrcan.gc.ca/energy/efficiency/buildings/20707), accessed on Sept 4, 2018.

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because of improved operations and maintenance. The studies also showed that the resulting simple payback periods are typically less than 2 years.<sup>7</sup> Typical commissioning activities include:

- Adjusting reset and set-back temperatures and temperature settings
- Staging/sequencing of boilers, chillers, and air handling units
- Adjusting and repairing dampers and economizers
- Modifying control strategies for standard hours of operation
- Eliminating simultaneous heating and cooling
- Air and water distribution balancing and adjustments
- Verifying controls and control sequencing, including enabling and re-enabling automatic controls for set points, weekends, and holidays

It is recommended that the City schedule the commissioning of buildings on at least a five-year cycle or when the function of a building or facility changes, and that an ongoing-commissioning program be developed, managed, and tracked by the Building Services division in conjunction with the City's asset management system. To limit the impact of occupant behavior on building performance, it is also recommended that the City use change management techniques to help occupants understand and adapt to the defined parameters (i.e., temperature range, light, air flows, etc.) for conditioned spaces.

In terms of an update, retro/recommissioning is set to begin in 2022 with the Grant Harvey facility being completed by end of November 2022. The initial round of retro commissioning will be completed within 3-7 years.

### 5.1.5 B5: Complete Building & Facility Utilization Assessments

To inform the development of the decarbonization plans for buildings and facilities, the City has begun to reassess the suitability of its assets to meet current and long-term needs and demands through the completion of a facility utilization and needs assessment. This is a comprehensive examination of all of the City's major facilities, such as fire stations, maintenance shops and other public buildings and takes into consideration expected life expectancy of the facility, current and projected utilization, changing demographics and trends, and feedback from the community. The objective of the assessment process is to guide future investment in City facilities while meeting community service requirements, realizing operational energy cost savings and reducing GHG emissions, while potentially avoiding unnecessary capital projects. An additional outcome of the assessments will be the development of key performance indicators (KPI) that relate building and facility energy consumption to operational parameters (e.g., energy consumption (GJ) / operating hour, # of community programs per day by facility, etc.). This will enable the City to better understand and track energy and GHG drivers related to facility operation and service levels. Energy and GHG KPIs will be tracked via Energy Star Portfolio Manager (Initiative B8).

The assessments will be finalized as part of the update to the building and facilities asset management plan. It is expected that this draft will be ready by June 2022.

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<sup>7</sup> Office of Energy Efficiency and Renewable Energy, 2010. *Operations & Maintenance Best Practices: A Guide to Achieving Operational Efficiency*, [https://www.energy.gov/sites/prod/files/2013/10/f3/omguide\\_complete.pdf](https://www.energy.gov/sites/prod/files/2013/10/f3/omguide_complete.pdf) August 3, 2018.

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### **5.1.6 B6: Provide Building Energy, Net-Zero and Renewable Energy System Training to City Staff**

Building managers and supervisors are responsible for day-to-day maintenance and operation of buildings and facilities with complex heating, mechanical and electrical systems and requirements. Proper understanding and training in the systems is key to achieving and maintaining net zero energy buildings and associated renewable energy systems. Training building managers and supervisors on best management practices and concepts builds competencies that they can use to operate their facilities and carry out operations more effectively and efficiently. It is recommended that the City seek a building training program that:

- Examines best-practices, approaches, case studies and the role of technology
- Examines in detail the investigation process
- Identifies how to assess and implement measures
- Provides details on the requirements for ongoing maintenance, monitoring and reporting
- Incorporates hands-on activities that allows for onsite assessment of equipment and systems
- Provides case studies and approaches to dealing with staff and tenants

Additional information on a best practice approach for training can be found in ASHRAE Guideline 0, The Commissioning Process, and Guideline 1.3P, Building Operation and Maintenance Training for the HVAC&R Commissioning Process.

### **5.1.7 B7: Implement an Energy Performance Monitoring & Benchmarking Program**

Buildings do not always operate as they were designed as a result of human influences and factors (e.g., overriding temperature controls, keeping doors and windows open, use of personal heaters, etc.) which can result in reduced energy performance. Annual energy and water performance monitoring through Energy Star Portfolio Manager can close the gap between predicted and actual energy by establishing a performance baseline. With this data, the City can assess and track building performance information and condition assessments to identify opportunities for improvement. The City has just begun using Energy Star Portfolio Manager to track building energy performance.

This Initiative will result in the development of key performance indicators (KPI) that relate building and facility energy consumption to operational parameters (e.g., energy consumption (GJ) / operating hour). This will help the City better understand and track energy and GHG drivers related to facility operation and service levels.

It is best practice to summarize benchmarked performance for each building and reporting on progress every six months.

### **5.1.8 B8: Implement Technological and Behavioral Energy Efficiency (BEE) Reduction Programs**

Behavioral Energy Efficiency (BEE) reduction programs provide end users with information on their energy usage, a comparison of their usage to others, and offer goals and rewards to encourage efficient use. Typically, these programs are communicated via social media, through peer interaction, educational programs and take home packages, and games. BEE programs bypass a number of typical energy efficiency barriers as there is no required injection of capital or the installation of energy conservation measures. Rather, they are designed to overcome information and knowledge barriers around a lack of energy consumption awareness (e.g., habits and efficient

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products). When implemented correctly and maintained, BEE programs can reduce energy consumption in buildings by up to 15 percent with a very low investment. When combined with building automation systems, sensors, and smart systems, the savings can be increased and maintained over time. It is recommended that the City organize a BEE team and explore the deployment of a BEE program on a facility by facility basis supported with educational programs, building energy dashboards, and an awards / recognition program.

### 5.2 SUMMARY OF CURRENT BUILDING INITIATIVES

A summary of the status and recommend next steps for existing initiatives is presented in Table 10.

**Table 10. Status of Current Buildings & Facilities Initiatives**

#	Initiative	Status	Next Steps
B1	Develop a Green Building Policy	<ul style="list-style-type: none"> <li>Finalizing: Delivery end of June from MCW</li> </ul>	<ul style="list-style-type: none"> <li>Adopt and implement Policy. May require the development of supporting technical standards.</li> </ul>
B2	Implement Energy Audit Recommendations	<ul style="list-style-type: none"> <li>Work underway/ongoing - implemented most lighting project, no mechanical system upgrades</li> <li>Reviewing realized GHG reductions with MCW: Delivery August 30</li> </ul>	<ul style="list-style-type: none"> <li>Use the information to inform de-carbonization plans</li> </ul>
B3	Develop De-Carbonization Plans for Buildings & Facilities	<ul style="list-style-type: none"> <li>Asset management plan and current MCW work (initiative B2) will inform the plans</li> </ul>	<ul style="list-style-type: none"> <li>Complete deep retrofit of facilities as outlined by de-carbonization plans &amp; updated energy audit recommendations</li> <li>Implementation will depend on if budget is authorized by council</li> </ul>
B4	Implement a Building Commissioning Program	<ul style="list-style-type: none"> <li>Retro/recommissioning to start this year (Grant Harvey completed by end of November 2022)</li> </ul>	<ul style="list-style-type: none"> <li>Expand initiatives to other City owned buildings and facilities (3-7 year time horizon)</li> </ul>
B5	Complete Buildings Utilization Assessments	<ul style="list-style-type: none"> <li>Finalizing through Asset Management Plan: Deliver end of 2nd quarter for draft</li> </ul>	<ul style="list-style-type: none"> <li>Use the information to inform building and facility planning and asset management (e.g., divest, acquire, build new) with consideration to energy and GHG emission impacts.</li> <li>Log building data into Energy Star Portfolio Manager (will be completed by end of 2022)</li> </ul>

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### 5.3 SUMMARY OF PROPOSED BUILDING INITIATIVES

A summary of the proposed initiatives is presented in Table 11.

**Table 11. Summary of Buildings & Facilities Initiatives**

#	Initiative	Description	Energy Reduction Potential	Estimated Cost	Priority	Responsibility
B6	Provide Net-Zero and Renewable Energy System Training to City Staff	Support the training of City staff to gain skills unique to net-zero emission buildings, and renewable energy systems.	Supportive Initiative	<ul style="list-style-type: none"> <li>• Cost of Training</li> <li>• Staff Time</li> </ul>	<ul style="list-style-type: none"> <li>• Short-term</li> </ul>	<ul style="list-style-type: none"> <li>• Building Services</li> <li>• Corporate Services</li> </ul>
B7	Implement an Energy Performance Monitoring & Benchmarking Program	Utilize Energy Star Portfolio Manager to track and assess energy and water consumption. Report annually on building energy ratings. Provide City staff resources with training.	Supportive Initiative	<ul style="list-style-type: none"> <li>• Staff Time</li> </ul>	<ul style="list-style-type: none"> <li>• Short-term</li> </ul>	<ul style="list-style-type: none"> <li>• Building Services</li> <li>• Corporate Services</li> </ul>
B8	Implement Technological and Behavioral Energy Efficiency (BEE) Reduction Programs	Implement energy saving changes in buildings and facilities through behavioral improvements, and through changes to the software of buildings.	Up to 15%	<ul style="list-style-type: none"> <li>• Staff Time</li> </ul>	<ul style="list-style-type: none"> <li>• Short-term</li> </ul>	<ul style="list-style-type: none"> <li>• Building Services</li> <li>• IT</li> <li>• Corporate Services</li> <li>• Human Resources</li> </ul>

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Notation	Timeline
Short-term	Complete by end of 2023
Medium-term	Complete by end of 2027
Long-term	Complete by end of 2030
Ongoing	Work will be ongoing between 2022 and 2030
Work underway	The project has begun

## 6.0 TRANSIT, FLEET & EQUIPMENT

The City owns and operates nearly 400 light-, medium-, heavy-duty vehicles, transit vehicles and equipment. Both fleet and equipment are powered by gasoline, and diesel which accounted for 38 percent of total energy consumption and GHG emissions in 2021 as detailed in Table 12 and Figure 11. Light duty vehicles and trucks accounted for 32 percent of the fleet and equipment's GHG emissions, with heavy duty vehicles and off-road equipment accounting for the remainder of the GHG emissions (68 percent).

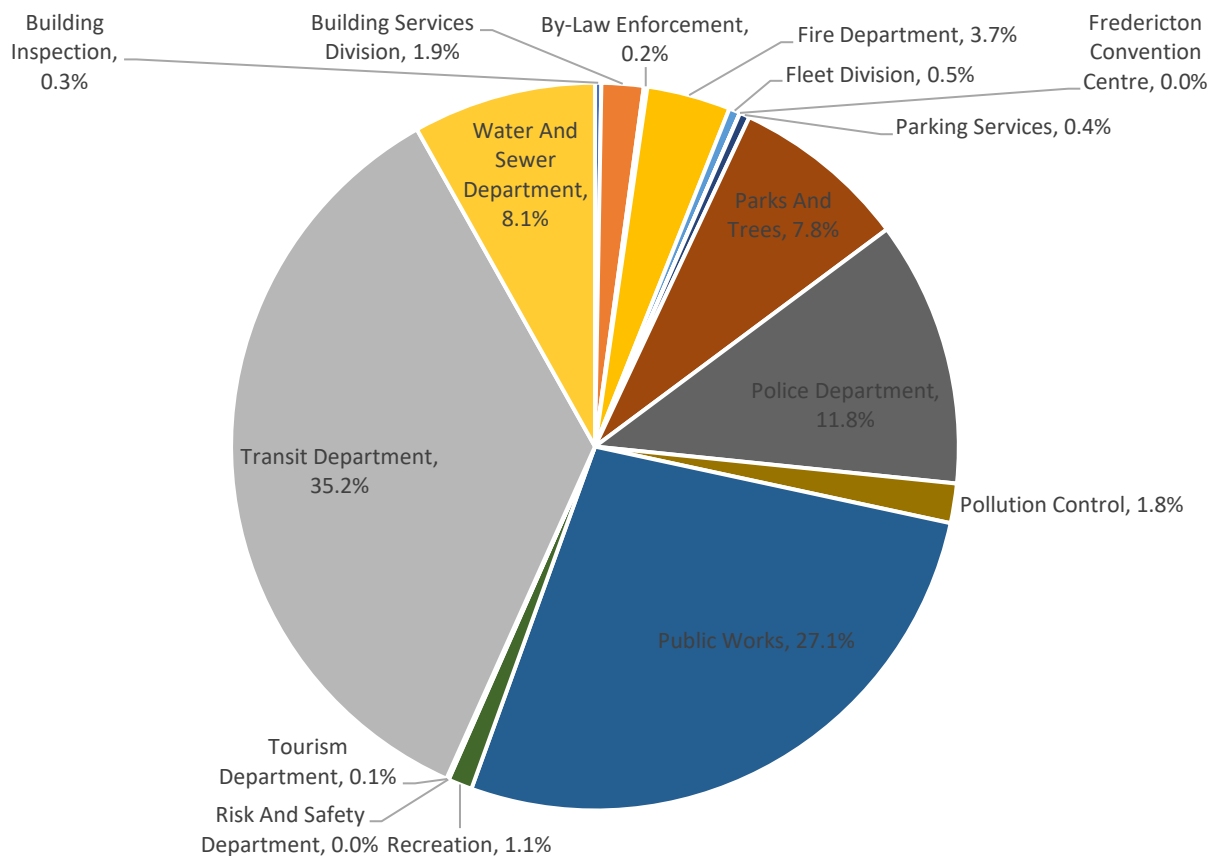
**Table 12. Fleet & Equipment Energy And GHG Emissions By Department**

Department	2021 Energy	Percentage of Total Energy	2021 GHG Emissions	Percentage of Total GHG Emissions
Building Inspection	180	0.1%	12	0.1%
Building Services Division	1,168	0.7%	82	0.7%
By-Law Enforcement	102	0.1%	7	0.1%
Fire Department	2,279	1.4%	164	1.4%
Fleet Division	315	0.2%	22	0.2%
Fredericton Convention Centre	7	0.0%	0	0.0%
Parking Services	286	0.2%	20	0.2%
Parks And Trees	4,890	3.0%	345	3.0%
Police Department	7,522	4.6%	520	4.5%
Pollution Control	1,105	0.7%	77	0.7%
Public Works	16,425	10.0%	1,195	10.2%
Recreation	762	0.5%	47	0.4%
Risk And Safety Department	29	0.0%	2	0.0%
Tourism Department	40	0.0%	3	0.0%
Transit Department	21,974	13.4%	1,548	13.3%
Water And Sewer Department	5,129	3.1%	359	3.1%
<b>Total</b>	<b>62,215</b>	<b>38.0%</b>	<b>4,403</b>	<b>37.8%</b>

Broken down by department / unit, it is estimated that Police, Public Works, and Transit accounted for 74 percent of the total fleet GHG emissions.

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**Figure 11. Vehicle & Equipment GHG Emissions by Department / Unit**

Transit vehicles, fleet and equipment GHG emissions are the direct result of a wide and varied range of services delivered to the community. As no single measure can eliminate all vehicle and equipment related GHG emissions, a suite of fleet and transit strategies are required.

The following initiatives were proposed in the original CEEP. For each of these initiatives, a status update and next step recommendation is provided.

