



**City of Brantford
Corporate Energy Management Plan
2024-2028**

April 2024

Contents

Executive Summary.....	3
Introduction	4
About the City of Brantford	4
Energy Consumption, Cost, Emissions	4
Report on 2019-2024 Plan	6
Measures and Actions Taken	7
Goals & Objectives	9
Energy and Carbon Emissions Reduction Potential	9
Organizational Alignment	11
Management Commitment	12
Alignment of CEMP with other City Plans and Initiatives	12
Measures, Projects, Programs Planned/Proposed	12
Energy Team	13
Facilities	14
Fleet and Transit Services	16
Procurement	17
Programs and Other Initiatives	17
Systems	17
Tracking & Reporting	17
Communications	18
Appendix A: 2023 Energy and Water Consumption, Intensity and GHG Emissions	19
Appendix B: Summary of Practices in Other Municipalities	26
Goals	26
Municipal Facilities.....	26
Water	27
Transportation/Fleet.....	27
Community.....	28
Appendix C: Emissions and Conversion Factors, Utility Costs	30

Executive Summary

The Corporate Energy Management Plan (CEMP) describes the strategies and roadmap for reducing energy and greenhouse gas (GHG) emissions over the five-year period from 2024-2028 for the City of Brantford. Through implementation of the processes and actions outlined in the plan, the City will be building the foundations to achieve the City's longer-term reduction goals.

The City has had some early success in taking action to mitigate unnecessary energy consumption and this plan is designed to broaden and operationalize the proven practices that will put it on a strong path to significant reductions to 2030.

The City's focus and actions are in line with the municipal sector's drive to reduce energy and emissions across their portfolios. Most municipalities of Brantford's size and larger have short- and longer-term energy and GHG emissions reduction targets. They have shown success with good practices in managing energy use across all facility types. The solutions are well proven and practical to implement. With the addition of the City's Climate Change Officer, there is enhanced capacity for coordinating action, facilitating and managing initiatives across and throughout City departments. The early initiatives demonstrate a growing culture of good energy management at the City.

The plan describes a clear, proven process to identify facilities that use more energy than necessary through benchmarking. It follows with energy audits to select conservation measures and then implementation of those measures. Throughout the process, opportunities for optimizing operations across all facilities are identified and implemented. As an example, initiatives such as the development of the Building Operation and Maintenance Standard and related training will facilitate quick wins in reducing energy with little or no cost.

Introduction

The intention of the Corporate Energy Management Plan (CEMP) is to specify and guide action on energy consumption reduction and to bring more focus on energy management across all departments at The City of Brantford. In addition, by setting clear goals and objectives stakeholders will have targets to achieve and a means to measure progress. The objective, over time, is an evolution in culture to integrate energy and carbon emissions management into the daily activities and decisions of the City.

Ontario Regulation 25/23: Broader Public Sector: Energy Reporting and Conservation and Demand Management Plans, under the *Electricity Act (1998)*, requires municipalities to develop and publish an Energy Conservation and Demand Management (ECDM) Plan every five years. The previous five-year period ran from 2019 to the end of 2023. This Plan meets the requirements of O. Reg 25/23.

Since the last plan was written, a number of initiatives have been undertaken. One of the key actions was the hiring of a Climate Change Officer (CCO) in 2019. The CCO coordinates the overall efforts to manage and reduce energy, greenhouse gas (GHG) emissions and water more effectively. This plan is a living document to guide the actions the City as a Corporation can take over the next five years from 2024 to 2028 to increase its energy efficiency, reduce its energy demand, and minimize its carbon footprint.

The CEMP has incorporated the principles and actions set out in related City documents, namely Corporate Climate Change Action Plan (CCAP) from 2020 and the Net-Zero Building Standard from 2022. The CEMP is complementary to and in alignment with these plans. In addition, it addresses fleet and transit energy management and street lighting.

The development of this plan was a collaboration between several departments with coordination from the Climate Change Officer and Jupiter Energy Advisors. The following departments were consulted: Environmental Services, Operational Services, Engineering Services, Fleet and Transit Services, and Parks and Recreation Services.

About the City of Brantford

The City of Brantford is a single-tier municipality and is dedicated to corporate energy conservation and environmental sustainability. Energy is essential to the operation of the City's buildings, services, and production of water and treatment of wastewater. The City of Brantford has been monitoring, tracking, and reporting its energy consumption since 2011.

The development and implementation of a corporate-wide Energy Management Plan supports the City's 2023 to 2026 Strategic Priorities Theme 10: Build a Greener Brantford.

Energy Consumption, Cost, Emissions

The CEMP uses fiscal year 2023 as the base year for the following five years from 2024-2028. Table 1 summarizes the total energy, cost and emissions for the base year.

Table 1: Total energy consumption, cost and GHG emissions 2023

2023			
Buildings	31,765,565	2,897,383	4,403
Water/wastewater	22,336,109	2,907,714	2,247
Street & Traffic Lights	5,373,707	806,056	437
Total	59,475,381	6,611,153	7,087
less electricity generated at landfill site (direct to grid)	(8,525,742)	-	-
Total (net of electricity generation)	50,949,639	-	-

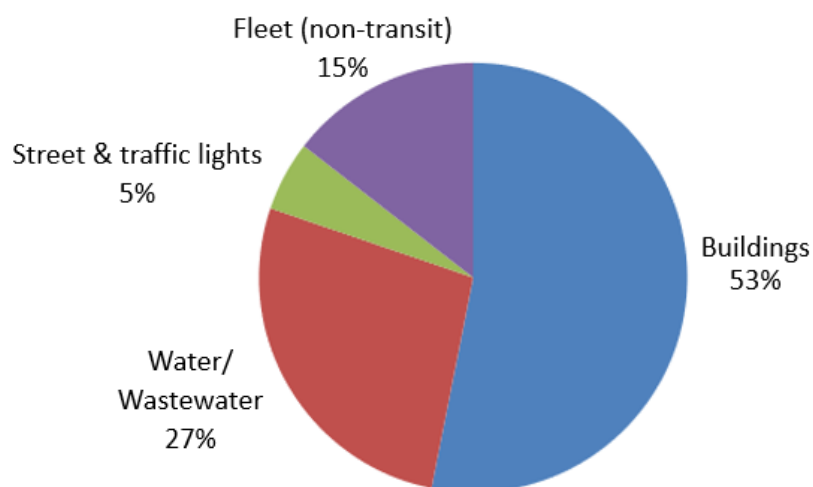
Table 2: Fuel consumption

2023			
Fleet (non-transit)	476,500	759,973	1,175

A detailed list of each facility's consumption, energy intensity and emissions for 2023 is in Appendix A.

