Report to Civic Works Committee

To: **Chair and Members**
Civic Works Committee
From: **Kelly Scherr, P.Eng., MBA, FEC**
Deputy City Manager, Environment & Infrastructure
Subject: **2020 Corporate Energy Consumption and Activities Report**
Date: **August 31, 2021**

Recommendation

That, on the recommendation of the Deputy City Manager, Environment & Infrastructure and City Engineer, the following actions **BE TAKEN:**

a) this report on the 2020 Corporate Energy Consumption and Activities Report **BE RECEIVED** for information; and,

b) this report **BE CIRCULATED** to the Advisory Committee on the Environment (ACE) for their information.

Executive Summary

The Ontario Electricity Act (1998), under Regulation 507/18, requires all public agencies to prepare and publish annually updated reports on the energy consumption and greenhouse gas (GHG) emissions for City's facilities. Since 2014, public agencies are also required to prepare a Conservation and Demand Management (CDM) Plan and update it every five years.

The 2019-2023 Corporate Energy Conservation and Demand Management (CDM) Plan, the most recent plan, has the following targets using 2018 as the baseline year:

- A 5% reduction in total annual energy use by 2023;
- A 10% decrease in energy use per capita; and
- Keep annual total energy cost increases within five percent of 2018 costs.

The secondary long-term goals identified in this plan are to monitor and track the City's water consumption starting in 2018 and investigate possible pathways for achieving net zero emissions by 2050 or sooner.

In 2020, the Corporation of the City of London spent $17.6 million on energy for municipal operations. Total energy used in 2020 was eight percent lower than the 2018, the baseline year used for the 2019-2023 CDM Plan. Energy-related greenhouse gas emissions from corporate energy use in 2020 was 17,500 tonnes per year. Corporate energy use in 2020 was influenced by COVID-19 pandemic restrictions, primarily in office environments. Corporate energy management activities continued in 2020, with projects completed in 2020 contributing $200,000 in annual energy cost savings, with an additional $160,000 received in incentives from energy utilities.

The City's performance in 2020 is currently exceeding the 2023 targets established in the 2019-2023 CDM Plan as follows:

Goal	2018 Baseline	2023 Reduction Target	Progress as of end of 2020
Reduction in total energy use	-	5%	8%
Total energy use (million Equivalent kilo-watt hours - ekWh)	174	165	160

Goal	2018 Baseline	2023 Reduction Target	Progress as of end of 2020
Energy performance for service delivery (ekWh/person)	436	394	386
Energy related GHG emissions (tonnes)	18,700	17,800	17,500
Total energy costs (millions)	$17.9	$18.8	$17.6
Water consumption (thousands m^3)	646	-	587

It is expected that, except where investments are made to create sustainable reductions, energy and water use trends will return to a more typical level once City office facilities are fully staffed post-pandemic. Since the first year of baseline energy data was collected in 2007, however, the City's water and energy performance has been improving year over year with:

- Energy performance for service delivery (ekWh/person) 31% better than 2007;
- Total greenhouse gas emissions 61% lower than 2007; and,
- Total water consumption 29% lower than 2007.

Since 2014, the start of the first CDM Plan, there have been several other key outcomes:

- The City has received approximately $3 million in incentives for energy management projects; and,
- The City has avoided about $20 million in utility costs through the combination of energy conservation projects and energy commodity procurement strategies.

In 2020, there was a shift in focus from making decisions based just on the reduction of energy usage towards making decisions from an integrated climate change perspective, particularly as it related to projects and funding opportunities for projects. Many internal studies are underway to identify net-zero emission opportunities at individual facilities including operations centres, community centres, and wastewater treatment facilities The development of the Climate Lens Process in 2020 and 2021 has increased the visibility and awareness of the need for energy conservation measures for City facilities, programs, projects, and operations.

Linkage to the Corporate Strategic Plan

Municipal Council continues to recognize the importance of managing energy costs, energy conservation, and climate change and other related environmental issues in its 2019-2023 - Strategic Plan for the City of London. Specifically, London's efforts in climate change mitigation address three of the five Areas of Focus, at one level or another:

- Building a Sustainable City
- Growing our Economy
- Leading in Public Service

Analysis

1.0 Background Information

1.1 Previous Reports Related to this Matter

Relevant reports that can be found at www.london.ca under Council and Committee meetings include:

- Report to the October 22, 2019 Civic Works Committee (CWC) Meeting, 2018 2019-2023 Corporate Energy Conservation and Demand Management (CDM) Plan (Agenda Item #2.8)

1.2 Context

Addressing the Need for Action on Climate Change
On April 23, 2019, the following was approved by Municipal Council with respect to climate change:

> *Therefore, a climate emergency be declared by the City of London for the purposes of naming, framing, and deepening our commitment to protecting our economy, our eco systems, and our community from climate change.*

The 2020 Corporate Energy Consumption and Activities Report is the measurement tool to highlight The Corporation of the City of London's progress towards meeting its energy reduction and greenhouse gas reduction targets along with other targets and directions.

Background
The Ontario Electricity Act (1998), under Regulation 507/18, requires all public agencies to prepare and publish:

- Annually updated reports on the energy consumption and greenhouse gas (GHG) emissions for City's facilities; and,

- A Conservation and Demand Management (CDM) Plan starting in 2014 and to update this plan every five years.

The Annual Energy Consumption and GHG Emissions Report submissions can be found on the City's open data catalogue.

The provincial reporting requirement does not include significant corporate energy users such as street lighting and corporate fleet fuel use, nor other needs such as sports field lighting. However, these energy needs are included within the scope of the 2020 Corporate Energy Consumption and Activities Report, as in previous years, as it is imperative that all energy uses and impacts within the City's control are continuously examined for reduction opportunities.

The 2019-2023 Corporate Energy Conservation and Demand Management (CDM) Plan has the following targets, using 2018 as the baseline year:

- A 5% reduction in total annual energy use by 2023;
- A 10% decrease in energy use per capita; and,
- Keep annual total energy cost increases within five percent of 2018 costs.

The secondary long-term goals identified in this plan were to:

- Monitor and track the City's water consumption starting in 2018; and,
- Investigate possible pathways for achieving net zero emissions by 2050 or sooner

To achieve these goals, planned, proposed, and behavioural initiatives were identified in the CDM Plan for each service area and the primary goal was further divided into individual goals. All City service areas are separated into two areas: buildings and vehicle fleet. Additionally, wastewater treatment, water operations and traffic signals and streetlights are monitored separately in the Environment & Infrastructure service area.