- Fleet:
  - F1: Implement Review of Fleet
  - F2: Optimize and Right-Size Fleet
  - F3: Opportunistically Switch Light Duty Fleet to Hybrid / Electric
  - F4: Monitor Renewable Energy and Fuel Technologies
  - F5: Opportunistically Switch Off-Road and Hand-Held Equipment to Electric
- Transit
  - T1: Monitor Cold-Weather City EV Bus Programs
  - T2: Complete an On-Demand Transit Feasibility Study & Implement the Recommendations



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The following new initiatives are being included in the CEEP Update:

- Fleet:
  - F5: Develop an EV Strategy
  - F6: Develop a Fleet Electrification Financing Strategy
  - F7: Develop Anti-Idling Policy
  - F8: Expand Automatic Vehicle Location (AVL) Telematics Program Across Fleet
  - F9: Implement a Sustainable Commuting Program
- Transit:
  - T3: Complete an Alternative Propulsion Study for the Transit Fleet
  - T4: Implement an alternative fuel-powered bus pilot project.

Many of the proposed actions will set the City on a pathway to net zero GHG emissions by 2050. Based on the lifecycle of vehicles and supply chain issues for electric vehicles (there is a 2-3 year back log), major reduction from Transit and fleet will occur in the early 2030s. Table 13 presents the reductions up to 2030.

**Table 13. Estimated GHG Emission Reductions From Transit, Fleet & Equipment**

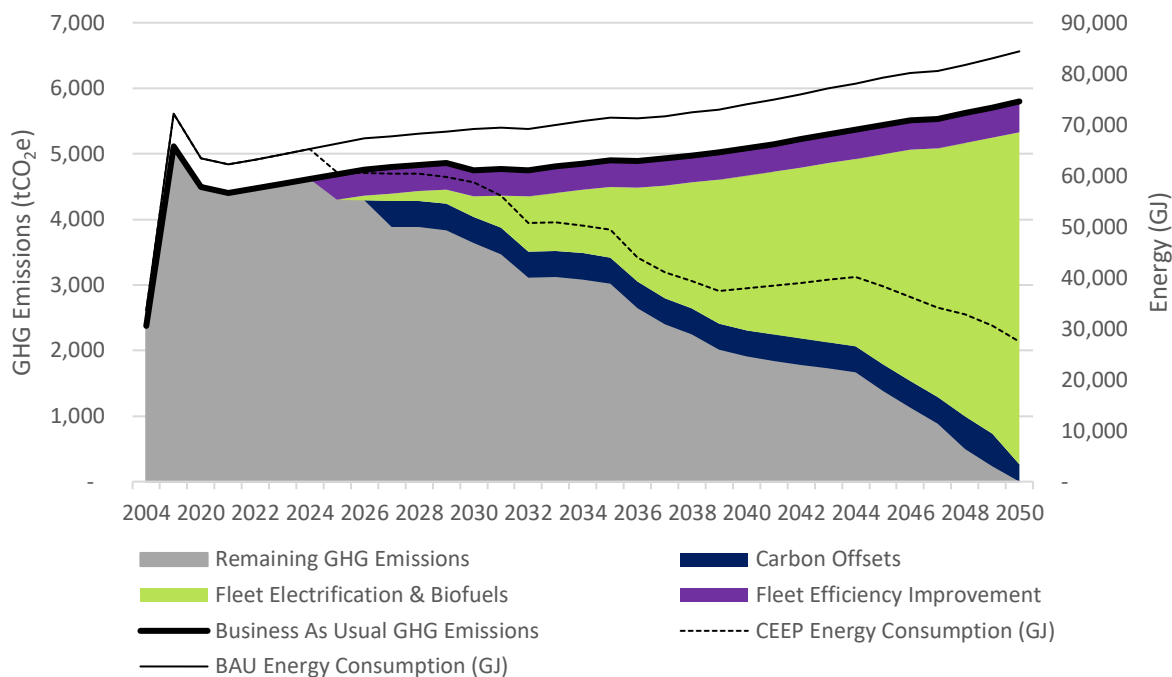
Year Ended	2025	2030
Business as Usual Forecasted GHG Emissions (tCO <sub>2</sub> e)	4,689	4,746
Emissions Reductions (tCO <sub>2</sub> e)	393	1,108
<b>Remaining GHG Emissions (tCO<sub>2</sub>e)</b>	<b>4,296</b>	<b>3,638</b>
<b>Change from 2004 Base Year</b>	<b>81%</b>	<b>53%</b>
<b>Change from 2021 Reporting Year</b>	<b>-2%</b>	<b>-17%</b>

Notes to Table:

Base Year GHG emissions: 4,973 tCO<sub>2</sub>e. Reduction values and percentages do not include the procurement of offsets.

Figure 12 illustrates the progression of GHG emissions reductions over time compared to the forecasted business as usual scenario. It shows that a focus on fleet efficiency improvements and the adoption of low carbon fuel sources will be the main driver of energy and GHG reductions over time.

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**Figure 12. Forecast of Fleet & Equipment Energy and GHG Emissions**

To achieve the GHG reduction targets, the City must aggressively electrify the fleet and convert all equipment to electric or renewable fuels. Achievement of the 2050 target will involve converting all emergency and non-emergency light duty vehicles, trucks, and heavy duty equipment to electric or renewable fuels. While many non-essential service vehicles can soon be replaced with electric vehicles that are available on the market, the City’s capability to replace emergency vehicles or heavy-duty vehicles with zero emission vehicles will rely upon the advancement of electric vehicle technology and enabling legislation. High ethanol content gasoline can reduce the GHG emissions of gasoline vehicles when no electric alternative is available in the short-term.

Descriptions of the actions that can lead to the estimated reductions are discussed in the following sections.

## 6.1 FLEET & EQUIPMENT INITIATIVES

### 6.1.1 F1: Implement Review of Fleet

The City has committed to reducing GHG emissions by 50 percent below 2004 levels by 2030 and net zero by 2050. Converting this target into action requires the implementation of a review of fleet to optimize, and possibly reduce fleet size, maximize vehicle use, and adjust fleet composition which will result in reduced fuel consumption and GHG emissions. As it relates to fleet, the process typically involves examining existing vehicles, including their purpose, fuel use and emissions, and how other factors like driving techniques can positively and negatively impact fuel consumption, operation and maintenance costs and GHG emissions. This information can then be used to establish a baseline for fuel costs and GHG emissions by vehicle type and class to which the City can then model process changes to identify cost and energy saving opportunities. As part of this process, the City could evaluate its current practices to take advantage of techniques that can result in lower fuel consumption, such as the

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naturalization of park areas. Naturalization of parks not only reduces the amount of energy-intensive grass mowing areas, thus reducing fuel use, but would also synergistically benefit local air quality and plant biodiversity. Staff time previously used for grass mowing could be switched to establishing and maintaining naturalized areas.

In terms of implementing this initiative, the City is in the process of developing an RFP structured around asset management that will help inform the implementation of this initiative.

### 6.1.2 F2: Optimize and Right-Size Fleet

Vehicle right sizing assigns vehicles based on identified need rather than driver preference. Using the information collected in Initiative F1, it is recommended that the City develop a program that allocates vehicles for staff based on the functional need with the objective of rationalizing fleet assets, reducing fuel consumption and GHG emissions, and increasing fleet efficiency. Complementing this initiative would be the development of a Low-Carbon Vehicle Standard, where the City purchases vehicles that provide the same level as operational service and the highest possible GHG reduction.

### 6.1.3 F3: Opportunistically Switch Light Duty Fleet to Hybrid / Electric

To move forward with this initiative, it is recommended that the City monitor hybrid light duty vehicle trial that is underway at the City and apply learnings to other departments with light duty vehicles and trucks when the opportunity arises. For new vehicle and equipment purchases, the City should leverage the purchasing power of the Tri-City Purchasing Agreement and Government of New Brunswick tenders, where feasible.

### 6.1.4 F4: Monitor Renewable Energy and Fuel Technologies

It is recommended the City continue to monitor the development and implementation of practical research, technologies, and investment in the area of renewable energy, including energy conservation, efficiency, generation sources (e.g., a mix of expanded sewer heat recovery, waste heat recovered from data centers, thermal energy storage, bio-fuels, hydrogen, or other renewable energy sources), energy storage (e.g. fuel cells), and carbon offset opportunities ultimately to the benefit of the City. For example, micro-turbine and battery storage may be viable energy conservation and generation opportunities for water and wastewater pumping stations. There may also be opportunities for the City to use bio-materials use as fuel and income generating potential with the amount organic material discharged from the Barker Street Pollution Control Centre. The information should be compiled annually and disseminated to City departments for piloting and to inform departmental energy and GHG plans where feasible.

### 6.1.5 F5: Opportunistically Switch Off-Road and Hand-Held Equipment to Electric

The City has been actively piloting new technologies as part of reducing fleet and equipment fuel consumption and GHG emissions. The City should continue to use this experience to consider city-wide approaches to develop a formal strategy to transition small mobile equipment (e.g., mowers and leaf blowers) to electric or zero emissions technologies.

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### 6.1.6 F6: Develop an EV Strategy

According to Bloomberg New Energy Finance, by 2040, nearly 55 percent of vehicle sales will be electric, and are projected to achieve cost parity to their equivalent gasoline powered vehicle by the early 2020s (Figure 13). It is anticipated that by 2025 light duty electric vehicles (EV) will reach cost parity with their gasoline and diesel counterparts<sup>8</sup>. The variety and types of electric vehicles available for sale are also expected to expand significantly from the current offering of light-duty vehicles to pick-up trucks and SUVs over the next five years. As the battery life, charge time, cost-parity of electric vehicles have improved significantly, it is now feasible for the City to opportunistically reduce energy and GHG emissions from its light duty vehicle (LDV) fleet by replacing these with electric vehicles.

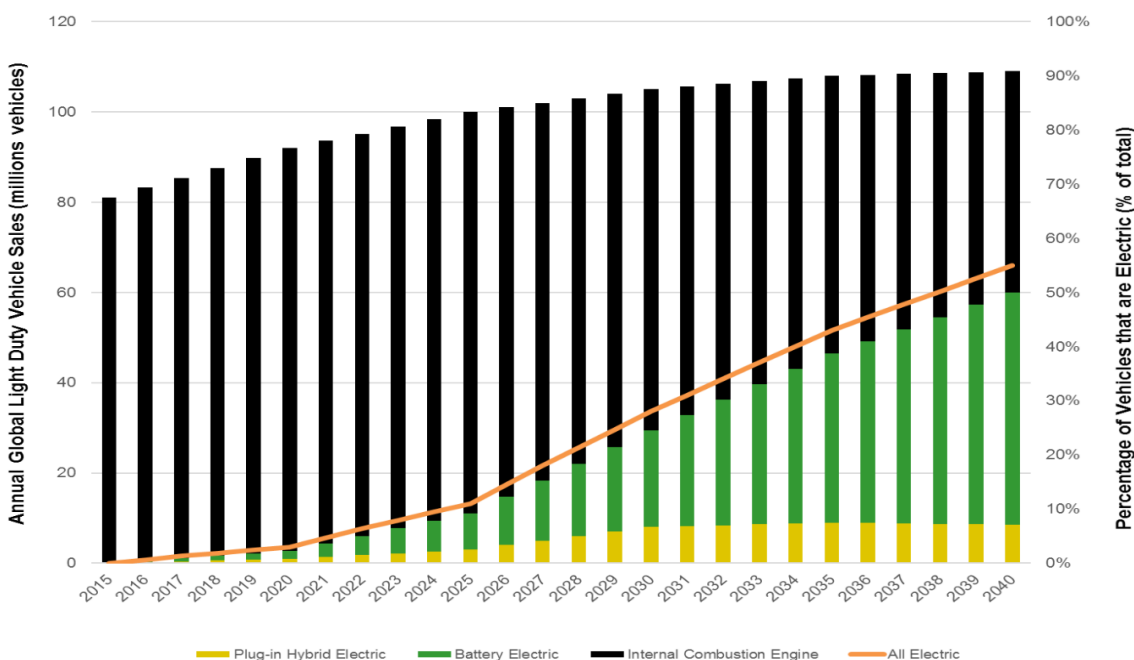


Figure 13. Forecasted Electric Vehicle Global Sales<sup>9</sup>

This Plan recommends that the City develop an EV strategy so that EVs can be incorporated into the light duty non-transit fleet as part of the City’s vehicle replacement lifecycle and to provide this infrastructure to the community.

To move forward with this initiative, in the short-term, the City will need to identify a process that incorporates vehicle right-sizing requirements to identify which vehicles can be replaced with EVs, and complete EV facility survey to assess if the current electrical systems can handle charging stations (i.e., transformer and main disconnect), and to assess if there is spare electrical capacity to install the disconnects/switchgear for the charging stations. These

<sup>8</sup> Bloomberg New Energy Finance, 2018, *Electric Vehicle Outlook 2018*, <https://about.bnef.com/electric-vehicle-outlook/>, accessed August 15, 2018.

<sup>9</sup> Bloomberg Finance, 2018. *Electric Vehicle Outlook 2018*, <https://about.bnef.com/electric-vehicle-outlook/>.

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studies if done on multiple facilities can cost around \$4,000 each facility assessed. Once this pre-work is completed, in the medium term, the EV strategy can be developed. At a minimum, the EV strategy should:

- Establish an EV target for light duty vehicles (e.g., require a minimum of 50 percent of annual light-duty vehicle purchases be EV by 2030, etc.).
- Identify a process that incorporates vehicle right-sizing requirements to identify which vehicles can be replaced with EVs.
- Establish a process to budget for EV infrastructure capital costs as part of annual EV replacements.
- Include a system to monitor billing and electricity use for the EV fleet to allow for tracking, allocating, and reporting of costs and benefits.
- Identify possible charger installations that serve the non-fleet to allow for daytime public charging and nighttime fleet charging, when feasible.
- Identify priority locations and opportunities to develop integrated multimodal mobility hubs that include EV infrastructure on City-owned property.
- Identify suitable locations for cost-effective low-power and high-power charging to allow for a range of vehicle types and charges.
- Identify priority areas for the co-location of EV infrastructure that supports both light-duty and heavy-duty vehicles.
- Identify opportunities to upgrade charging infrastructure at City properties to allow for submetering of charging activity, improve remote management capabilities, and increase charging options.
- Include policies that require all new or renovated City-owned buildings to provide EV charging infrastructure, or at a minimum, have the infrastructure in place (EV ready).
- Include a phased approach to address increased charging access (e.g., encourage other types of EVs, encourage at-home charging when feasible, etc.)
- Include a workplace charging program to expand charging access for employees at City facilities.

While many non-essential service vehicles can soon be replaced with electric vehicles that are available on the market, the City's capability to replace emergency vehicles or heavy-duty vehicles with alternative fuel/low emission fuels will rely upon the advancement of EV technology and enabling legislation.

