

2024-2028 Corporate Conservation and Demand Management Plan

July 2024



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ClimateAction



Land Acknowledgement

We acknowledge that we are gathered today on the traditional lands of the Anishinaabek (AUh-nish-in-ah-bek), Haudenosaunee (Ho-den-no-show-nee), Lūnaapéewak (Len-ah-pay-wuk) and Attawandaron (Add-a-won-da-run).

We acknowledge all the treaties that are specific to this area: the Two Row Wampum Belt Treaty of the Haudenosaunee Confederacy/Silver Covenant Chain; the Beaver Hunting Grounds of the Haudenosaunee NANFAN Treaty of 1701; the McKee Treaty of 1790, the London Township Treaty of 1796, the Huron Tract Treaty of 1827, with the Anishinaabeg, and the Dish with One Spoon Covenant Wampum of the Anishnaabek and Haudenosaunee.

This land continues to be home to diverse Indigenous peoples (First Nations, Métis, and Inuit) whom we recognize as contemporary stewards of the land and vital contributors to society. We hold all that is in the natural world in our highest esteem and give honor to the wonderment of all things within Creation. We bring our minds together as one to share good words, thoughts, feelings and sincerely send them out to each other and to all parts of creation. We are grateful for the natural gifts in our world, and we encourage everyone to be faithful to the natural laws of Creation.

The three Indigenous Nations that are neighbours to London are the Chippewas of the Thames First Nation; Oneida Nation of the Thames; and the Munsee-Delaware Nation who all continue to live as sovereign Nations with individual and unique languages, cultures, and customs.

This Land Acknowledgement is a first step towards reconciliation. It is the work of all citizens to steps towards decolonizing practices and bringing our awareness into action. We encourage everyone to be informed about the traditional lands, Treaties, history, and cultures of the Indigenous people local to their region.



Executive Summary

The City of London (the City) has been committed to corporate energy management since the 1990s.

On July 1st, 2014, the City submitted its first Corporate Energy Conservation and Demand Management (CDM) Plan to the Ontario Ministry of Energy in compliance with the former Ontario Regulation 397/11 Green Energy Act (now O. Reg 25/23 Electricity Act 1998). The regulation also mandates municipalities to document and report on the results of their CDM plans and update their CDM Plans every five years. The development of the CDM Plan in 2014 was also vital to curb the increasing utility costs to the City.

This report meets the regulatory requirements by providing:

- The results from the 2019-2023 CDM Plan, documenting energy management initiatives implemented between 2019 and 2023 within various Service Areas, and
- The 2024-2028 CDM Plan, which outlines the goals and energy management initiatives to be undertaken by the City over the next five years.

2019-2023 CDM Plan Update

The 2019-2023 CDM Plan covered the City's plan to reduce energy use and greenhouse gas (GHG) emissions across its corporate service areas, including:

- Facilities and buildings owned and operated by the City of London;
- Wastewater treatment and pumping facilities and operations;
- Water distribution and storage facilities and operations;
- Street lighting; and
- Fleet vehicles and equipment.

The 2019-2023 CDM Plan was developed according to Ministry of Energy's direction to provide the City's annual energy consumption information to the public and set goals and actions for conserving energy and reducing greenhouse gas emissions from 2019 to 2023. However, the City's 2019-2023 CDM Plan went above and beyond regulatory requirements with the inclusion of vehicle fleet fuel use.

The 2019-2023 CDM Plan had primary goals and secondary goals and measurable action items to achieve these goals. The highlights of the 2019-2023 CDM Plan's performance are as follows:

- ✓ Achieved a 5% total energy reduction from the 2018 baseline year, meeting the primary goal of a 5% reduction.



- ✓ Exceeded energy efficiency (energy use per capita) target by achieving 16% reduction compared to the target of 10%.
- ✓ Reduced 915 tonnes per year of greenhouse gas emissions as a result of implementing energy efficiency projects, noting that the overall corporate energy-related greenhouse gas emissions increased by 2% (300 tonnes per year) due to the increase in carbon intensity of Ontario's electricity grid because of the increased use of natural gas for electricity generation.
- ✓ Achieved a 53% reduction in corporate energy-related greenhouse gas emissions compared to 2007 level.
- ✓ Avoided \$6 million in total energy costs over the last five years.
- ✓ Started monitoring and tracking the City's water consumption and water conservation initiatives.
- ✓ Established a target to achieve net-zero corporate emissions by 2045 through the Climate Emergency Action Plan (CEAP) approved in 2022.

New 2024-2028 CDM Plan

The new 2024-2028 CDM Plan builds on the successful foundation laid by the previous two CDM Plans. The new plan aligns with the City's 2023-2027 Strategic Plan, with "Climate Action & Sustainable Growth" as one of the main Areas of Focus, as well as aligns with the Climate Emergency Action Plan and its "Demonstrating Leadership in Municipal Processes and Collaborations" Area of Focus.

The 2024-2028 CDM Plan adopts an Enterprise-wide approach, developing greenhouse gas emission reduction initiatives where they are most suitable, based on:

- Available technology;
- Building or equipment life cycle timelines; and
- Funding and resources available.

The initiatives were developed through inter-divisional consultations and detailed energy consumption analysis for each service area.

Goals for the Next Five Years

The goals are divided into primary and secondary goals based on measurable initiatives that directly and indirectly contribute to the reduction of energy consumption and greenhouse gas emissions.



Primary Goals:

- 7% reduction in total energy use from 2023 to 2028; and
- 56% reduction in energy related GHG emissions from the 2007 baseline year by 2028.

The energy efficiency and conservation initiatives contributing to the primary goals are categorized as Planned and Proposed initiatives:

- Planned Initiatives: Measures with an approved business case that have been funded by City Council.
- Proposed Initiatives: Projects under investigation that will be developed into business cases and requested for future funding approval.

Implementing just the Planned measures will result in a seven per cent total energy reduction from 2023 to 2028, with an additional two per cent reduction achievable by implementing both Planned and Proposed projects. This combined effort is equivalent to a reduction of 2,270 tonnes per year of greenhouse gas emissions by 2028.

Secondary Goals:

- Foster a culture of conservation; and
- Develop a pathway to achieve net-zero corporate energy-related emissions by 2045.

Implementation and Funding

To implement these energy measures, the City's Service Areas will:

- Apply for federal and provincial incentives as they become available; and
- Utilize the new internal Climate Change Reserve Fund alongside existing internal funding sources such as the Effectiveness, Efficiency and Economy (EEE) Reserve.

Living Document

The 2024-2028 CDM Plan will be a dynamic document, providing a roadmap to enhance internal energy management knowledge and awareness. This will lay the groundwork for successful energy management decisions and actions across all corporate operations over the next five years and beyond.



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1. Background

In compliance with Ontario Regulation 25/23 under the Electricity Act, 1998, the Corporation of the City of London has developed its third iteration of the Corporate Energy Conservation and Demand Management (CDM) Plan, incorporating updated goals and initiatives. Since July 2014, this regulation has mandated that Ontario municipalities, universities, schools, and hospitals develop a CDM plan and update it every five years. These plans must address energy conservation and demand management strategies for buildings and facilities related to water or sewage treatment, regardless of whether they are heated or cooled. The regulation aims to promote energy conservation and demand management within the broader public sector.

1.1. Historical Commitment to Energy Management

The City of London has been dedicated to energy management and cost reduction since the early 2000s, with some initiatives dating back to the 1990s. Significant milestones include:

2007: The City began tracking and monitoring its energy consumption.

2009-2014: A series of reports were published to assess the City's energy management performance:

- *Past and Current Energy Management Activities*
- *Culture of Conservation – The Next Steps*
- *2011 Corporate Energy Consumption Report*
- *2011 Energy Consumption and Greenhouse Gas Emissions (Ministry of Energy)*

1.2. Impact of the CDM Plan

The introduction of the CDM Plan in 2014, mandated by the province, has streamlined the City of London's reporting of corporate energy management activities and initiatives to the public. The City has published two five-year CDM Plans so far:

2014-2018 CDM Plan: Targeted a 10% reduction in total energy consumption

2019-2023 CDM Plan: Targeted a 5% reduction in total energy consumption

The detailed performance of the previous CDM Plan (2019-2023) is outlined in Section 4 of this report, showcasing the City's commitment to continuous improvement in energy conservation and demand management. By adhering to these regulations and setting clear goals, the City of London demonstrates its commitment to sustainable energy practices and efficient resource management.

2. Commitment to Climate Change

Commitment to climate change, energy management, and conservation is essential for municipalities in Canada to reduce emissions, save costs, enhance resilience, improve public health, stimulate economic growth, meet regulatory requirements, engage communities, and ensure long-term sustainability in alignment with national and global climate goals.

City of London's Climate Emergency Declaration

In April 2019, the City of London declared a *Climate Emergency*. This declaration underscores the City's commitment to prioritizing climate change and its impacts.

Climate Emergency Action Plan (CEAP)

Following the declaration, City Council approved the [Climate Emergency Action Plan](#) (CEAP) in April 2022. The CEAP sets ambitious goals:

- Achieving net-zero emissions for the community by 2050
- Achieving net-zero energy-related emissions for corporate operations by 2045 along with interim targets
 - 65% reduction from 2007 levels by 2030
 - 75% reduction by 2035
 - 90% reduction by 2040

Strategic Plan Integration

To reinforce its commitment to climate action, the City has included "Climate Action and Sustainable Growth" as one of the eight Strategic Areas of Focus in the 2023-2027 Strategic Plan.

Alignment of CDM Plan with Climate Goals

The initiatives and targets of the current 2024-2028 CDM Plan are designed to align with both the City's CEAP and its Strategic Plan.

By integrating these efforts, the City of London is demonstrating leadership in sustainable growth and climate resilience, ensuring that its actions contribute to broader environmental and economic objectives.

3. 2024-2028 CDM Plan Goals

To ensure the success of the 2024-2028 CDM Plan, four goals have been established. The CDM Plan adopts an "Enterprise-wide" strategy to effectively meet the objectives outlined in both the CEAP and the 2023-2027 Strategic Plan. By integrating various energy efficiency and renewable energy measures across individual facilities, the City aims to maximize energy consumption reduction in the shortest timeframe possible where they are most suitable, based on:

- Available technology;
- Building or equipment life cycle timelines; and
- Funding and resources available.

The Plan has four distinct goals, categorized as primary goals and secondary goals to differentiate between those linked to energy consumption and those associated with initiatives promoting energy awareness.

Formulating Goals

These goals were developed through consultations with staff, managers, and directors using a "bottom-to-top" approach. This ensures that the goals are both realistic and ambitious, closely aligning with CEAP initiatives.

3.1. Primary Goals

Primary goals were developed by calculating the total energy and associated greenhouse gas emissions reductions from planned projects with approved budgets. These projects lead to measurable savings.

1. Seven per cent reduction in total energy use from 2023 levels by 2028.

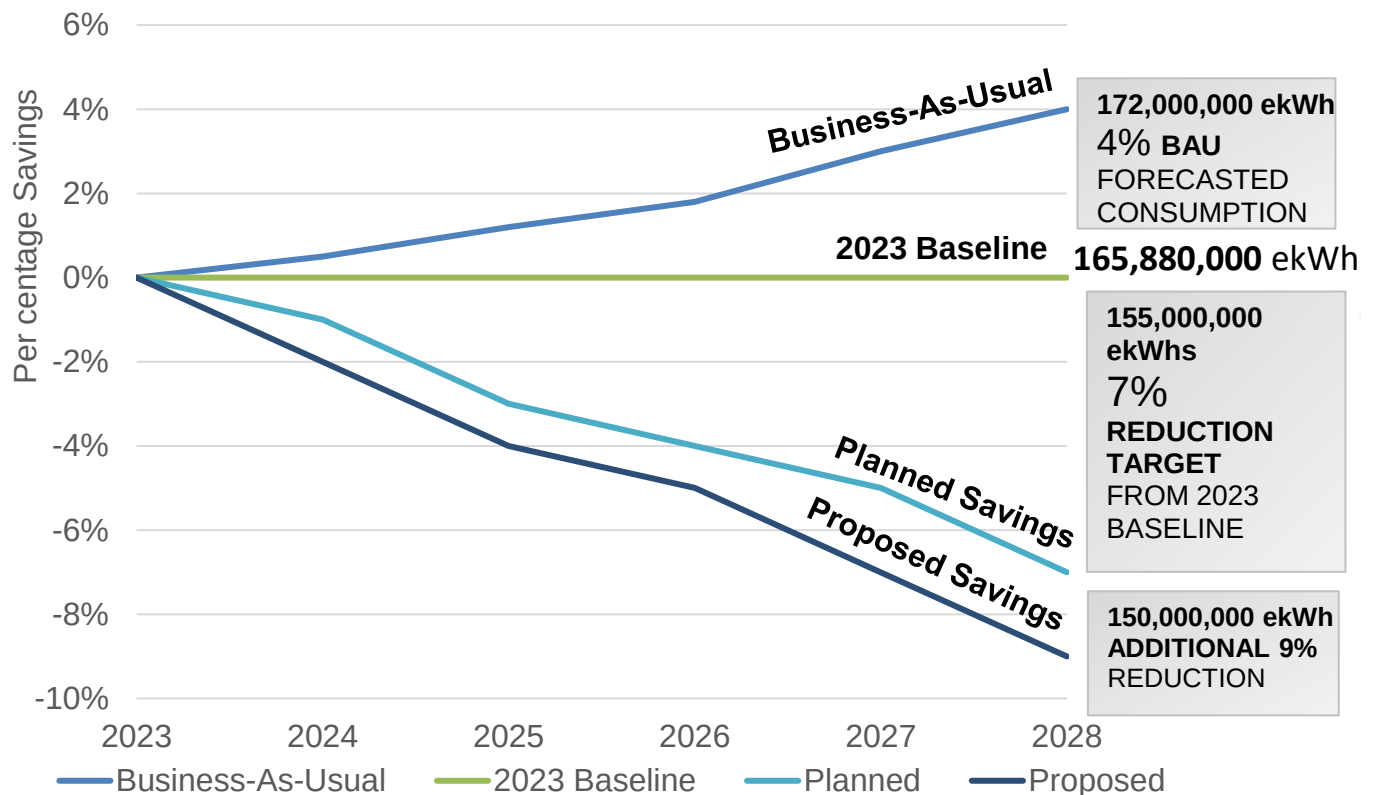
- This will be achieved by reducing 11,000 equivalent megawatt-hours per year of energy consumption by 2028.

Figure 1 illustrates the energy-related goals outlined in the 2024-2028 CDM Plan. The goal is to achieve a seven per cent reduction from 2023 levels by implementing all planned projects across various service areas. These planned projects have approved budgets.

A more ambitious goal of nine per cent can be achieved by implementing proposed projects, which will be presented to Council once business cases are developed and funding sources identified within the next four years. Comprehensive details and descriptions of both planned and proposed projects are provided in each Service Area section of this report.

In comparison, if the City does not implement any energy or decarbonization projects within the next four years, total energy consumption is projected to rise by four per cent, as illustrated in the Business-As-Usual (BAU) scenario in Figure 1.

Figure 1 - 2024-2028 CDM Plan Energy Goal



2. 56 per cent of GHG reductions from the 2007 baseline by 2028.

- This will be achieved by reducing 1,550 tonnes per year (or 8%) of GHG emissions from 2023 levels.

This assumes no change in the emissions intensity of Ontario's electricity grid from current levels.