The breakdown of GHG emissions by department in Figure 1 indicates where the greatest opportunities for emissions reductions can be found.

Figure 1: 2023 GHG emissions by Department



Report on 2019-2024 Plan

The 2019-2024 plan set out targets for energy efficiency reductions by 2024 in energy use, energy intensity per square foot for buildings and greenhouse gas reductions for facilities. These targets and results were as follows:

Table 3: Summary of actual results 2019-2024

Reduction Targets	Plan (2019-2023)	Actual (2023)	Result
Energy intensity (ekWh/ft2)	2.4	4.1	Surpassed target
Total energy use* (%)	11.8	15.4	Surpassed target
GHG emissions (%)	7.3	-10.5	Missed target**

* Total energy use excludes transportation fleets.

** The increase in GHG emissions is due to the increase in the electricity grid emissions factor from 20 to 81.3 gCO₂/kWh from 2018 to 2023. This factor is beyond the control of the City.

Using the 2018 electricity grid emissions factor in 2023 to normalize the comparison to 2018, the actual 2023 emissions reduction would be 11.6%, surpassing the reduction target.

Table 4: Actual results 2019-2024

	Base year 2018	Target (2019-2023)	Actual (2023)	Variance from Target
Buildings				
Energy Intensity (ekWh/ft2)	32.2	29.8	25.7	-13.7%
Total energy use (ekWh)	39,473,540	35,920,921	31,765,565	-11.6%
GHG emissions (t CO ₂ e)	4,255	-	4,403	-
Floor area (ft2)	1,227,190	1,227,190	1,236,948	0.8%
Water Treatment				
Energy Intensity (ekWh/ML)	936	988	692	-30.0%
Energy use (ekWh)	11,885,779	12,552,000	11,813,494	-5.9%
GHG emissions (t CO ₂ e)	615	-	1,149	-
Flow volume (ML)	12,700	-	17,068	-
Wastewater Treatment				
Energy Intensity (ekWh/ML)	896	679	693	2.1%
Energy use (ekWh)	11,376,185	8,622,000	10,522,616	22.0%
GHG emissions (t CO ₂ e)	552	-	1,098	-
Flow volume (ML)	12,696	-	15,183	-

	Base year 2018	Target (2019-2023)	Actual (2023)	Variance from Target
Streetlights				
Electricity use (kWh)	7,590,000	4,933,500	5,373,707	8.9%
GHG emissions (t CO ₂ e)	131	-	437	-
Total Energy Use				
	70,325,504	62,028,421	59,475,382	-4.1%
Fleet (non-transit)				
Fuel volume (L)	726,855	661,438	476,500	28.0%
GHG emissions (t CO ₂ e)	1,792	1,630	1,175	28.0%
Fleet - Total				
Fuel volume (L)	1,862,548	1,789,909	1,756,664	-1.9%
GHG emissions (t CO ₂ e)	4,990	4,800	4,563	-4.9%
Total GHG emissions (t CO₂)	10,543	9,773	11,650	19.2%

Notes:

GHG emissions increases from 2018 to 2023 (excluding Fleet) are due to the large increase in the electricity grid emissions factor from 20 to 81.3 gCO₂/kWh.

Blanks for a target indicate no targets were set in the 2019-2024 plan.

Measures and Actions Taken

The 2019-2024 plan outlined several action items to be completed over the five-year period to reduce energy consumption. Table 4 outlines the key plan components and a summary of the major actions taken.

Table 5: 2019-2024 CEMP actions review

Key plan component	Summary of major actions taken
Governance and accountability	- Establish and commit to long-term and short-term targets - Hire a new full-time, permanent staff position for the Climate Change Officer
Partnerships and collaboration	Collaborate and exchange information with other municipalities
Communications and training	- Develop training modules for staff - Provide specific training for staff who operate and maintain buildings or vehicles - Encourage staff to participate in conferences, tradeshow, and other events, and to share learnings from these with colleagues
Funding and procurement	Identify opportunities to piggyback efficiency improvements on planned capital projects

Key plan component	Summary of major actions taken
	• Review the criteria for prioritizing and budgeting, including life-cycle financial analysis • Formalize responsibility for seeking incentives • Develop an energy reserve fund
Monitoring and tracking	• Acquire an Energy Management System to facilitate tracking and reporting on energy use • Develop a plan for analyzing and using energy data
Advanced technology and energy efficiency standards	• Continue upgrading existing equipment with energy efficient equivalents • Review and pilot alternatives to fossil fuels, such as ground source heat pumps, electric pick-up trucks, and heavy-duty electric vehicles (including transit) • Review alternative energy systems, such as solar, or anaerobic digestion of organics

Over the past five years, several capital projects and initiatives were undertaken to reduce energy consumption across the City. These projects included upgrading high pressure sodium streetlights to LED, replacing light duty auto with electric, and upgrading building equipment to energy efficient models.

Goals & Objectives

Since 2019, the City has been setting the foundations for operationalizing energy management practices across its portfolio. The key piece was the hiring of a Climate Change Officer who is coordinating the efforts of the departments to systematically prioritize energy efficiency improvements and GHG emissions reductions as the opportunities arise. This integrated effort is in the early stages, but it is already having a positive effect on the culture in the City. Along with energy management, initiatives set out in the Corporate Climate Action Plan will help create momentum for not only better energy conservation and management but also GHG emissions reductions to meet the overall targets for 2030 and to 2050.