### 6.1.7 F7: Develop a Fleet Electrification Financing Strategy

The corporate fleet is currently capitalized to support the replacement of vehicles on a like-for-like basis and add new vehicles to the fleet based on growth and development of corporate services. It does not support a transition to electrified or low-carbon powered vehicle and equipment fleet which have higher capital costs, require trained staff, and require new fueling infrastructure systems. Some of the costs are offset from reduced fuel and maintenance costs, but additional support is needed in the short term to support the transition. It is therefore recommended that the City:

- Apply an internal cost of carbon (Initiative C10). This recommendation will be to make this an actual cost for fleet users.
- Implement a Fleet Electrification Levy: Departments choosing to purchase internal combustion vehicles will pay a percentage premium over retail value to fund fleet electrification, 10 percent in 2023, 15 percent in 2024 and 20 percent in 2025 is proposed.

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- Implement a Fleet Vehicle Electrification Fund: To avoid impacting the budgets of departments with high fleet demands, the City should develop a fund to support fleet electrification

### 6.1.8 F8: Develop Anti-Idling Policy

Some corporate vehicles have anti-idling technology installed which ensures that vehicles can maintain the interior temperature and battery charge without wasteful fuel consumption and the additional generation of GHG emissions. It is recommended that the City develop an appropriate anti-idling policy applicable to all staff whilst recognizing the needs of emergency services. All staff should be engaged on an ongoing basis about the vehicle anti-idling systems, policies and the importance of not idling vehicles unnecessarily. An anti-idling policy is a best management practice that should be deployed and enforced as part of a broader fleet fuel management strategy to reduce fleet fuel usage.

### 6.1.9 F9: Expand Automatic Vehicle Location (AVL) Telematics Program Across Fleet

Automated vehicle location (AVL) and global positioning systems (GPS) have been widely used by transportation agencies to monitor vehicle locations and operational status. AVL systems are typically comprised of AVL/GPS installed in the vehicle that facilitates data exchanges between vehicles and a central system, and software that enables tracking of vehicle locations throughout a geographic region. Using telematics, route, odometer, and maintenance and operations data, the City can optimize and reduce fleet size, maximize vehicle use, and adjust fleet composition which will result in reduced fuel consumption and GHG emissions. AVL/GPS technology can be used to monitor driving behaviors (e.g., idling, harsh braking, hard acceleration, speeding, engine abuse and fuel consumption) which can be used to inform driver training programs.

In 2019, the City implemented an AVL pilot project on Pollution Control vehicles and should now expand this to the rest of the City's fleet. The telematics data collected will support the City's vehicle right sizing initiative (initiative F2) and inform a guideline or policy that assigns vehicles based on identified need rather than driver preference. As part of processing the telematics data, it is recommended that the City evaluate vehicle routes to see if they are optimal in terms of fuel and driver time efficiency and consider other technologies or opportunities to reduce travel.

### 6.1.10 F10: Implement a Sustainable Commuting Program

Active transportation and other sustainable transportation options, like EV car share, e-bikes, virtual meetings, and alternative work arrangements, can play a key role in reducing the City's GHG emissions. The City can expand active transportation programs and facilities for City staff in all locations, by providing employee transit programs, access to electric bikes (E-Bikes), access to car share vehicles etc., and dis-incentivizing staff parking. The City can also support ride sharing or similar staff commuting to work by creating a car sharing program to more efficiently allocate city resources and demonstrate the value of this to City staff.

## 6.2 TRANSIT INITIATIVES

Transit plays a critical role in the Fredericton community. It transports people throughout the community, reduces traffic congestion and therefore GHG emissions by reducing the number of single occupant vehicles, and also supports compact community developments. In 2021, the City accomplished this with 31 diesel buses and support

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vehicles which collectively account for 15 percent of the City's annual energy usage and 14 percent of its GHG emissions.

### **6.2.1 T1: Monitor Cold-Weather City EV Bus Programs**

The current lifecycle of a transit bus can be up to 18 years which means that transit choices made in 2031 will still have an impact on corporate GHG emissions in 2050. Hybrid and battery electric propulsion technology is currently the desired path for the City because these buses have the potential to reduce transit fleet emissions by upwards of 90 percent over the current diesel models. However, battery electric buses are still in their infancy relative to the adoption of hybrid diesel-electric technology. Exclusive of the infrastructure required to support the vehicle, hybrid and battery electric buses are purchased at a significant premium over conventional diesel buses and in some cases do not perform well in cold weather climates. As general adoption of the technology progresses, it is anticipated that the premium will dissipate, and the cold weather operational concerns be addressed.

It is recommended that the City continue to monitor other cold weather City electric and hybrid bus initiatives (e.g., the City of Edmonton) to gain insights into the resources required and the lessons learned in order to inform future pilot hybrid / EV transit projects that could be implemented as City buses are replaced.

### **6.2.2 T2: Complete an On-Demand Transit Feasibility Study & Implement the Recommendations**

On-demand transit is often used where traditional public transit services are lacking, or not cost-effective, to cover the demand areas. In the case of the City, overall ridership utilization is low and is often not cost-effective. In its simplest form, on-demand transit is seen as a combination of regular public transit services (fixed route, fixed schedule) and personalized taxi services (flexible route, flexible schedule) and can help address the first/last mile problem due to the flexible nature of the service. On-demand transit services can reduce the cost of providing transit services and GHG emissions while improving the customer experience by using technology to request a ride.

The City is in the process of completing the on-demand transit feasibility study.

### **6.2.3 T3: Complete an Alternative Propulsion Study for the Transit Fleet**

As new low-carbon or zero emission technologies become more affordable and available, it is recommended that the City complete a study on alternative propulsion systems for the transit fleet including electric, R-CNG (renewable compressed natural gas), hydrogen, hybrid-diesel, etc. to understand the impacts to operation, maintenance, and costs.

The City is in the process of completing the alternative propulsion transit feasibility study.

### **6.2.4 T4: Implement an Alternative Fuel-Powered Bus Pilot Project**

Upon completion of Initiative T3, implement an alternative fuel powered bus pilot project.

### 6.3 SUMMARY OF EXISTING FLEET, EQUIPMENT & TRANSIT INITIATIVES

A summary of the status and recommend next steps for existing initiatives is presented in Table 14.

**Table 14. Status of Current Fleet, Equipment & Transit Initiatives**

#	Initiative	Status	Next Steps
F1	Implement Review of Fleet	<ul style="list-style-type: none"> <li>• Work Underway</li> <li>• The City is in the process of developing an RFP structured around asset management that will help inform the implementation of this initiative.</li> </ul>	<ul style="list-style-type: none"> <li>• Implement recommendations from study.</li> </ul>
F2	Optimize and Right-Size Fleet	<ul style="list-style-type: none"> <li>• Medium Term</li> </ul>	<ul style="list-style-type: none"> <li>• Utilize information collected in Initiative F1.</li> </ul>
F3	Opportunistically Switch Light Duty Fleet to Hybrid / Electric	<ul style="list-style-type: none"> <li>• Ongoing</li> </ul>	<ul style="list-style-type: none"> <li>• Expand program to other departments as new electric vehicle technologies emerge for trucks and heavy duty vehicles when technology is introduced.</li> </ul>
F4	Monitor Renewable Energy and Fuel Technologies	<ul style="list-style-type: none"> <li>• Ongoing</li> </ul>	<ul style="list-style-type: none"> <li>• Continue monitoring</li> </ul>
F5	Opportunistically Switch Off-Road and Hand-Held Equipment to Electric	<ul style="list-style-type: none"> <li>• Ongoing. Parks &amp; Trees division is standardizing the battery and charger types to allow for increased use across the work force and cost efficiency.</li> </ul>	<ul style="list-style-type: none"> <li>• Monitor the development of new technologies and adapt as required.</li> </ul>
T1	Monitor Cold-Weather City EV Bus Programs	<ul style="list-style-type: none"> <li>• Ongoing</li> </ul>	<ul style="list-style-type: none"> <li>• Evaluate outcome and application to Fredericton</li> </ul>
T2	Complete an On-Demand Transit Feasibility Study & Implement the Recommendations.	<ul style="list-style-type: none"> <li>• Work Underway</li> </ul>	<ul style="list-style-type: none"> <li>• Implement recommendations from study.</li> </ul>



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### 6.4 SUMMARY OF PROPOSED FLEET, EQUIPMENT & TRANSIT INITIATIVES

A summary of the CEEP Update proposed initiatives is presented in the following table.

**Table 15. Summary of Proposed Transit, Fleet & Equipment Initiatives**

#	Initiative	Description	Energy Reduction Potential	Estimated Cost	Priority	Responsibility
F6	Develop an EV Strategy	Develop an EV strategy so that EVs can be incorporated into the light duty non-transit fleet as part of the City's vehicle replacement lifecycle.	Supportive	<ul style="list-style-type: none"> <li>• Staff Time</li> <li>• Consultant (\$150k+)</li> </ul>	<ul style="list-style-type: none"> <li>• Short-Medium Term</li> </ul>	<ul style="list-style-type: none"> <li>• Fleet</li> <li>• Corporate Services</li> <li>• Building Services</li> </ul>
F7	Develop a Fleet Electrification Financing Strategy	Develop a three-tiered approach to finance investment in fleet electrification using an internal cost of carbon, a levy and vehicle electrification fund.	Supportive	<ul style="list-style-type: none"> <li>• Staff Time</li> </ul>	<ul style="list-style-type: none"> <li>• Short-Medium Term</li> </ul>	<ul style="list-style-type: none"> <li>• Fleet</li> <li>• Corporate Services</li> <li>• Building Services</li> </ul>
F8	Develop Anti-Idling Policy	Develop an appropriate anti-idling policy applicable to all staff while recognize the needs of emergency and essential services. Educate staff on an ongoing basis about the vehicle anti-idling systems, policies and the importance of not idling vehicles unnecessarily.	5-7%	<ul style="list-style-type: none"> <li>• Staff Time</li> </ul>	<ul style="list-style-type: none"> <li>• Short-Term</li> </ul>	<ul style="list-style-type: none"> <li>• Fleet</li> <li>• CAO's office</li> </ul>
F9	Expand Automatic Vehicle Location (AVL) Telematics Program Across Fleet	Expand telematics program to all City owned fleet to optimize and reduce fleet size, maximize vehicle use, and adjust fleet composition which will result in reduced fuel consumption and GHG emissions.	5-10%	<ul style="list-style-type: none"> <li>• Staff Time</li> <li>• Dedicated Staff (\$100k)</li> <li>• AVL Technology Costs</li> </ul>	<ul style="list-style-type: none"> <li>• Medium to Long-Term</li> </ul>	<ul style="list-style-type: none"> <li>• Fleet</li> <li>• User departments</li> </ul>

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#	Initiative	Description	Energy Reduction Potential	Estimated Cost	Priority	Responsibility
F10	Implement a Sustainable Commuting Program	Expand active transportation programs and facilities for City staff by providing employee transit programs, access to electric bikes, access to vehicles for sharing, secure bike racks, end of trip facilities, etc.	Unknown	<ul style="list-style-type: none"> <li>• Staff Time</li> </ul>	<ul style="list-style-type: none"> <li>• Medium to Long-Term</li> </ul>	<ul style="list-style-type: none"> <li>• Fleet</li> <li>• Corporate Services</li> <li>• Building Services</li> </ul>
T3	Complete an Alternative Propulsion Study for the Transit Fleet	Explore alternative propulsion systems for the transit fleet including electric, CNG, hydrogen, hybrid-diesel, etc considering the impacts to operation, maintenance, and costs.	Supportive Initiative	<ul style="list-style-type: none"> <li>• Consultant</li> </ul>	<ul style="list-style-type: none"> <li>• Work Underway</li> </ul>	<ul style="list-style-type: none"> <li>• Transit</li> </ul>
T4	Implement an Alternative Fuel-Powered Bus Pilot Project.	Based on the outcome of Initiative T3, implement a pilot alternative fuel-powered bus project.	Unknown	<ul style="list-style-type: none"> <li>• Unknown</li> </ul>	<ul style="list-style-type: none"> <li>• Medium to Long-Term</li> </ul>	<ul style="list-style-type: none"> <li>• Transit</li> <li>• Corporate Services</li> </ul>

Notation	Timeline
Short-term	Complete by end of 2023
Medium-term	Complete by end of 2027
Long-term	Complete by end of 2030
Ongoing	Work will be ongoing between 2022 and 2030
Work underway	The project has begun

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### 7.0 SOLID WASTE

Waste does not directly consume energy but when deposited into landfills, it decomposes and releases methane which is a potent GHG. Much of these GHG emissions have been mitigated through the installation of a landfill gas capture system at the landfill which also means the GHG intensity of landfilling organic waste is low. In addition, the extraction and processing of raw materials, the manufacturing, and transportation of these materials prior to disposal also creates GHG emissions. There are other impacts beyond the GHG impacts that waste have which range from land-management (using land to bury waste), air quality impacts because of transporting the waste, managing any contaminated water that comes from the waste, amongst many others. Keeping waste out of the landfill requires a focus on diverting waste to other uses as well as minimizing the amount of waste generated in the first place.

To achieve this, a solid waste management plan is proposed that would extend beyond corporate boundaries but to the community as well.

No new solid waste initiatives are proposed in the CEEP Update.