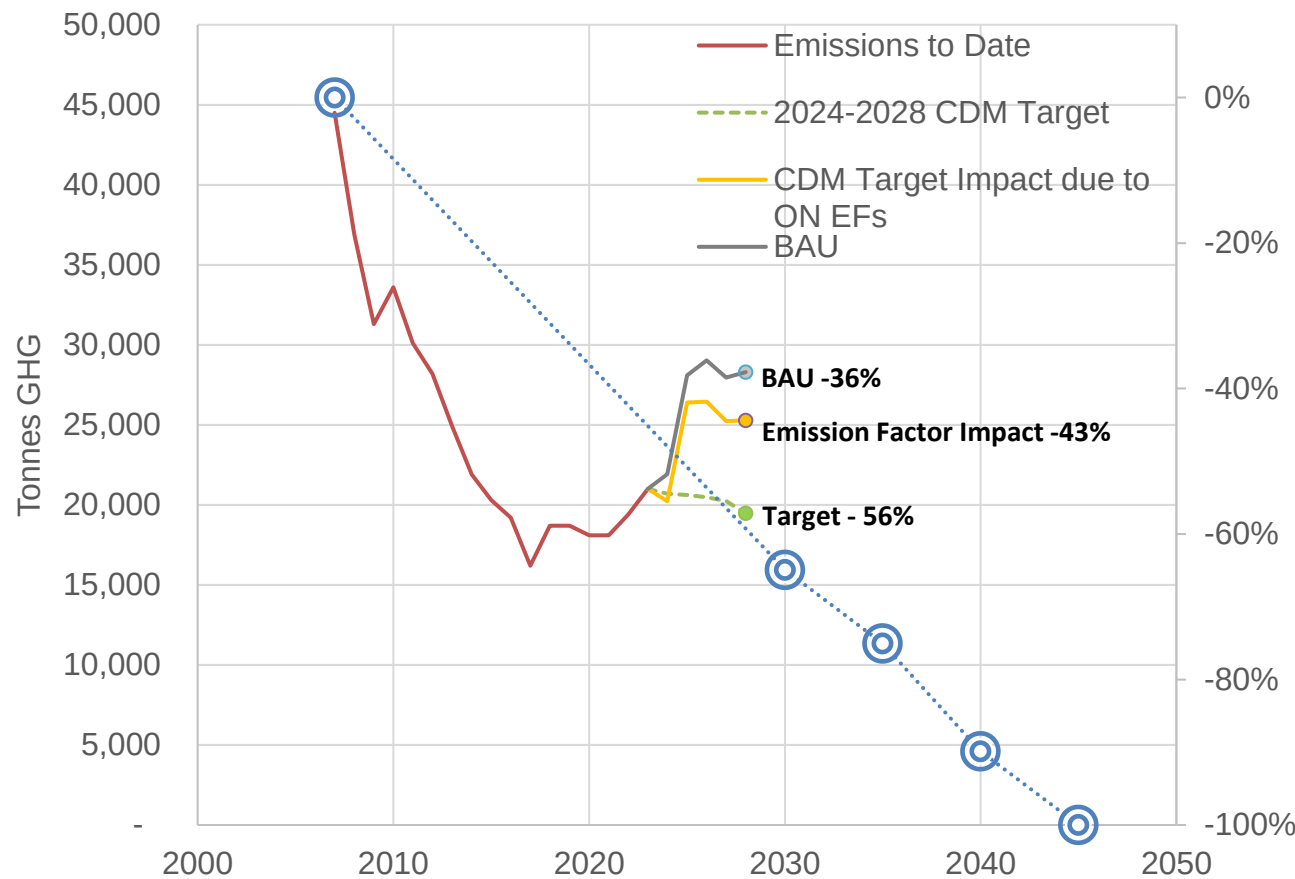
Figure 2 illustrates the corporate energy-related emissions to date, the 2024-2028 CDM Plan goal, and the CEAP targets. As depicted in the figure, the 2024-2028 CDM Plan goal is set at 56 per cent relative to the 2007 baseline year. An additional one per cent or 57 per cent reduction can be achieved by implementing proposed savings projects as described under primary energy reduction goal 1.

It is anticipated that the rise in Ontario's electricity grid emission factors (EFs), which fall outside the City's jurisdiction, will affect the City's corporate greenhouse gas emissions performance to CEAP greenhouse gas target. Due to ongoing refurbishments of nuclear plants in Ontario, there has been an increase in natural gas-powered generation which has increased the emission factor for the electricity grid. The details of an increasing grid electricity emission factor are explained the Section 5 of this report. The estimated impact of this forecasted increase in carbon intensity of the electricity grid would be for

corporate energy-related emissions to be 43 per cent below 2007 levels instead of the targeted 56 per cent reduction.

Conversely, if the proposed projects are not executed, total GHGs would increase by 8,800 tonnes in the next five years to up to 36 per cent below 2007 levels in a Business-As-Usual (BAU) scenario, as depicted in Figure 2. This would be a 35 per cent increase from 2023.

Figure 2 - 2024-2028 CDM Plan GHG Emissions Goal



3.2. Secondary Goals

Secondary goals are long-term initiatives that significantly impact greenhouse gas emissions and overall utility consumption. These goals promote energy awareness, a sense of responsibility, and support the City's CEAP and Strategic Plan.



1. **Foster a culture of conservation** by providing tools and resources that empower City staff to reduce energy consumption and contribute to sustainable practices.

The City launched the *Culture of Conservation* campaign in 2012 and has conducted several employee engagement events and activities since then. However, due to organizational changes and the pandemic, many energy awareness activities were delayed. Under the current CDM Plan, the Climate Change and Environmental Stewardship (CC&ES) team will lead and implement six specific activities to empower corporate employees to actively contribute to energy conservation efforts and promote sustainable practices within the organization.

2. Identify and develop a Net-Zero by 2045 Pathway for corporate energy-related greenhouse gas emissions.

With a Council-endorsed net-zero target by 2045, the City aims to develop a comprehensive plan to achieve this target for its operations. Currently, the City is investigating different scenarios for reaching the net-zero goal. These include:

- Investing solely in energy efficiency measures;
- Invest in a mix of energy efficiency and renewable energy measures as the technology advances; and
- Forecasting policy or regulation changes for use of renewable energy and establish a carbon offset policy.

The City engaged Blackstone Energy Services (Blackstone) and Stantec to complete decarbonization and renewable energy studies which will be major inputs to the net-zero pathway for reducing corporate emissions. These studies are anticipated to be completed by September 2024. Details of these two studies are as follows:

Decarbonization Study: The City engaged Blackstone to complete a decarbonization study for 36 municipally owned buildings to define the necessary strategic planning, technology, implementation timelines, government incentives, utility rate structures, grid emissions, funding, and implementation solutions to achieve the emissions outcomes defined in the CEAP. The main types of buildings included in the scope of this study are:

- Arenas
- Community Centres
- Fire Halls
- Office Buildings
- Senior Centres

The objectives and expected outcomes of the Decarbonization Study are:

1. Aim to reach net-zero by 2045.
2. Implementation of a decarbonization program leveraging grants, incentives, and innovative funding structures to maximize value for the City.
3. Reduce deferred maintenance and replace end of life equipment and systems.
4. Offset electricity consumption with on-site renewable generation and generate revenue when possible.

Solar PV Study at Water and Wastewater Sites: Renewable energy such as net-metered solar PV installations at water pumping and wastewater treatment sites is ideal as both these operations are 90 per cent dependant on electricity from the grid. Solar PV installation at these sites would reduce corporate emissions associated with using electricity from the grid (especially in the short term with increased grid emission factors in Ontario) and reduce uncertainty associated with electricity costs which are projected to increase by more than 50 per cent in the next 15 years.

As part of this study, Stantec performed a high-level assessment for solar projects on City's water and wastewater properties as identified below. Modelling was done to assess where solar PV panels could be placed and included ground-mounted racks, tank-mounted racks, and parking canopies. This study will also include estimated costs for solar projects for the five locations listed as follows:

- Greenway Pollution Control Plant (PCP)
- Vauxhall PCP
- Pottersburg PCP
- Adelaide PCP
- Arva Water Pumping Station

With input from the above-mentioned studies and internal staff engagement, the CC&ES team aims to complete the Net-Zero by 2045 Pathway for Corporate operations within the current CDM Plan timeframe.

4. Review of the 2019-2023 CDM Plan

The implementation of the 2019-2023 CDM Plan was successful, with 95 per cent completion of the planned projects and the achievement of the energy reduction goal of five per cent. The performance against goals is outlined next, and project highlights for each service area are listed in their respective sections of this report. Additionally, a detailed list of completed past energy projects is provided in Appendix A.

4.1. Performance to Goals

The 2019-2023 CDM Goals were categorized into primary and secondary, using 2018 as the baseline year. Primary goals were the focal point, driving the achievement of secondary goals and long-term goals and initiatives with a significant impact on greenhouse gas emissions and total utility consumption.

The primary goals included:

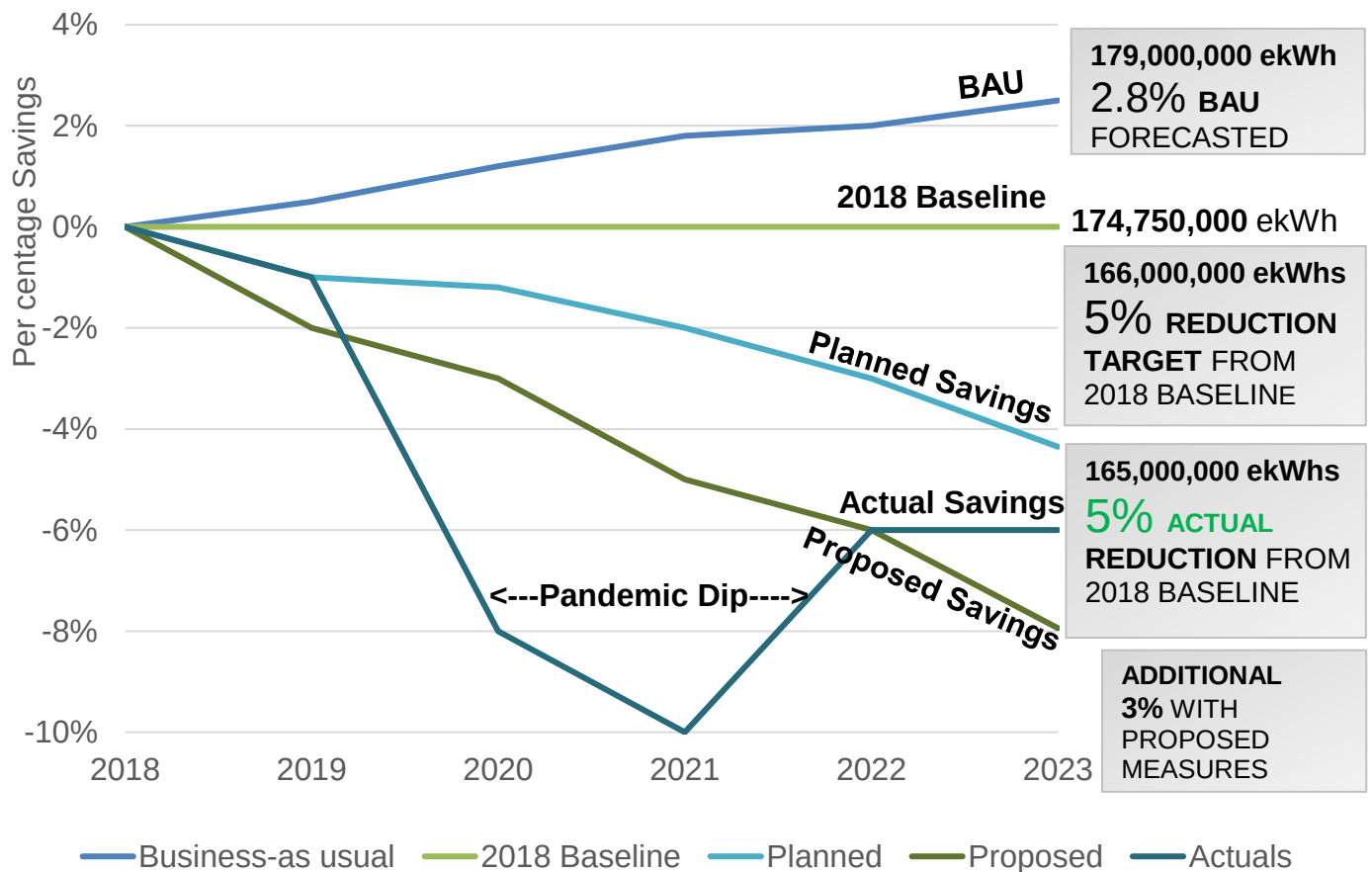
1. Total energy reduction of 5% by 2023, tied to this are:
 - a. 10% decrease in energy use per capita
 - b. 900 tonnes of avoided GHG emissions by 2023; and
2. Keep total energy cost increases within 5% from 2018 baseline year.

The secondary goals included:

1. Monitor and track City of London's corporate water consumption starting 2018; and
2. Investigate possible pathways for achieving net zero emissions by 2050 or sooner (2030, 2040).

Primary goals were established by encompassing all planned, behavioral, and proposed initiatives aimed at measurable savings. The performance against primary and secondary goals is illustrated in Figure 3 and detailed in Table 1.

Figure 3 2019-2023 CDM Plan Target & Performance



As shown in Figure 3, the 2019-2023 CDM Plan's energy performance goal was met. The performance in 2020 and 2021 was influenced by COVID-19 restrictions. A similar consumption pattern continued in 2021. However, corporate energy management activities also continued during this period which led to the six per cent reduction overall in 2023.

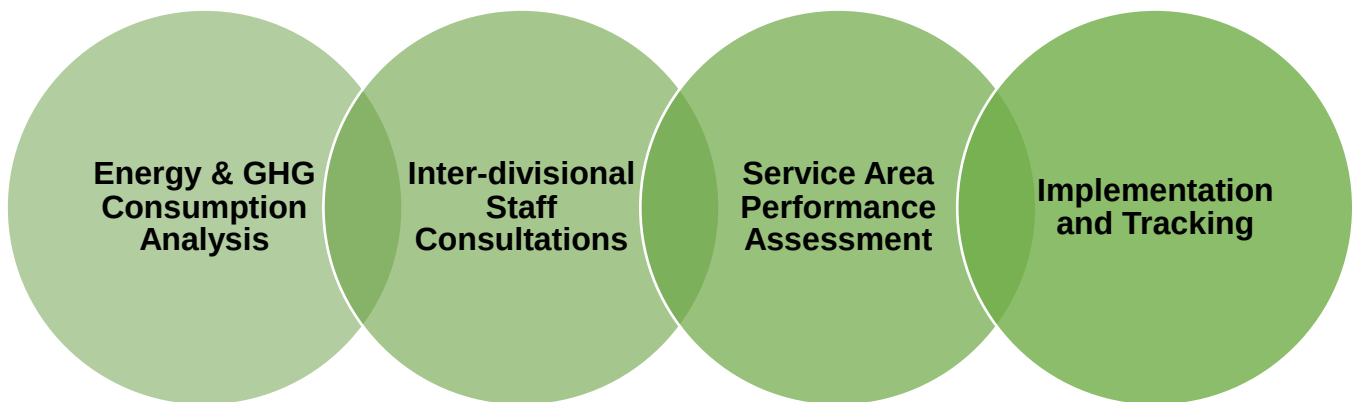
A breakdown of this goal and performance to secondary goals is explained in Table 1.

Table 1 2019-2023 CDM Performance to Goals

Goals	2018 Baseline	2023 Reduction Goal	Progress as of end of 2023	Comments
<u>Primary (short-term)</u>				
Total energy use (million ekWh/year)	174	166	165	5% reduction in total energy to a target of 5%
Total GHG (tonnes)	18,700	17,800	21,000	Impact of increased Ontario electricity grid carbon intensity is 3,600 tonnes or 21 percent. Electricity related emissions increased by 120% between 2018 and 2023 and natural gas emissions reduced by 13% during the same time.
Energy Per Capita (ekWh/pp)	435	392	367	As the city operations are expanding to meet the rapid population growth in the last five years the total per capita energy target exceeded expectations by achieving 16% reductions to a target of 10%.
Energy Costs (millions)	\$18.0	\$18.8	\$19.1	Utility costs increase is not entirely under city's control. Even though total consumption dropped by 6%, utility costs increased by 7%. The global fossil fuel market and the nuclear plant refurbishments underway in Ontario are all impacting the utility price increase. Carbon pricing contributed to 5% of the total utility cost in 2023
<u>Secondary (long-term)</u>				
Monitor, track, and develop conservation initiatives for Water.	Starting 2019	On-going	On Target	Started tracking, monitoring, and reporting on water conservation projects, corporate consumption, and costs since 2019.
Investigate Net-Zero emissions target	Starting 2020	By 2023	On Target	With the CEAP in progress City has set a Net-Zero target by 2045.

5. 2024-2028 CDM Development Strategy

Staff from the City's Climate Change & Environmental Stewardship section informed the development of the 2024-2028 CDM Plan by analyzing current consumption, conducting service area staff reviews and past performance and resources identification. Through this systematic approach, City staff created a comprehensive and adaptable plan aimed at enhancing sustainability across the organization.