2.0 Discussion and Considerations

A collaborative process to implement the action items in the 2019-2023 CDM Plan was introduced with major service areas during the development of the CDM Plan in 2019. Bi-weekly meetings with Facilities and monthly meetings with Fleet and Wastewater Treatment Operations teams are held to review current energy consumption, progress towards CDM goals, and to discuss future projects and initiatives as these service areas contribute to highest energy consumption. Regular quarterly meetings are also held with

other service areas who have direct control over energy use and GHG emissions. These focused staff meetings facilitated sharing of best practices and the identification of measures and initiatives that will work towards achieving the overall 2019-2023 CDM plan goal.

Highlights from the 2020 report (Appendix A) are below in two categories:

1. Corporate Energy CDM Plan Progress
2. Summary of corporate energy CDM actions taken in 2020

The 2020 Corporate Energy Consumption and Activities Report can be found on the Get Involved London Climate Emergency Action Plan website.

2.1 Corporate Energy CDM Plan Progress

Table 1 outlines the City's overall progress towards the 2019-2023 CDM Plan goals as of 2020:

Table 1 – 2019-2023 CDM Plan Target Tracking

Goal	2018 Baseline	2023 Reduction Target	Progress as of end of 2020
Reduction in total energy use	-	5%	8%
Total energy use (million Equivalent kilo-watt hours - ekWh)	174	165	160
Energy performance (ekWh/person)	436	394	386
Energy related GHG emissions (tonnes)	18,700	17,800	17,500
Total energy costs (millions)	$17.9	$18.8	$17.6
Water consumption (thousands m^3)	646	-	587

In terms of assessing options for achieving net-zero emissions for the Corporation by 2050 or sooner, City staff are currently working on an internal net-zero analysis study. In support of this activity:

- In 2020, Facilities staff commissioned a study to look at the feasibility of retrofitting fifteen existing City facilities, including the A.J. Tyler Operations Centre, Exeter Road Operations Centre, and Earl Nichols Arena, to be net-zero energy or near net-zero emission buildings through the implementation of heat pump technology. Preliminary results indicate that these retrofits are financially feasible.

- Request for Qualifications have been received for companies to test the deployment of large-scale net-metered solar PV power generation at wastewater treatment plants and water supply pumping stations.

In the 2019-2023 CDM Plan, the corporate CDM primary goals are further divided to individual service areas. The performance to date is summarized in Table 2.

Overall, the City's performance in 2020 is currently exceeding the 2019-2023 CDM Plan's goals. The performance in 2020 was influenced by COVID-19 pandemic restrictions limiting in-office work and reduced employee travel requirements. A similar consumption pattern to 2020 might be observed in 2021 as well as the pandemic continues. While the pandemic restrictions have impacted usage in 2020, corporate energy management activities also continued in 2020.

Table 2 – Individual Service Area 2019-2023 CDM Plan Tracking

Service Area	2018 Baseline	2023 Reduction Target	Progress as of end of 2020
Buildings – energy use (million ekWh)	68.3	64.1	62.6
Wastewater treatment – energy efficiency (ekWh/megalitre)	738	671	628
Traffic and streetlights – energy use (million ekWh)	18.4	15.1	17.7
Water supply – energy use (million ekWh)	8.7	7.8	8.9
Fleet operations – GHG emissions (tonnes CO_2e)	7,340	7,090	6,910

2.2 Summary of Corporate Energy CDM Actions Taken in 2020

The City's corporate energy team worked closely with various service areas within the City, utility personnel, and industry experts to retrofit existing buildings, construct new buildings, and upgrade equipment and processes.

An important part of the process also involves securing incentives and funding opportunities and post-project monitoring and verification of savings. The City tracks the energy savings achieved from projects once they are complete. Projects completed in 2020 contributed $200,000 in annual energy cost savings, with an additional $160,000 (one-time incentive) received in incentives from utility providers.

2020 highlights include:

- Aeration Blower Upgrades - Upgrades to all aeration blowers at wastewater treatment plants to new efficient turbo blowers were initiated in 2016 and were completed in 2020. This work is estimated to provide over $600,000 in energy savings annually. Over $1 million in incentives is being provided from the Ontario Independent Electricity System Operator (IESO) to support this work.

- Electric Ice Resurfacers - In 2020, the City made the decision to replace all compressed natural gas (CNG) ice resurfacers with electric resurfacers. Four unit are now ready to go into service when arenas re-open and four additional units are planned for use in the 2021/2022 arena season.

- Green Fleet – The City commissioned its first two CNG packers for solid waste collection services. This started the process of moving away from fossil fuel for the packers, as the long-term goal is to use renewable natural gas (RNG) from the W12A landfill as fuel in the City's waste collection fleet.

- Insulation Upgrades - Arena glass walls were replaced with insulated panels at Bostwick Community Centre.

- Organic Rankine Cycle (ORC) Engine Project - The City completed most of the installation of the ORC engine for waste heat recovery for power generation at Greenway Wastewater Treatment Facility in 2020. When commissioned in 2021, this will offset 475 kilowatts of electrical grid consumption, which represents over 12 percent of the City's overall CDM Plan goal for energy reduction by 2023.

2.3 Corporate Energy CDM Plan Progress Since 2007

Since 2007, the first year for baseline energy data, the City's energy performance has been improving year over year with:

- Energy performance for service delivery (ekWh/person) 31% better than 2007;
- Total greenhouse gas emissions 61% lower than 2007; and,
- Total water consumption 29% lower than 2007.

The introduction of the first CDM Plan in 2014 provided the City with an opportunity to review its energy management program initiatives and proposed energy targets. It provided the groundwork for successful implementation of energy management decisions and actions within all corporate operations, particularly those that begin to take actions needed to respond to the City of London's Climate Emergency Declaration.

The City has seen a number of key achievements since 2014, as listed below:

- Met and exceeded its 2014 CDM target for a 10% reduction in energy use by 2020, with a 16% reduction in total energy consumption;
- Received approximately $3 million in energy conservation and management incentives;
- Invested in deepening the culture of conservation within the Corporation's operations by having regular employee engagement activities and awareness programs;
- Avoided about $20 million in energy costs through the combination of energy conservation projects and energy commodity procurement strategies; and,
- Improved energy performance (energy used per capita for service delivery) by 25%

2.4 Development of the Climate Lens Process

The Climate Lens Process was designed to ensure that climate emergency issues are part of the decision-making processes throughout the Corporation. To date, it has been considered in a number of areas of the Corporation. The Climate Lens Process will take this experience and new knowledge to significantly increase climate emergency activities and actions. The objectives associated with the creation and use of the Climate Lens Process are to:

- Ensure climate emergency issues are included in decision-making and evaluation of existing plans, programs and projects;
- Establish a clear process for accountability and tracking of climate emergency issues, including collection of information on decision outcomes and tracking the progress of projects/programs implemented; and,
- Elevate understanding of the importance of climate emergency issues in decision-making across the Corporation.