#### 7.1.1 SW1: Develop Solid Waste Management Plan

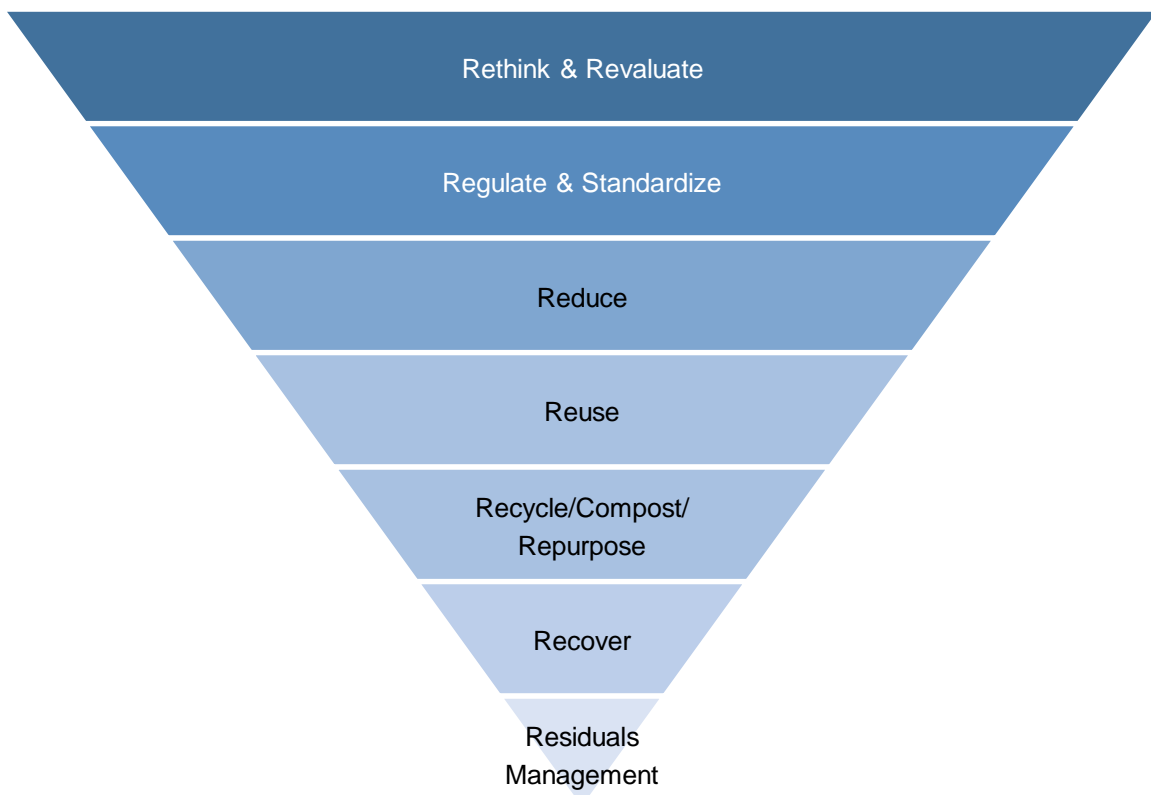
Reducing the amount of waste created is a critical first step to reduce the burden on local landfills and reduce GHG emissions throughout a product's lifecycle from extraction to disposal. By reducing and eliminating waste, GHG emissions can be avoided not only in the landfill, but through a product's life cycle. This initiative recommends the development of a solid waste management plan that aligns with the 7R's of zero waste (Figure 14):

- **Rethink & Reevaluate** – Current purchasing habits and systems that encourage consumption create much of the waste we need to reduce. The first step is to examine what processes, policies, and actions the City can implement / change immediately to reduce waste.
- **Regulate & Standardize** – Waste suffers from the free rider effect where someone else pays environmentally, economically, or socially, whilst others do not. When City waste is sent to the landfill the waste is buried and left for future generations to contend with. An effective method to addressing this challenge is to implement regional waste reduction initiatives like source waste separation requirements, recycling standards, etc. This will require engagement with the Province, the Regional Solid Waste Commission, and surrounding local governments.
- **Reduce** – Reducing end use waste is very important, but so is reducing waste throughout the supply chain. This means considering the ecological footprint of goods and services by choosing products that last longer, can be repaired, reused, recycled, or sold. It also means prioritizing the purchase of locally grown foods and goods.
- **Reuse** – Wherever possible, use products that retain their value, usefulness, and function. It means using products that have been designed for disassembly and reuse and repairing products when they have broken down.

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- **Recycle/Compost/Repurpose** – Many products sold on the market are disposable, but not recyclable/reusable and are meant to be discarded. The solid waste management plan will encourage staff and the community to purchase goods that can be upcycled or recycled and incent the use of diversion systems that allow for the highest and best use of materials, including organics.
- **Recover** – The current waste systems co-mingle, or mix, waste streams, making it difficult to recover some of the materials thrown out. Change will be required at the Regional Solid Waste Commission and Provincial levels and will require the reexamination of processes to support the separation of waste streams so that as much material is recovered as possible. This will reduce the amount of virgin materials being used in new products.
- **Residuals Management** – The City will need to monitor and track all waste streams, diversion rates, and residual waste to identify new opportunities to reduce residual waste to zero.



**Figure 14. Zero Waste Hierarchy**

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For this initiative, it is recommended that the City first focus on larger facilities – for example those over 100,000 square feet such as Grant Harvey Centre, Willie O'Ree Place, and Fredericton Convention Centre. Over time, waste diversion rates at smaller facilities could also be examined and strategies put in place to improve performance. Table 16 presents the forecasted emissions from waste – the expectation is that waste generation will increase as a result of increased staffing requirements. Depending on how aggressive the City is with the implementation of this initiative, the City could negate the projected increase in GHG emissions and possibly eliminate all corporate waste streams and GHG emissions by 2030 (i.e., 155 tCO<sub>2</sub>e) as well as reduce community waste and associated GHG emissions.

**Table 16. Estimated GHG Emission Reductions From Solid Waste**

Year Ended	2025	2030
Business as Usual Forecasted GHG Emissions (tCO <sub>2</sub> e)	152	155
Emissions Reductions (tCO <sub>2</sub> e)	0	0
<b>Remaining GHG Emissions (tCO<sub>2</sub>e)</b>	<b>152</b>	<b>155</b>
<b>Change from 2004 Base Year</b>	<b>-34%</b>	<b>-33%</b>
<b>Change from 2021 Reporting Year</b>	<b>2%</b>	<b>5%</b>

*Notes to Table:*

*Base Year GHG emissions: 231 tCO<sub>2</sub>e. Reduction values and percentages do not include the procurement of offsets.*

## 7.2 SUMMARY OF EXISTING SOLID WASTE INITIATIVES

A summary of the status and recommend next steps for existing initiatives is presented in Table 17.

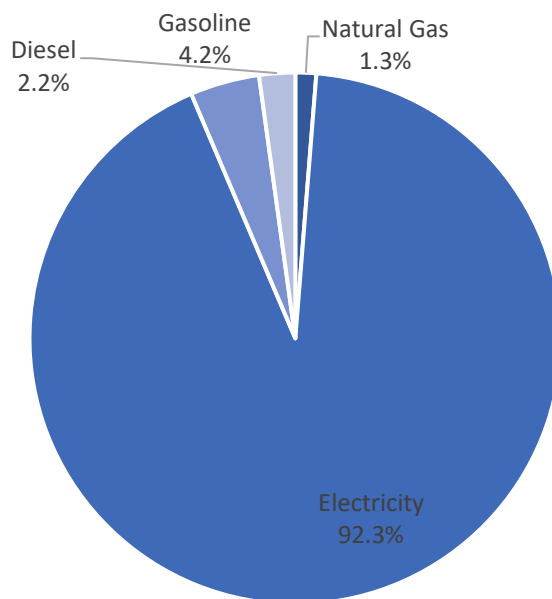
**Table 17. Status of Current Solid Waste Initiatives**

#	Initiative	Status	Next Steps
SW1	Develop Solid Waste Management Plan	<ul style="list-style-type: none"> <li>Medium Term</li> </ul>	<ul style="list-style-type: none"> <li>Implement Plan</li> </ul>

Notation	Timeline
Short-term	Complete by end of 2023
Medium-term	Complete by end of 2027
Long-term	Complete by end of 2030
Ongoing	Work will be ongoing between 2022 and 2030
Work underway	The project has begun

## 8.0 WATER & WASTEWATER

The City is the wholesale supplier of water and wastewater services to the Fredericton community, and is responsible for bulk supply, treatment and storage of drinking water and conveyance and treatment of wastewater. This infrastructure equipment operates 24 hours a day, seven days a week, and accounted for 22 percent of the City’s total energy use and 23 percent of 2021 GHG emissions. The bulk of these GHG emissions (92 percent) arise from the consumption of electricity (Figure 15).



**Figure 15. Water & Wastewater GHG Emissions By Fuel Type**

The water and wastewater initiatives presented herein leverage existing programs already underway, including the water conservation, sanitary sewer inflow and infiltration reduction, and process energy programs (e.g., opportunistically installing variable frequency drives (VFD) on motors, use solar PV electricity and scheduling water tower filling, to match available solar power). These programs are managed by the Water and Pollution Control divisions.

The City’s energy-related water and wastewater initiatives have been organized into two main categories:

**Water:**

- W1: Expand Pilot Remote Water Metering Program to City
- W2: Implement Pilot GPS AVL Study on Vehicle Fleet Pollution Control

**Pollution Control:**

- P1: Complete a City-Wide Sewer-Shed Study

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- P2: Assess the Feasibility of a Large Solar PV Array
- P3: Implement Energy Audit Recommendations
- P4: Assess the Energy and Revenue Potential of the Bio-Materials Generated at the Barker Street PCC

No new water and wastewater initiatives are proposed in the CEEP Update.

Based on the actions underway, it is estimated that the City can reduce water and wastewater related GHG emissions by 44 percent from 2021 levels by 2030 (Table 18). However, when compared to the 2004 base year, the GHG emissions are expected to increase by 4 percent by 2030 which is the direct result of a growing community. As the bulk of the GHG emissions arise from the consumption of electricity, there is an opportunity to offset those GHG emissions through the investment in renewable infrastructure systems like solar photovoltaics (PV).

**Table 18. Estimated GHG Emission Reductions From Water & Wastewater**

Year Ended	2025	2030
Business as Usual Forecasted GHG Emissions (tCO <sub>2</sub> e)	2,755	2,892
Emissions Reductions (tCO <sub>2</sub> e)	12	428
<b>Remaining GHG Emissions (tCO<sub>2</sub>e)</b>	<b>2,743</b>	<b>2,464</b>
<b>Change from 2004 Base Year</b>	<b>16%</b>	<b>4%</b>
<b>Change from 2021 Reporting Year</b>	<b>-38%</b>	<b>-44%</b>

Notes to Table:

Base Year GHG emissions: 3,160 tCO<sub>2</sub>e. Reduction values and percentages do not include the procurement of offsets.

Figure 16 illustrates the progression of GHG emissions reductions over time compared to the forecasted business as usual scenario. The pathway to net zero for water and wastewater departments will rely heavily on renewables.

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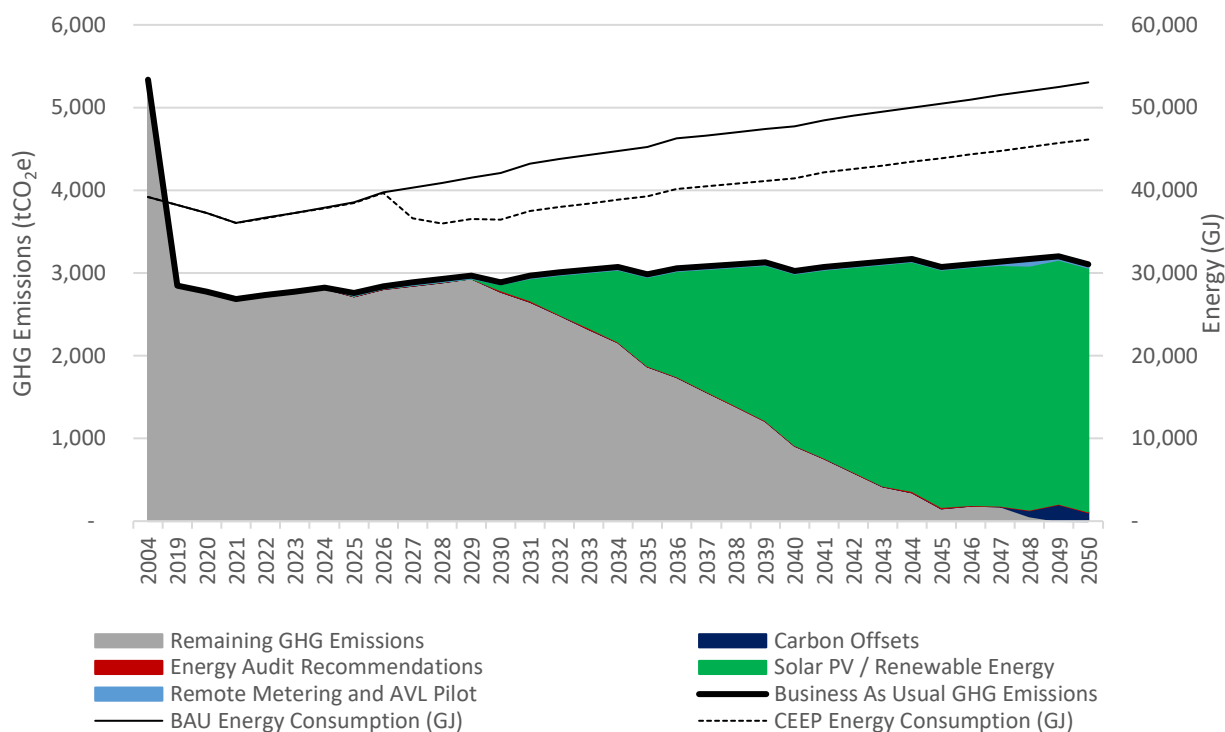


Figure 16. Forecast of Water & Wastewater Energy and GHG Emissions

Descriptions of the current water and wastewater initiatives underway are presented in the following sections.

## 8.1 WATER INITIATIVES

### 8.1.1 W1: Expand Pilot Remote Water Metering Program to City

Water metering is recognized as a best practice by the Federation of Canadian Municipalities as the practice contributes to achieving water conservation goals, improves billing equity, helps with leak detection and reduction, and support the planning and management of water delivery systems. Like many cities, the water metering program currently in place is a manual and touch-read systems, which require staff to collect data through handheld devices and vehicle units which results in fuel consumption and GHG emissions. A remote water metering program involves the use of advanced metering infrastructure (AMI) that allow automatic collection and transmission of meter data via a regular radio frequency transmission sent directly from each individual meter.

With the completion of a successful a pilot remote water metering program, the City is in the process of expanding the remote water metering program to the rest of the City. This has currently involved the City submitting a grant for tower based radio frequency water reading system.

### 8.1.2 W2: Implement Pilot GPS AVL Study on Vehicle Fleet Pollution Control

With the AVL pilot already underway for pollution control vehicles, the following next steps are recommended:

- Process data and seek opportunities to reduce fuel use and GHG emissions and share results with Fleet.



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- Expand the AVL program to Water Resource Recovery vehicles.

## 8.2 POLLUTION CONTROL INITIATIVES

### 8.2.1 P1: Complete a City-Wide Sewer-Shed Study

A city-wide sewer-shed study evaluates the current sewer capacity and identifies the pipeline segments which will need capacity improvements to reduce inflow and infiltration (I&I) and increased demands as the population increases. I&I reduction strategies link energy and GHG emissions reductions to water conservation and limiting the inflow and infiltration of rain and groundwater into the City's wastewater systems. By reducing the volume of stormwater in the system, the City consumes less energy for pumping and treatment which results in reduced GHG emissions.

This initiative is underway.

### 8.2.2 P2: Assess the Feasibility of a Large Solar PV Array

There exists an opportunity to install a large solar photovoltaic array on an underutilized landscape on lands near the Barker Street Pollution Control Centre (PCC). MCW has estimated that the large field within the site property lines would be an ideal location for a 200 kW solar PV array. As the PCC is equipped with multiple NB Power meters, there is an opportunity to divide this 200 kW array into two (2) separate 100 kW main feeders to comply with the NB Power connected load requirements.

While this initiative is already underway, it is also recommended that the City:

- Explore PV opportunities related the 200 KW system for blower / treatment buildings.
- Advocate to NB Power to change net metering rules (i.e., to allow electricity generation in one area to offset consumption in another) (Initiative C10).

### 8.2.3 P3: Implement Energy Audit Recommendations

Several building energy audits at the PCC buildings and facilities have been completed to which the recommendations have been implemented.

### 8.2.4 P4: Assess the Energy and Revenue Potential of the Bio-Materials Generated at the Barker Street PCC

The current treatment of wastewater biosolids involves the dewatering and trucking of the materials offsite by a private company for disposal. Although the contractor's fuel use is not included in the corporate energy and GHG emissions, the activity increases GHG emissions in the community. Furthermore, the disposal of the biosolids results in the release of methane (CH<sub>4</sub>) a potent GHG emission as a result of decomposition.