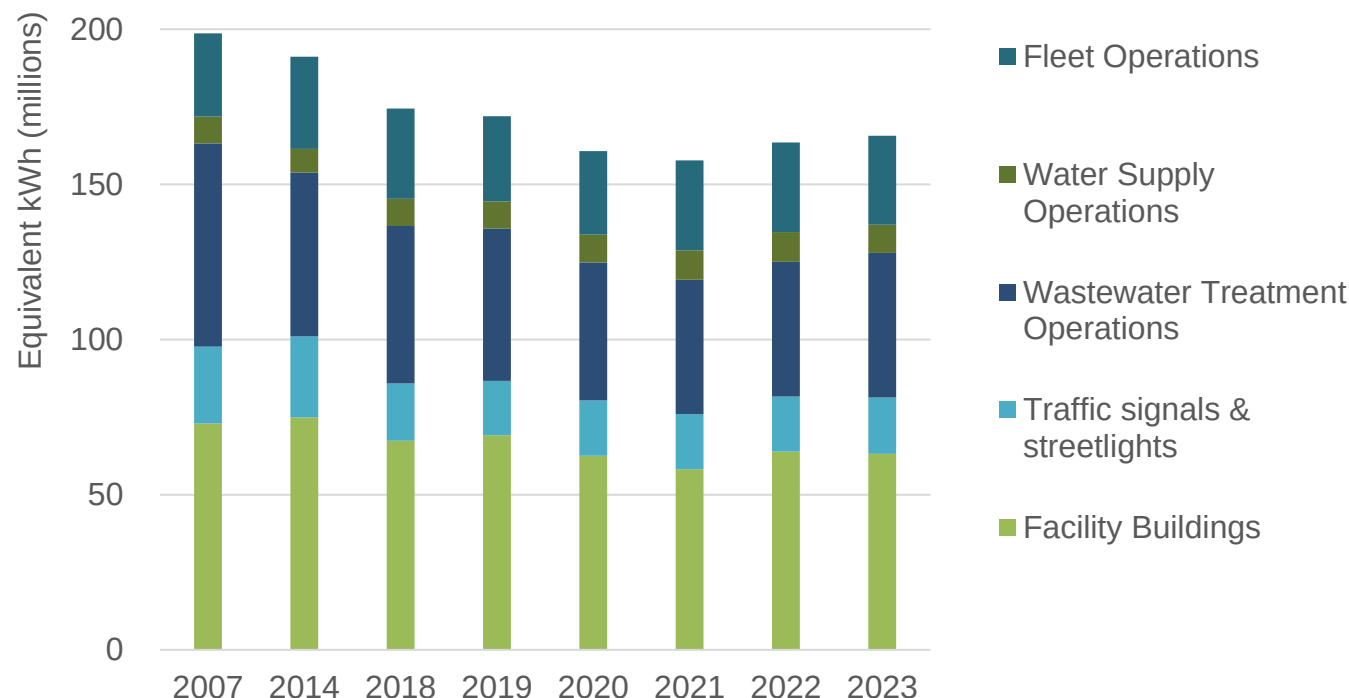


5.1. Energy Consumption and GHG Analysis

The 2024-2028 CDM Plan goals were developed by reviewing total energy consumption, emissions, and cost trends for the previous five years. The City has expanded its portfolio of buildings by 3,900 square metres (42,000 square feet) by adding the new East Lions Community Centre in 2021. Currently, City operations span over 480,000 square metres (5.2 million square feet) and has 249 utility meters. The total City operations have been divided by operational type as follows to better understand the unique energy portfolio within the City's operations:

- Facility buildings
- Wastewater treatment operations
- Water supply operations
- Traffic signals & streetlights
- Fleet operations

Figure 4 Total Energy Use by Service Area Categories



There has been a consistent decline in total energy consumption year over year, resulting in an overall five per cent reduction from 2018 to 2023 as shown in Figure 4. However, greenhouse gas emission have increased by twelve per cent (2,300 tonnes per year) in the last five years due to the impact of higher carbon intensity of Ontario’s electricity grid, but overall, there has still been a reduction of 53 per cent since 2007. A detailed analysis of energy use, greenhouse gas emissions and utility cost analysis are listed in Appendix C.

5.2. Inter-divisional Staff Consultations

City of London takes a ‘Enterprise-wide’ approach in managing its Corporate energy activities. The structure of corporate energy management within the City is identified in Figure 5.

A series of staff meetings were held for Service Areas whose operations have direct control over energy use and greenhouse gas emissions. A review of current consumption, proposed purpose of the 2023-2028 CDM Plan, direction, and ingredients for future success were discussed in these meetings. A collaborative process to implement the key initiatives in the 2024-2028 CDM Plan was introduced.

These focused meetings facilitated sharing of best practices and identification of opportunities and requirements that will work towards achieving the overall GHG goals of the 2024-2028 CDM Plan. These are identified in Figure 6.

Figure 5 Corporate Energy Management Structure



Figure 6 Strengths and Opportunities for Improvement



The key measures identified by staff are divided into planned and proposed measures:

Planned measures lists all the projects that have funding assigned in the current multi-year budget. These measures are included in existing capital and operating forecasts. All of these measures are near-term actions within each Service Area and supports the proposed 2028 goals. By 2028, these initiatives are expected to account for seven per cent of corporate energy use reduction and 1,550 tonnes per year of greenhouse gas emission reductions from 2023 levels.

Proposed measures are built upon planned measures and initiatives and required operational or policy changes. Business cases will be required to justify project funding. Capital budgets will be impacted by the additional qualified and approved projects. These initiatives will rely heavily on staff time, additional dedicated human resources and additional capital investment and will account for additional two per cent of corporate energy use reductions and 720 tonnes per year of greenhouse gas emission reductions.

The measures identified in the staff meetings provided specific guidance and direction to set new goals that were realistic and achievable. These measures are elaborated further under each service area, Section 5.3 of this report.

5.3. Service Area Performance Assessment

It is important to note that for the success of the 2024-2028 CDM Plan, Service Areas need to adopt and implement measures identified in this plan. The Service Areas that include planned and proposed measures are categorized into Facility Buildings, Water Supply Operations, Wastewater Treatment Operations, Traffic Signals & Streetlights, and Fleet Operations (Figure 7).

5.3.1. Facility Buildings

Facilities is responsible for the design, construction, energy management, life cycle renewal works, and maintenance of facilities operated by the City except for streetlights, water and wastewater treatment and Fleet.

5.3.1.1 Energy Use and GHG Emissions

Facilities maintains and operates over 95 sites, 279 buildings, 304 hectares (750 acres) of property and approximately 315,870 square meters (3,400,000 square feet) of owned and leased space.

Currently, Facilities contributes the highest (39 per cent) greenhouse gas emissions in the City due to the dependence on fossil fuel for building heat. This is followed by Fleet at 34 per cent as shown in Figure 8.

Figure 7 Greenhouse Gas Emissions by Service Area Categories

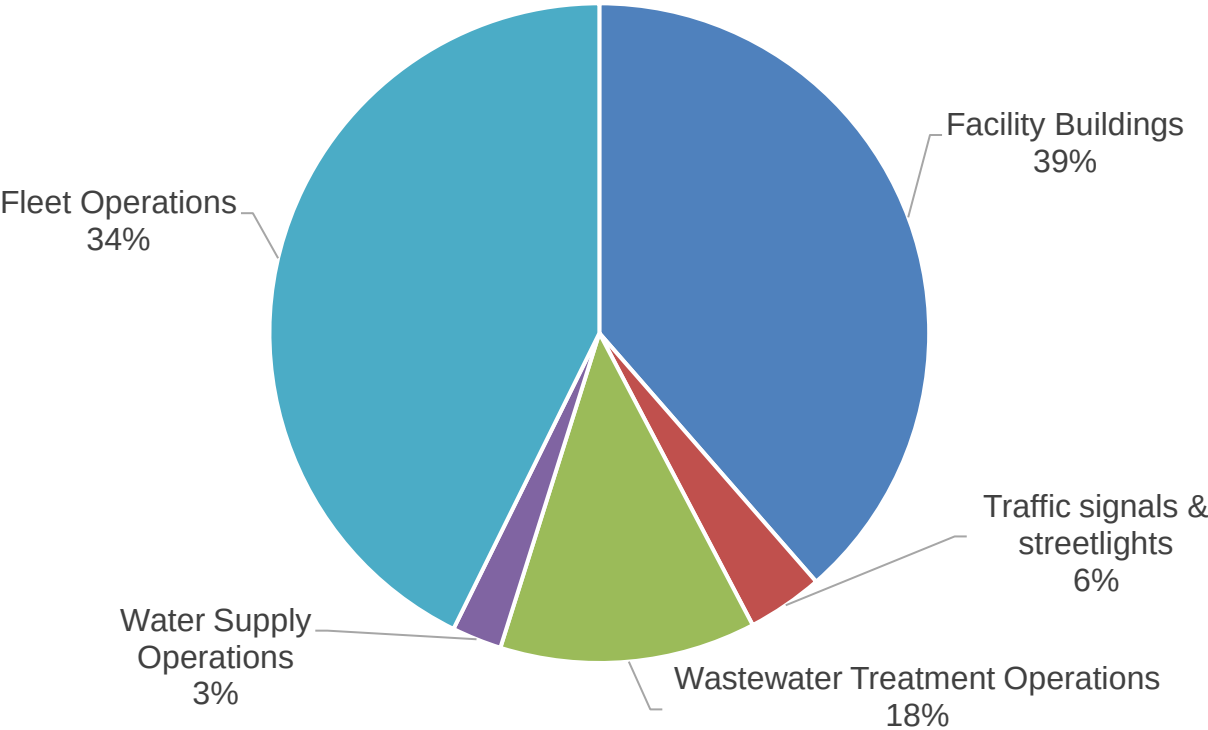
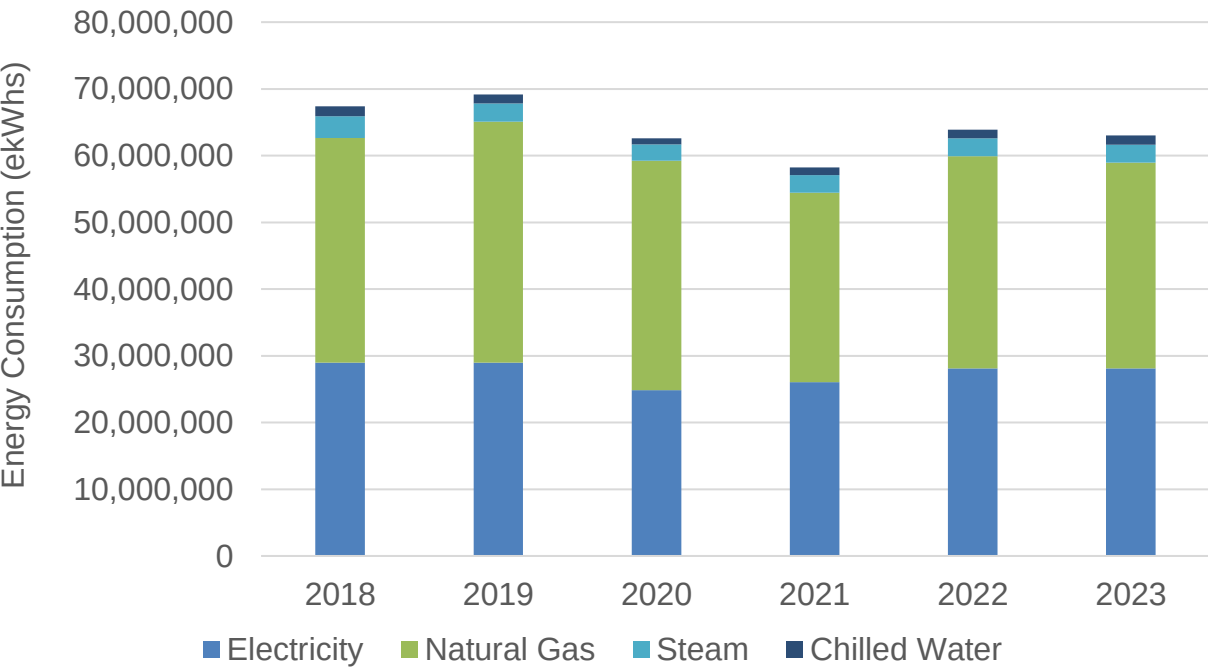


Figure 8 Facilities Energy Consumption by Commodity



About 95 per cent of the City's facility buildings are heated using natural gas, except for the downtown office buildings (e.g., City Hall, J. Allen Taylor Building), which are heated and cooled by a district heating system managed by Enwave.

Over the past five years, total energy consumption across all City facilities has decreased by five per cent.

With the goal of reducing greenhouse gas emissions from City buildings, Facilities has proposed 36 decarbonization heating, ventilation, and air conditioning (HVAC) projects with two deep building retrofit projects in the 2024-2028 CDM Plan. These projects are expected to reduce total energy consumption by eight per cent and cut greenhouse gas emissions by 990 tonnes per year over the next five years. These projects are part of the regular lifecycle renewal of HVAC equipment, which helps to make a stronger business case for decarbonization efforts.

5.3.1.2 2018-2023 CDM Plan Energy Conservation Measures

Facilities has consistently invested in energy conservation, adopting newer and greener technologies. In the last five years, Facilities implemented 14 energy projects in buildings that resulted in \$150,000 in annual savings (Table 2). A detailed list of past energy projects is provided in Appendix A.

Table 2 Facility Buildings – 2019-2023 CDM Energy Project Savings

Service Area/Utility Type	Energy Savings (kWhs/year)	Incentives	Utility Cost Savings/Year	GHG Reductions (tonnes/year)
Facilities – Electrical	760,000	\$ 105,000	\$ 108,000	43
Facilities – Natural Gas	130,000	N/A	\$ 21,000	27

Lighting Retrofits: In 2022, Facilities participated in IESO's Auction Pilot program where it replaced seven arena pad lighting systems with LEDs (Figure 9) and upgraded all the lights to LEDs at North London Optimist Community Center. This project received \$92,000 in incentives from the IESO. This project costed \$650,000 and resulted in 650 megawatt-hours of electricity savings per year, which is equal to \$103,000 in electricity cost savings per year.

In addition to the above-mentioned program, facilities have also replaced indoor and outdoor lights with energy efficient LEDs at Canada Games Aquatic Centre, Dearness Home, and the Adelaide Operations Centre as part of the life cycle replacements and on-going energy efficiency initiatives. This initiative received \$9,000 in incentives from the IESO.

Additionally, at the J. Allen Taylor building, Facilities replaced the existing lights with smart LED lights with individual dimming capability. This resulted in \$10,000 in annual electricity savings and received \$4,000 in incentives from the IESO.

Figure 9 Earl Nichols indoor ice rink with new LEDs



HVAC optimization at Fire Hall and Civic Garden Complex: Roof Top Unit (RTU) coils were treated to offer better heat transfer rate using Blue Box technology at Fire Hall 2 and Museum London as part of maintenance project.

Boiler performance improvement projects were completed at Fire Hall 1 and Civic Garden Complex where Endotherm additives applied to the boiler loop increased heat transfer efficiency.

Solar PV at New East Lions Community Centre: As a demonstration project, the City invested in a 10-kilowatt PV array, placed on the roof of the East Lions Community Centre. This unit generates 12,500 kilowatt-hours of electricity annually.

5.3.1.3 Planned 2024-2028 CDM Measures

Facilities is undertaking decarbonization projects as part of the building HVAC life cycle renewal upgrades. The total expected energy savings from planned projects is 5,000 equivalent megawatt hours and 990 tonnes per year of avoided greenhouse gas emissions. Measures listed so far are focused on the following energy savings initiatives:

- Energy management upgrades
- Heating, ventilation, and air conditioning (HVAC) upgrades
- Lighting upgrades
- Deep energy retrofits

A detailed list of planned and proposed 2024-2028 energy conservation projects are provided in Appendix B, including several described below.

Deep Energy Retrofits – Kinsmen Arena (Figure 10): This project is expected to increase energy efficiency of the existing building by 43 per cent which will result in a 167 tonnes per year reduction of greenhouse gas emissions. The energy retrofit components of this project include:

- Renewal of existing hydronic distribution, Building Automation System (BAS) HVAC infrastructure.
- Construction of a new central heat pump plant.
- Installation of electric personal mobility device charging infrastructure
- Installation of a new modified bitumen roof and structural upgrades for a future solar project

The estimated cost of this project is approximately \$2.7 million. This project has been approved for the Federal Green and Inclusive Community Buildings (GICB) funding which will cover 80 per cent (\$2.1 million) of the project costs, with the City of London contributing the remaining \$550,000. Currently a detailed design and planning is underway with construction to begin in 2025.

Figure 10 Kinsmen Arena Building



Deep Energy Retrofit – Earl Nichols Arena: The expected energy savings from this project are 43 per cent along with 200 tonnes per year reductions in greenhouse gas emissions. The energy retrofit components of this project include:

- Replacement of existing ice plant with new heat pump plant coupled to geothermal energy system to capture of waste heat from the existing ammonia refrigeration plant;
- Replacement of existing natural gas fired appliances with electric;
- Installation of a new hydronic HVAC system including electric heat pump; and
- Installation of high-contrast painting and electric personal mobility device charging stations.

This project has also been approved under federal GICB funding which covers \$2 million, or 80 per cent of the project costs, with the balance covered by the City's contribution of \$600,000.

Heat Pump Rooftop Unit at Carling Arena: This project is replacing an existing gas-fired rooftop unit (RTU) with hybrid heat pump RTUs. The new RTUs will run mostly on electricity in heat pump mode which is up to 300 per cent more efficient than traditional RTUs. However, these units utilize natural gas as a backup source of heat during extreme cold weather days to ensure uninterrupted service.

This project is planned to be completed in 2025 with estimated annual energy savings of 201,000 equivalent kilowatt-hours and 45 tonnes per year reduction in greenhouse gas emissions.