The Climate Lens Process 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. Annual Budget Updates & Multi-year Budgets
5. Building Climate Change Capacity

The Climate Emergency Screening Tool (CEST) can be used in the Climate Lens Process especially when it is customized for an area. The customized CEST is used to guide the screening of projects and programs for key climate emergency issues and opportunities for improvement.

The development of the Climate Lens Process in 2020 and 2021 has increased the visibility and awareness of the need for energy conservation measures for City facilities, programs, projects, and operations.

2.5 Development of the Climate Emergency Action Plan

The development of a Climate Emergency Action Plan is a fundamental and required response to the City of London's climate emergency declaration. The goals are to improve London's resilience to climate change impacts, reduce London's greenhouse gas emissions by at least 37% below 1990 levels by 2030 and reach net-zero emissions by 2050.

A recent report to Council's Strategic Priorities and Policy Committee on April 27, 2021 provided an update on the plan's engagement and development to date. City staff are currently reviewing the ideas and feedback collected from residents and businesses submitted between October 2020 and April 2021 as part of the development of the plan. Opportunities for input continue and can found at https://getinvolved.london.ca/climate

The 2020 Corporate Energy Consumption and Activities Report, reporting on corporate energy use and resulting greenhouse gas emissions, and the background data behind it, are part of the foundation for the development of the Climate Emergency Action Plan (CEAP). The CEAP is currently scheduled to be submitted to the Strategic Priorities and Policy Committee (SPPC) in late fall 2021.

Conclusion

Overall, 2020 saw a large shift in focus from making decisions based on the reduction of energy usage to decision-making from an integrated climate change perspective, particularly as it related to projects and funding opportunities for projects. Many internal studies are underway to identify net-zero opportunities at individual facilities.

The City will always require energy to run its facilities, vehicles, and operations, but the 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.

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Appendix A 2020 Corporate Energy Consumption and Activities Report

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2020 Corporate Energy Consumption and Activities Report

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London CANADA

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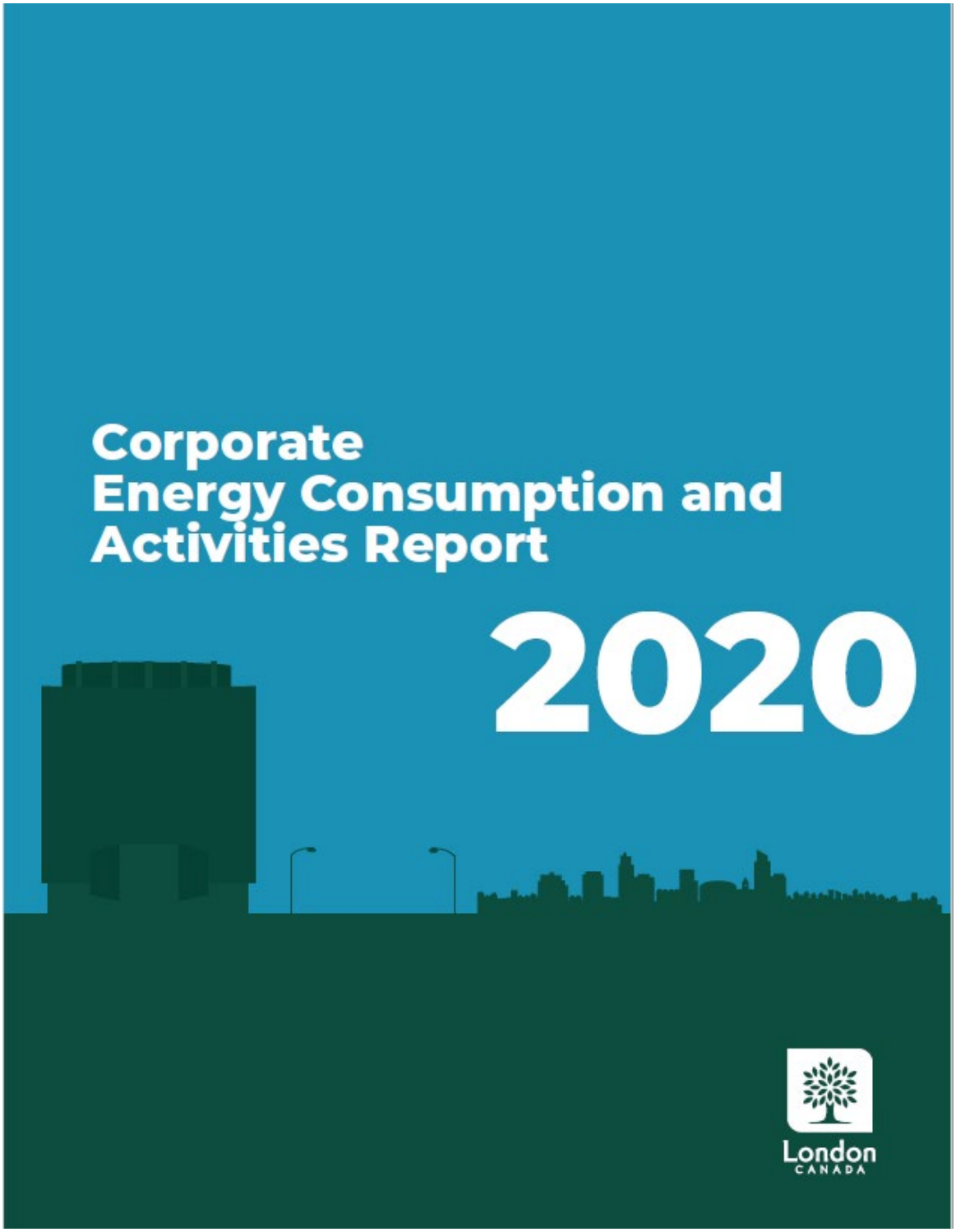
Executive Summary

The Executive Summary for the 2020 Corporate Energy Consumption & Activities Report is now a stand-alone document.



1. Background

In 2009, the Ontario legislature passed the *Green Energy Act (GEA).* As one of its objectives, the GEA aimed to increase energy conservation by introducing measures to help Ontarians manage energy use. The GEA's Regulation 397/11 (now the O. Reg 507/18, Electricity Act 1998), requires all public agencies to prepare and publish:

- Annually updated reports on the energy consumption and greenhouse gas emissions for City's facilities.
- A Conservation and Demand Management (CDM) Plan starting in 2014 and to update this plan every five years. The CDM Plan outlines strategies for identification and implementation of CDM projects throughout City facilities. The first plan was released in July 2014, and an updated 2019-2023 CDM Plan was released in August 2019.