Committing to clear targets motivates actions and allows progress to be measured. The City of Brantford has set the following targets with the CEMP from the 2023 base year to 2028:

- 10% reduction in energy intensity consumption
- 25% reduction in GHG emissions

In addition, the City has set the following primary objectives:

- Foster a corporate commitment to energy efficiency
- Improve energy data and management processes
- Improve capital asset systems to reduce energy use and cost
- Demonstrate leadership in energy and GHG management

Energy and Carbon Emissions Reduction Potential

Most buildings do not operate at their optimal levels. Through benchmarking analysis, they can be ranked to determine which facilities are the most energy efficient and which can be better performing. The benchmarking methodology groups the City of Brantford facilities by type and ranks the total energy, electricity and natural gas intensities (ekWh/sqft) for each facility. These intensity values are then compared with similar facilities from six nearby municipalities*. Using nearby municipal facilities provides a larger data set for comparisons and also minimizes the effect of weather differences on consumption since the municipalities are close to Brantford.

To determine the energy and GHG emissions reduction potential, the nearby municipal facilities are ranked by type, and benchmarks are determined from top quartile electricity and natural gas intensities for each facility type. Using the top quartile intensity values as indicators of good operations, the reduction potential for each City facility can be calculated using these benchmarks as the target intensity values. Table 5 summarizes the potential of those facilities that were below the top quartile in electricity or natural gas intensity. The totals provide a good indicator of how much portfolio reduction potential there is and guides the setting of targets.

Benchmarking energy performance through energy intensity metrics also provides a good start to setting a priority list of those facilities that can be further investigated for immediate action when they rank as poor performers in their facility type group.

Table 6: Energy intensity, energy and GHG emissions reduction potential for corporate buildings

Property Name	Energy Intensity (ekWh/sqft)	Modeled Energy Intensity (ekWh/sqft)	Modeled Energy Savings (%)	Modeled Energy Savings Potential (\$/yr)	GHG Emissions Reduction Potential (t CO2e)
Arnold Anderson Stadium	44.4	11.5	74%	5,917	3
Tranquility Hall	47.0	12.4	74%	1,804	8
Harmony Square Garage	79.9	22.1	72%	21,192	12
Transit Terminal	32.1	9.9	69%	12,025	7
Public Works Yard	49.9	19.4	61%	25,840	113
Earl Haig	57.2	26.5	54%	20,365	37
Herbert Street Storage	32.3	15.5	52%	1,922	8
Eagle Place Community Centre	22.5	13.9	38%	4,327	19
Woodman Community Centre	27.7	17.5	37%	9,415	20
Wayne Gretzky Centre	41.9	26.5	37%	554,754	576
Transit Garage	30.8	22.1	28%	63,946	67
Farmer's Market	13.7	9.9	28%	6,025	3
T.B Costain Community Centre	19.8	14.6	26%	4,627	20
Visitor & Tourism Centre	22.9	18.2	21%	2,285	10
Police HQ	30.4	25.1	17%	14,664	64
Glenhyrst Art Gallery - (Main Building & Coachhouse)	20.7	17.7	14%	3,077	2
Fire Hall - 1	27.4	23.8	13%	8,360	5
Fire Hall - 3	28.1	25.1	11%	1,147	2
New City Hall	19.2	18.5	3%	9,500	5
Fire Hall - 2	21.4	20.7	3%	1,009	1
Total				857,531	1,208

Table 7: Water energy intensity, energy and GHG emissions reduction potential for water and wastewater

Property Name	Water Energy Intensity (ekwh/ML)	Modeled Water Energy Intensity (ekWh/ML)	Modeled % Water Energy Savings (%)	Modeled Energy Savings Potential (\$/yr)	GHG Emissions Reduction Potential (t CO2e)
Environmental Services Building & Water Treatment Plant	678	372.0	45%	556,820	434
Waste Water Treatment Plant	594	407.5	31%	346,297	306
Total				903,117	740

Table 8: Summary of Total Reduction Potential

Total Energy Savings Potential (ekWh)**	Total Energy Savings Reduction % (from 2023)	Total GHG Emissions Reduction Potential (t CO2e)	Total GHG Emissions Reduction % (from 2023)
7,630,090	14%	1,948	27%

Notes:

* nearby municipalities: City of Burlington, City of Cambridge, City of Guelph, City of Hamilton, City of London, and the Town of Oakville using 2019 Ontario Ministry of Energy BPS data which is the most recent, representative (non-pandemic) data set available. The City of Brantford data is from 2023.

**excludes street and traffic lighting

Not all facilities are included in the benchmarks as there were not a sufficient number of similar facilities across the other municipalities to provide meaningful comparisons.

Organizational Alignment

Organizations that are the most successful in reaching energy conservation goals all have one thing in common. They not only have a dedicated energy team focused on energy management but also have commitment from senior management and other departments to support the efforts of the team. The City has made solid strides in aligning the various departments and the CEMP sets additional actions to reinforce this integration.

Part of the commitment is to make energy, water and carbon emissions reductions an integral part of the corporate organizational structure and culture. Through the approved initiatives documented in the CCAP, NZBS and this plan, the City enables work across departments to continuously reduce unnecessary energy and water consumption which will also lead to a reduction in carbon emissions.

Management Commitment

The approved CEMP by senior management and Council affirms their understanding of the importance of managing energy, water and GHG emissions and are committed to supporting the CCO (and to-be-formed Energy Team) and staff in achieving the goals and objectives of the plan. Successful implementation of the elements of the CEMP will also further the other corporate initiatives, namely the Corporate CCAP and the strategic priority Greener Brantford to achieve their goals.

Alignment of CEMP with other City Plans and Initiatives

There are several City plans, strategies and initiatives that address elements of energy efficiency and conservation within their overall mandates. The CEMP has been developed to reinforce and complement the actions in those initiatives. The key initiatives include:

- Corporate Climate Change Action Plan
- Net-Zero Building Standard
- Council Strategic Priority Theme 10: Greener Brantford (February 2023)

Measures, Projects, Programs Planned/Proposed

The following table summarizes the actions and initiatives planned over the next five years. Some of these have been part of the CCAP and are included for completeness. The department sections below the table describe some of the key actions in more detail.