5.3.1.4 Proposed 2024-2028 Energy Measures

In addition to the planned energy projects, the City is targeting an additional two per cent reduction in overall energy use (resulting in 116 tonnes per year greenhouse gas emissions reduction) in City facilities from:

- Energy Management System (EMS) optimization projects which will be undertaken as part of life cycle renewal of the HVAC system in various facilities buildings.

5.3.2. Wastewater Treatment Operations

Wastewater Treatment Operations focuses on treating sewage to meet Ministry of Environment, Conservation & Parks standards. Its initiatives aim to optimize energy use, maintain treatment standards, and enhance on-site energy generation and recovery. The initiatives in this plan build on energy projects from the past five years.

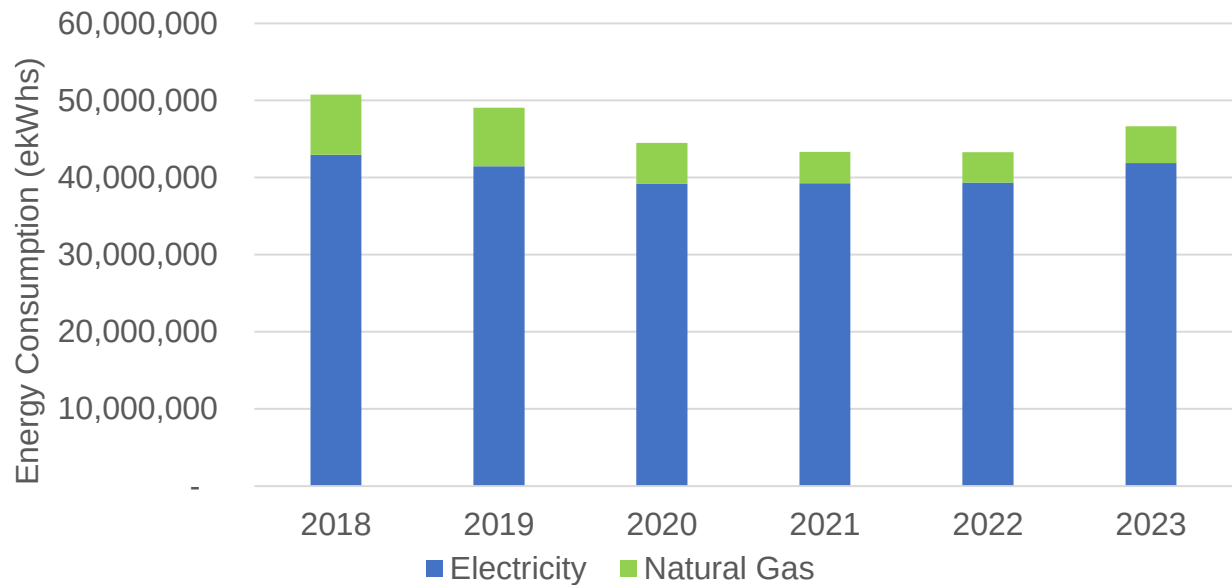
5.3.2.1 Energy Use and Greenhouse Gas Emissions

The City owns and operates five wastewater treatment plants (WWTPs) and 36 pumping stations to assist wastewater flow to plants from gravity sewers or force mains. A new Dingman creek pumping station under construction and expected to be in operation in the next five years.

Currently, the wastewater treatment plants have the second highest (29 per cent) total energy consumption after facilities, but it contributes only 18 per cent of total City

greenhouse gas emissions (as shown in Figure 7) due to its high dependence on electricity for processing sewage (as shown in Figure 11).

Figure 11 Wastewater Treatment Operations Energy Use by Commodity



5.3.2.2 Past Energy Conservation Measures

As shown in Figure 11, both natural gas and electricity consumption have decreased each year, resulting in a 40 per cent reduction in natural gas and a three per cent reduction in electricity from 2018 to 2023.

The electricity reduction is due to the ultraviolet light (UV) disinfection upgrade project, while the natural gas reduction is due to the temporary shutdown of the Greenway plant’s sludge incinerator during the Organic Rankine Cycle (ORC) engine installation. Other contributing factors include completing HVAC upgrades at the Grit Building in the Adelaide and Greenway wastewater treatment plants by the end of 2019. All these projects together resulted in \$1 million in energy savings per year and received \$750,000 in incentives as shown in Table 3.

Table 3 Wastewater Treatment Operations - 2019-2023 CDM Energy Project Savings

Service Area	Energy Savings (ekWhs/year)	Incentives	Utility Cost Savings/Year	GHG Reductions (tonnes/year)
Wastewater Treatment Operations	4,300	\$ 750,000	\$1 million	150

However, total natural gas consumption is expected to increase to five million equivalent megawatt-hours once the Greenway sludge incinerator refurbishments are completed over the next five years. Highlights of past projects are as follows:

UV Disinfection System Upgrades: The City's wastewater operations have also completed upgrading the existing disinfection system, which was approaching the end of its asset life, with more current technology. UV disinfection is recognized as the most effective, safe, and environmentally friendly method for treating wastewater. The upgraded system, Trojan UV Signa™, has also provided 685,000 kilowatt-hours per year in energy savings at both the Greenway and Adelaide wastewater treatment plants, along with reductions in costs and significantly simplified operation and maintenance of the system.

5.3.2.3 Planned Energy Measures

Historically, wastewater treatment plants have made the largest investments among City facilities in energy projects, resulting in a reduction of greenhouse gas emissions by more than 50 per cent over the last 10 years.

In the 2024-2028 CDM Plan, energy savings depend on the recently installed ORC project (Figure 12). The Greenway WWTP, the City's largest, has installed an ORC engine to use waste heat from the Fluidized Bed Combustor (FBC) unit to generate electricity and additional heat for building air heating. The installation was completed in 2022.

The ORC system is expected to generate 3,675 megawatt-hours of electricity annually, operating 24 hours a day for 330 days per year, and produce 9,300 equivalent megawatt-hours of reusable heat energy.

However, not all expected savings have been realized yet as the system is still being fine-tuned for efficiency. Additionally, the existing incinerator at Greenway is scheduled for refurbishment in 2024, which will require the ORC to be shut down for six months. Full energy savings from this initiative will be realized once the refurbishment is completed in 2025.

New Dingman Creek Pumping Station: A new wastewater pumping facility is currently being built to meet the growing demand within London and to treat new industrial wastewater in the south end. This facility will consume only electricity and will not use any fossil fuels, thus having no significant impact on the corporate greenhouse gas emissions.

5.3.2.4 Proposed Energy Measures

The City recently collaborated with Stantec to conduct a Solar PV Feasibility Study, assessing the potential, cost, and capacity of solar PV installations at the City's water

Figure 12 ORC Engine at Greenway WWTP



pumping and wastewater treatment sites. The study suggests that installing a 2.5-megawatt solar PV system at the Pottersburg and Vauxhall treatment plants within the next five years could save an estimated 4,000 megawatt-hours of electricity, equating to \$972,000 in annual utility savings and reducing greenhouse gas emissions by 180 tonnes per year.

Pottersburg and Vauxhall are identified as ideal locations for solar projects, as no major process or operational projects are scheduled at these sites in the next five years. The City will focus on developing a business case, investigating funding sources, and assessing necessary resources, such as human resources, to undertake these renewable energy projects.

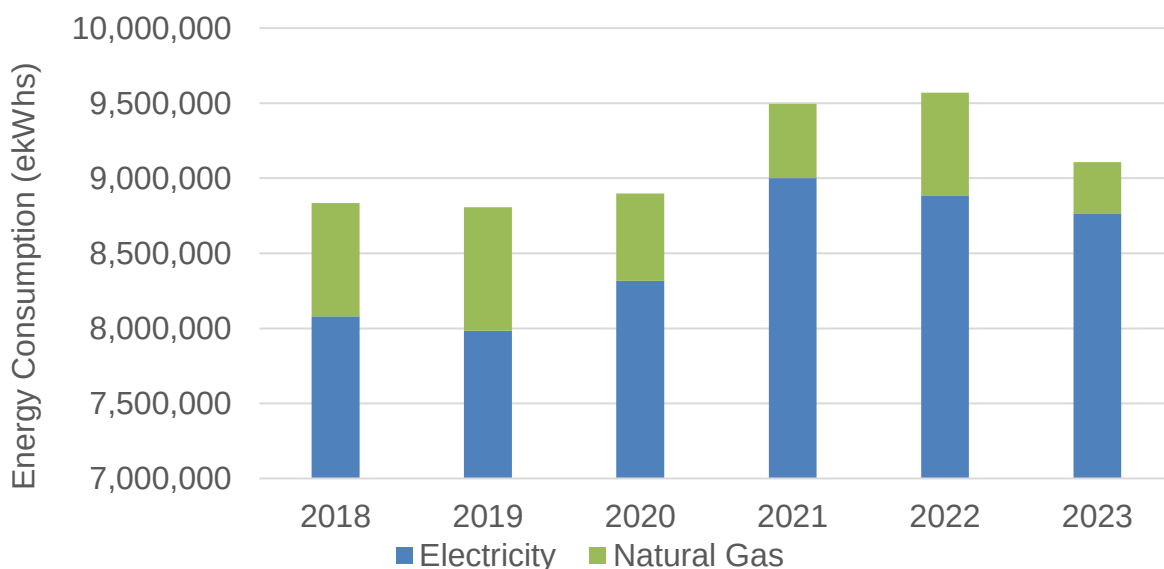
5.3.3. Water Supply Operations

The City receives water from Lake Huron to the Arva Pumping Station, where the City of London's water distribution system begins. Similarly, water from Lake Erie is pumped to the Elgin-Middlesex Pumping Station, from which the City assumes responsibility. Water Operations maintain, operate and control drinking water infrastructure, fire hydrants, water meters, and standby emergency well supplies through both operator-controlled and automated processes.

5.3.3.1 Energy Use and Greenhouse Gas Emissions

As represented earlier in Figure 7 under section 5.3, water supply operations accounts to only three per cent of the total corporate greenhouse gas emissions. Similar to wastewater, water operations are electricity dependent (Figure 13) operations with 86 per cent of greenhouse gas emissions from electricity and 14 per cent coming from natural gas use.

Figure 13 Water Supply Operations Energy Use By Commodity



It should be noted that only one water pumping station, the Southeast Reservoir Pumping Station (SERPS), uses natural gas for heating. This facility was recently

constructed and has been operational since 2018. Due to its relatively new age, no decarbonization efforts will be undertaken at this facility in the near term.

Over the past five years, the total water pumped by water operations has increased by three per cent, with a corresponding 1.5 per cent increase in electricity usage. Natural gas is only utilized for building heat in the occupied areas of the SERPS, which is 90 per cent unoccupied. Natural gas consumption at this facility has decreased by 55 per cent over the last five years, closely following heating degree days.

5.3.3.2 Past Energy Conservation measures

Water Engineering and Operations administers several pump optimization studies in the past years. One highlight contributing to on-going energy savings is as follows.

Table 4 Water Supply Operations - 2019-2023 CDM Energy Project Savings

Service Area	Energy Savings (ekWhs/year)	Incentives	Utility Cost Savings/Year	GHG Reductions (tonnes/year)
Water Operations	Peak Demand Reduction	\$ 40,000	\$ 2,000	200* (peak grid emission reductions)

**Calculated using Marginal Emission Factors (MEFs) as natural gas generators operate at peak electricity demand periods*

Arva and SERPS Demand Response Program Participation: Arva Pumping Station stands as the City's largest freshwater pumping station, closely followed by the SERPS. Operating around the clock, seven days a week, both facilities ensure a steady supply of fresh water from Huron and Elgin water sources to the City. Despite their continuous operation, both Arva and SERPS can adjust pump operations to shift electricity demand to off-peak hours. This helps alleviate strain on the provincial grid during peak periods.

After six months of demand analysis and pump optimization testing, the City entered a Demand Response (DR) agreement with Voltus in 2020. Under this agreement, the City reduces electricity consumption at Arva and SERPS during peak demand days in the province. This not only safeguards the provincial grid from blackouts but also cuts down greenhouse gas emissions associated with natural gas-generated electricity during peak hours. Additionally, the City benefits financially by participating in this program with Voltus, having received approximately \$40,000 in incentives over the last five years (Table 4).

5.3.3.3 Planned Energy Measures

Water Operations is seeing a steady increase in total water demand as London's population increases, rising by three per cent over the past five years and expected to grow by another four per cent in the next five years. To meet this projected capacity, Water Operations is currently working on several pump upsizing and optimization projects. During the 2024-2028 CDM Plan, the total energy demand for Water Operations is expected to increase by at least two per cent. However, no energy-saving projects have been identified for Water Operations in the next five years.

5.3.3.4 Proposed Energy Measures

Similar to wastewater operations, the City will explore funding sources and develop a business case to install a 1-megawatt solar PV system at the Arva pumping station. If approved, the project is expected to save twelve per cent of the total energy consumption at the Arva pumping station.

5.3.4. Traffic Signals and Streetlights

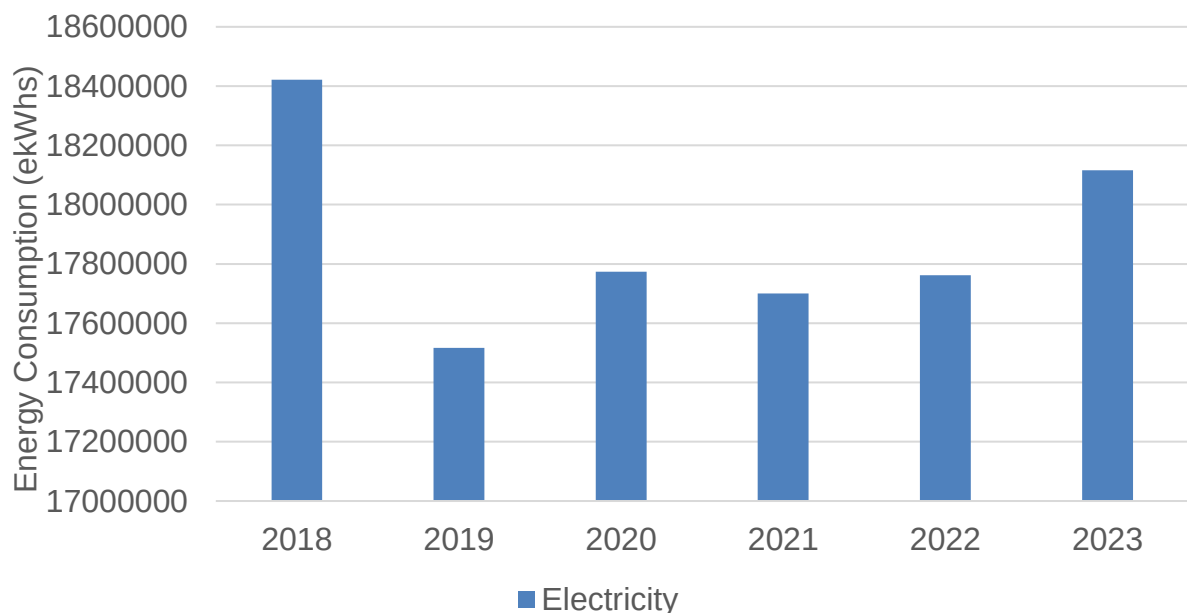
This section covers all the energy consumption related to traffic signals and streetlights. This does not include energy related to the City's parking lots, which comes under Facilities service area.

5.3.4.1 Energy Use and Greenhouse Gas Emissions

Traffic signals and streetlights contribute to six per cent of the total corporate greenhouse gas emissions, all of which are attributable to electricity-related emissions as shown in Figure 14.

The total energy consumption in the last five years has reduced by two per cent, these savings are attributed to the completion of phase two LED lighting project. Also, there is

Figure 14 Traffic Signals & Streetlights Energy Use by Commodity



a slight increase of three per cent in total energy consumed in 2023 compared to 2022, due to the increase in total streetlights inventory by ten per cent in the last two years.

5.3.4.2 Planned Energy Measures

The City has completed LED conversions for 20,000 streetlights, resulting in utility cost reductions of 30 per cent and 14 per cent in Phases One and Two by 2018. Over the past five years, the streetlight stock has increased by ten per cent, with all new lights being LED. However, the remaining 15,000 fixtures, including decorative and pedestrian tunnel lights, await conversion in Phase Three. Lack of funding has hindered this

process, but the current plan aims to retrofit at least 5,000 fixtures to LED, contingent upon funding.

If implemented, this project will result in 1,000 megawatt-hours in energy savings per year which is equivalent to \$480,000 utility cost savings annually and 55 tonnes of greenhouse gas reductions annually.

5.3.4.3 Proposed Energy Measures

The proposed energy measure assumes that all the remaining 15,000 fixtures will be converted to LEDs if a feasible business case is developed. This will reduce the energy consumption by additional 2,000 megawatt-hours and contributes to 110 tonnes per year reduction in greenhouse gas emissions.