The Ontario Regulation 507/18 reporting requirement does not include significant corporate energy users such as street lighting and corporate fleet fuel use, nor other needs such as sports field lighting. However, these energy needs are included within the scope of this Corporate Energy Consumption and Activities Report as it is imperative that all energy uses and impacts within the City's control are continuously examined for reduction opportunities.

2. Alignment with Existing Strategies

This report and the CDM Plan align with:

1. The City's Climate Emergency Declaration: On April 23, 2019, the following was approved by the municipal Council with respect to Climate change:

   Therefore, a climate emergency be declared by the City of London for the purposes of naming, framing, and deepening our commitment to protecting our economy, our eco systems, and our community from climate change

2. Climate Emergency Action Plan (CEAP)– The development of the Climate Emergency Action Plan will be a fundamental response to the City's climate emergency declaration. The goals will be to improve London's resilience to climate change impacts, reduce London's community-wide greenhouse gas emissions by at least 37 per cent below 1990 levels by 2030 and reach net-zero by 2050. The 2019-2023 CDM plan's long-term goals closely align with CEAP.

3. City of London Strategic Plan – Building a Sustainable City is one of the Strategic Areas of Focus in the 2019-2023 Strategic Plan with a key performance indicator being to conserve energy and increase actions to respond to climate change and severe weather.

3. Collaboration with Service Areas

A collaborative process to implement the energy conservation action items was introduced with major service areas during the development of the CDM Plan in 2019. Bi-weekly meetings with Facilities and monthly meetings with Fleet and Wastewater Treatment service areas are held to review current energy consumption, progress towards CDM goals and to discuss future projects and initiatives as these service areas contribute to highest energy consumption. Regular quarterly meetings are also held with other service areas who have direct control over energy use and greenhouse gas emissions. These focused staff meetings facilitated sharing of best practices and identification of measures and initiatives that will work towards achieving the overall 2019-2023 CDM plan goal.

Further, the implementation and development of the Climate Lens Process as discussed in section 7.2 in this report, includes collaborative work with every service area and operational units within the Corporation to work together towards the common net-zero goal by 2050 or sooner.

4. 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 centers.

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. This energy use and greenhouse gas emissions are captured in the 2020 Community Energy Use & Greenhouse Gas Emissions Inventory report.

4.1 Service Areas 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 plants, 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 areas are divided in the following categories to compare their individual contribution to City's total energy consumption:

- Buildings
- Wastewater Treatment Plants

- Water Supply Operations
- Traffic Signals & Streetlights, and
- Fleet Operations

4.2 Sources and Emission Factors for Greenhouse Gas

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 highest emissions per equivalent kWh of fuel as shown in table 1.

Table 1: Commodity Emission Factors - Grams of CO_2 equivalent per equivalent kilowatt-hour (kWh)

Commodity	**2020**
Electricity	30
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 Atmospheric Fund report (TAF) https://taf.ca/wp-content/uploads/2019/06/A-Clearer-View-on-Ontarios-Emissions-June-2019.pdf.
- 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.
- Gasoline and diesel have highest emission factors and are used in City fleet vehicles.

5. Performance to 2019-2023 CDM Plan Goals

The City's 2019-2023 CDM Plan primary goal is to achieve a five per cent reduction on overall annual energy use by 2023. The baseline year is 2018. Tied to this goal are:

- A ten per cent reduction in energy use per capita,
- 900 tonnes of avoided greenhouse gas emissions by 2023, and
- Keeping the total energy cost increases within five per cent from 2018 baseline year.

The secondary long-term goals identified in this plan are:

- Monitor and track the City's water consumption starting in 2018, and
- Investigate possible pathways for achieving net zero emissions by 2050 or sooner

To achieve these goals, Planned, Proposed, and Behavioural initiatives were identified in the CDM Plan for each service area and the primary goal was further divided into individual goals for each service area. All the City service areas are separated into five areas as below:

- Buildings
- Wastewater & treatment operations
- Water pumping operations
- Traffic signals & streetlights, and
- Vehicle fleet

Identified in Table 2 is the City's detailed progress towards the 2019-2023 CDM goals to date:

Table 2 – 2019-2023 CDM Plan Target Tracking

Goal	2018 Baseline	2023 Reduction Target	Progress as of end of 2020	Notes
Reduction in total energy use from 2018 baseline	-	Down by 5%	Down by 8%	Exceeded target (mostly due to COVID-19 shutdowns, which reduced buildings energy consumption).
Total Energy use (million ekWh)	174	165	160	Exceeding target so far.
Energy Performance (ekWh/person)	436	394	386	Exceeding target so far.
Energy related greenhouse gas emissions (tonnes)	18,700	17,800	17,500	Exceeded target by 2% so far due to: • COVID -19 shutdowns • Greenway incinerator off for two months for Organic Rankine Cycle (ORC) project installation.
Total Energy Costs (millions)	$17.9	$18.8	$17.6	2% below baseline so far (within target).

Goal	2018 Baseline	2023 Reduction Target	Progress as of end of 2020	Notes
Monitor and Track water consumption (thousands m^3)	646	-	587	6% reduction year over year so far.

In terms of assessing options for achieving net-zero emissions for the Corporation by 2050 or sooner, City staff are currently working on an internal net-zero analysis study. In support of this activity:

- Ameresco has completed a net-zero energy buildings pathway study involving 16 buildings, and
- Request for Qualifications have been received for companies to test the deployment of large-scale net-metered solar PV power generation at wastewater treatment plants and water supply pumping stations.

In the 2019-2023 CDM Plan, the corporate CDM primary goals are further divided to individual service areas. This performance is tracked in Table 3:

Table 3 – Individual Service Area 2019-2023 CDM Plan Tracking

Service Area	2018 Baseline	2023 Reduction Target	Progress as of end of 2020	Notes
Buildings (million ekWh)	68.3	64.1	62.6	Decrease in consumption due to COVID-19 shutdowns.
Wastewater Treatment Operations (ekWh/megalitre)	738	671	628	Energy efficiency exceeded 2018 target. This is mostly due to natural gas being turned off at Greenway incinerator for two months for ORC project.