Table 9: Summary of actions

Action	Included in CCAP	Timeframe-Year
Buildings		
Develop Building Operation and Maintenance Standard (BOMS)	X	2024-2025
Install Building Automation Systems (BAS) in key buildings		2025-2040
Benchmark buildings by type to identify high energy users		2024-2025
Optimize operations of high energy users through BOMS, recommissioning, etc.		2024-2028
ASHRAE Level 2 energy audits on high energy users		2024-2028
Develop roadmap for building retrofit measures	X	2026-2035
Reimagine the workplace	X	2024-2050
Develop a system for regularly monitoring and reporting energy consumption to asset managers		2024-2025
Include Climate Changer Officer in decision making workshops and design meetings		2024-2050
Water/Wastewater/Landfill		
Develop water conservation programs	X	2024-2050
Develop wastewater reduction programs	X	2024-2050
Develop stormwater reduction programs	X	2024-2050

Action	Included in CCAP	Timeframe-Year
Retrofit wastewater treatment plant	X	2026-2030
Identify and implement system infrastructure improvements	X	2024-2050
Investigate renewable energy generation and utilization from the landfill and wastewater treatment plant		2024-2030
Fleet		
Convert light duty autos to electric	X	2024-2027
Convert transit bus fleet to electric or other alternative energy source	X	2024-2037
Optimize fleet (including right-sizing and vehicle sharing)	X	2024-2050
Prepare Plan for Emergency Services Fleet Emissions Reduction	X	2024-2025
Initiate EV sharing pilot project	X	2024-2025
Convert light duty trucks to electric or other low emissions option	X	2026-2035
Convert outstanding equipment to electric where available	X	2026-2035
Street & Traffic Lights		
Convert HPS bulbs to LED	X	2024-2030
Continue implementing solar powered lights where possible		2024-2050
Corporate		
Create a cross-departmental Energy Team		2024-2025
Investigate the creation of a reserve for operational savings to be used for energy initiatives		2025-2026
Provide awareness training for Senior Management and Council		2024-2050
Continue staff training through conferences, trade shows, etc.		2024-2050

Energy Team

A proven best practice in managing energy throughout an organization is an active, cross-departmental Energy Team. Its composition would include members whose departments are large users of energy and who should be part of any decisions around improving operational practices and efficiency projects to reduce consumption. Having a broad group also helps develop a commitment to energy management across the organization and fulfills one of the objectives of the CEMP as well as the CCAP. The Energy Team will be comprised of people from several departments, including:

- Climate Change Officer
- Parks and Recreation Services
- Operational Services
- Environmental Services
- Engineering Services
- Fleet and Transit Services
- Finance

The Energy Team also intends to become a corporate resource as experts in energy management for the City. It will provide technical support and guidance on energy efficiency matters and will help facilitate better energy management understanding and practices across the City.

Facilities

The most effective sequence of actions taken to reduce building energy consumption starts with optimizing operations followed by larger capital retrofit projects. It is only when the building is operating as efficiently as possible with its existing equipment can a proper assessment of energy savings potential of retrofit projects be determined. As much as 30% energy savings can come practically immediately when a building is operating optimally. This includes paying attention to occupant behaviour like turning off equipment when not in use.

Benchmarking all facilities by type by total energy intensity, followed by electricity and natural gas intensities, will help identify the poorer performing buildings for initial attention. All facilities will undergo operational efficiency improvements regardless of their benchmark results.

Building Operations

Optimizing ongoing operations of facilities such as tighter temperature control set points and operating schedules have a significant impact on energy costs and budgets. Using tools like building automation systems (BAS) where they exist, helps operators understand operating performance of a facility over occupied and unoccupied periods and across seasons. Focusing on how a building operates and optimizing current systems is the easiest action to take with little or no cost and in almost all cases generates immediate savings.

Building Operation and Maintenance Standard

A Building Operation and Maintenance Standard document helps facility operators better manage the daily operations of facility HVAC equipment across all facility types. The Facilities Operations and Maintenance department and Climate Change Officer will be developing the document that will describe the operating setpoints, schedules and sequences of HVAC equipment during each season. These standards will also take into account occupied and unoccupied space guidelines and metrics to help ensure the most efficient operation of equipment while maintaining comfort levels in our facilities.

Consideration will be given to developing standards and guidelines for IT and other equipment.

Other operational improvements will include:

- Installing a BAS in facilities that do not currently have a system in place
- Ensuring facilities are operating optimally by monitoring energy intensities and equipment controls
- Identifying high energy using facilities through energy intensity benchmarking. These facilities will be assessed for operating optimization and recommissioning opportunities.
- Assessing training requirements for facility staff

Following this operational optimization process, further energy and emissions reductions are found through the retrofit stage described below.

Recommissioning

Complementing ongoing operational optimization is the re- or retro-commissioning process. The City will investigate initiating a recommissioning process by which buildings will be assessed on rotation to ensure that their equipment and systems are operating as designed. The process will identify low and no-cost actions to be done to the equipment and controls. Generally, when the payback is less than 2 years the action is usually justified. Actions with longer paybacks will typically require some amount of capital funding and would be identified by an ASHRAE Level 2 energy audit. This would be the first step of a capital retrofit program.

Capital/Retrofit Projects

Development of the Net-Zero Building Retrofit Guideline will guide the retrofit process and set standards when upgrading the equipment and envelope of a facility. There are four key categories for retrofit measures:

1. User-driven loads and occupancy-based controls
2. Building Envelope
3. HVAC & Equipment
4. Renewable Energy

Once operational opportunities are implemented, identified facilities through the benchmarking process will have ASHRAE Level 2 energy audits done while also being informed by the building condition assessment if available. This will help identify the equipment that is at or near end-of-life and appropriate for replacement with high efficiency units. The audit will list measures in the first three categories for action with the cost, estimated savings and simple payback. The audit process will also investigate opportunities for transitioning fossil-fuel based equipment to electric equivalents, contributing to corporate emissions reductions goals.

Occupant Behaviour

Staff and visitors in buildings can make an important difference in energy use and a facility's carbon footprint but it is often a neglected area of focus. Through better communications and clear messaging of goals and practices and their importance, occupants can play a role in helping the City achieve its energy goals. Simple measures like communicating temperature setpoints or operating schedules for conservation can help set expectations with occupants and minimize occupant complaints.

The CCO/Energy Team will explore policies and standards that will engage occupants to conserve energy.

New Construction

New facilities have a life span of 30 plus years so much of a facility's lifetime energy use is designed at the beginning through envelope and HVAC design decisions as well as equipment purchases. These choices will have a long-term impact on the City's annual budgets. High efficiency equipment and building envelope choices made during design will save decades worth of energy costs and carbon emissions. This includes material selection which locks in embodied energy and carbon (energy and resulting carbon emissions required to extract, manufacture and deliver material) for the long-term.