5.3.5. Fleet Operations

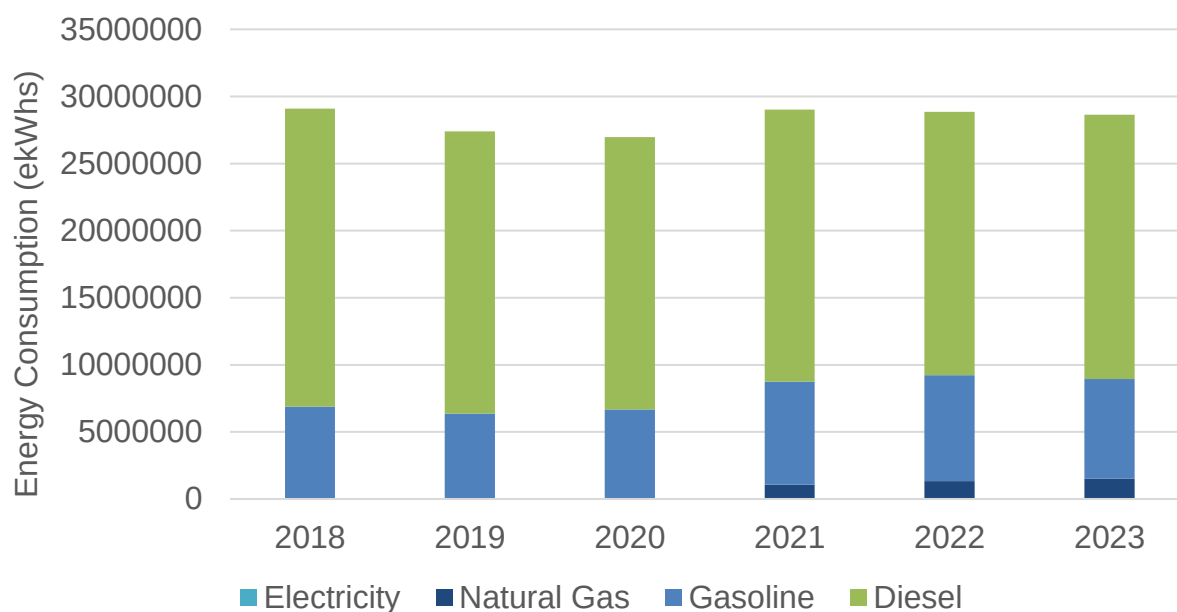
Fleet Services oversees vehicle and equipment purchases, disposals, maintenance, asset management, and fuel management. It supports more than 30 City of London service areas, including Water, Sewer, Wastewater, Transportation, Solid Waste, and Parks & Recreation. Additionally, it serves agencies such as the London Public Library, Tourism London, London Animal Care Centre, EMS, Fire, and Police Services. The division manages municipal assets worth over \$70 million, comprising over 1,410 units ranging from handheld equipment to commercial vehicles and heavy machinery.

5.3.5.1 Energy Use and Greenhouse Gas Emissions

The corporate fleet fuel consumption does not include fuel used by Police and EMS services. Currently, the fleet operates only one electric vehicle, which consumes an average of 3,000 kilowatt-hours of electricity annually.

As shown in Figure 7 previously, Fleet is the corporation's second-largest source of greenhouse gas emissions at 34 per cent, after Facilities (39 per cent). Diesel accounts for 70 per cent of fuel-related energy use, followed by gasoline at 25 per cent and compressed natural gas at five per cent. Figure 15 shows a year-over-year reduction in diesel consumption due to fuel conservation and switching projects initiated by Fleet Services, with few projects highlighted in the next section.

Figure 15 Fleet Operations Fuel Consumption by Commodity



5.3.5.2 Past Energy Measures

Fleet has invested in Green Fleet initiatives and projects over the last five years. The combined energy savings and utility cost savings from these initiatives amount to 2,000,000 ekWh and \$260,000, as shown in Table 5. The results of these initiatives, along with a couple of project highlights, are:

Table 5 Fleet Operations - 2019-2023 CDM Energy Project Savings

Service Area	Energy Savings (ekWhs/year)	Incentives	Utility Cost Savings/Year	GHG Reductions (tonnes/year)
Fleet Operations	2,000,000	N/A	\$ 260,000	250

Diesel to Compressed Natural Gas Conversion of Solid Waste Collection Trucks

(Figure 16): Fleet has been continuously investing in green fleet strategies over the year. Conversion of 39 waste management trucks to compressed natural gas (CNG) has been one of the major undertakings by Fleet in the last five years. Despite delays due to pandemic, Fleet was able to convert 39 trucks to from diesel to CNG before the target year of 2025. Any future solid waste collection trucks purchased by Fleet in the foreseeable future will be CNG fuelled vehicles. This initiative was estimated to have reduced greenhouse gas emissions by 150 tonnes per year as of 2023 with the conversion to 23 CNG trucks at that time, but with all the 39 trucks converted to CNG in 2024, emission reductions will increase to around 250 tonnes GHG per year.

Further, Fleet is currently investigating conversion of these CNG operated trucks to RNG.

Figure 16 Compressed Natural Gas Solid Waste Collection Truck



Natural Gas to Electric Zambonis (Figure 17): In September 2019, Zamboni Company Ltd. delivered an electric Zamboni Model 450 ice resurfacer to the Bostwick Community Centre. After a successful trial and testing for over a year, the City got approval from Council in 2020 to convert 12 ice resurfacers to electric from natural gas. This transition was completed by 2023. The City of London was one of the first cities in North America to adopt electric ice resurfacers.

The transition to battery electric engines eliminates the greenhouse gases and harmful air pollutants produced from burning natural gas. Each unit converted to battery electric resulted in a savings of 19 tonnes of GHGs annually. Following the conversion of the entire fleet to battery electric, operational units mitigated 212 tonnes of greenhouse gas emissions annually and contributed to 24 per cent of the corporation's overall greenhouse gas curtailment target of 900 tonnes annually, and 85 per cent of Fleet's greenhouse gas curtailment target of 250 tonnes annually.

Furthermore, this move to battery electric powered equipment has enabled the City to investigate and move to renewable energy sources such as solar PV to reduce operational costs and eliminate greenhouse gas emissions.

Overall, in addition to the environmental benefits this move has also resulted in operations and mechanical savings, infrastructure benefits and increase in the expected extended lifecycles of electric ice resurfacers.

Figure 17 City of London Electric Ice Resurfacer



5.3.5.3 Planned Energy Measures

Fleet has secured a \$100,000 grant from Natural Resources Canada over the past five years to install 20 electric vehicle chargers at the A.J Tyler Operations Centre. With Council approval, Fleet Operations will replace up to 20 end of life internal combustion engine vehicles with new all electric models.

Also, Fleet is replacing eight cargo vans from gasoline to electric in 2024-2025, which will use these charging stations. This project when implemented reduces greenhouse gas emissions by 42 tonnes per year by 2028 compared to 2023 levels.

Along with this Fleet will see an additional 260 tonnes reduction in greenhouse gas emissions per year starting end of 2025 due to the conversion of the remaining 12 Solid waste trucks (out of 51) to CNG in 2025.

5.3.5.4 Proposed Energy Measures

As part of fuel conservation efforts, Fleet completed an optimization study with Deloitte last year to identify and eliminate fuel waste. The strategies from this report may lead to indirect fuel savings, which will be quantified as different initiatives are implemented during the current Conservation and Demand Management (CDM) Plan.

Additionally, contingent upon a source of finance, it is estimated that Fleet can reduce greenhouse gas emissions by an additional 280 tonnes per year through electrification of its light duty vehicle fleet and by incorporating active transportation strategies for employee fleet vehicle use, such as cycling, walking, virtual meetings, transit etc.

Fleet's fuel conservation efforts rely on the adoption of green fleet initiatives by every service area.

5.3.4. Other Area Measures

5.3.4.1 Past CDM Measures

Corporate EV Charging: After successful pilot projects at City Hall in 2012, City conducted employee EV charging survey and identified demand at various employee parking locations. The City currently owns and operates 16 charging ports of which ten ports are located at City Hall, four at AJ Tyler Operations Centre and couple more at Fire Hall One. The City owns, operates, and maintains these stations. A user fee is collected as revenue from these chargers which is designed to help with charger's life cycle replacement.

Climate Lens Framework: The purpose of the Climate Lens Framework is to:

- Ensure climate change considerations and issues are included in decision-making and evaluation of existing practices.
- Establish a clear process for accountability and tracking of the consideration and/or issue of climate change issues in decision-making, including collection of information on decision outcomes.
- Elevate understanding of the importance of climate change issues in decision-making across the Corporation.

The Climate Lens Framework includes the following five streams of activities:

1. Master Plans, Guidelines and Strategies
2. Existing and New Projects/Programs
3. Quick Assessment of Existing Operations
4. Multi-year Budget & Annual Budget Updates
5. Building Climate Change Capacity within the Service Area

The development of the Climate Lens Framework has increased the visibility and awareness of the need for energy conservation measures for City facilities, programs, projects, and operations.

5.3.4.2 Proposed CDM Measures

Other service areas of the City of London listed below contributed indirectly to the CDM goals:

Table 6 Other Service Area – 2024-2028 CDM Measures

Service Area	Goal	Expected Results
Purchasing and Supply	Sources and identify energy efficient products during the procurement of equipment	Build upon the existing sustainable purchasing policy. Adopt Green procurement standards.
Purchasing and Supply	Energy procurement strategy for energy commodity	Continue to evaluate utility rates on behalf of the City's commodity supply arrangements to optimize rates favourable to the City
Asset Management (Facilities)	Adopt climate change impacts in financial planning	Assign funds to climate change mitigation actions such as reduced energy consumption and emissions reductions which are significant decision drivers when planning new assets or renovating existing assets.
Planning – Environmental and Parks Planning	Reduce energy consumption in City of London parks	Review lighting standards for parks to assess the needs and to adjust lighting requirements to suit time of use. Expand the use of solar-powered lighting and LED technology.

5.4. Implementation and Tracking

The implementation strategy identified next targets both the short term CDM and the long-term CEAP targets, considering anticipated changes in federal and provincial legislation, regulations, and technological advancements that will influence long-term initiatives. The core elements of the framework are:

- Organizing and collaboration
- Funding opportunities
- Annual reporting
- Communication and motivation

5.4.1 Organizing and Collaboration

The 2024-2028 CDM Plan will undergo annual review and updates to Council along with the CEAP report update, relying on commitment and collaboration among City staff for

successful implementation. The level of commitment to the plan hinges on Council, senior management, and staff dedication. To enhance adoption, it is recommended that:

- The City establish and maintain energy-focused Service Area group meetings weekly or bi-weekly to discuss ongoing initiatives and best practices; and
- Assign corporate energy management engineers to these committees, representing all users, to track progress and share regional initiatives as needed.

5.4.2 Funding Opportunities

Since expanding the Corporate Energy Management program in 2007, the City of London allocates an annual budget ranging from \$300,000 to \$600,000 for program costs, including energy management staff, feasibility studies, and consulting. Additionally, the City invests between \$250,000 and \$1 million annually in capital expenditures for energy efficiency projects. Additionally, to implement standalone energy and climate change adaptation/resiliency projects and initiatives with no budget constraints, City is taking the following initiatives:

Climate Change Reserve (CCR) Fund: The creation of a Climate Change Reserve Fund (\$1 million per year for four years) to accelerate implementation of climate actions. The monies standing in the Fund shall be used by The Corporation of the City of London to fund any initiatives that support the Climate Emergency Declaration adopted by Council, April 23, 2019, including operating or capital expenditures related to:

- a. One-time initiatives/projects; or
- b. Initiatives/projects that require a temporary source of financing not to exceed four years. Should The Corporation of the City of London wish to deliver an initiative/project on a permanent basis, transition plans must identify permanent sources of financing to commence no later than the fifth year.

Efficiency, Effectiveness & Economy (EEE) Reserve: the EEE Reserve will also be used, where appropriate, to implement energy efficiency projects and green initiatives that provide financial payback which contribute to the Strategic Plan's Climate Change and Sustainability and Well-Run City goals.

Federal and Provincial Funding/Incentives: The City will proactively seize external funding opportunities when available, while also incorporating necessary operating and capital budgets into future planning to secure funding and support the City's long-term Net-Zero goals. The city has been actively pursuing the Demand Side Management (DSM) incentives available from Enbridge, the electricity rebates and incentives available from Independent Electricity System Operator (IESO), Federal Green and Inclusive Community Building (GICB) program funding, the Federation of Canadian Municipalities' Green Municipal Fund (GMF), and Canada Infrastructure Banks' (CIB) funding and will continue to investigate and participate in any existing and new funding opportunities for decarbonization and conservation projects.

5.4.3 Annual Reporting

The City uses EnergyCAP software for billing analysis and London Hydro's Interval Data Centre for detailed electrical consumption analysis. Additionally, Natural Resources Canada's RETScreen software is employed to improve energy monitoring and project assessment.

Using these tools, City staff will provide annual updates to Council on the corporation's greenhouse gas emission reduction progress through annual progress reports on CEAP implementation which will include the annual CDM update report. This informs the public about progress towards short-term and long-term net-zero goals, including updates on energy conservation measures implemented across city operations.

The annual updates will also identify any potential challenges, such as an increase in grid emission factors, which could undermine the City's conservation efforts. Strategies for mitigating and addressing these challenges will be outlined.

5.4.4 Communication and Motivation

Previously, energy management relied on informal contacts. The focus of the 2024-2028 CDM Plan is to highlight the value of energy efficiency both within and outside the organization. Implemented energy measures and their results will be promoted internally through the Culture of Conservation program. Staff and service areas making significant strides in emission reductions will be recognized through employee awards, celebrations, forums, and engagement events.

CDM Plan goals will be met by adoption of the plan by various service areas and staff. The City is committed to implementing and ensuring the success of the plan, which serves as a living document guiding energy management decisions and actions for the next five years and beyond.

Appendix A – Past Energy Projects

Service Area	2019-2023 Energy Conservation Projects	GHG Reductions (tonnes/year)
Facility Buildings	Demand Response	4 (associated with peak grid emission factor)
Facility Buildings	Demand Response	4 (associated with peak grid emission factor)
Facility Buildings	Bostwick Heat Recovery	12
Facility Buildings	Bostwick feasibility Study	N/A
Facility Buildings	Winter Ops-Energy Recovery Ventilators	7
Facility Buildings	Canada Games CHP	N/A
Facility Buildings	Fire Station #1 HVAC retrofit	2
Facility Buildings	AJ Tyler Ops – RTU replacement	5
Facility Buildings	Argyle Arena – Building automation system implementation	7
Facility Buildings	Fire Station #1 – Replace Roof Top Unit	3
Facility Buildings	Exterior and Parking lot lights retrofit	15
Facility Buildings	Lighting controls & upgrades at AJT	5
Facility Buildings	Replace glass wall in arena with insulated panels – Bostwick	Not available
Facility Buildings	Adelaide ops Centre - lights retrofit	5
Facility Buildings	Fire hall 9- lights upgrade	3
Facility Buildings	Dearness - BAS upgrades	40
Facility Buildings	Adelaide Ops Centre ERV	3
Facility Buildings	Argyle Arena lighting upgrade	4

Service Area	2019-2023 Energy Conservation Projects	GHG Reductions (tonnes/year)
Facility Buildings	Carling Arena	4
Facility Buildings	Kinsmen Arena	4
Facility Buildings	Lambeth Community Centre	2
Facility Buildings	Medway Community Centre	2
Facility Buildings	Earl Nichols Arena	6
Facility Buildings	Stronach Arena & Community Centre	4
Facility Buildings	North London Optimist Community Center	10
Facility Buildings	Fire Hall 2	1
Facility Buildings	Museum London	4
Facility Buildings	Fire Hall 1	7
Facility Buildings	Civic Garden Complex	15
Facility Buildings	indoor/outdoor Lighting retrofits - CGAC, Dearness, Adelaide Ops Centre, and Fire Hall 9	1
Facility Buildings	J. Allen Taylor	1
Facility Buildings	EROC main ERV	4
Facility Buildings	EROC Bldg. 2 ERV	3
Facility Buildings	Oxford Ops Centre ERV	7
Fleet Operations	Solid waste trucks conversion from diesel to CNG	150 (100 tonnes savings associated with 14 trucks conversion in 2024)
Fleet Operations	Natural Gas Zamboni conversion to Electric	212
Wastewater Treatment Operations	Greenway – Organic Rankine Cycle Project	110 (savings will be realized after incinerator refurbishment completes in 2024-2025)
Wastewater Treatment Operations	Aeration building lighting retrofit- Greenway	6

Service Area	2019-2023 Energy Conservation Projects	GHG Reductions (tonnes/year)
Wastewater Treatment Operations	Greenway Fluorescent lights	5
Wastewater Treatment Operations	UV Disinfection upgrade at Greenway and Adelaide WWTPs	38
Water Supply Operations	Demand Response for SERPS & ARVA	200 (associated with peak grid emission factor)
	Total	915