Service Area	2018 Baseline	2023 Reduction Target	Progress as of end of 2020	Notes
Traffic and Streetlights Operations (million ekWh)	18.4	15.1	17.7	3% decrease as of 2020 and on track towards 2023 target. Phase 1 and Phase 2 LED conversion of streetlights are resulting in continued energy savings year over year.
Water Supply Operations (million ekWh)	8.7	7.8	8.9	4% increase in electricity consumption led to overall energy increase. Electricity increase was due to a 3% increase in water supply.
Fleet operations (tonnes CO_2e greenhouse gas emissions)	7,340	7,090	6,910	Decrease in fuel emissions by almost 6% in 2020 compared to 2018 and exceeded target. This is due to reduced diesel consumption in 2020 by conversion of 4 solid waste packers to CNG. Use of CNG contributed to only 0.03 tonnes of greenhouse gas in 2020.

Overall, the City's performance in 2020 is currently exceeding the 2019-2023 CDM goal. The performance in 2020 was influenced by COVID-19 restrictions. A similar consumption pattern to 2020 might be observed in 2021 performance as well, as the pandemic continues in 2021. However, corporate energy management activities also continued in 2020. A complete list of 2020 corporate energy activities are provided in Section 7 and Appendix B of this report.

6. Corporate Annual Energy Analysis

In 2020, the City's energy use is categorized by consumption, associated emissions, and costs by commodity. The 2020 energy data are also normalized to London's population to measure improvements in efficiency. This allows City to demonstrate and relay to Londoners the energy consumed in relationship to service delivery provided by the City.

For this report, all the 2020 energy emissions data are compared to below two years:

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

6.1 Total Corporate Energy Consumption

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

Table 4 – Total Energy Consumption by Commodity

Energy Consumption (ekWh)	2007	2018	2020	Change from 2007	Change from 2018
Electricity	108,328,000	98,448,000	89,893,000	-17%	-9%
Natural Gas	58,682,000	42,430,000	40,889,000	-30%	-4%
Steam	3,499,000	3,269,000	2,093,000	-40%	-36%
Chilled Water	1,759,000	1,521,000	913,000	-48%	-40%
Diesel Fuel	20,129,000	22,194,000	20,306,000	0.8%	-9%
Gasoline	6,718,000	6,889,000	6,667,000	-1%	-3%
Total	199,115,000	174,751,000	160,761,000	-19%	-8%

Table 4 shows the City's energy consumption by commodity, which amounts 160 million equivalent kilowatt-hours (kWh) in 2020. Electricity represents the 56 per cent of all the energy used by the City. Out of this, more than 50 per cent is consumed by electricity-intensive operations such as water supply and wastewater treatment plants, 20 per cent is consumed by streetlights and traffic lights, and the remaining 30 per cent is consumed for maintain building ventilation, lighting, and office equipment.

Natural gas is second highest commodity, representing 25 per cent of the total energy consumption. Most of the natural gas is used for space heating and hot water heating, but approximately eight to ten per cent of the total natural gas is used for wastewater sludge incineration at Greenway Wastewater Treatment Plant every year.

Diesel and gasoline are consumed by 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.

Steam and Chilled water account for only one per cent of the total energy consumption each and is completely used by administration buildings owned by the City in downtown London including City Hall. Steam and chilled water are supplied by London District Energy.

Overall, total energy use is 20 per cent lower compared to 2007 and eight 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 major role in conservation.

6.2 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.

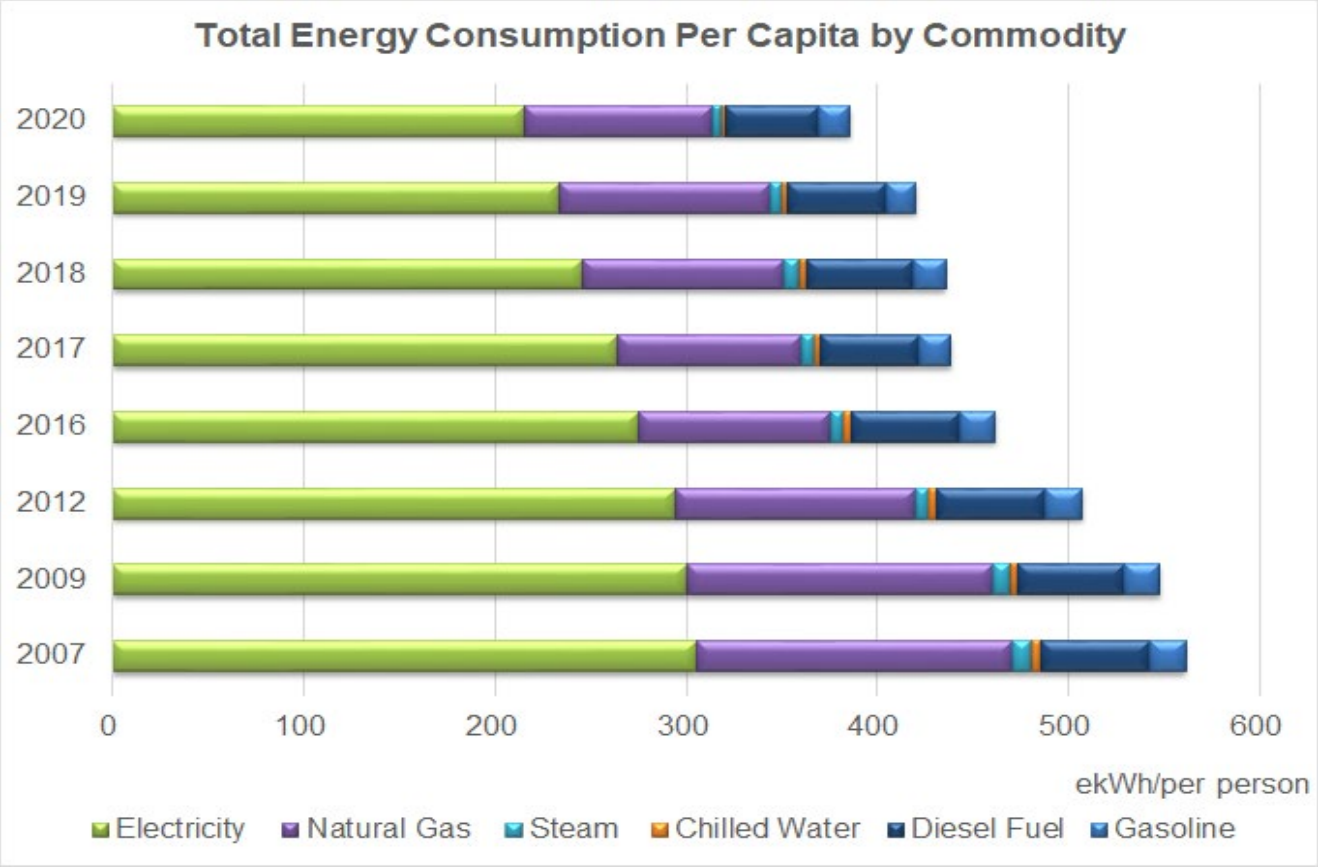


Figure 1: Corporate Total Energy Consumption per Capita by Commodity Type

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

- London's population has grown by almost 18 per cent (62,000 people) since 2007. Thirteen years of data show continued improvement of corporate energy use per

capita with an overall reduction of 31 per cent in 2020 compared to 2007.