Net-Zero Building Standard and Checklist

Net-zero carbon buildings are strategically designed with a combination of energy efficiency, renewable energy generation, and either eliminate or offset carbon emissions. In 2022 the City approved the Net-Zero Building Standard and Checklist for new municipally owned buildings. The standard was developed to help designers and consultants understand and implement the Net-Zero Building Strategy for buildings. Included in the document are the Net-Zero Building Standard and the Net-Zero Building Checklist that should be referred to when contemplating which performance measures are to be implemented.

Renewable Energy

The City has a landfill gas utilization facility where landfill gas is converted to electricity. Currently, the City is investigating the feasibility of transferring anaerobic digester gas from the neighbouring Wastewater Treatment Plant (WWTP) to the co-gen facility. The City will also be investigating opportunities to use thermal energy from the co-gen unit.

In Ontario, the electricity grid has a very low carbon intensity. While the intensity will be rising over the course of the five-year plan with the addition of more gas-fired generation, it will still provide clean energy. In this light, the choice to adopt renewable energy like solar PV should be based on the desire for better cost certainty rather than to reduce carbon emissions. The CCO/Energy Team will review opportunities to use renewable energy to offset energy costs or gain other benefits as technologies and market conditions change.

Areas of Focus

Table 5 identifies the facilities that have significant energy and emissions reduction potential through the benchmarking exercise. These will be prioritized for further investigation and taken through the operational optimization and /or retrofit process as appropriate. One of the largest consumers of energy is the Wayne Gretzky Centre. A recent feasibility study of the Centre lists a number of measures that would significantly reduce its energy consumption and emissions.

Other facilities that are large energy consumers are the water/wastewater treatment plants. These are currently being prioritized with an energy audit just completed on one plant (WTP). This has informed the roadmap for completing retrofits and opportunities for recommissioning.

Fleet and Transit Services

The general strategy for reducing emissions from fleet vehicles follows the principle described in the CCAP, namely reduce, improve, switch. For a detailed description and listing of specific strategies and measures for reducing fossil-fuel consumption with the fleet, refer to the CCAP.

In summary, the City currently has over 400 vehicles and uses 2.7 million litres of fuel which contribute to the City's carbon footprint. There are currently 14 electric light-duty vehicles with plans to add an additional eight EVs over the next four years. Key initiatives include:

- Tracking: the City will be upgrading its tracking systems for better accuracy
- Review consumption annually/quarterly
- Fleet Optimization Strategy: incorporates strategies for vehicle sharing and right sizing, green driving practices, optimizing vehicle usage and lifespan, fuel switching, etc.

- Behavioural & operational changes: driver training to reduce idling and reduce emissions and pollution
- Fuel switching:
 - investigating alternative fuel sources such as hydrogen and renewable natural gas (RNG)
 - continuing to replace with electric where feasible

Procurement

Equipment procurement

For end-of-life equipment replacement, the City will select the highest efficiency option feasible, such as ENERGY STAR equipment.

The CCO will explore opportunities to include energy efficiency and decarbonization as a factor in the City's Prioritization Matrix.

Programs and Other Initiatives

Specific training will be organized for building operators once the Building Operation and Maintenance Standard document has been developed to ensure they have the latest knowledge of optimal running and maintenance of HVAC equipment and energy management practices for their facilities.

There is activity across municipalities in Ontario to reduce energy and water consumption and emissions. The CCO/Energy Team will be liaising with some of these municipalities and develop closer relationships with their counterparts to learn best practices in operating facilities and undertaking capital projects with energy efficiency strategies.

Finally, the CCO/Energy Team will be investigating incentives during the planning of capital projects, including funding available from the Federation of Canadian Municipalities.

Systems

Tracking & Reporting

Having complete, accurate and easily accessed energy and water consumption data and costs for all facilities in the City is critical in order to optimally manage those utilities and costs.

The City has software to facilitate easier and more timely access to critical monthly utility consumption and cost data. This will enable the CCO and Energy Team to monitor data monthly and identify irregularities to building operators for investigation and adjustment.

The CCO/Energy Team will meet quarterly to review consumption, progress towards goals and review projects.

Facility operators will receive monthly reports on energy consumption for their facilities. Senior management will receive quarterly reports.

Annual consumption reports will be provided to Council with highlights and progress.

Communications

A good communications plan helps to build a culture of energy conservation within an organization and normalize activities that emphasize reducing unnecessary use of energy and water across all departments. The communications plan will inform audiences of activities and progress of the CCO/Energy Team, Building Operators and others as well as help inspire staff to take action and offer suggestions themselves. It will be targeted to these key audiences: staff, senior management, Council members and the community when appropriate.

The communications plan will:

- post good news stories and highlight energy projects on social media and other City media, such as the City's intranet
- provide annual/quarterly updates to Council and staff with highlights & progress
- highlight building operator activities that reduce energy and water consumption

Appendix A: 2023 Energy and Water Consumption, Intensity and GHG Emissions

Table 10: Building Energy Consumption, Intensity and GHG Emissions

Property Name	Street Address	Property Type	Gross Floor Area (sqft)	Total Energy Use (ekWh)	Electric Usage (kWh)	Natural Gas Usage (m3)	Energy Intensity (ekWh/sqft)	Electricity Intensity (kWh/sqft)	Natural Gas Intensity (ekWh/sqft)	GHG Emissions (t CO2)
Fire Hall - 3	7 Lynden Rd.	Fire Station	5,000	140,665	46,681	9,107	28.1	9.3	18.8	21
Fire Hall - 1	60 Clarence St.	Fire Station	15,556	426,634	186,405	23,278	27.4	12.0	15.4	60
Ambulance Station & Firehall 4	400 Colborne St.	Fire Station	13,000	253,767	87,656	16,096	19.5	6.7	12.8	38
Fire Hall - 2	21 Fairview Drive	Fire Station	10,550	225,555	95,347	12,617	21.4	9.0	12.3	32
Old Fire Hall - 2	311 St. Paul Ave.	Fire Station	3,400	37,756	2,482	3,418	11.1	0.7	10.4	7
Earl Haig	101 Market St. S.	Indoor Arena	8,100	463,326	184,366	27,031	57.2	22.8	34.4	67
Wayne Gretzky Centre	254 North park St.	Indoor Arena	319,600	13,379,508	6,895,607	628,285	41.9	21.6	20.3	1,768
Mohawk Park Pavillion	51 Lynnwood Dr.	Indoor Arena	8,500	169,999	65,767	10,100	20.0	7.7	12.3	25
Bell Homestead - (Main Facility Complex, Reception & Henderson)	94 Tutela Heights	Indoor Arena	15,000	110,641	-	10,721	7.4	-	7.4	21
Northridge Golf Course - (Pro Shop & Club House)	320 Balmoral Dr.	Indoor Arena	25,000	288,918	138,907	14,536	11.6	5.6	6.0	39
Arnold Anderson Stadium	35 Sherwood Drive	Indoor Arena	1,200	53,247	53,247	-	44.4	44.4	-	4