As biosolids contain about as much energy as low-grade coal (lignite), there is possibly an opportunity to utilize a waste stream as local fuel source through anaerobic digestion to produce combustible gas or thermal ignition of the solids – i.e., pressure cooking biosolids to produce a combustible coal-type substance. In terms of an update, the City has submitted a funding application for a Biosolids facility (no energy generation) and is exploring using heat

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from bioreactors for use in the wastewater treatment plant. It is recommended that the City continue to monitor for new waste management technology developments.

### 8.3 SUMMARY OF EXISTING WATER & WASTEWATER INITIATIVES

A summary of the status and recommend next steps for existing initiatives is presented in Table 19.

**Table 19. Status of Current Water & Wastewater Initiatives**

#	Initiative	Status	Next Steps
W1	Expand Pilot Remote Water Metering Program	<ul style="list-style-type: none"> <li>Ongoing. (8,445 of 18,000 customers are RF units but some are at end of battery life)</li> </ul>	<ul style="list-style-type: none"> <li>Construct tower based RF system &amp; install remaining receivers.</li> </ul>
W2	Implement Pilot GPS AVL Study on Vehicle Fleet	<ul style="list-style-type: none"> <li>Pilot has been implemented.</li> </ul>	<ul style="list-style-type: none"> <li>Process data and seek opportunities to reduce fuel use and GHG emissions. Share results with Fleet.</li> <li>Expand program to Water Resource Recovery vehicles.</li> </ul>
P1	Complete a City-Wide Sewer-shed Study	<ul style="list-style-type: none"> <li>Work underway</li> <li>Water systems study is on-going</li> <li>Sewer shed study will be implemented later this year.</li> </ul>	<ul style="list-style-type: none"> <li>Implement recommendations from studies.</li> </ul>
P2	Assess the Feasibility of a Large Solar PV Array	<ul style="list-style-type: none"> <li>Work underway</li> <li>Some design work has been completed (admin building 50 KW system is tender ready). The City is preparing a federal funding grant application in reference to this project</li> </ul>	<ul style="list-style-type: none"> <li>Explore PV opportunities related the 200 KW system for blower / treatment buildings and other structures.</li> <li>Advocate to NB Power to change net metering rules (i.e., to allow electricity generation in one area to offset consumption in another).</li> </ul>
P3	Implement Energy Audit Recommendations	<ul style="list-style-type: none"> <li>Completed.</li> </ul>	<ul style="list-style-type: none"> <li>Monitor systems and adjust as needed to maintain energy reductions.</li> </ul>
P4	Assess the Energy and Revenue Potential of the Bio-Materials Generated at the Barker Street PCC	<ul style="list-style-type: none"> <li>Work underway</li> <li>The City submitted a funding application for a Biosolids facility (no energy generation). The City is exploring using heat from bioreactors for use in WWTP.</li> </ul>	<ul style="list-style-type: none"> <li>Monitor for new waste management technology development.</li> </ul>

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Notation	Timeline
Short-term	Complete by end of 2023
Medium-term	Complete by end of 2027
Long-term	Complete by end of 2030
Ongoing	Work will be ongoing between 2022 and 2030
Work underway	The project has begun

### 9.0 CORPORATE LEADERSHIP

As cities contribute to more than 70 percent of global GHG emissions, they have both a responsibility and an opportunity to respond to the causes and impacts of climate change. This CEEP proposes that the City commit to reducing corporate annual GHG emissions, to help manage climate-related risks to the City. By implementing priority actions identified in the climate adaptation plan and developing processes so that all actions are informed by a fuller understanding of through-life social, environmental, and economic costs, risks, and benefits. A better understanding of the suite of sustainability risks and benefits for each asset and service area can enable the City to make smart investments to reduce GHG emissions as much as possible for every dollar invested.

The following initiatives were proposed in the original CEEP. For each of these initiatives, a status update and next step recommendation is provided.

- C1: Establish Energy and GHG Reduction Targets
- C2: Continue to Enhance FTE Capabilities And Increase Staff Capacity for Implementing CEEP
- C3: Update Asset Management Plan and Policy
- C4: Pilot the Use of LCA Tools When Making Capital Purchases
- C5: Develop A Corporate Energy Savings Policy and Terms of Reference (ToR)
- C6: Create Sustainable Purchasing Policy
- C7: Establish Departmental GHG Accounting & Reporting Program
- C8: Develop Alternative Work Strategies and Supportive Policies

The following new initiatives are being included in the CEEP Update:

- C9: Explore Meeting the Taskforce for Climate Related Disclosures (TCFD) Reporting Requirements.
- C10: Advocate to NB Power to change net metering rules
- C11: Complete a Review Of City Services
- C12: Develop an Internal Cost of Carbon (ICC) Policy
- C13: Recognize Natural Assets as an Asset Class
- C14: Seek Opportunities To Develop Nature Based Solutions / Carbon Offsets On City Lands.
- C15: Investigate Sustainable Infrastructure Rating System Policy
- C16: Incorporate Contracted Emissions Into Corporate GHG Emissions Inventory

These initiatives are presented in the following sections.

#### 9.1.1 C1: Establish Energy & GHG Reduction Targets

As centers of communication, commerce, and culture, municipal government organizations play an important role in the reduction of GHG emissions and the impacts that climate change can have on a community. They have a leadership role that influences their communities beyond their organization's carbon footprint. On this basis, the City has adopted GHG reduction targets that align with federal commitments as well as the international targets agreed to in the 2015 Paris Climate Agreement. These are as follows:

- 50 percent, below 2004 levels by 2030
- Net zero by 2050

The establishment of these GHG reduction targets help galvanize and align the innovative and creative solutions that are required. As part of meeting these GHG reduction targets, it is recommended that the City require key City department, functions or units to develop a 5-year energy and GHG emissions reduction plan for their operational activities, and report on progress annually. This would enable each department, function or unit to directly engage in the CEEP by tracking the energy use and GHG emissions resulting from day to day operations, decision-making, and capital purchases.

### **9.1.2 C2: Continue to Enhance FTE Capabilities and Increase Staff Capacity for Implementing CEEP**

The implementation of the proposed initiatives within the corporate and community CEEP will require the City to expand staff capability and capacity to implement and maintain the initiatives presented in this CEEP Update. The expansion should be focused on developing a cross functional team. It should be noted that irrespective of how many staff are put in place to implement the proposed initiatives, success will be largely based on a stable operating budget and what oversight systems and accountability systems the City puts in place (e.g., implementation of a driver accountability reporting system, assignment of GHG emissions to end users) to change the current culture. To bridge the gap between operational budgets and CEEP initiative budget needs, it is recommended that the City continue to identify and pursue external funding opportunities to support CEEP implementation (see Table 9 for possible sources).

### **9.1.3 C3: Update Asset Management Plan and Policy**

An effective asset management plan and policy should reference the impacts of climate change on asset systems and commit the organization to understanding and managing these risks, as one of several types of risk to assets.

In terms of an update, the City is in the process of updating the building and facility asset management plan and policies. The associated fleet management plan and policies updates are being planned (RFP being developed) for this year. As part of these updates, it is recommended that these plans and policies include the objective of investing in and upgrading assets to mitigate and adapt to climate change, as part of asset management planning.

### **9.1.4 C4: Pilot the Use of LCA Tools When Making Capital Purchases**

Like most local governments, the City is often juggling and prioritizing competing financial priorities, which can result in a procurement culture where the lowest bid is often seen as the most viable and best value for taxpayers. The result, however, is a system that defaults to 'like-for-like' replacements, penalizes higher cost energy and GHG emission reduction technologies and best-practices, and does not account for the GHG footprint of the products or services being provided. For example, NRCAN estimates that 20 percent of Canada's GHG emissions are embodied in the construction sector – which are not accounted for in most municipal GHG accounting systems.<sup>10</sup> To shift the current City culture and narrative, the City will need to begin integrating LCA processes into budget and capital planning, strategic planning, purchasing policies, preventative maintenance plans, environmental management plans, and asset management. The simplest form of integration is using publicly available or low cost LCA tools as

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<sup>10</sup> [https://sencanada.ca/content/sen/committee/421/ENEV/reports/ENEV\\_Buildings\\_FINAL\\_e.pdf](https://sencanada.ca/content/sen/committee/421/ENEV/reports/ENEV_Buildings_FINAL_e.pdf)

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part of pilot projects to account for energy and GHG emissions in budget and capital planning and asset management. For example, when considering the need for new municipal facilities or retrofits to existing facilities, a lifecycle analysis can provide information about the amount of energy used over the entire span of a building's life – from planning and design, to construction, through operation, to decommissioning. Success from this initiative would mean that LCA measures are incorporated into the initial stages operational and capital project planning, and that options for energy efficiency and conservation are considered, evaluated, and quantified in terms of life cycle, which includes cost, maintenance, and energy and GHG reductions.

The City has begun work on this initiative. It is in the process of finalizing a Climate Lens process that would be applied to capital projects and changes in service levels which will be implemented (along with training) by August 2022. The City is working with a consultant to determine a tonnes GHG/metre metric for capital infrastructure projects (paving, sidewalks, pipe renewal, etc.). These emission factors will feed into the climate lens process.

### 9.1.5 C5: Develop A Corporate Energy Savings Policy and Terms of Reference (ToR)

When actual utility savings occur from energy reductions projects, future operational budgets are often reduced to reflect this change. However, in many cases the operational costs to maintain the energy reductions are higher than what has been historically required, and the reduction of budget reduces a department's resource capacity to maintain the energy reductions. The proposed initiative would assign the remaining budget to a special projects account (e.g., realized utility savings from an LED retrofit program would be assigned to a financial account for use in the future) for the discretionary use of the department that implemented the energy savings project.

This initiative has not been implemented – it is recommended that the City accelerate its implementation to support the proposed CEEP Update initiatives.

### 9.1.6 C6: Create Sustainable Purchasing Policy

The City has supported the purchase of environmentally friendly products and services in principle and as set out in its Sustainability Purchasing Policy. However, there is no policy that directly addresses purchasing sustainable products or services that generate positive social, environmental and economic outcomes. Economic, social, and cultural aspects of procurement include ethical and fair-trade practices such as economic and employee equity, worker health and safety, child labor, and community economic development. Environmental aspects include items such as recycled content, renewable versus non-renewable resource inputs, greenhouse gas emissions and embodied energy, other contaminant emissions, energy efficiency, and waste production and reduction. It is recommended that in support of sustainability and climate action across the entire value chain that a Sustainability Purchasing Policy be developed and consider:

- All costs and impacts over the service life (e.g., total cost of ownership and best value)
- The opportunity to collaborate with suppliers to improve sustainability and climate action in the supply chain
- The opportunity to consider procurement alternatives (e.g., used goods, etc.)
- Updating the Sustainability Purchasing Policy every 5 years.

This is an initiative that will take some time to implement. It is first recommended that the City work with legislators to give flexibility to local governments as well as build the tools to support market adoption.

### 9.1.7 C7: Establish Departmental GHG Accounting & Reporting Program

The tracking of energy consumption and GHG emissions data from fuel and utility bills is valuable for departmental energy-related decision making and should be provided to department directors and managers to support energy conservation and demand management. It is recommended that the larger energy consuming departments (i.e., Engineering and Operations, Recreation, Transit and the Water and Sewer Department) develop a 5-year energy and GHG emissions reduction plans for their operational activities, and report on progress annually. This would enable each department to directly engage in the CEEP by tracking the energy use and GHG emissions resulting from day to day operations, decision-making, and capital purchases.

This initiative has not been started yet.

### 9.1.8 C8: Continue to Develop Alternative Work Strategies and Supportive Policies

A cost-effective energy and GHG reduction program implements policies that allow for more flexible work environments and dis-incentivizes travel. The City's forecast of office space needs for the corporation estimates that to serve the projected annual year-over-year population growth, staff levels will also need to increase over the same period. Policies that support enhanced staff mobility, hoteling, and improved space layouts, are currently being examined and modified as a result of COVID-19 to achieve the same level of functionality and comfort while additional office and building space is being sought and planned for. These strategies include:

- **Alternative work schedules** which allow employees to vary their hours from day to day or compress more working hours into fewer days.
- **Telecommuting** which enables employees to work from home offices or other alternative spaces.
- **Shared offices and hoteling:** This strategy provides a flexible work environment that allows for better space utilization, in that employees do not have a dedicated office space. This approach can have a significant reduction on greenhouse gas emissions as the strategy can enable the City to avoid adding additional buildings to accommodate increased staff.
- **Virtual meeting rooms and teleconferencing:** The City uses various platforms to facilitate virtual meetings which create the same experience for the user as face-to-face meetings.

Post-COVID-19, it is recommended that the City continue to deploy these strategies as a means to reduce travel related costs (both staff time and reimbursement of fees) and GHG emissions.

### 9.1.9 C9: Explore Meeting the Taskforce for Climate Related Disclosures (TCFD) Reporting Requirements

Created by the Financial Stability Board in 2015, the Task Force for Climate Related Disclosures (TCFD) was established with the aim to ensure the investor community was aware of climate-related investment risk through a consistent set of climate-related disclosures. In 2017, the TCFD established a climate-related risks and opportunities framework that have now become the reporting standard for many publicly traded companies and exchange commissions. The TCFD framework has 4 main disclosure areas:

- **Governance:** An organization's governance around climate-related risks and opportunities.
- **Strategy:** The actual and potential impacts of climate-related risks and opportunities on an organization's businesses, strategy, and financial planning.
- **Risk Management:** The process used by an organization to identify, assess, and manage climate related risks.
- **Metrics and Targets:** The metrics and targets used to assess and manage relevant climate-related risks and opportunities.

While the TCFD framework was designed for publicly traded companies, it is being adopted by cities as cities are being impacted by climate change and it is becoming critical that they apply a climate lens to operational decision making, medium and long-term financial capital planning, and building awareness within the City and the broader community. Cities, like Fredericton, who have been proactively moving through other climate related frameworks like the PCP program and ICLEI Canada's Building Adaptive Resilience Communities (BARC) program, provide much of the information and data required to meet the requirements of the TCFD framework (Table 20). The pivotal next step for these cities will be publishing the climate-related information in their financial reports.

Since the City has developed a CEEP and climate change adaptation plan, it is recommended that the City complete a TCFD maturity assessment as a means to explore meeting these additional reporting requirements. Doing this exercise will help the City identify barriers, gaps and opportunities within its internal risk management, strategy and governance systems and help build the City's capacity to proactively prepare, monitor and respond to the impacts of climate change. To assist with this process, Table 20 presents the typical gaps between the PCP and BARC frameworks.