- In 2020, the City improved energy efficiency by over twelve per cent compared to 2018. This significant reduction in 2020 is mostly due to offices and community service centers being shutdown in 2020 due to the COVID-19 pandemic.

- London's population increased by four per cent in 2020 from 2018, while corporate energy use per person decreased by twelve per cent from 2018.

6.3 Total Corporate Energy Consumption by Service Area

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.

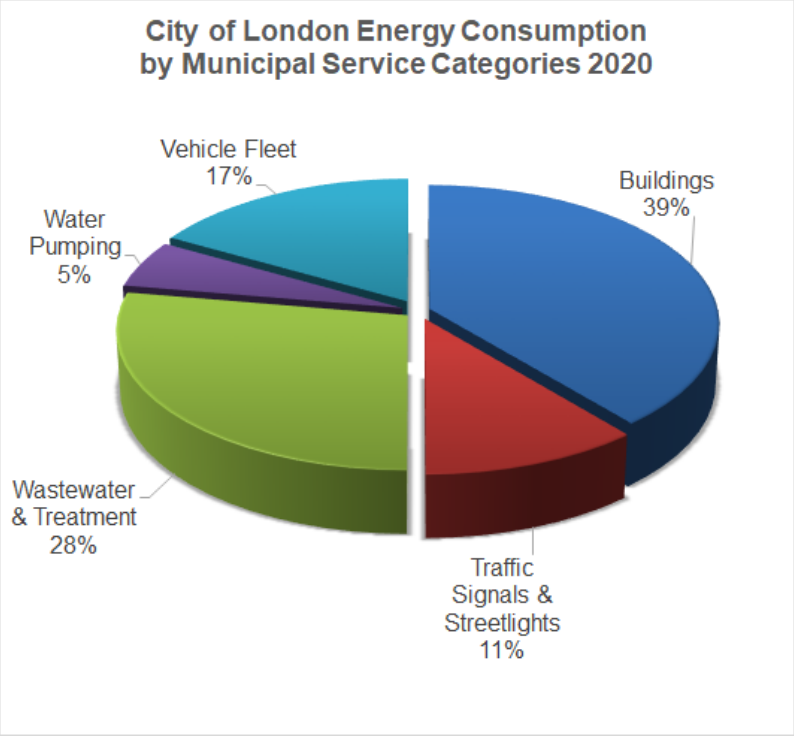


Figure 2: City of London 2020 Energy Consumption by Municipal Service Categories

Figure 2 is a pie chart showing buildings as the highest energy consumer at 39 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 five per cent.

Figure 3, a stacked bar graph, represents the overall energy consumption (ekWh) by the municipal service categories since 2007. The last six years are highlighted in this figure to show continuous improvement year over year since 2015.

Most of the energy consumption reductions have been observed in buildings, wastewater treatment operations and traffic signals & streetlights.

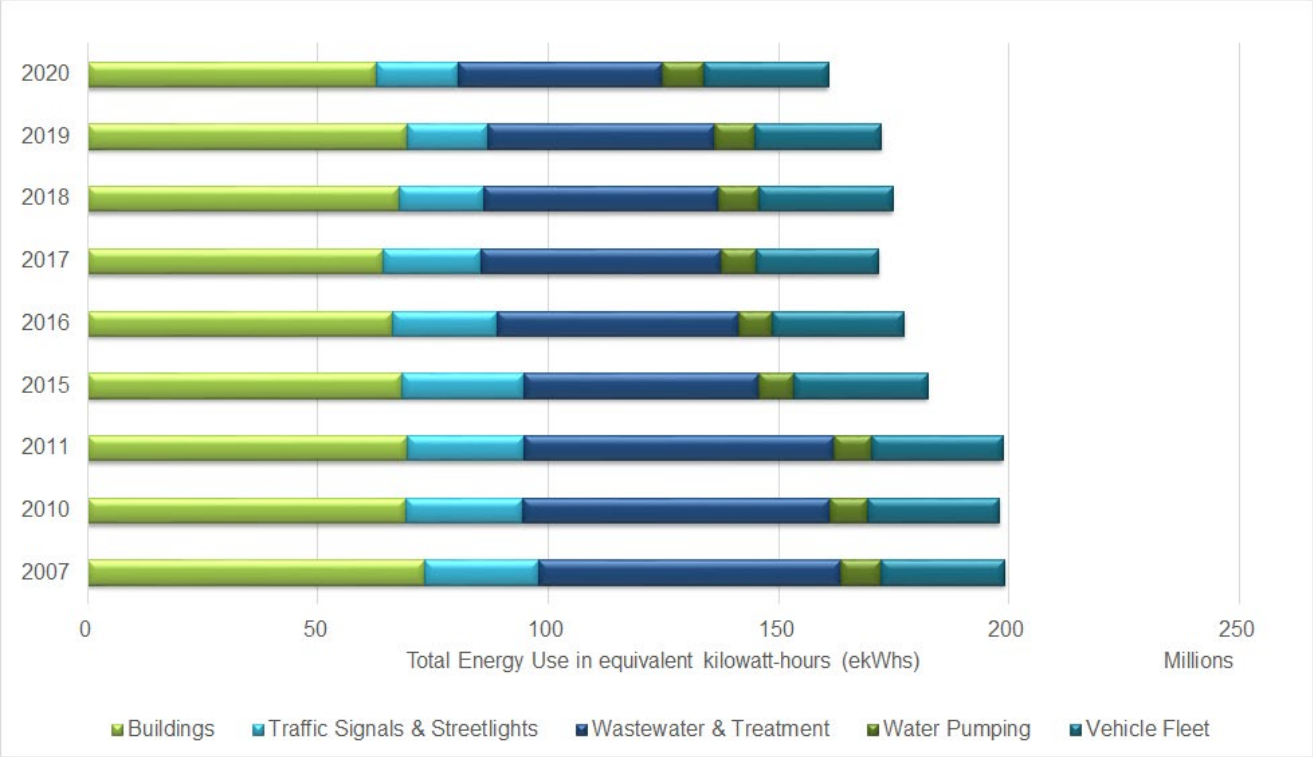


Figure 3 – Total Energy Consumption by Service Area (ekWhs)

Buildings reduced energy consumption by 17 per cent compared to 2007 and eight per cent to 2018. Most of these reduction from 2007 are a result of heating, ventilation, and air conditioning (HVAC) upgrades and LED lighting upgrades at Buildings.