Appendix B – 2024-2028 Planned and Proposed Energy Projects

Service Area	2024-2028 Energy Conservation Projects	GHG Reductions
Facility Buildings	Adelaide Ops Centre HVAC upgrade	17
Facility Buildings	Argyle Arena rooftop-hybrid heating	26
Facility Buildings	Carling Arena – Rooftop Hybrid Heat Pump	49
Facility Buildings	Carling Heights Optimist Community Centre and Pool – HVAC upgrades	144
Facility Buildings	City Hall – Hybrid Heating	13
Facility Buildings	Fire Station # 4 & 6 Rooftop Hybrid Heat Pump	14
Facility Buildings	Fire Station # 8 & 10 – Outdoor Hybrid heat pumps	25
Facility Buildings	Fire Station #12 & Emergency operations centre – Hybrid heap pumps	27
Facility Buildings	Hamilton Road Seniors Community Centre – Rooftop Hybrid Heat Pump	25
Facility Buildings	Lambeth Arena and community centre – HVAC upgrades	113
Facility Buildings	Oakridge arena – Rooftop Hybrid Heat Pump	17
Facility Buildings	Ray Lanctin Arena – Rooftop Hybrid Heat Pump	54
Facility Buildings	South London Community Centre – HVAC upgrades and Heat pumps	51

Service Area	2024-2028 Energy Conservation Projects	GHG Reductions
Facility Buildings	Tourism London Information Centre – HVAC upgrades and heat pumps	17
Facility Buildings	Kinsmen Arena – Deep energy retrofit	167
Fleet Operations	Conversion of 8 cargo vans from gasoline to electric	42
Facility Buildings	Earl Nichols Arena – Deep energy retrofit	150 (100 tonnes savings associated with 14 trucks conversion in 2024)
Facility Buildings	Proposed – 2% reduction in natural gas from EMS optimization projects	120
Fleet Operations	Savings from 14 Diesel to CNG solid waste trucks conversion in 2024	261
Fleet Operations	Proposed – 2% reduction in gasoline and 2% in overall other Fleet fuels due to additional fuel switching, optimization and awareness strategies	110
Traffic signals & Streetlights	Planned and Proposed – Phase 3 LED lighting project	165
Wastewater Treatment Operations	Actual savings from ORC project after incineration refurbishments completed in 2024-2025	212
Wastewater Treatment Operations	Proposed – Solar PV at Vauxhall and Pottersburg PCP	184 – Peak emissions reductions
Water Supply Operations	Proposed – Solar PV at Arva	50 – Peak emissions reductions
Water Supply Operations	Demand Response Participation for Arva and SERPS	200 – Peak emissions reduction
Total		2,250 (1,550 from planned projects and 700 from proposed projects)

Appendix C - 2023 Corporate Energy Use and Greenhouse Gas Emissions Report



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1. Methods and Limitations of Measurement

The City procured the EnergyCap software in 2007 to log monthly utility bills for municipally owned and administered buildings and facilities. This software has the capability to track, monitor and capture data to assist the City with reporting consumption and providing historical data.

Fleet fuel use data is provided from the PetroVend fuel management software system which is used for tracking vehicle fuelling at operation centres.

The annual energy consumption and greenhouse gas emissions for the City does not include energy consumed in leased office space where the utility costs are incorporated in the leasing agreements. However, a rough estimate for leased space is provided in Section 3.4.

1.1. Service Area Categories and Energy Consumption

The City manages diverse operations of buildings, including office spaces, community centres, arenas, and fire halls which use energy for interior and exterior lighting, heating, and cooling of buildings, and energy associated with maintaining recreational services like pools and arenas. The City also manages linear assets such as wastewater treatment facilities, water supply and pumping facilities, traffic lights, and City fleet operations. Ninety per cent of the energy consumed by linear assets is electricity associated with running and maintaining the processes.

For this report, all the City's service categories are divided in the following categories to compare their individual contribution to City's total energy consumption:

- Facility Buildings
- Wastewater Treatment Operations
- Water Supply Operations
- Traffic Signals & Streetlights
- Fleet Operations

1.2. Sources and Emission Factors for Greenhouse Gases

Greenhouse gas emissions within City operations are contributed by consumption of electricity, natural gas, steam, chilled water, diesel, and gasoline. Among these, fleet

fuel, followed by natural gas and steam have the highest emissions per equivalent kWh of fuel as shown in Table C-1.

Table C-1 - Commodity Emission Factors - Grams of CO₂ equivalent per equivalent kilowatt-hour (kWh)

Commodity	2023
Electricity	67
Natural Gas	182
Diesel	262
Gasoline (E-10 blend)	237
Steam	143
Chilled Water	98

Table Notes:

- The electricity emission factors are based on the Ontario Electricity Emissions Factors and Guidelines – 2024 Edition from The Atmospheric Fund (TAF).

Steam and chilled water are supplied by London District Energy (LDE) for City's downtown office building locations and its associated emissions have been provided by LDE.

2. Annual Corporate Energy Analysis

In 2023, the City's energy use is categorized by consumption, associated emissions, and costs by commodity. The 2023 energy data are also normalized to London's population to measure improvements in efficiency. This allows the City to demonstrate and relay to Londoners the energy consumed in relationship to service delivery provided by the City. For this report, all the 2023 energy emissions data are compared to the following years:

- 2007 – as this was the first year that City started measuring and monitoring its corporate energy consumption; and
- 2018 – as this is the baseline year for the 2019-2023 CDM Plan.

2.1 Total Corporate Energy Consumption

With the use of the EnergyCap software, the City has the ability to breakdown and report annual energy consumption by commodity and by service category.

Table C-2 – Total Energy Consumption by Commodity

Energy Consumption (ekWh)	2007	2018	2023	Change from 2007	Change from 2018
electricity	108,328,000	98,448,000	96,885,000	-11%	-2%
natural gas	58,682,000	42,430,000	36,038,000	-38%	-14%
steam	3,499,000	3,269,000	2,723,000	-22%	-17%
chilled water	1,759,000	1,521,000	1,385,000	-21%	-9%
diesel fuel	20,129,000	22,194,000	19,694,000	-2%	-11%
gasoline	6,718,000	6,889,000	7,417,000	10%	8%
CNG fuel	-	-	1,516,000	n/a	n/a
Total	199,115,000	174,751,000	165,658,000	-17%	-5%

Table C-2 shows the City's energy consumption by commodity, which amounts to 165 million equivalent kilowatt-hours (kWh) in 2023. Energy consumption has decreased for every energy commodity except gasoline, which has seen an eight per cent increase since 2018. Overall, total energy use is 17 per cent lower compared to 2007 and five per cent lower compared to 2018. Energy associated with heating and cooling buildings (steam, electricity, chilled water, and natural gas) have shown greatest reduction from 2007. This shows that energy efficiency measures in place since 2007 have played a significant role in conservation.

Electricity represents 57 per cent of all the energy used by the City. Out of this, 52 per cent is consumed by electricity-intensive operations such as water supply and wastewater treatment plants, 19 per cent is consumed by streetlights and traffic lights, and the remaining 29 per cent is consumed by building ventilation, lighting, and office equipment.

Natural gas is the second highest commodity, representing 23 per cent of the total energy consumption. Most of the natural gas is used for space heating and hot water heating, but 13 per cent of the total natural gas is used in wastewater treatment facilities every year.

Diesel and gasoline are consumed by a variety of fleet vehicles and equipment which include waste collection trucks, snowplows, off-road construction equipment, and portable hand-held tools used by Parks & Recreation.

Compressed natural gas (CNG) was consumed by 24 of the waste collection packer trucks in the vehicle fleet. Steam and chilled water account for only one per cent of the total energy consumption each and both are completely used by administration buildings owned by the City in downtown London including City Hall. Steam and chilled water are supplied by Enwave London District Energy.

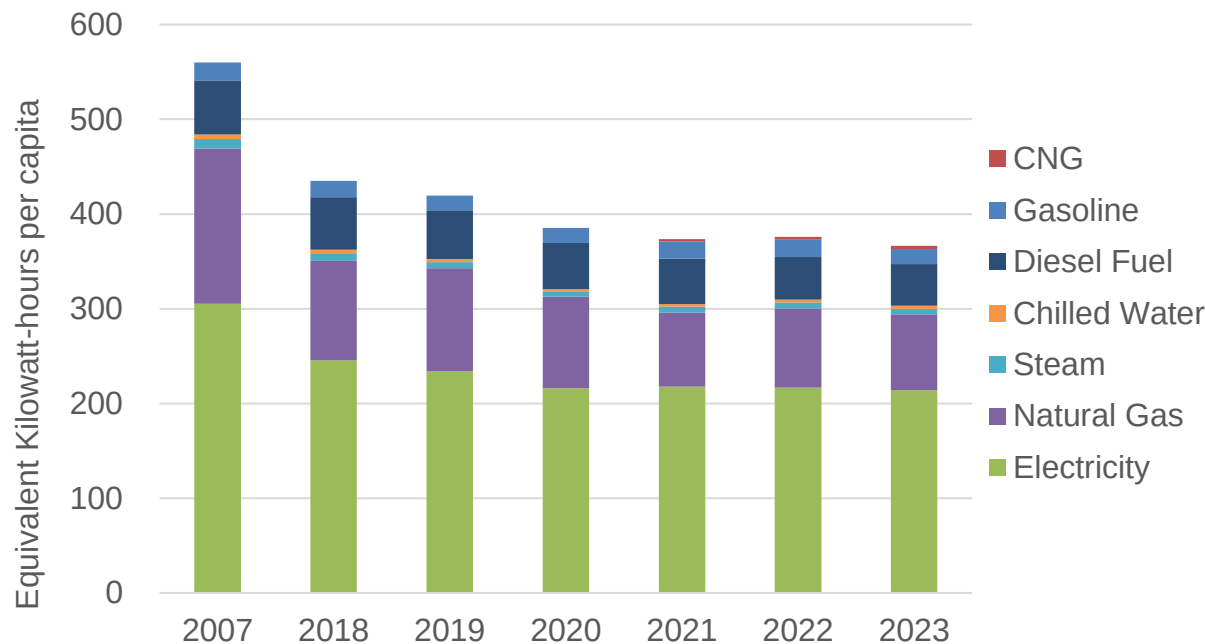
2.2 Total Corporate Energy Consumption Per Capita

The City's energy consumption is a direct function of serving the public, businesses, and visitors of London. The trends in consumption reported is significant to the services provided to the community. London continues to grow in population and increased services are required to support that growth. It is important to capture energy usage per capita to demonstrate the City's achievements in energy reductions while continued growth occurs in London.

Figure C-1 shows total energy consumption per capita by commodity which is explained as follows:

16 years of data show continued improvement of corporate energy use per capita with an overall reduction of 34 per cent in 2023 compared to 2007; and in 2023, overall energy efficiency improved by about 16 per cent compared to 2018. The increase in population by more than three per cent per year in 2023, contributed to increased efficiency in 2023.

Figure C-1 - Corporate Total Energy Consumption per Capita by Commodity Type



2.3 Total Corporate Energy Consumption by Service Category

Separating the municipal service by categories gives the City the ability to see where progress is being made and the opportunity to target areas for improvements.

Figure C-2 shows facility buildings as the highest energy consumer at 38 per cent followed by wastewater treatment operations at 28 per cent, fleet operations at 17 per cent, traffic signals & streetlights at eleven per cent, and water operations at six per cent.

Figure C-3 shows the overall energy consumption (ekWh) by the municipal service categories over the last five years compared to the 2007 baseline year. The five years are highlighted in this figure to show continuous improvement year over year since 2018 with 2020 and 2021 at eight per cent and nine per cent dip due to pandemic. With all the operations returning to normal starting 2022, the expected energy use is at 165,000,000 ekWhs.

Most of the energy consumption reductions have been observed in buildings and wastewater treatment operations. Facility buildings reduced energy consumption by 13 per cent compared to 2007 and six per cent to 2018. Most of the reduction is a result of heating, ventilation, and air conditioning (HVAC) upgrades and LED lighting upgrades.

Figure C-2 - City of London 2023 Energy Consumption by Municipal Service Category

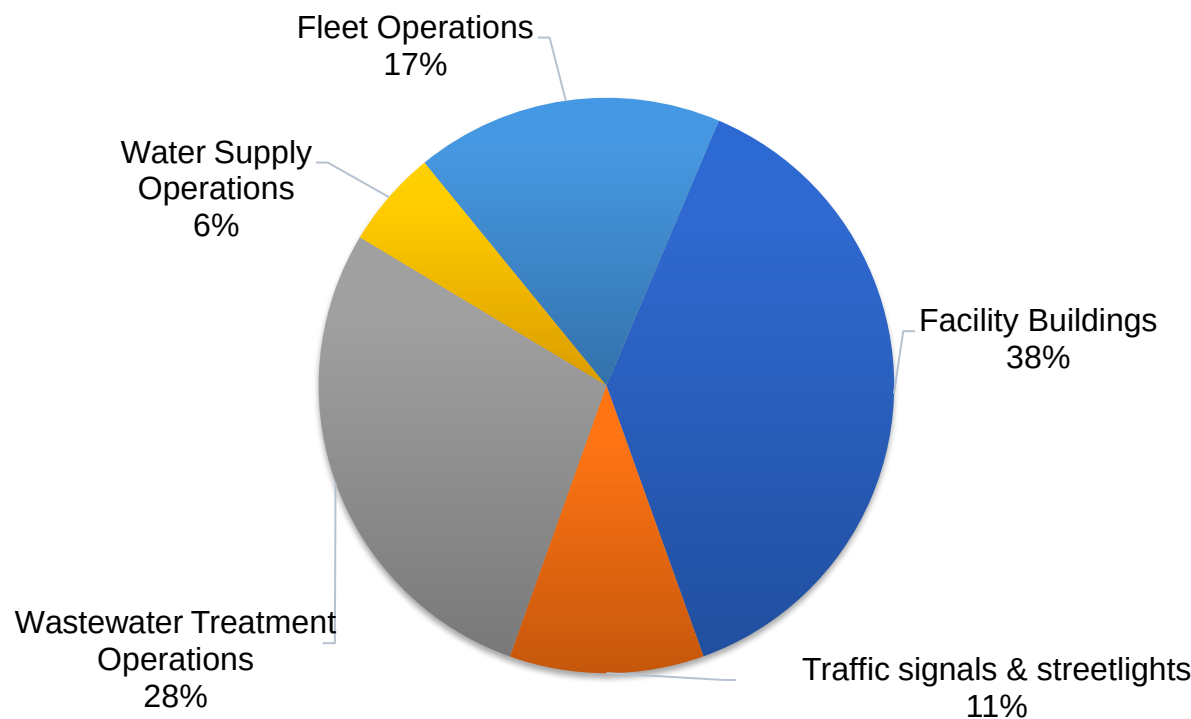
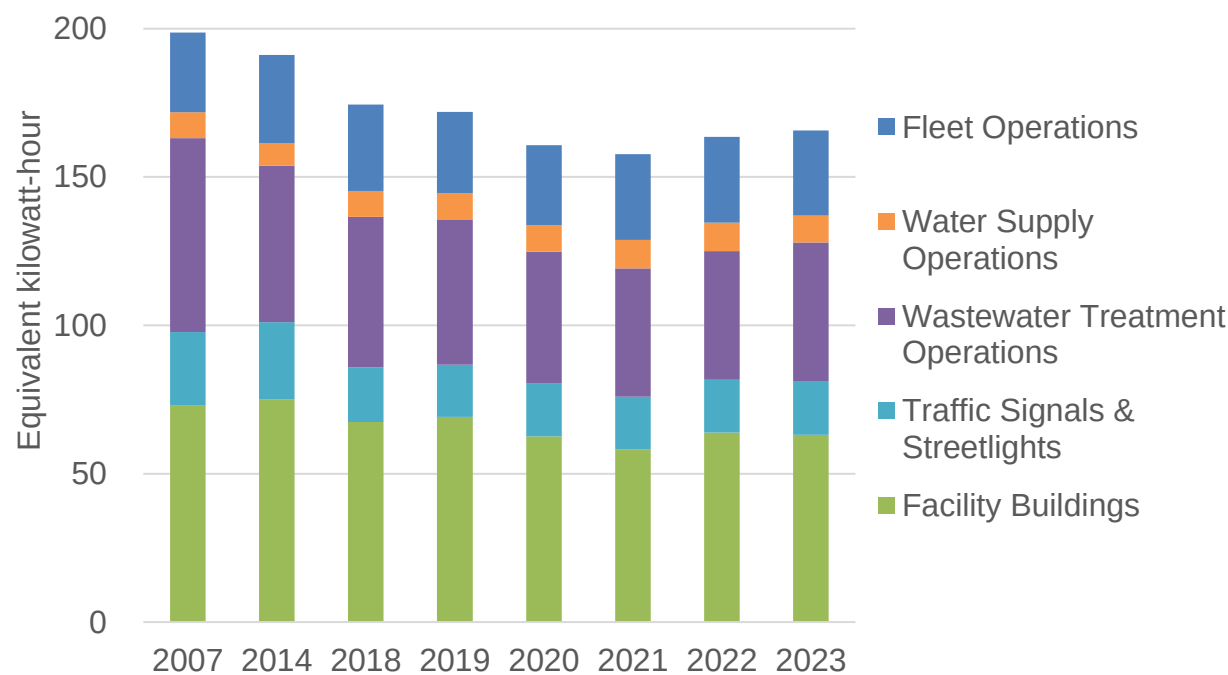


Figure C-3 – Total Corporate Energy Consumption by Service Category (ekWhs)



Wastewater treatment continues to see improved energy efficiency as a result of HVAC upgrades, aeration blower upgrades and using waste heat. Energy consumption was reduced by 29 per cent compared to 2007 and eight per cent compared to 2018. Energy use by traffic signals and streetlights has decreased by 27 per cent from 2007 and two per cent from 2018. Total Streetlights inventory increased by ten per cent during the same period.