**Table 20. Summary of TCFD Requirements, Relations to Existing Climate Frameworks, and Typical Gaps<sup>11</sup>**

TCFD Areas	TCFD Recommended Actions	PCP and BARC Framework Requirements	Typical Gaps Between Municipal Climate Frameworks & TCFD
Governance	<ul style="list-style-type: none"> <li>Describe mayor and council’s oversight of climate-related risks and opportunities.</li> </ul>	<ul style="list-style-type: none"> <li>PCP Milestone 2 includes a council resolution on an GHG target</li> <li>BARC Milestone 1 requires council to pass a resolution on adaption.</li> </ul>	<ul style="list-style-type: none"> <li>Both frameworks have elements of governance, but it is only established at a high level and lacks specific accountability and responsibility.</li> <li>There is no requirement for City council to consider climate-related issues when reviewing and guiding strategy, major plans of action, risk management policies, annual budgets, and business plans as well as setting the organization’s performance objectives, monitoring implementation and performance.</li> </ul>
	<ul style="list-style-type: none"> <li>Describe management’s role in assessing and managing climate related risks and opportunities.</li> </ul>	<ul style="list-style-type: none"> <li>PCP Milestone 3 requires naming the department / organization responsible for the plan and action.</li> <li>BARC Milestone 1 requires building a climate change adaption team and identifying an adaption champion.</li> </ul>	<ul style="list-style-type: none"> <li>Both frameworks have elements of governance, but it is only established at a high level and lacks specific accountability and responsibility. There is no specific requirement around City management being responsible for climate change; nor do the frameworks require that a City develop processes by which management is informed about climate-related issues.</li> </ul>

<sup>11</sup> Adapted from Chartered Professional Accountants of Canada: Enhancing Climate-related Disclosure by Cities: A Guide to Adopting the Recommendations of the Task Force on Climate Related Financial Disclosures (TCFD). <file:///C:/Users/dhegg/Downloads/02337-RG-TCFD-Guidance-for-Cities-Feb-2020.pdf>

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TFCD Areas	TCFD Recommended Actions	PCP and BARC Framework Requirements	Typical Gaps Between Municipal Climate Frameworks & TCFD
Strategy	<ul style="list-style-type: none"> <li>Describe the climate-related risks and opportunities the city has identified over the short-, medium-, and long-term.</li> </ul>	<ul style="list-style-type: none"> <li>PCP Milestone 1 requires a minimum 10-year businesses-usual energy and GHG forecast.</li> <li>BARC Milestone 2 requires research on the impacts of climate change and how different service areas will be affected.</li> </ul>	<ul style="list-style-type: none"> <li>The BARC framework does not consider transition risks (only physical).</li> <li>The frameworks do not require a City to develop process(es) used to determine which risks and opportunities could have a material financial impact to the City or community, taking into consideration the useful life of the City's assets or infrastructure.</li> </ul>
	<ul style="list-style-type: none"> <li>Describe the impact of climate-related risks and opportunities on the strategy and financial planning of the city's businesses.</li> </ul>	<ul style="list-style-type: none"> <li>Milestone 3 recommends a description of costs and funding sources for the emission plan.</li> <li>BARC Milestone 3 examines financing and budget considerations required for the plan. It also identifies possible drivers and constraints.</li> </ul>	<ul style="list-style-type: none"> <li>There is no requirement of the BARC framework to quantify the possible financial impacts or costs avoided.</li> <li>The BARC framework does not require the consideration of upstream and downstream implications of climate change (e.g., supply chain).</li> <li>There is no requirement to describe the impact of climate-related issues on their financial performance (e.g., revenues, costs) and financial position (e.g., assets, liabilities).</li> </ul>
	<ul style="list-style-type: none"> <li>Describe the resilience of the city's strategy, taking into consideration different climate-related scenarios, including a 2°C or lower scenario.</li> </ul>	<ul style="list-style-type: none"> <li>Milestone 2 requires a vulnerability and risk assessment to determine sensitivity to climate change, adaptive capacity, consequences and likelihood of impacts.</li> </ul>	<ul style="list-style-type: none"> <li>There is no requirement under PCP Framework.</li> </ul>

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TFCD Areas	TCFD Recommended Actions	PCP and BARC Framework Requirements	Typical Gaps Between Municipal Climate Frameworks & TCFD
Risk Management	<ul style="list-style-type: none"> <li>Describe the city’s processes for identifying and assessing climate-related risks.</li> </ul>	<ul style="list-style-type: none"> <li>PCP Milestone 1 takes an initial look at the impacts of climate change.</li> <li>BARC Milestone 2 initiates research and a more comprehensive review of climate risks and opportunities.</li> </ul>	<ul style="list-style-type: none"> <li>Neither program links the risks back to the Corporate Enterprise Risk Management Systems. While the BARC framework provides a risk rating scale, it does not identify how Cities should determine the relative significance of climate-related risks in relation to other risks.</li> <li>Adaption Plans and GHG Reduction Plans are often not connected to broader organizational strategy and asset management plans.</li> </ul>
	<ul style="list-style-type: none"> <li>Describe the city’s processes for managing climate-related risks.</li> </ul>	<ul style="list-style-type: none"> <li>BARC Milestone 3 identifies potential options and actions on adaption</li> </ul>	<ul style="list-style-type: none"> <li>PCP program does not require the evaluation of risks.</li> <li>Neither program links the risks back to the Corporate Enterprise Risk Management Systems, organizational strategy and asset management plans.</li> <li>While the BARC framework suggests prioritizing risks based on the overall risk rating, it does not provide guidance on prioritizing amongst the highest rated risks and how materiality considerations should be considered.</li> </ul>
	<ul style="list-style-type: none"> <li>Describe how processes for identifying, assessing and managing climate-related risks are integrated into the city’s overall risk management.</li> </ul>	<ul style="list-style-type: none"> <li>PCP Milestone 4 requires that cities mechanisms and allocate funding to implement the plan.</li> <li>BARC Milestone 4 requires the implementation of the adaptation plan developed.</li> </ul>	<ul style="list-style-type: none"> <li>Neither program links the risks back to the Corporate Enterprise Risk Management Systems, organizational strategy and asset management plans.</li> </ul>

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TCFD Areas	TCFD Recommended Actions	PCP and BARC Framework Requirements	Typical Gaps Between Municipal Climate Frameworks & TCFD
Metrics and Targets	<ul style="list-style-type: none"> <li>Disclose the metrics used by the city to assess climate-related risks and opportunities in line with its strategy and risk-management process.</li> </ul>	<ul style="list-style-type: none"> <li>PCP Milestone 1 includes a description of emission intensity values and indicators for future monitoring.</li> <li>BARC Milestone 3 requires the development of baseline and indicator data.</li> </ul>	<ul style="list-style-type: none"> <li>Neither program links the metrics back to the Corporate Enterprise Risk Management Systems, organizational strategy and asset management plans.</li> <li>Neither framework recommends that climate related metrics should be incorporated into remuneration policies.</li> </ul>
	<ul style="list-style-type: none"> <li>Disclose Scope 1, Scope 2 and, if appropriate, Scope 3 GHG emissions and the related risks.</li> </ul>	<ul style="list-style-type: none"> <li>PCP Milestone 1 requires a summary of either the city's corporate or community emission inventory, as well as a 10-year forecast.</li> </ul>	<ul style="list-style-type: none"> <li>There is no requirement to internalize the cost of carbon and therefore results in a disconnect between GHG emissions and financial planning.</li> </ul>
	<ul style="list-style-type: none"> <li>Describe the metrics used by the city to manage climate-related risks and opportunities as well as performance against targets.</li> </ul>	<ul style="list-style-type: none"> <li>PCP Milestone 3 and 5 require the development of a baseline, and the quantification of the GHG reduction impact of each measure outlined in the GHG reduction Plan.</li> <li>BARC Milestone 3 requires the establishment of a vision and objectives along with goals.</li> </ul>	<ul style="list-style-type: none"> <li>Neither program links the metrics back to the Corporate Enterprise Risk Management Systems, organizational strategy and asset management plans.</li> </ul>

### 9.1.10 C10: Advocate to NB Power to Change Net Metering Rules

NB Power's current net metering rules of not allowing systems to exceed 100 kW in nameplate capacity<sup>12</sup> is a regulatory and consequence financial barrier to industrial level systems that the City could install and operate at sites like the wastewater treatment plant. It is recommended that the City advocate to NB Power to change the net metering rules to provide allowances for commercial projects to go over this threshold and to allow electricity generation in one area to offset consumption in another so that systems can be adequality sized to meet City consumption demands, but not burden the grid with net imports.

### 9.1.11 C11: Complete a Review Of City Services

The City's corporate GHG emissions are the direct result of services being offered by the City – while many of the services are critical to the safety, health and well-being of Fredericton, many are also not and could be adjusted (e.g., frequency of mowing, changes to fleet and bus services, etc.). It is recommended that the City complete a review of City services and associated service levels to determine where there could be a modification to service levels resulting in reduced energy / fuel use and GHG emissions.

### 9.1.12 C12: Develop an Internal Cost of Carbon (ICC) Policy

Although the social and environmental benefits of reducing energy and GHG emissions are well established, their recognition or importance in decision making processes are often under-represented. Applying an internal cost of carbon (ICC) allows organizations to better account for these benefits and is a key component to moving an organization towards its energy and GHG reduction targets. To support many of the proposed initiatives in this Plan, it is recommended that the City establish an ICC which would be used to calculate the value (expressed as a cost) of GHG emissions associated with decision-making in respect to all City assets and infrastructure. It is recommended that the policy require that all City departments internalize the cost of corporate GHG emissions in their respective budgets and pay into an internal carbon reserve fund that can be used to support climate mitigation and adaptation projects at both the corporate and community level.

While it is simple enough to commit to an ICC policy, establishing the actual cost of carbon is difficult. As there is no true global benchmark, the price of carbon typically can range anywhere between CAN \$1–\$50 per tCO<sub>2e</sub> if the cost is associated with a voluntary or regulatory GHG program, or between CAN \$200–\$400 per tCO<sub>2e</sub> if the cost is based on a more comprehensive assessment of the cost of carbon and its associated damages. While a high ICC of \$400 per tCO<sub>2e</sub> is the preferable route, starting with an ICC that is significantly higher than current provincial policy without adequate education and change management is likely to stall the implementation of the policy.

It is therefore recommended that the City align its policy with other climate leaders in BC — i.e., the City of Victoria, City of Vancouver, and Metro Vancouver — whose current ICC are \$160/tCO<sub>2e</sub> and are set to escalate at 6 percent per year.

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<sup>12</sup> <https://www.nbpower.com/media/1490380/net-metering-application-info-final.pdf>

### 9.1.13 C13: Recognize Natural Assets as an Asset Class

The City has committed to reducing base year GHG emissions 50 percent by 2030 and to achieve net zero operations by 2050. As there will be some residual GHG emissions that will not be able to be eliminated, the City will need to neutralize (e.g., direct air capture, reforestation, etc.) these GHG emissions. The neutralization of GHG emissions can be done by investing in local nature-based solutions / projects — such as land conservation projects (e.g., parks), the rehabilitation of riparian ecosystems and wetlands, the construction and maintenance of wetland-based stormwater systems — all of which can act as green infrastructure and replace grey infrastructure and provide GHG sequestration benefits. To be able to recognize the benefits from these systems, and to properly account and manage them in such a manner to maximize the co-benefits, it is recommended that the City explicitly define and recognize natural assets as an asset class in the City financial accounting systems. This will also require the establishment of obligations to operate, maintain, and replace natural assets alongside traditional capital assets. There are now several examples of local governments exploring and undertaking such initiatives (e.g., Town of Gibson's, City of Surrey, City of Prince George, City of West Kelowna, etc.).<sup>13</sup>

### 9.1.14 C14: Seek Opportunities to Develop Nature Based Solutions / Carbon Offsets on City Lands

By implementing Initiative C13, the City will be in a better position to possibly recognize neutralized GHG emissions against its GHG emissions inventory or develop carbon offsets from nature based solutions. To do this, the City will need to complete an assessment of City owned lands (and those potentially available for purchase) to identify, value (e.g., socio-economic, cultural and ecological values) and assess the carbon stored and sequestration potential of natural asset features and corridors, and linkages to the surrounding environment, including agricultural lands, and urban areas. Some examples of nature-based solutions include:

- planting trees and shrubs along riverbanks and shorelines to restore bankside vegetation, stabilize the watercourse, and reduce erosion and sedimentation
- daylighting streams to restore the natural watercourse, improve stormwater management and reduce flooding
- restoration of prairie and grassland habitats
- reforestation and afforestation of steep slopes to stabilize the earth and prevent landslides
- protecting, enhancing, and conserving wetlands, salt marshes and marine kelp and seaweed beds to stabilize habitat, improve water quality, and promote sustainable fisheries
- increasing shoreline resilience by respecting natural processes, enhancing terrestrial and marine habitats, and providing recreational opportunities
- protecting urban and rural water supply areas to sustain clean potable water and natural heritage ecosystems
- enhancing and sustaining urban canopy to provide shelter, reduce urban heat, improve human wellbeing and restore urban habitats
- restoring degraded lands and waters to enhance and sustain terrestrial and aquatic habitats and potentially to improve neighborhood aesthetics, access to nature, and property value

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<sup>13</sup> <https://mnai.ca/>

### 9.1.15 C15: Investigate Sustainable Infrastructure Rating System Policy

Numerous infrastructure sustainable rating systems are available to facilitate and assess sustainable practices throughout the various phases of a project's life cycle. Many of these systems, like GreenRoads and CEEQUAL/BREEAM, are infrastructure type specific (transportation, water, and roads) and do not always assess the holistic nature and impacts of a project. Envision<sup>14</sup>, developed by the Institute for Sustainable Infrastructure (ISI), is a comprehensive rating system that assesses not only individual project performance, but also how the project contributes to the sustainability of the community it is situated within. Envision includes 5 main categories: Quality of Life, Leadership, Resource Allocation, Natural World and Climate and Risk.

The rating system seeks to address two questions: is this the right project and is the approach right. The Envision ISI Framework has several credits specific to the Plan objectives including requirements to reduce embodied, construction and operational GHG emissions and energy usage over a project's life cycle. It is recommended that the City investigate a policy that requires all infrastructure capital projects over \$100,000 be assessed, but not registered or verified, under the Envision ISI Framework.

Use of the Envision ISI Framework does not require staff credentialling (the cost is \$250 USD for local government staff), and training in the program via online videos takes upwards of 8 hours. There are no membership fees for local governments.

### 9.1.16 C16 : Incorporate Contracted Emissions Into Corporate GHG Emissions Inventory

Many cities contract out services - like road maintenance, janitorial services and solid waste disposal - to third party organizations usually due to cost-efficiency and resourcing. While this is a common practice within Canada, it can result in the under reporting of GHG emissions as the contracting City may not feel that it has operational control over the contracted party and service provided and is thereby not required to capture the GHG emissions from this service in the GHG emissions inventory. By not capturing and reporting on this data, the City is unable to influence and reduce these GHG emissions which also show up in the Community GHG emissions profile.

It is recommended that the City seek to work with the Procurement department to include contractor GHG emissions from contracts that are:

- New or renewals after January 1, 2023; and
- Over \$25,000 in value in any calendar year; and
- Are deemed to be within scope of the City's responsibilities - i.e., contracted services related to:
  - administration and governance
  - drinking, storm and wastewater
  - solid waste collection, transportation and diversion
  - roads and traffic operation
  - arts, recreation and cultural services
  - fire and police services

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<sup>14</sup> <https://sustainableinfrastructure.org/>

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Implementing this initiative would involve building in requirements for contractors to track and report on fuel consumption into all Requests for Proposals for the provision of City services.