Wastewater treatment continues to see improved energy efficiency as a result of HVAC upgrades, aeration blower upgrades and utilizing waste heat. There was 30 per cent drop in natural gas at wastewater treatment operations in 2020 alone compared to 2019 due to the sludge incinerator at the Greenway Wastewater Treatment Plant being shut off for two months for the installation of the Organic Rankine Cycle (ORC) engine. With the completion of the ORC engine commissioning in 2021 and boiler upgrades at Greenway in 2022, the natural gas consumption at the plant is expected to drop further by five to ten per cent by end of 2022.

Traffic signals and streetlights have seen an 18 per cent decrease from 2007 and a four per cent decrease from 2018. However, electricity use has remained the same over the last two years as the first two phases of the LED streetlighting project are completed. There is an opportunity to further reduce streetlights consumption by completing the third phase of decorative and side streetlights conversion from halogens to LEDs. However, the current cost of decorative LED fixtures is high and does not meet the City’s business case requirements.

Fleet fuel consumption has remained the same since 2018 and is influenced directly by activities undertaken by different service areas. Although total consumption increased by just under one per cent compared to 2007, the per capita consumption shows a decrease by 14 per cent. This shows that the efficiency of fleet operations increased over the years.

Adding the new Southeast Reservoir Pumping Station (SERPS) water supply facility in 2017 increased water supply's overall energy consumption by two per cent compared to 2007 and 2018. However, on-going energy efficiency efforts at this new facility and other water supply facilities will help reduce energy consumption in the next five years.

6.4 Total Energy-Related Corporate Greenhouse gas Emissions

In 2020, greenhouse gas emissions from energy use were six per cent (1,200 tonnes) lower than 2018 and 61 per cent lower compared to 2007. Figure 4 shows the greenhouse gas reduction trend since 2007. Greenhouse gas reductions have been observed across the corporation since 2007, except for Fleet.

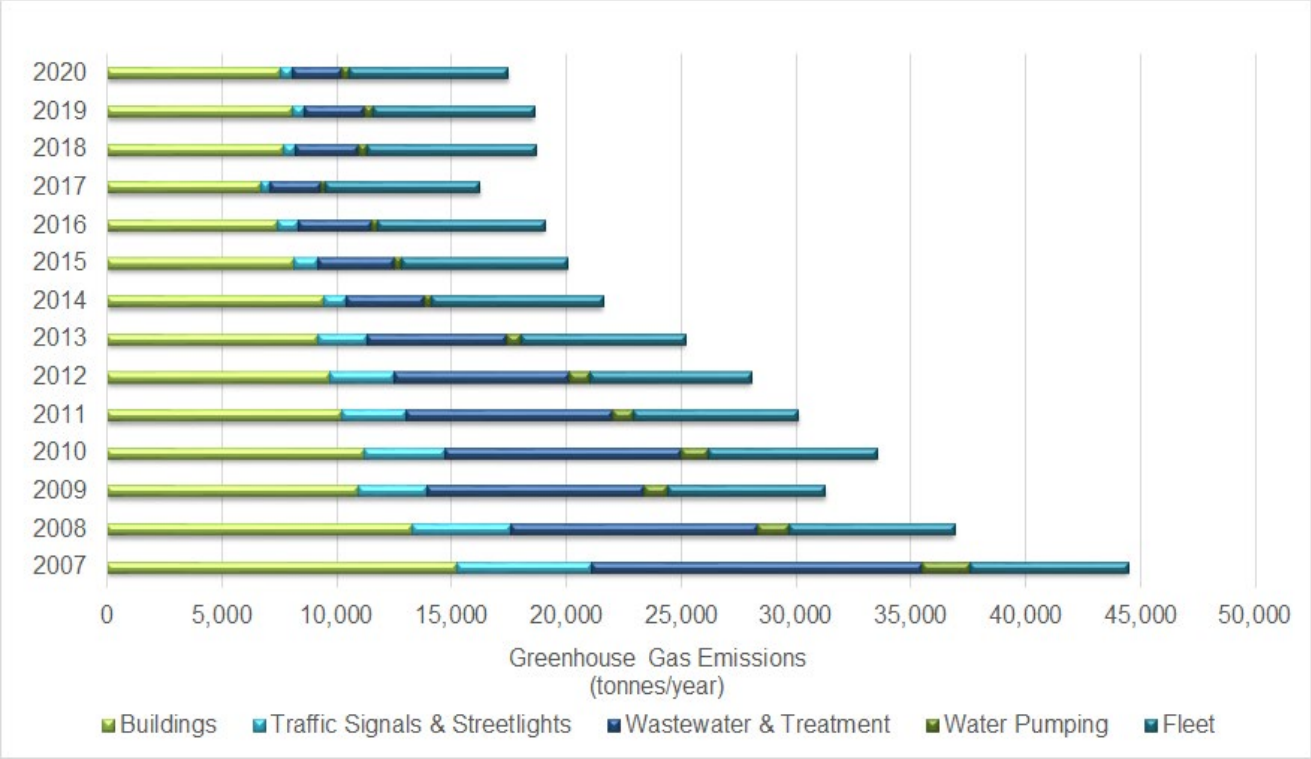


Figure 4 – Corporate Energy-Related Greenhouse Gas Emissions since 2007

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

Wastewater treatment operations have reduced their greenhouse gas emissions by 21 per cent (580 tonnes per year) since 2018. Most of these reductions per cent between 2019 and 2020 were due to the sludge incinerator at Greenway being shutoff for two

months in 2020 for the installation of the ORC engine. However, since 2007, wastewater has seen overall reductions of 85 per cent (12,300 tonnes per year) due to the sludge dewaterer eliminating the need to constantly burn natural gas for sludge incineration, as well as energy efficiency projects as waste heat recovery, aeration blowers, and HVAC upgrades.

Most of the emission reductions 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:

- 90% reduction in electricity-related emissions
- 44% reduction in steam-related emissions, due solely to corporate actions
- 23% reduction in natural gas related emissions, due solely to corporate actions

However, 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 2035, from 30 to 86 grams of CO_2e/kWh. This is due to an expected greater reliance on gas-fired power plants after the closure of the Pickering Nuclear Generating Station after 2024 as well as the Provincial Government's cancellation of the last round of renewable power generation procurement in 2018.