Property Name	Street Address	Property Type	Gross Floor Area (sqft)	Total Energy Use (ekWh)	Electric Usage (kWh)	Natural Gas Usage (m3)	Energy Intensity (ekWh/sqft)	Electricity Intensity (kWh/sqft)	Natural Gas Intensity (ekWh/sqft)	GHG Emissions (t CO2)
Arrowdale Golf Course - (Pro Shop & Club House)	282 Stanley St.	Indoor Arena	6,000	361	361	-	0.1	0.1	-	0
Brantford Public Library - Main	173 Colborne St.	Library	61,000	103,406	-	10,020	1.7	-	1.7	19
Brantford Public Library - Branch	441 St. Paul St.	Library	5,750	-	-	-	-	-	-	-
Glenhyrst Art Gallery - (Main Building & Coachhouse)	20 Ava Rd.	Museum	6,900	142,990	51,565	8,859	20.7	7.5	13.2	21
Landfill Compost Electricity (kWh)	511 Mohawk Street	Office	0	1,618	1,618		16,179.5	16,179.5	-	0
Parks Head Office - 1 & 3 Sherwood	1-3 Sherwood Dr.	Office	2,700	1,233,251	110,992	108,746	456.8	41.1	415.7	218
Public Works Yard	10 Earl Ave.	Office	20,000	997,204	176,960	79,481	49.9	8.8	41.0	167
Visitor & Tourism Centre	399 Wayne Gretzky Pkwy	Office	11,400	261,444	87,098	16,894	22.9	7.6	15.3	40
New City Hall	58 Dalhousie Street	Office	99,210	1,902,940	1,043,233	83,305	19.2	10.5	8.7	245
Old City Hall & Provincial Offence Courthouse	100 & 102 Wellington St.	Office	73,800	961,665	373,528	56,990	13.0	5.1	8.0	140
Landfill Scale House	20 Morrison Rd.	Office	400	179,025	179,025		447.6	447.6	-	15
Transit Terminal	64 Darling St.	Office	3,600	115,727	115,727		32.1	32.1	-	9
Farmer's Market	79 Icomm Dr.	Office	10,500	143,877	143,877		13.7	13.7	-	12
Market Square Mall	220	Office	73,280	423,896	423,896		5.8	5.8	-	34

Property Name	Street Address	Property Type	Gross Floor Area (sqft)	Total Energy Use (ekWh)	Electric Usage (kWh)	Natural Gas Usage (m3)	Energy Intensity (ekWh/sqft)	Electricity Intensity (kWh/sqft)	Natural Gas Intensity (ekWh/sqft)	GHG Emissions (t CO2)
	Colborne St.									
IT & Hydro Building	84 Market St.	Office	25,600	-	-	-	-	-	-	-
Landfill Administration Building	415 Mohawk Rd.	Office	2,800	-8,525,742	-8,525,742		-3,044.9	-3,044.9	-	-693
Herbert Street Storage	77 Herbert St.	Other - Public Services	2,700	87,215	3,324	8,129	32.3	1.2	31.1	16
Transit Garage	400 Grand River Ave.	Other - Public Services	66,000	2,030,628	885,996	110,914	30.8	13.4	17.3	285
Harmony Square Garage	120 Colborne St.	Other - Public Services	2,500	199,716	159,612	3,886	79.9	63.8	16.0	20
Parks Workshop	20 Catharine Ave	Other - Public Services	3,900	55,374	4,569	4,923	14.2	1.2	13.0	10
Oakhill Cemetery	17 Jennings Rd.	Other - Public Services	10,500	90,517	-	8,771	8.6	-	8.6	17
Traffic Services	33 Earl Ave.	Other - Public Services	40,000	430,208	93,807	32,597	10.8	2.3	8.4	70
Records Building	190 Aviation Avenue	Other - Public Services	14,000	107,400	-	10,407	7.7	-	7.7	20
Mt. Hope Cemetery	169 Charing Cross St.	Other - Public Services	13,500	37,322	11,315	2,520	2.8	0.8	1.9	6
Sanderson Centre	88 Dalhousie St.	Performing Arts	53,112	818,819	267,659	53,407	15.4	5.0	10.4	124

Property Name	Street Address	Property Type	Gross Floor Area (sqft)	Total Energy Use (ekWh)	Electric Usage (kWh)	Natural Gas Usage (m3)	Energy Intensity (ekWh/sqft)	Electricity Intensity (kWh/sqft)	Natural Gas Intensity (ekWh/sqft)	GHG Emissions (t CO2)
Police HQ	344 Elgin St.	Police Station	65,000	1,977,404	952,453	99,317	30.4	14.7	15.8	268
Tranquility Hall	335 Francis St.	Social/Meeting Hall	1,230	57,806	1,201	5,485	47.0	1.0	46.0	11
Eagle Place Community Centre	333 Erie Ave.	Social/Meeting Hall	11,760	264,832	28,070	22,942	22.5	2.4	20.1	46
Woodman Community Centre	491 Grey St.	Social/Meeting Hall	12,500	346,390	111,755	22,736	27.7	8.9	18.8	53
T.B Costain Community Centre	16 Morrel St.	Social/Meeting Hall	21,000	414,857	65,112	33,890	19.8	3.1	16.7	70
Civic Centre	69 Market St. S.	Stadium (Closed)	55,000	2,090,558	968,640	108,713	38.0	17.6	20.4	288
Lions Park	20 Edge St.	Stadium (Closed)	36,400	739,099	385,454	34,268	20.3	10.6	9.7	97