### 9.2 SUMMARY OF EXISTING CORPORATE INITIATIVES

A summary of the status and recommend next steps for existing initiatives is presented in Table 21.

**Table 21. Status of Current Corporate Initiatives**

#	Initiative	Status	Next Steps
C1	Establish Energy and GHG Reduction Targets	<ul style="list-style-type: none"> <li>Complete</li> </ul>	<ul style="list-style-type: none"> <li>Re-evaluate progress towards targets annually and update targets (as needed) to stay in line with other levels of government.</li> <li>Define the City's interpretation of what net-zero is and how it could be achieved.</li> </ul>
C2	Continue to Enhance FTE Capabilities And Increase Staff Capacity For Implementing CEEP	<ul style="list-style-type: none"> <li>Ongoing</li> </ul>	<ul style="list-style-type: none"> <li>Continue to enhance FTE capabilities to implement CEEP.</li> <li>Increase staff capacity for implementing CEEP (focus on continued cross functional team). approach/assignment.</li> <li>Dedicate annual on-going operating funding to enable CEEP implementation.</li> <li>Continue to identify and pursue external funding opportunities to support CEEP implementation.</li> </ul>
C3	Update Asset Management Plan and Policy	<ul style="list-style-type: none"> <li>Work Underway</li> <li>The building and facility asset management updates to the plan and policies are underway. The associated fleet management plan and policies updates are planned (RFP being developed) for this year.</li> </ul>	<ul style="list-style-type: none"> <li>Incorporate CEEP targets, funding allocations into long-term financial plan and associated processes.</li> </ul>



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#	Initiative	Status	Next Steps
C4	Pilot the Use of LCA Tools When Making Capital Purchases	<ul style="list-style-type: none"> <li>• Work Underway.</li> <li>• The city is in the process of finalizing a Climate Lens process that would be applied to capital projects and changes in service levels. The process will be implemented (along with training) by August 2022.</li> <li>• The City is working with a consultant to determine a tonnes GHG/metre metric for capital infrastructure projects (paving, sidewalks, pipe renewal, etc.). These emission factors will feed into the climate lens process.</li> </ul>	<ul style="list-style-type: none"> <li>• Monitor implementation of the climate lens process and update accordingly based on feedback.</li> </ul>
C5	Develop A Corporate Energy Savings Policy and Terms of Reference (ToR)	<ul style="list-style-type: none"> <li>• Not complete.</li> </ul>	<ul style="list-style-type: none"> <li>• Accelerate the implementation of this initiative.</li> </ul>
C6	Create Sustainable Purchasing Policy	<ul style="list-style-type: none"> <li>• Not complete.</li> </ul>	<ul style="list-style-type: none"> <li>• Work with legislators to give flexibility to local governments as well as build the tools to support market adoption.</li> </ul>
C7	Establish Departmental GHG Accounting & Reporting Program	<ul style="list-style-type: none"> <li>• Not complete</li> </ul>	<ul style="list-style-type: none"> <li>• Update carbon budgets based on new GHG targets.</li> </ul>
C8	Develop Alternative Work Strategies and Supportive Policies	<ul style="list-style-type: none"> <li>• Ongoing.</li> <li>• Work from home policy is being finalized.</li> </ul>	<ul style="list-style-type: none"> <li>• Maintain and enhance program as needed.</li> </ul>

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### 9.3 SUMMARY OF PROPOSED INITIATIVES

A summary of the proposed initiatives is presented in the following table.

**Table 22. Summary of Corporate Leadership Initiatives**

#	Initiative	Description	Energy Reduction Potential	Estimated Cost	Priority	Responsibility
C9	Explore Meeting the Taskforce for Climate Related Disclosures (TFCD) Reporting Requirements.	Explore the evolution and efficacy of TFCD reporting (e.g., review and engage with other cities such as Edmonton, Vancouver, Ottawa) to understand pros and cons and to prepare for what eventually may become a mandatory reporting framework.	<ul style="list-style-type: none"> <li>• Supportive Initiative</li> </ul>	<ul style="list-style-type: none"> <li>• Staff Time</li> </ul>	<ul style="list-style-type: none"> <li>• Short-Term</li> </ul>	<ul style="list-style-type: none"> <li>• Corporate Services</li> </ul>
C10	Advocate to NB Power to Change Net Metering Rules	Advocate to NB Power to change net metering rules (i.e., to allow electricity generation in one area to offset consumption in another).	<ul style="list-style-type: none"> <li>• Supportive Initiative</li> </ul>	<ul style="list-style-type: none"> <li>• Staff Time</li> </ul>	<ul style="list-style-type: none"> <li>• Short-Term</li> </ul>	<ul style="list-style-type: none"> <li>• Corporate Services</li> <li>• CAO's office</li> </ul>
C11	Complete a Review Of City Services	Complete a review of City services and associated service levels to determine where there could be a modification to service levels (e.g., frequency of mowing, changes to fleet and bus services, etc.) resulting in reduced energy / fuel use and GHG emissions.	<ul style="list-style-type: none"> <li>• Supportive Initiative</li> </ul>	<ul style="list-style-type: none"> <li>• Staff Time</li> </ul>	<ul style="list-style-type: none"> <li>• Medium-term</li> </ul>	<ul style="list-style-type: none"> <li>• All Departments</li> </ul>
C12	Develop an Internal Cost of Carbon (ICC) Policy	Establish an ICC which would be used to calculate the value (expressed as a cost) of GHG emissions associated with decision-making in respect to all	<ul style="list-style-type: none"> <li>• Supportive Initiative</li> </ul>	<ul style="list-style-type: none"> <li>• Staff Time</li> </ul>	<ul style="list-style-type: none"> <li>• Short-term</li> </ul>	<ul style="list-style-type: none"> <li>• Corporate Services</li> </ul>

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#	Initiative	Description	Energy Reduction Potential	Estimated Cost	Priority	Responsibility
		City assets and infrastructure. It is recommended that the policy require that City departments internalize the cost of corporate GHG emissions in their respective budgets and pay into an internal carbon reserve fund that can be used to support climate mitigation and adaptation projects at both the corporate and community level. It is also recommended that the ICC start at \$170/tCO <sub>2</sub> e.				
C13	Recognize Natural Assets as an Asset Class	Explore means and methods to define and recognize natural assets as an asset class in the City's financial accounting systems (follow trends on best practice, examples from other communities). This will also require the establishment of obligations to operate, maintain, and replace natural assets alongside traditional capital assets.	<ul style="list-style-type: none"> <li>• Supportive Initiative</li> </ul>	<ul style="list-style-type: none"> <li>• Staff Time</li> </ul>	<ul style="list-style-type: none"> <li>• Underway</li> </ul>	<ul style="list-style-type: none"> <li>• Corporate Services</li> <li>• Parks</li> </ul>
C14	Seek Opportunities To Develop Nature Based Solutions / Carbon Offsets On City Lands.	Assess the carbon stored and sequestered by city lands in order to establish policies to maximize carbon stored, and possibly generated carbon offsets, from city-owned land by converting, acquiring, protecting, and restoring lands.	<ul style="list-style-type: none"> <li>• Supportive Initiative</li> </ul>	<ul style="list-style-type: none"> <li>• Staff Time</li> <li>• Consultant (\$30k-50k)</li> </ul>	<ul style="list-style-type: none"> <li>• Medium-term</li> </ul>	<ul style="list-style-type: none"> <li>• Corporate Services</li> <li>• Parks</li> </ul>

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#	Initiative	Description	Energy Reduction Potential	Estimated Cost	Priority	Responsibility
C15	Investigate Sustainable Infrastructure Rating System Policy	Investigate a policy that requires all City infrastructure or building / facility capital projects over \$100,000 be assessed under the Envision ISI Framework.	<ul style="list-style-type: none"> <li>• Supportive Initiative</li> </ul>	<ul style="list-style-type: none"> <li>• Staff Time</li> </ul>	<ul style="list-style-type: none"> <li>• Medium-term</li> </ul>	<ul style="list-style-type: none"> <li>• Corporate Services</li> </ul>
C16	Incorporate Contracted Emissions Into Corporate GHG Emissions Inventory	Incorporate fuel use reporting requirements in all new and renewed City service contracts post 2022.	<ul style="list-style-type: none"> <li>• Supportive Initiative</li> </ul>	<ul style="list-style-type: none"> <li>• Staff Time</li> </ul>	<ul style="list-style-type: none"> <li>• Short-term</li> </ul>	<ul style="list-style-type: none"> <li>• Corporate Services</li> <li>• Procurement</li> </ul>

Notation	Timeline
Short-term	Complete by end of 2023
Medium-term	Complete by end of 2027
Long-term	Complete by end of 2030
Ongoing	Work will be ongoing between 2022 and 2030
Work underway	The project has begun

## 10.0 IMPLEMENTATION & MONITORING

### 10.1 CEEP INITIATIVE TIMING

The analysis in this CEEP indicates that there is a pathway for the City to make significant progress towards the proposed 2030 and 2050 GHG emissions reduction targets. This CEEP Update has identified a total of 45 initiatives – 24 were brought forward from the original CEEP and 21 new initiatives which were selected based on their direct energy and GHG reduction potential. Table 23 presents these initiatives and the timing of their implementation between now and 2030.

**Table 23. CEEP Initiative Timing**

Initiative	The Project Is Complete	The Project Has Begun	Complete By End Of 2023	Complete By End Of 2027	Complete By End Of 2030	Work Will Be Ongoing Between 2022 And 2030
C1: Establish Energy and GHG Reduction Targets	X					
P3: Implement Energy Audit Recommendations	X					
B1: Develop a Green Building Policy		X				
B2: Implement Energy Audit Recommendations		X				
B3: Develop De-Carbonization Plans for Buildings & Facilities		X				
B5: Complete Buildings Utilization Assessments		X				
C3: Update Asset Management Plan and Policy		X				
C4: Pilot the Use of LCA Tools When Making Capital Purchases		X				
C7: Establish Departmental GHG Accounting & Reporting Program		X				
C8: Develop Alternative Work Strategies and Supportive Policies		X				
F1: Implement Review of Fleet		X				
F5: Opportunistically Switch Off-Road and Hand-Held Equipment to Electric		X				
P1: Complete a City-Wide Sewer-shed Study		X				
P2: Assess the Feasibility of a Large Solar PV Array		X				
P4: Assess the Energy and Revenue Potential of the Bio-Materials Generated at the Barker Street PCC		X				
T1: Monitor Cold-Weather City EV Bus Programs		X				
T2: Complete an On-Demand Transit Feasibility Study & Implement the Recommendations.		X				
T3: Complete an Alternative Propulsion Study for the Transit Fleet		X				
W1: Expand Pilot Remote Water Metering Program		X				
W2: Implement Pilot GPS AVL Study on Vehicle Fleet		X				

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Initiative	The Project Is Complete	The Project Has Begun	Complete By End Of 2023	Complete By End Of 2027	Complete By End Of 2030	Work Will Be Ongoing Between 2022 And 2030
C13: Recognize Natural Assets as an Asset Class		X				
B4: Implement a Building Commissioning Program						X
C2: Continue to Enhance FTE Capabilities and Increase Staff Capacity for Implementing CEEP						X
C6: Create Sustainable Purchasing Policy						X
F3: Opportunistically Switch Light Duty Fleet to Hybrid / Electric						X
F4: Monitor Renewable Energy and Fuel Technologies						X
B6: Provide Net-Zero and Renewable Energy System Training to City Staff			X			
B7: Implement an Energy Performance Monitoring & Benchmarking Program			X			
B8: Implement Technological and Behavioral Energy Efficiency (BEE) Reduction Programs			X			
C10: Advocate to NB Power to Change Net Metering Rules			X			
C12: Develop an Internal Cost of Carbon (ICC) Policy			X			
C16: Incorporate Contracted Emissions Into Corporate GHG Emissions Inventory			X			
C5: Develop A Corporate Energy Savings Policy and Terms of Reference (ToR)			X			
C9: Explore Meeting the Taskforce for Climate Related Disclosures (TFCD) Reporting Requirements.			X			
C11: Complete a Review Of City Services				X		
C15: Investigate Sustainable Infrastructure Rating System Policy				X		
F2: Optimize and Right-Size Fleet				X		
F7: Develop an EV Strategy				X		
F6: Develop a Fleet Electrification Financing Strategy				X		
F8: Develop Anti-Idling Policy				X		
SW1: Develop Solid Waste Management Plan				X		
C14: Seek Opportunities To Develop Nature Based Solutions / Carbon Offsets On City Lands.					X	
F9: Expand Automatic Vehicle Location (AVL) Telematics Program Across Fleet					X	
F10: Implement a Sustainable Commuting Program					X	
T4: Implement an Alternative Fuel-Powered Bus Pilot Project.					X	

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The following 9 initiatives are planned to be implemented within the 2022 and 2023 reporting years:

- B6: Provide Net-Zero and Renewable Energy System Training to City Staff
- B7: Implement an Energy Performance Monitoring & Benchmarking Program
- B8: Implement Technological and Behavioral Energy Efficiency (BEE) Reduction Programs
- C5: Develop A Corporate Energy Savings Policy and Terms of Reference (ToR)
- C7: Establish Departmental GHG Accounting & Reporting Program
- C9: Explore Meeting the Taskforce for Climate Related Disclosures (TCFD) Reporting Requirements.
- C10: Advocate to NB Power to Change Net Metering Rules
- C12: Develop an Internal Cost of Carbon (ICC) Policy
- C16: Incorporate Contracted Emissions Into Corporate GHG Emissions Inventory

### 10.2 CEEP MANAGEMENT SYSTEM

A management system is a tool to facilitate the continuous improvement of a plan. For the CEEP, it ensures that there will be ongoing monitoring, management, and refinement over time. This will keep the CEEP current and ensure it is a living document.

Management systems in general range from simple documents to elaborate IT systems. In the context of the CEEP, the management system is simply a documented delineation of the processes, roles and responsibilities to ensure the CEEP is implemented and its initiatives are actioned and progressed towards the proposed GHG emissions reduction targets. The key focus of a management system is its commitment to continuous improvement. Moving forward, the actions and monitoring requirements developed for the CEEP will be regularly reassessed and refined.

It is recommended that the CEEP should be updated every five years. The following management system framework focuses primarily on the five and ten-year planning horizon. Changes to federal and provincial legislation and regulations, as well as technological advances are anticipated over the next decade that will impact the adoption and implementation of longer-term initiatives. The following are the framework's core elements:

- Governance and Collaboration
- Energy / GHG Boundaries
- Data Collection
- Data Analysis
- Evaluating Future Initiatives
- Monitoring & Reporting
- Communication Strategy

### 10.3 DEPARTMENTAL GHG BUDGETS

The use of GHG budgets can create more accountability and improve the likelihood that the City will achieve the GHG emission reduction targets. The departmental milestone GHG budget years for up to 2030 are presented in Table 24 below.