Fleet fuel consumption has increase by seven per cent since 2018 and is influenced by increased rental Fleet since the pandemic. Although total Fleet consumption increased by seven per cent compared to 2007, the per capita consumption shows a decrease of 15 per cent. This shows that the efficiency of fleet operations increased over the years.

Operational issues at the new Southeast Reservoir and Pumping Station (SERPS) water supply facility and increased water demand by three per cent increased water supply's overall energy consumption by four per cent compared to 2018.

2.4 Leased Spaces

Leased spaces, for which the City does not pay for utility use, make up 7.3 per cent of city-owned spaces. The energy used by these spaces is not included within the City's reported energy use, but it has been estimated to provide an understanding of its potential contribution overall.

The energy intensity in Canada for office buildings in 2018 was reported to be 0.99 gigajoules per square metre (GJ/m²) in a report by Natural Resources Canada (NRCan). Assuming the same in 2023, the City's leased spaces are estimated to have consumed about 4,500,000 ekWh which is almost three per cent (2.7%) of the total corporate energy consumption. Considering the leased space would have the same per unit cost and emission factor as the city owned buildings, leased space energy cost would be approximately \$430,000 and would result in about 540 tonnes of greenhouse gas emissions in 2023.

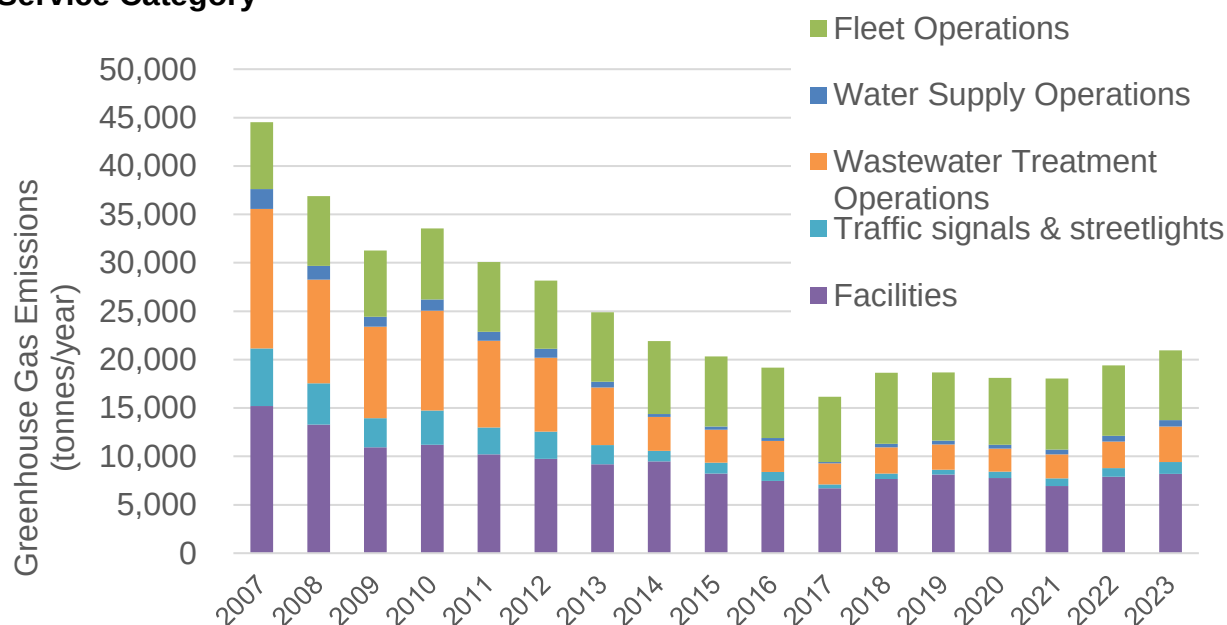
These emissions are accounted for within the reported community GHG emission values for commercial office buildings.

2.5 Energy-Related Corporate Greenhouse Gas Emissions

In 2023, greenhouse gas emissions from energy use were twelve per cent (2,300 tonnes) higher than 2018, but 53 per cent lower compared to 2007. Figures C-4 and C-5 show the greenhouse gas emission reduction trend since 2007. Greenhouse gas emission reductions have been observed across the corporation since 2007, except for Fleet.

Fleet's greenhouse gas emissions are now a larger share of corporate energy-related emissions due to emissions from burning gasoline, diesel, and compressed natural gas as explained in section 4.2 of this report.

Figure C-4 – Corporate Energy-Related Greenhouse Gas Emissions since 2007 by Service Category



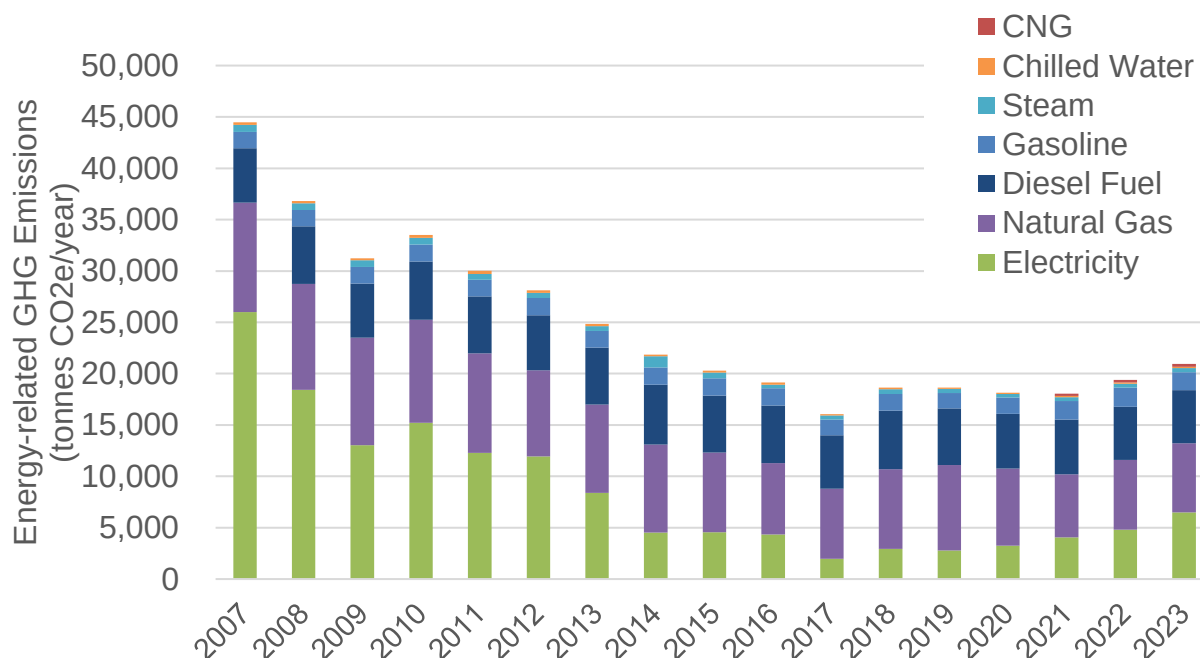
Most of the emission reductions since 2007 are due to a cleaner electricity grid in Ontario due to increased conservation efforts and cleaner sources of energy used to generate electricity in Ontario:

- 84% reduction in electricity-related emissions;
- 46% reduction in steam-related emissions, due solely to corporate actions; and
- 33% reduction in natural gas related emissions, due solely to corporate actions.

However, in the last couple of years, greenhouse emissions from Ontario's electricity grid have increased, from 29 grams equivalent carbon dioxide per kilowatt-hour in 2019 to 67 grams per kilowatt-hour in 2023. Given that electricity represents 57 per cent of all the energy used by the City, changes in Ontario's electricity grid will have a significant impact on corporate energy-related emissions. As a result, the City's greenhouse gas emissions in 2023 are about 3,600 tonnes (21 per cent) higher than they would have been if Ontario's grid emissions had not changed.

Looking ahead, based on power supply forecasts provided by Ontario's Independent Electricity System Operator (IESO), The Atmospheric Fund estimates that greenhouse gas emission factors for Ontario's electricity grid will increase between 2018 and 2030, from 30 to 126 grams of equivalent carbon dioxide per kilowatt hour. This is due to an expected greater reliance on gas-fired power plants after the closure of the Pickering Nuclear Generating Station as well as the Provincial Government's cancellation of the last round of renewable power generation procurement in 2018.

Figure C-5 – Corporate Energy-Related Greenhouse Gas Emissions since 2007 by Energy Commodity



2.6 Non-Energy Related Greenhouse Gas Emissions

The City also has direct control over two major sources of greenhouse gas emissions not associated with energy use:

- Methane emissions from the W12A Landfill as well as closed landfills; and
- Nitrous oxide (N₂O) emissions from the incineration of sewage sludge at the Greenway Wastewater Treatment Facility.

In fact, methane emissions from landfill sites are significantly larger in magnitude than energy related greenhouse gas emissions. With the installation and ongoing expansion of the landfill gas collection and flaring system at the W12A landfill, the City has made significant reductions in greenhouse gas emissions as seen in Table C-3.

As a result of London having joined the Compact of Mayors in 2015, nitrous oxide (N₂O) emissions from sewage treatment are now included within London's energy and greenhouse gas emissions inventory as per the Global Protocol for Community-Scale Greenhouse Gas Emission Inventories. Nitrous oxide, a potent greenhouse gas with 310 times the global warming potential of carbon dioxide, is a combustion by-product from the incineration of sewage sludge and its formation is influenced by incinerator operating conditions (i.e., combustion temperature).

Since 2008, annual stack testing at the Greenway Wastewater Treatment Facility

sludge incinerator has included the measurement to nitrous oxide alongside other air pollutants. Table C-4 summarizes the nitrous oxide stack test results. As can be seen from this table, measured emissions of nitrous oxide can vary from year to year.

Table C-3 - Summary of Landfill Gas Flaring at W12A Landfill

Year	Methane Flared (tonnes)	Equivalent CO₂ Reduced (tonnes)	Cumulative Methane Flared (tonnes)	Cumulative CO₂e Reduced (tonnes)
2004	852	24,000	852	24,000
2005	1,980	55,000	2,830	79,000
2006	1,800	50,000	4,630	129,000
2007	1,440	40,000	6,070	169,000
2008	1,850	52,000	7,910	221,000
2009	2,280	64,000	10,200	285,000
2010	2,320	65,000	12,520	350,000
2011	2,660	74,000	15,180	424,000
2012	3,240	91,000	18,420	515,000
2013	4,520	127,000	22,930	642,000
2014	4,170	117,000	27,100	759,000
2015	4,300	120,000	31,400	879,000
2016	5,990	168,000	37,380	1,047,000
2017	6,380	179,000	43,760	1,226,000
2018	4,290	120,000	48,060	1,346,000
2019	5,250	147,000	53,300	1,493,000
2020	6,790	190,000	60,100	1,683,000
2021	7,860	220,000	67,950	1,903,000
2022	7,670	215,000	75,600	2,118,000
2023	7,450	209,000	83,050	2,327,000

Landfill gas emissions have decreased significantly since 2005 due to the installation of the landfill gas collection and flaring system at the W12A Landfill, London's active landfill. In 2023, the flaring system collected and destroyed around 7,450 tonnes per year of methane (209,000 tonnes per year of equivalent carbon dioxide), which is approximately 66 per cent of overall emissions from the landfill. The installation of the new landfill gas flare in late 2024 will help increase this amount towards the target of 85 per cent collection and destruction.

Table C-4 - Summary of Stack Test Results for N₂O Emissions from the Greenway Wastewater Treatment Plant's Sewage Sludge Incinerator

Year	Measured average N₂O emissions g/s	Measured average N₂O emissions kg/hour	Estimated annual N₂O emissions tonnes/year	Estimated annual CO₂e tonnes/year
2008	0.1	0.4	3.1	800
2009	1.1	3.9	28.3	7,500
2010	1.1	3.9	28.0	7,400
2011	1.2	4.4	31.9	8,400
2012	1.0	3.5	25.5	6,800
2013	0.2	0.6	4.4	1,200
2014	1.1	4.1	29.3	7,800
2015	1.0	3.7	26.4	7,000
2016	0.3	1.1	7.4	2,000
2017	2.4	8.6	65.3	17,300
2018	1.7	6.0	42.6	11,300
2019	1.5	5.5	32.9	8,700
2020	0.8	3.0	16.4	4,400
2021	0.5	1.6	9.4	2,500
2022	1.2	4.4	26.2	6,900
2023	1.6	5.7	34.2	9,100

2.7 Water Consumption

Water is the second highest utility cost for the City. In 2023 alone, water cost was \$2.35 million for the City and hence is an important utility to monitor and track consumption. Figure 6 shows total water consumed by the City plotted along cooling degree-days (CDD - a measure of how hot the summer weather was for that year), given that water use for municipal buildings tends to increase during hot weather when it also tends to be dry. Most of the water consumed at municipal buildings is for public facilities or employee use. Also, the portion of water consumed by buildings and wastewater treatment facilities is identified in the graph.

Figure C-6 also shows:

- Buildings consume 80 per cent of the total water consumed by City;
- Buildings water consumption is influenced by weather i.e., with hotter weather, as measured by cooling degree days, water consumption and vice versa; and
- Wastewater operations consume about 20 per cent of the total water consumed by the City. Majority of this usage is in summer months to flush and clean wastewater holding tanks at pumping stations.

Figure C-7 shows how water consumption has been reduced by 24 per cent from 2007 to 2023. During the same period, water cost increased by more than double due to the changes made to water billing between 2012 and 2014.