Table 11: Water and Wastewater Energy and Water Consumption, Intensity and GHG Emissions

Property Name	Street Address	Property Type	Gross Floor Area (sqft)	Total Energy Use (ekWh)	Electric Usage (kWh)	Natural Gas Usage (m3)	Water Volume (ML)	Water Energy Intensity (ekwh/ML)	GHG Emissions (t CO2)
106 Tollgate Water Pumping Station & Reservoir	106 Tollgate Rd.	Drinking Water Treatment & Distribution	100	509,325	509,325				41
180-182 Albion Water Pumping Station Booster & Waste Disposal Pumping Station	182 Albion St.	Drinking Water Treatment & Distribution	10,000	108,982	108,982				9
310 Campbell Water Pumping Station & Reservoir	310 Campbell St.	Drinking Water Treatment & Distribution	10,000	588,162	588,162				48
5 Kraemers Water Pumping Station & Reservoir	5 Kraemers Way.	Drinking Water Treatment & Distribution	10,000	1,087,228	1,087,228		3,019	360	88
Environmental Services Building & Water Treatment Plant	324 Grand River Ave.	Drinking Water Treatment & Distribution	92,000	9,519,797	7,721,475	174,256	14,049	678	963
119 St. Andrews Sanitary Pumping Station	119 St. Andrews Dr.	Wastewater Treatment Plant	376	29,296	29,296				2
215 Greenwich Sanitary Pumping	215 Greenwich	Wastewater Treatment	1,707	241,072	241,072				20

Property Name	Street Address	Property Type	Gross Floor Area (sqft)	Total Energy Use (ekWh)	Electric Usage (kWh)	Natural Gas Usage (m3)	Water Volume (ML)	Water Energy Intensity (ekwh/ML)	GHG Emissions (t CO2)
Station	St.	Plant							
24 Alexander Sanitary Pumping Station	24 Alexander Dr.	Wastewater Treatment Plant	1,262	16,294	16,294				1
25 Fifth Sanitary Pumping Station	25 Fifth Ave.	Wastewater Treatment Plant	869	63,970	63,970				5
33 Empey Sanitary Pumping Station	33 Empey St.	Wastewater Treatment Plant	1,740	203,878	203,878				17
4 Hansford Sanitary Pumping Station (Johnson)	4 Hansford Dr.	Wastewater Treatment Plant	1,070	38,726	38,726				3
50 Empey Sanitary Pumping Station	50 Empey St.	Wastewater Treatment Plant	1,740	157	157				0
8-14 Lawren S. Harris Sanitary Pumping Station (Northridge)	8-14 Lawren S. Harris	Wastewater Treatment Plant	1,314	39,364	39,364				3
85 Woodlawn Sanitary Pumping Station	85 Woodlawn Rd.	Wastewater Treatment Plant	664	43,637	43,637				4
87 Somerset Sanitary Pumping Station	87 Somerset Rd.	Wastewater Treatment Plant	848	64,664	64,664				5
Market Parkade & 59 Icomm	59 Icomm Dr.	Wastewater Treatment	2,600	710,379	710,379				58

Property Name	Street Address	Property Type	Gross Floor Area (sqft)	Total Energy Use (ekWh)	Electric Usage (kWh)	Natural Gas Usage (m3)	Water Volume (ML)	Water Energy Intensity (ekwh/ML)	GHG Emissions (t CO2)
Wastewater Treatment		Plant							
Waste Water Treatment Plant	385 Mohawk Rd.	Wastewater Treatment Plant	60,000	9,017,323	6,699,709	224,575	15,183	594	976
Wastewater Treatment System Electricity (kWh)	87 Stauffer	Wastewater Treatment Plant		27,254	27,254				2
Wastewater Treatment System Electricity (kWh)	Jennings Side Rd	Wastewater Treatment Plant		14,276	14,276				1
Wastewater Treatment System Electricity (kWh)	66 Mohawk St	Wastewater Treatment Plant		10,465	10,465				1
Wastewater Treatment System Electricity (kWh)	Jennings Side Rd	Wastewater Treatment Plant		1,861	1,861				0

Table 12: Total consumption, intensity and GHG emissions across all corporate buildings

	Gross Floor Area (sqft)	Total Energy Use (ekWh)	Electric Usage (kWh)	Natural Gas Usage (m3)	Energy Intensity (ekWh/sqft)	Electricity Intensity (kWh/sqft)	Natural Gas Intensity (ekWh/sqft)	GHG Emissions (t CO2)
Total	1,433,238	45,575,932	24,097,742	2,081,220	31.8	16.8	15.0	6,650

Appendix B: Summary of Practices in Other Municipalities

This summary surveyed six nearby municipalities: City of Burlington, City of Cambridge, City of Guelph, City of Hamilton, City of London, and the Town of Oakville with their projects and initiatives categorized by type.

Goals

Municipality	Goal
City of Cambridge	80% reduction in GHG emissions by 2050
City of Guelph	Reduce community GHG emissions by 63 per cent against the 2018 baseline by 2030. Work together to become a net zero carbon community by 2050
City of Burlington	Target year 2050 has been set for Burlington to become a net carbon neutral community, with an interim target of reducing emissions to 50% below 2016 levels by 2030.
City of Hamilton	Net-zero carbon emissions by 2050
City of London	Net-zero carbon emissions by 2050
Town of Oakville	Increase energy efficiency by 40% by 2041, reduce emissions by 50% by 2041 from 2016 baseline

Municipal Facilities

Municipality	Notable Projects
City of Cambridge	- Update Green Building Policy and Technical Standards - o Updated to require all new constructions or deeply renovated buildings undergo net-zero/alternative energy evaluations - Complete Building & Facility Utilization Assessments - o Identify operational and service delivery efficiencies - Develop De-Carbonization Plan for Buildings & Facilities - o Assess & develop de-carbonization plans for major city buildings and facilities - Pilot Building Energy Management System - Continue to Develop Alternative Work Strategies and Supportive Policies
City of Guelph	- LED lighting retrofits - multiple locations - Solar PV additions on select buildings - Built multiple Zero Carbon Buildings using the Zero Carbon Building design standard
City of Burlington	- Burlington Low Carbon New Building Guideline: Enhanced energy performance for new buildings. - o tiered set of performance measures that will require, incentivize and/or encourage new buildings to be built to a low carbon standard - Burlington Deep Energy Retrofit Program: Transforming existing buildings. - Renewable Energy Co-operative: Stimulating local renewable energy projects.