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**Table 24. Department Unit GHG Budgets**

Department	2021	2025	2030
Building Inspection (Planning & Development)	12	12	9
Building Services Division	192	181	139
By-Law Enforcement (Safety Dept)	7	7	6
Fire Department	452	110	89
Fleet Division	22	23	17
Fredericton Convention Centre	0	0	0
Parking Services	79	72	55
Parks & Trees	472	431	336
Police Department	556	555	426
Pollution Control	77	78	61
Engineering & Operations	2,257	2,153	1,674
Recreation	2,374	2,163	1,802
Safety Services	2	2	2
Tourism Department	142	135	106
Transit Department	1,824	1,802	1,447
Water & Sewer Department	3,044	2,950	2,402
CAO's Office	-	-	-
Corporate Services	149	143	115
HR, Legal & City Clerk	-	-	-

### 10.4 GOVERNANCE AND COLLABORATION

The Environmental Strategist is responsible for the coordination of the CEEP. Each City department is responsible for implementing actions assigned to them.

As part the CEEP management system, the implemented processes improvements, program implementation and projects will continue to be documented and reviewed annually to update consumption savings. By regularly monitoring and reporting consumption and dollar savings and/or avoidance to each function, department or unit, the outcomes of their participation in energy management initiatives can be demonstrated, and feedback can be obtained for any new ideas. Reporting on the overall energy and GHG emissions inventory, progress towards GHG reduction targets, and CEEP initiatives will be presented to Council through the annual CEEP Report. Along with the preparation of an annual CEEP Report, these activities will be rolled up into an annual CEEP work plan, which will be reviewed with the directors of City departments and reported to Council.

The CEEP should be updated every 5 years with the next update to occur in 2025.



## 10.5 ENERGY & GHG BOUNDARIES

Calculating corporate municipal GHG emissions can be complicated because of how City services are delivered and by who delivers them (e.g. contractors). To be relevant, GHG inventories must reflect the operations of a City and the way in which it interacts with the community. At the same time, it is important that the GHG inventory conform to international standards for reporting to ensure consistency and comparability with other cities. To this end, the City’s energy and GHG boundary has been set following an “operational control” approach where the City should track energy and GHG emissions of an asset when:

- The City owns or operates the asset, and
- The City is responsible for maintenance and capital upgrades.

The GHG emission sources included in the City’s GHG emissions inventory are presented in Table 25.

**Table 25. City Reporting Sectors**

Reporting Category	Emission Sources
Buildings and Other Facilities	Includes stationary emissions as well as GHG emissions from electricity.
Streetlighting & Traffic Signals	Includes GHG emissions from electricity related to street lighting, and traffic lights, including crosswalk signals, amber flashers, etc.
Transit Fleet	Includes GHG emissions from transit related mobile combustion.
Non-Transit Fleet & Equipment	Includes mobile combustion as well as GHG emissions from electricity for all electric vehicles and other electrified mobile equipment operated by the City.
Water & Wastewater	Includes water and waste pumping and treatment stationary emissions as well as GHG emissions from electricity.
Solid Waste	Includes fugitive emissions from landfills and disposal facilities.

## 10.6 ANNUAL DATA COLLECTION & REPORTING

To reinforce the concept that energy is a variable cost and to make individuals accountable and empower them to control energy use, the City will need to continue to track and report on energy and GHG emissions annually. This process has already been established internally as the City reports on energy and GHG emissions through the CDP-ICLEI Track Platform and both corporate and community energy and GHG emissions via the FCM PCP portal.<sup>15</sup>

## 10.7 EVALUATING FUTURE INITIATIVES

The CEEP contains a list of recommended initiatives to be completed over the next 8 years. Implementing the initiatives requires dedicated resources and systems in place to ensure that the policies, programs, and projects recommended are implemented and tracked so the City’s proposed GHG emission reduction targets are met. The objective of the CEEP is to dovetail energy conservation, energy demand management, and GHG emissions as part of the City’s normal course of business for asset retrofits, renewals, and life cycle replacement projects. Success in this endeavor requires incorporating conservation and demand management options at the initial design stages. In

<sup>15</sup> <https://pcptool.ca/>

## CORPORATE ENERGY & EMISSIONS PLAN (CEEP): 2021 UPDATE

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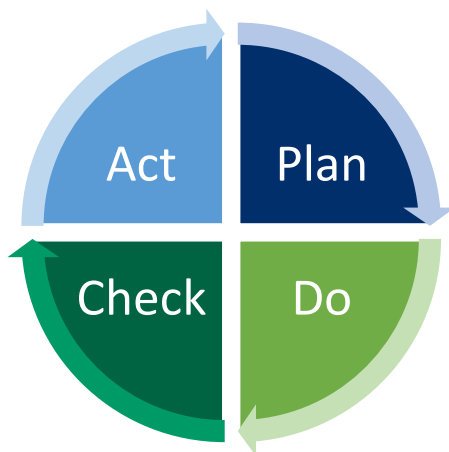
so doing, this ensures that options for improving energy efficiency are considered, evaluated, and quantified in terms of life cycle costing analysis, including cost, maintenance, GHG reductions and other co-benefits that may accrue to the City. When evaluating future initiatives, a City checklist should include the following:

- Project base case
- Energy efficient options
- Project costs (base case vs. energy efficient case)
- Project savings (in terms of energy, maintenance, avoided GHG emissions)
- Maintenance savings
- Financial benefits
- Environmental benefits
- Co-benefits
- Incentives/funding available
- Overall benefits
- Life cycle analysis recommendations

The implementation of the CEEP (the “Plan and Do” components of the cycle) will require the formulation of an annual work plan to define what actions are undertaken annually. To aid in successful implementation, the annual work plan should tie into departmental business plans and budgets to ensure responsibilities and resources are allocated accordingly. Progress will be reported to the following stakeholders as noted below.

### 10.8 MONITORING & REPORTING

An ongoing feedback loop, known as the Deming Cycle facilitates continuous improvement, and can be used to facilitate the continuous improvement of the CEEP, and ensure that it remains as a living document. The four components of the Deming Cycle, shown below in Figure 17, are “plan, do, check and act.” A run through the plan-do-check-act cycle must occur on an annual basis and should coincide with the City’s annual budget cycle for planning each year’s capital and operating budgets.



**Figure 17. The Deming Cycle (Plan-Do-Check-Act)**

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A monitoring framework provides the City with a task list of items to track that will help re-assess the effectiveness of the proposed initiatives over time (the “check” components of the cycle). Monitoring includes two components. The first is the monitoring of the proposed initiatives - what is being done, who is doing it, is the activity funded, etc. The second component is the compilation of the energy and GHG emissions inventory to monitor the success of the initiatives. Tracking, measuring, and sharing progress towards the City’s GHG reduction target is essential to maintaining momentum for change. The success of the CEEP will be measured by the results achieved relative to prior reporting years.

On an annual basis, the City will prepare an CEEP report, which at a minimum, will include:

- Current energy and GHG emissions profile in aggregate and broken down by department
- Change in energy and GHG emissions from the prior year and the baseline
- Follow up actions from the prior year’s report.
- A description of the work that has been completed.
- Progress towards the GHG reduction target.
- Identification of any issues or challenges faced in advancing each initiative
- An indication of progress toward achieving each initiative, using the following scale:
  - Not Started – The initiative has not been implemented.
  - On Track – The initiative has been implemented. For various initiatives, progress will be measured through quantitative and qualitative indicators (as identified in the initiatives tables).
  - Outstanding – An issue, barrier and/or challenge is prohibiting the initiative from being implemented.
  - Delayed – The initiative has been delayed or placed on hold.
  - Completed – The initiative has been completed.
- List of new initiatives to address issues, barriers, and challenges.
- Timing and assigned responsibilities of the initiatives.

The initiatives in this CEEP should be evaluated in consultation with the various City departments on an annual basis, as part of the departmental strategic operations planning process. This will be an opportunity to review and prioritize potential strategies based on resources and emerging technological opportunities.

### 10.9 RESOURCE & BUDGET PLANNING

The City’s 2021 energy expenditures including electricity, natural gas, diesel, gasoline, and propane was estimated to be \$5.8 million. It is anticipated over the next 10 years that the average cost of energy will increase by 1-2 percent per year, from which a large portion could be mitigated through the savings achieved by initiatives recommended in the CEEP.

#### 10.9.1 Financial Resources

It is estimated that to achieve the 2030 GHG reduction target, the City will need to spend between \$29-\$42 million in cost premiums (i.e., the cost above simple replacement cost). While this is a considerable premium, delaying any further investments to future years will simply result in increased capital costs and possible damage and loss from climate change. Specifically, by decarbonizing its buildings and facilities, the City can also incorporate adaptive measures and thus increase the resiliency of those assets to the effects of climate change. Such an investment can also improve the assets value on the City’s balance sheet. The cost premium to convert nearly all of the City’s fleet

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to electric and to decarbonize its buildings is estimated to be between \$60 and \$72 million (approximately 70 percent of these costs are related to buildings with 29 percent related to fleet and transit and the remaining from offsets). Note that all costs are in 2022 dollars and have not been discounted for the effects of time. Based on these range of costs, the City will need to develop a 10-year spending plan that can be considered in annual municipal budget processes and feed into the City's long-term financial plans. The next update to the City's long-term financial plan will be completed by 2025. These costs will need to be refined and updated when initiatives B2 and B3 are completed.

### 10.9.2 Staff Resources

A number of strategies are intended to embed sustainable energy management and GHG reduction programs into departments, systems and polices which requires time, staff, and the training of staff. While there will be a coordinated level of effort from City operations and various departments, the CEEP requires that an Environmental Strategist be hired which will require dedicated budget to support the role's salary as well as a budget to implement actions that benefit various departments, functions or units (e.g., studies). Training facility staff on energy and GHG management practices and concepts builds competencies that enables staff to carry out operations more effectively and efficiently. The City should seek to include energy training concepts for relevant staff, where appropriate.

### 10.9.3 Funding Opportunities and Risks

Wherever possible, the City should take advantage of funds to speed up the implementation of project initiatives. For example, the City could submit an application to Infrastructure Canada for federal funding under the Community, Culture and Recreation Fund to support the energy projects at the identified community centers under the basis that the retrofits would reduce GHG emissions, but also support using the community centers as 'cooling centers' during heatwaves. The FCM Green Initiative Funds often has grants available to support sustainability and climate action planning efforts and offset low-interest loans to support capital projects that reduce energy and GHG emissions. The list of available funding opportunities have been presented in Table 9.

As these programs are subject to political changes, the City should proactively plan and incorporate capital and operating costs of the proposed initiatives into future budgets. This will enable the City to take advantage of external funding opportunities when they are available, but not have to rely on these external sources to move forward on initiatives.

It should be noted that regardless of external funding availability, the proposed initiatives will require further business case development, are contingent on future Council approval, and future staff and budget (capital and operating) availability. As part of the implementing the initiatives in this CEEP, the following risks would need to be considered and addressed:

- Increasing capital and operating costs, as well as lower than expected saving and revenues.
- Regulatory barriers and compliance issues that impede the implementation of the initiatives.
- Competing Council and departmental priorities including current operational mandates of impacted services and how mandates have to change to achieve the energy and GHG reductions.

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## 10.10 COMMUNICATION STRATEGY

The overall goal of the communication strategy is to outline tools and techniques to assist the City with ongoing internal communication about the CEEP, including implementation and progress towards targets. The communication strategy is focused on internal communication for city staff and council and is not designed to be public. The key objectives of the strategy are:

- To communicate the presence and importance of the CEEP.
- To share progress towards the proposed GHG reduction targets.
- To motivate multiple audiences about what they can do to reduce the City’s energy use and GHG emissions.
- To communicate coming changes in business practices to support the ongoing implementation of the CEEP

### 10.10.1 Responsibility

Responsibility of the CEEP implementation rests with the Environmental Strategist through to delegation of actions to managers and staff. Each City department is responsible for implementing actions assigned to them.

### 10.10.2 Tactics

The communications strategy includes a series of strategic tactics (Table 26).

**Table 26. Suggested Communication Tactics**

Tactic	Description/Rationale
Host quarterly meetings with department leaders	The intent of these meetings is to: <ul style="list-style-type: none"> <li>• Share best practices between departments</li> <li>• Provide status/progress updates on Energy conservation and GHG emission reduction strategies across all departments</li> <li>• Prioritize work</li> <li>• Share funding opportunities</li> <li>• Collaborate on shared initiatives that flow into annual work plans and budgets.</li> </ul>
Develop an annual corporate Energy and GHG Emissions Progress Report	The Environmental Strategist will gather information from all departments, and report annually on energy and GHG emissions. Ensure the development of a one-page, graphic summary document which can be used to communicate results with a wide range of audiences.
Implement targeted energy skills training	Implement specialized training opportunities as per the CEEP initiatives.
Implement general energy skills training for all staff	Develop (or adopt) a stand-alone webinar that would be suitable for all City staff. The webinar could cover: <ul style="list-style-type: none"> <li>• The presence of the CEEP</li> <li>• The role of all staff members in contributing to energy conservation and GHG emission reductions</li> <li>• Easy tips and reminders for every day corporate energy conservation and GHG emission reductions</li> </ul>
Work to integrate key messaging into existing communications	Work alongside the communications department to share tips and reminders about energy conservation and GHG emission reductions with all staff.

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Tactic	Description/Rationale
Create (and publicize) a “bright lights” program	<p>Create a staff-based program to celebrate success. Suggest working with the Communications and Human Resources departments to develop a staff recognition program. This could include:</p> <ul style="list-style-type: none"> <li>• Seeking nominations for staff that have made a difference with energy efficiency</li> <li>• Developing short vignettes</li> <li>• Circulating stories and photos</li> </ul>
Create an annual staff questionnaire	<p>Include a staff questionnaire to survey staff on corporate climate progress and actions.</p>
Ensure open lines of communication	<p>Ensure that staff across the corporation have knowledge of, and access to an CEEP information-sharing portal. This portal might be used to:</p> <ul style="list-style-type: none"> <li>• Share innovative ideas</li> <li>• Identify areas of concern</li> <li>• Provide feedback or solutions</li> </ul>
Embed results in performance plans	<p>Consider the inclusion of energy and GHG emission reduction targets in select employee’s performance reviews. This would serve to recognize specific staff for their success in helping to achieve the CLP targets.</p>

### 10.10.3 Recommendations

The following table includes supporting details for each of the tactics.

**Table 27. Timing and Responsibility of Suggested Communication Tactics**

Tactic	Audiences	Level of Effort				Timing
Host quarterly CEEP Leadership Meetings	Senior leaders, representing key departments	■	■			Quarterly, Ongoing
Share the results of the CEEP Leadership Meetings	Leadership Council	■				Quarterly, Ongoing
Develop an annual CEEP Report	Council All staff	■	■			Annually
Implement targeted energy skills training	Specific, pre-identified staff	■	■			End of Year Two
Implement general energy skills training	All staff	■				End of Year Two
Work to integrate key messaging into existing communications	All staff	■				End of Year One
Create (and publicize) a “Bright Lights” program	All staff	■				End of Year One
Ensure open lines of communication	All staff	■				End of Year One
Embed results in performance plans	Specific, pre-identified staff	■	■			End of Year Three