Figure C-6 – Total Water Consumption (cubic meters per year)

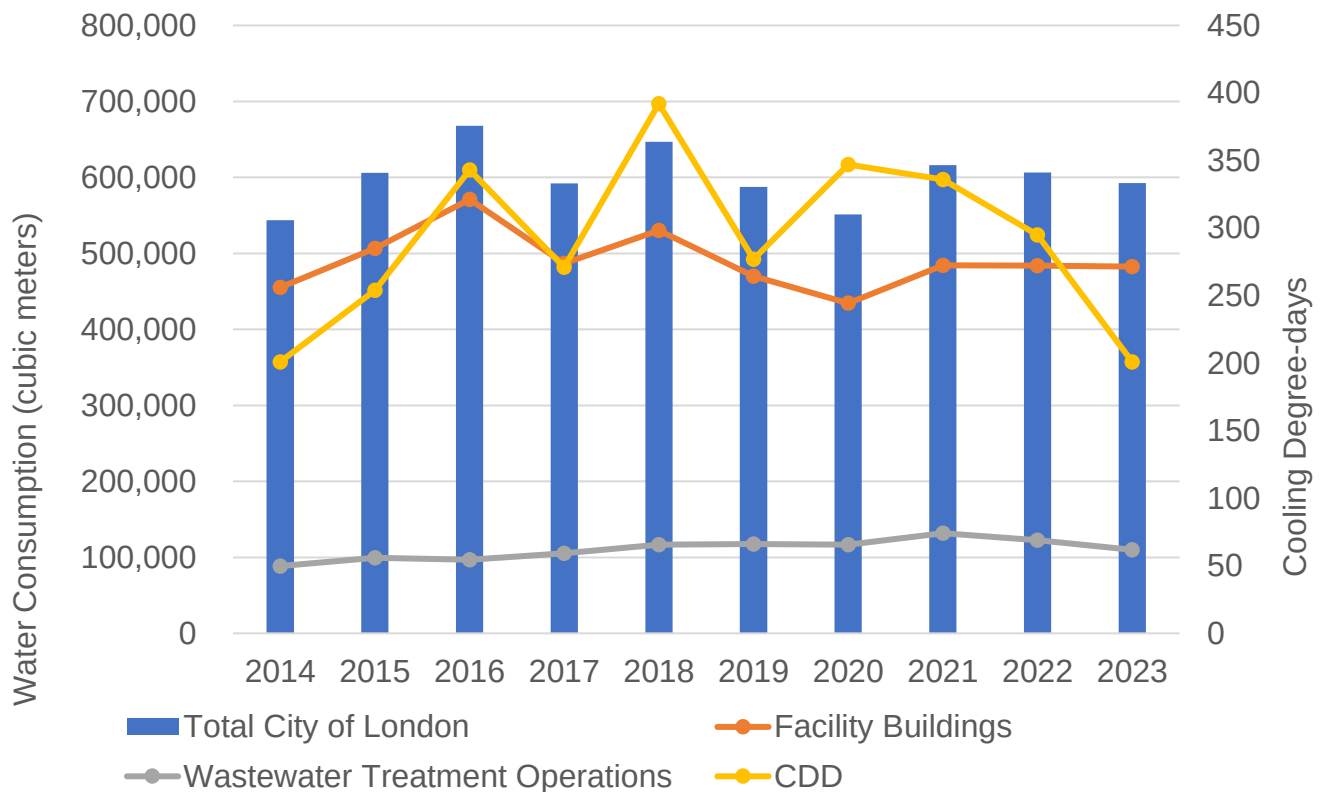
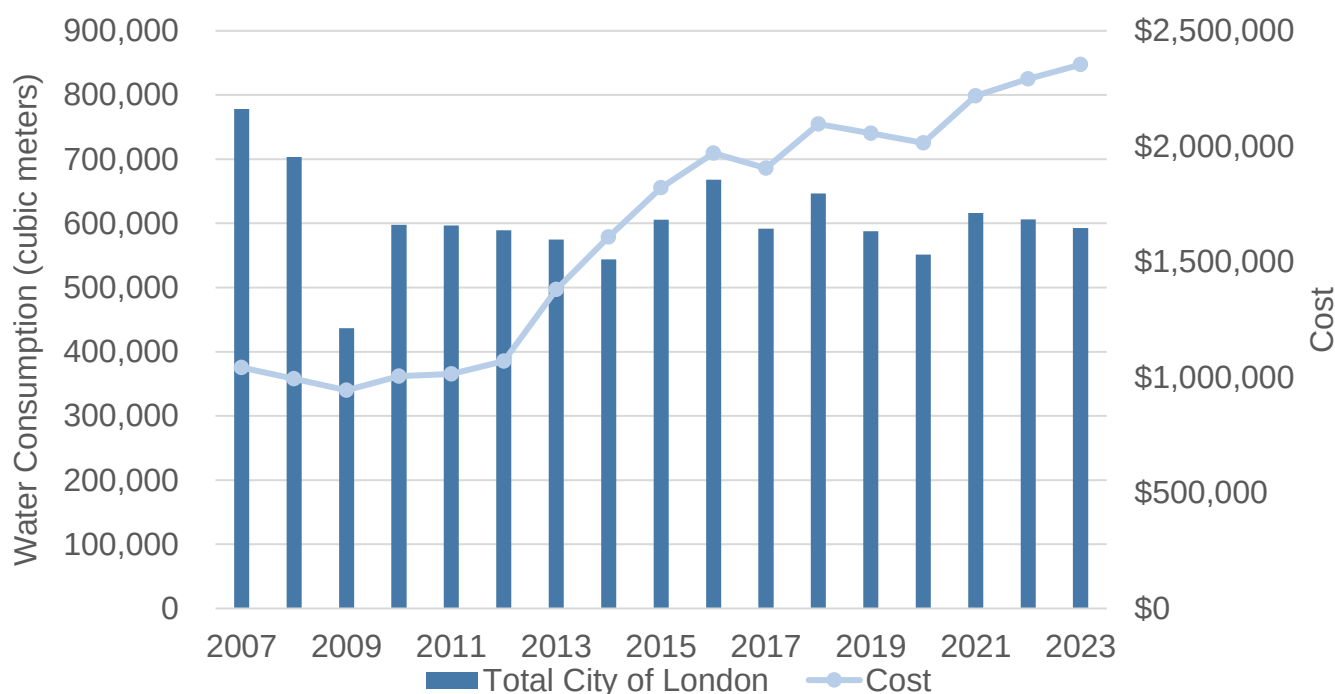


Figure C-7 – Water Cost and Consumption (cubic metres per year)



2.8 Corporate Energy Cost

In 2023, similar to 2022 corporate energy costs were significantly impacted by the global price increases on fossil fuels because of the Russian invasion of Ukraine. This was offset somewhat by lower electricity prices in Ontario because of the provincial government's decision to subsidize electricity prices in Ontario.

Corporate energy management practices by the City including cost avoidance measures through procurement, building retrofits, and other conservation measures assist in continued efforts to reduce amounts of energy used to help reduce the market cost increase.

Total energy costs in 2023 were \$19.2 million, 34 per cent higher than 2007 and seven per cent higher compared to 2018. As shown in Table C-5, electricity price still plays a key role in overall commodity costs.

Over the short term, compared to 2018, electricity prices are lower due to the Arva Pumping Station being classified as a Class A customer by the IESO and other reliefs on electricity rates made by provincial government on hourly rates.

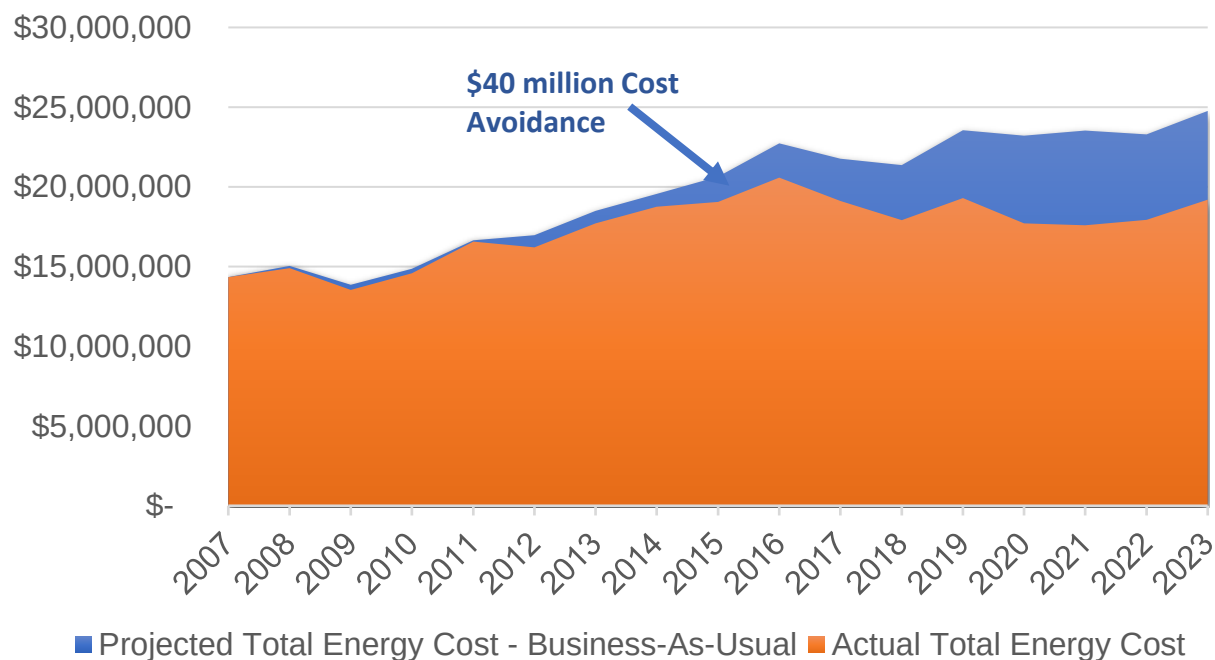
Table C-5 – Energy Costs by Commodity

Commodity	2007	2018	2023	Change since 2007	Change since 2018
Electricity	\$9,289,000	\$13,520,000	\$13,215,000	42%	-2%
Natural Gas	\$2,350,000	\$1,029,000	\$1,854,000	-21%	80%
Steam	\$273,000	\$192,000	\$257,000	-6%	34%
Chilled Water	\$251,000	\$277,000	\$257,000	2%	-7%
Diesel Fuel	\$1,518,000	\$2,133,000	\$2,472,000	63%	16%
Gasoline	\$664,000	\$755,000	\$1,024,000	54%	36%
CNG fuel	-	-	\$105,000	n/a	n/a
Total	\$14,345,000	\$17,906,000	\$19,184,000	34%	7%

Natural gas and gasoline fuel cost increases are also related to carbon pricing. However, the impact of this was only five per cent and the major influence is still by the global increase in commodity costs.

Energy efficiency and conservation measures have a cumulative financial benefit for the City of London. Avoided energy costs are estimated by comparing the City's use of energy commodities on a per person basis (an estimate of energy efficiency for service delivery) every year compared to our baseline year (2007). Figure C-8 shows that

Figure C-8 - Actual and Avoided Energy Costs



approximately \$6 million in energy costs were avoided in 2023 compared to 2007 levels and more than \$39 million in avoided energy costs have been accumulated since 2007. This chart also shows that energy efficiency and conservation measures have counteracted the impact that higher energy commodity prices could have had on the City of London's Operating Budget.

The City requires several different initiatives to sustain and/or reduce energy costs. The cost per capita dropped between 2016 and 2023 (from \$54 per person to \$43 per person in 2023) even with higher fossil fuel costs. The energy improvements and cost avoidance measures being implemented today are trying to avoid and sustain the market changes and inflation costs the City is faced with in the associated costs to procure energy.

2.8.1 Utility Cost Forecast

To assist the City of London in preparing forecasts for long-term budgetary considerations, Blackstone has provided the following commodity price escalation estimates in Table C-6.

Table C-6 Commodity Cost Forecast 2024-2028

	2024	2025	2026	2027	2028
Electricity	1.9%	2.3%	2.7%	3.0%	3.2%
Natural gas	2.7%	15.6%	7.2%	6.8%	4.5%
Steam	7.4%	23.5%	12.5%	7.2%	6.4%
Water	2.5%	1.5%	2.6%	4.8%	3.2%

3. Conclusion

Overall, in 2023 the focus shifted from purely reducing energy use to making decisions with a climate change perspective. Numerous internal studies are underway to identify net-zero opportunities at individual facilities. Additionally, energy consumption and emissions in recent years have decreased due to the shutdown of some municipal facility buildings during pandemic restrictions.

The City declared a climate emergency to focus its future development, infrastructure, corporate energy planning and community engagement to improve the City's resiliency plans and favorable climate change outcomes.

The City will always require energy to operate its facilities, vehicles, and operations, but strategic management of energy usage, emissions, investment in renewable technologies and a keen focus on climate change can help use less, become carbon neutral and greener overall. Detailed energy consumption and cost numbers are listed in Appendix D.

Appendix D – Energy Consumption and Cost Tables

Total Energy Consumption

Table D-1 – Consumption (equivalent kilowatt-hours) by Commodity 2018-2023

Energy Commodity	2018	2023	Change since 2018	% Change
Electricity	98,448,000	96,885,000	(1,563,000)	-2%
Natural Gas	42,430,000	36,038,000	(6,082,000)	-14%
Steam	3,269,000	2,723,000	(546,000)	-17%
Chilled Water	1,521,000	1,385,000	(136,000)	-9%
Diesel Fuel	22,194,000	19,694,000	(2,500,000)	-11%
Gasoline	6,889,000	7,417,000	528,000	8%
CNG	-	1,516,000	1,516,000	n/a
Total	174,751,000	165,658,000	(8,783,000)	-5%

Table D-2 – Consumption (equivalent kilowatt-hours) by Commodity 2007 – 2023

Energy Commodity	2007	2023	Change since 2007	% Change
Electricity	108,328,000	96,885,000	(11,443,000)	-11%
Natural Gas	58,682,000	36,038,000	(22,216,000)	-38%
Steam	3,499,000	2,723,000	(776,000)	-22%
Chilled Water	1,759,000	1,385,000	(374,000)	-21%
Diesel Fuel	20,129,000	19,694,000	(435,000)	-2%
Gasoline	6,718,000	7,417,000	699,000	10%
Total	199,115,000	164,142,000	(33,029,000)	-17%

Energy Consumption by Municipal Service Categories

Table D-3 Consumption (equivalent kilowatt-hours) by Municipal Service Categories 2018 – 2023

Service Category	2018	2023	Change since 2018	% Change
Facility Buildings	67,659,000	63,168,000	(4,244,000)	-6%
Traffic Signals & Streetlights	18,421,000	18,116,000	(305,000)	-2%
Wastewater Treatment Operations	50,823,000	46,640,000	(4,126,000)	-8%
Water Supply Operations	8,764,000	9,108,000	349,000	4%
Fleet Operations	29,083,000	28,627,000	(456,000)	-2%
Total	174,750,000	165,659,000	(8,782,000)	-5%

Table D-4 – Consumption (equivalent kilowatt-hours) by Municipal Service Categories 2007 – 2023

Service Category	2007	2023	Change since 2007	% Change
Facility Buildings	73,225,000	63,168,000	(9,800,000)	-13%
Traffic Signals & Streetlights	24,762,000	18,116,000	(6,646,000)	-27%
Wastewater Treatment Operations	65,594,000	46,640,000	(18,785,000)	-29%
Water Supply Operations	8,687,000	9,108,000	421,000	5%
Fleet Operations	26,847,000	28,627,000	1,780,000	7%
Total	199,115,000	165,659,000	(33,030,000)	-17%

Energy Consumption per Capita by Municipal Service Categories

Table D-5 Consumption (equivalent kilowatt-hours) Per Capita 2018 – 2023

Service Category			Change since 2018	Change since 2018
	2018	2023	Variance	% Change
Facility Buildings	169	140	(28.4)	-17%
Traffic Signals & Streetlights	46	40	(5.9)	-13%
Wastewater Treatment Operations	127	103	(23.4)	-18%
Water Supply Operations	22	20	(1.7)	-8%
Fleet Operations	73	63	(9.2)	-13%
Total	436	367	(68.5)	-16%
London's Population	401,000	452,000	51,000	13%

Table D-6 Consumption (equivalent kilowatt-hours) Per Capita 2007-2023

Service Category			Change since 2007	Change since 2007
	2007	2023	Variance	% Change
Facility Buildings	206	140	(66)	-32%
Traffic Signals & Streetlights	70	40	(30)	-43%
Wastewater Treatment Operations	185	103	(81)	-44%
Water Supply Operations	24	20	(4)	-18%
Fleet Operations	76	63	(12)	-16%
Total	561	367	(193)	-35%
London's Population	355,000	452,000	97,000	27%

Energy Costs per Capita by Municipal Service Categories

Table D-7 – Energy Costs Per Capita 2018- 2023

Service Category			Change from 2018	Change from 2018
	2018	2023	Variance	% Change
Facility Buildings	\$ 12.90	\$13.87	\$0.97	8%
Traffic Signals & Streetlights	\$ 8.45	\$7.07	\$(1.38)	-16%
Wastewater Treatment Operations	\$ 13.45	\$11.31	\$(2.13)	-16%
Water Supply Operations	\$ 2.66	\$2.22	\$(0.44)	-16%
Fleet Operations	\$ 7.20	\$8.00	\$0.79	11%
Total	\$ 44.66	\$42.47	\$(2.18)	-5%
London's Population	401,000	452,000	51,000	13%

Table D-8 – Energy Cost Per Capita 2007- 2023

Service Category			Change since 2007	Change since 2007
	2007	2023	Variance	% Change
Facility Buildings	\$ 14.31	\$13.87	\$(0.43)	-3%
Traffic Signals & Streetlights	\$ 5.29	\$7.07	\$1.78	34%
Wastewater Treatment Operations	\$ 12.59	\$11.31	\$(1.28)	-10%
Water Supply Operations	\$ 2.07	\$2.22	\$0.15	7%
Fleet Operations	\$ 6.15	\$8.00	\$1.85	30%
Total	\$ 40.41	\$42.47	\$2.07	5%
London's Population	355,000	452,000	97,000	27%

Greenhouse Gas Emissions

Table D-9 – Greenhouse Gas Emissions (tonnes/year) by Commodity

Commodity	2007	2023	Change since 2007	% Change
Electricity	26,000	6,490	(19,510)	-75%
Natural Gas	10,650	6,730	(3,920)	-37%
Diesel Fuel	5,290	5,170	(120)	-2%
Gasoline	1,590	1,750	160	10%
Steam	700	390	(310)	-44%
Chilled Water	240	140	(100)	-42%
CNG		290	290	n/a
Total	44,500	21,000	(23,500)	-53%

Table D-10 – Greenhouse Gas Emissions (tonnes/year) by Service Category

Service Category	2007	2023	Change since 2007	% Change
Facility Buildings	15,210	8,190	(7,020)	-46%
Traffic Signals & Streetlights	5,940	1,210	(4,730)	-80%
Wastewater Treatment Operations	14,400	3,690	(10,710)	-74%
Water Supply Operations	2,080	650	(1,430)	-69%
Fleet Operations	6,880	7,210	330	5%
Total	44,500	21,000	(23,500)	-53%