City of Hamilton	- Green Standards for New Buildings/ Moving toward Net Zero Buildings
	- Encourage Solar PV on New Buildings
	- Retrofitting Existing Buildings
City of London	- Transforming Buildings and Development
	○ The London Plan sets out clear direction for building inwards and upwards around a public transit system based on nodes ○ Work on the Masonville Secondary Plan embeds the principles of climate friendly development at the secondary plan level. ○ West 5, a Sifton Properties development, is one of Canada's first and largest net-zero communities.

Water

Municipality	Notable Projects
City of Cambridge	- Assess the Feasibility of Micro-Hydro Turbine Systems When Installing or Upgrading Existing Wastewater Infrastructure - Opportunistically Replace Diesel Powered Backup Generators with Energy Efficient Natural Gas Generators
City of Guelph	- Improved pumping station efficiency - Water Resource Recovery Centre aeration upgrades - Water efficiency programs - Raingarden Rebate program

Transportation/Fleet

Municipality	Notable Projects
City of Cambridge	- Conduct Fleet Data Analysis with Sustainability Focus - Develop a Low-Carbon Fleet Master Plan - Develop and Implement a Fleet Rightsizing Operational Procedure - Continue to Opportunistically Switch Off-road and Hand-Held Equipment to Electric
City of Guelph	- Fleet electric vehicles - Protected cycling infrastructure - Develop cycling tourism - 'Complete Streets' philosophy - Transit Action Plan implementation
City of Burlington	- Integrated Mobility Plan: Transit service improvements to reach mode share targets. - Electric Mobility and Equipment: Encouraging the adoption of electric mobility and equipment.
City of Hamilton	- Expand Active Transportation Networks - Decarbonize Transit - Expand Transit and E-mobility Services - Establish a City-wide EV Strategy - Commercial Fleet Decarbonization Working Group - Limit Parking and Incentivize EVs
City of London	- Transforming Transportation and Mobility

	○ London's 2018 Complete Streets Design Manual is being implemented to provide streets which are design to be safe for everyone and to include green infrastructure and low impact design features. ○ Implement Vision Zero road safety actions ○ Added a staff position dedicated to the implementation of active transportation infrastructure ○ Electrically assisted bicycles (e-bikes) have been introduced to support the delivery of municipal services such as parking enforcement. ○ Electric vehicle (EV) charging stations have been installed at most major City of London community centres
Town of Oakville	Transportation Efficiency - Continue to integrate Transportation Efficiency targets and emissions lens into municipal planning tools and processes as well as master plans - Increase public electric vehicle charging stations at municipal owned sites - Pursue opportunities to electrify local transit and corporate fleets

Community

Municipality	Notable Projects
City of Cambridge	- Update Asset Management Plan and Policy ○ include the objective of investing in and upgrading assets to mitigate and adapt to climate change - Incorporate Life Cycle Considerations into Capital Planning and Purchases ○ Use publicly available or low-cost Life Cycle Analysis (LCA) tools for energy and GHG emissions in budget and capital planning and asset management - Develop a Sustainable Purchasing Policy - Develop A Corporate Energy Savings Policy and Terms of Reference ○ tracks any operational budgets saved, as a result of energy conservation and demand initiatives - Develop a Sustainable Infrastructure Rating System Policy - Develop an Internal Cost of Carbon Policy - Establish Dedicated Sustainability Planning Resource(s) ○ champions the implementation of the energy and GHG reduction initiatives identified within the ECDM Plan, track and report progress
City of Burlington	- Industrial Innovation Program: Reducing energy demands by industry
City of Hamilton	- Industrial Energy Efficiency and Decarbonization Working Group - Establish a Clean-tech Accelerator ○ support the development of a clean-tech accelerator to prioritize and accelerate the development of technologies necessary for the decarbonization of the steel and other local industries. - Expand Local Industrial Energy Management Training Programs ○ work to expand local industrial energy management training programs

City of London	- Increasing knowledge, Research and Innovation ○ Western University and Fanshawe College including courses, programs and organizations that address sustainability and climate change ○ developed a Teachers Toolkit that provides London-specific information on climate change and our environment including topics of water quality, stormwater, wastewater management, and water efficiency for elementary school students to understand the value of water resources ○ working with partners such as Project Neutral to develop lesson plans built around the use of Project Neutral's carbon footprint calculator
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Town of Oakville	Industrial Efficiency - Establish a community of practice to share industrial energy management expertise Home and Building Efficiency - Incorporate a company to deliver standardized retrofits based on the results of the business case - Complete a business case for establishing an Energy Performance Labelling Program for homes and buildings in Oakville - Establish Energy Performance Labelling Program based on the results of the business case - Continue to integrate Home and Building Efficiency targets into municipal policy, regulations and processes, and ensure municipal measures are identified to achieve this strategy: ○ investigate application of Community Improvement Plans (CIPs), Local Improvement Charges (LICs), Tax Increment Financing (TIF) and planning tools (e.g. urban design guidelines, zoning, etc.)
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Appendix C: Emissions and Conversion Factors, Utility Costs

GHG Emissions Factors

Electricity 2023: 81.3 gCO₂/kWh

Natural gas: 1,921 gCO₂/m³

Gasoline 2023: 2,307 gCO₂e/l

Diesel 2023: 2,681 gCO₂e/l

from Government of Canada Environment and Climate Change Canada Data Catalogue, December 7, 2023, and Emissions Factors and Reference Values, June 2023

Conversions

Natural gas: 1 m³ = 10.32 kWh

Utility Unit Costs 2023

Electricity: \$0.15/kWh

Natural gas: \$0.438/m³

Gasoline: \$1.54/l

Diesel: \$1.67/l

from Jupiter Energy Advisors data and Ontario Fuel Prices Data Catalogue