This could result in corporate energy related greenhouse gas emissions increasing over the 2019-2023 timeframe even with the planned energy savings, given that electricity represents about 60 per cent of corporate energy needs.

However, after 2035, it is assumed that Ontario's electricity grid will become emissions free by 2050 as these natural gas power plants, designed to meet peak demand needs, are replaced by renewable power generation combined with power storage systems.

6.4.1 Net Zero Emissions Pathway by 2050

The City is currently working on developing projects and initiatives towards achieving its long-term target of Net-zero by 2050 or sooner as part of its 2019-2023 CDM Plan and as part of next steps of Climate Emergency Action Plan. Figure 5 shows City's performance to date towards achieving net zero by 2050. With 2020 emissions being 17,500, the actual emissions till date are below the trendline to net-zero by 2050.

The electricity emission factor is expected to increase from 30 to 85 grams of CO2 equivalent per kilowatt hour between 2021 and 2035 as Ontario nuclear power generators are undergoing refurbishment and natural gas generators would be used to compensate for the lost capacity during this period.

In terms of assessing options for achieving net-zero emissions for the Corporation by 2050 or sooner, City staff are currently working on an internal net-zero analysis study. In support of this activity:

- Ameresco has completed a net-zero energy buildings pathway study involving 16 buildings
- Request for Qualifications have been received for companies to test the deployment of large-scale net-metered solar PV power generation at wastewater treatment plants and water supply pumping stations

London District Energy is currently working on making its own steam and chilled water generation free of fossil fuels in the next ten years, which will directly help reduce City's emissions and contribute towards achieving net-zero goal by 2050 or sooner as a community.

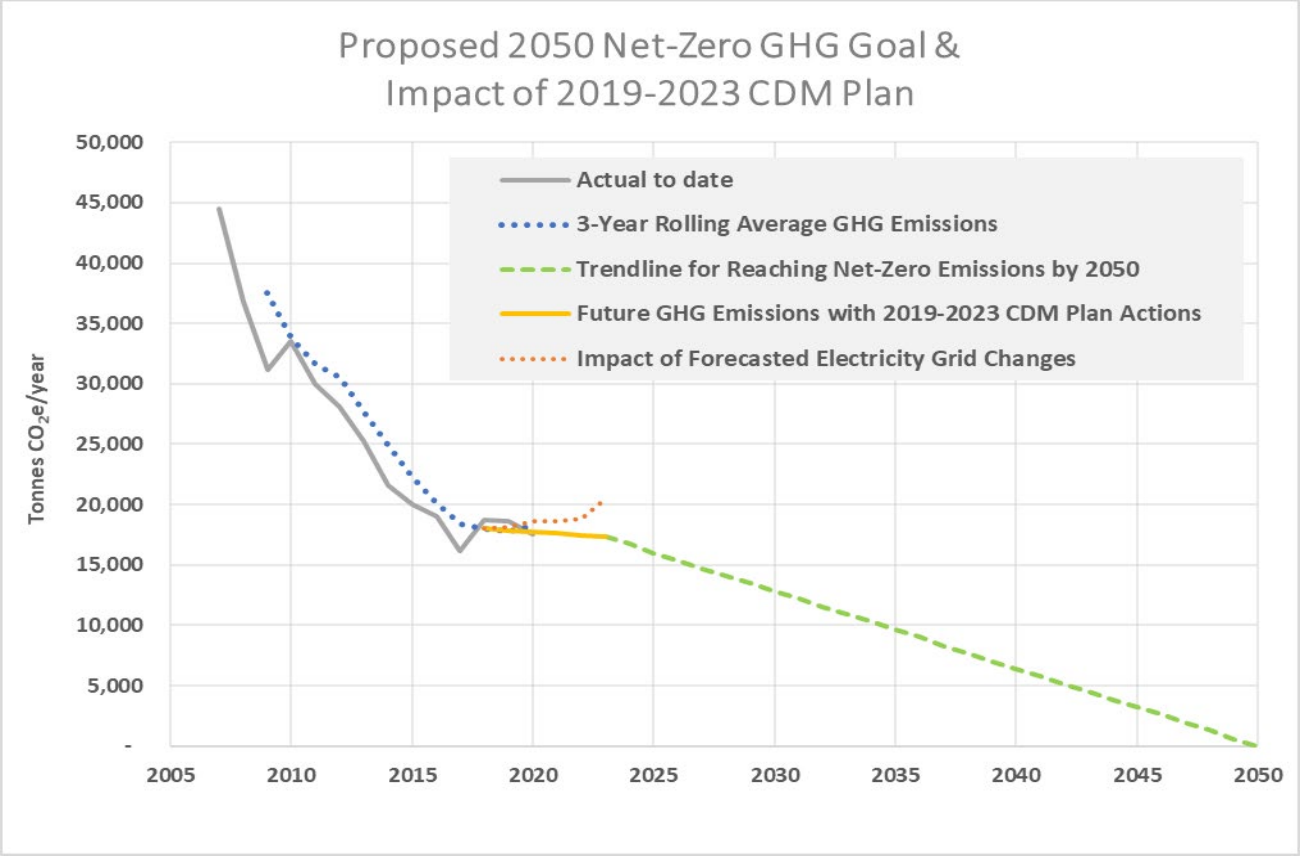


Figure 5 – Greenhouse Gas Emissions to Date and Progress Towards Goals

6.4.2 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 (N_2O) emissions from the incineration of sewage sludge at the Greenway Wastewater Treatment Plant.

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 3.

Table 5 – Summary of Landfill Gas Flaring at W12A Landfill

Year	Methane Flared (tonnes)	Equivalent CO_2 Reduced (tonnes)	Cumulative Methane Flared (tonnes)	Cumulative CO_2e Reduced (tonnes)
2004	852	21,000	852	21,000
2005	1,975	49,000	2,827	70,000
2006	1,800	45,000	4,627	115,000
2007	1,441	36,000	6,068	151,000
2008	1,845	46,000	7,914	197,000
2009	2,282	57,000	10,196	254,000
2010	2,324	58,000	12,520	312,000
2011	2,658	66,000	15,177	378,000
2012	3,237	81,000	18,415	459,000
2013	4,516	113,000	22,931	572,000
2014	4,165	104,000	27,096	676,000
2015	4,299	107,000	31,395	783,000
2016	5,989	149,700	37,384	932,700
2017	6,380	159,500	43,764	1,092,200
2018	4,292	107,300	48,056	1,199,500
2019	5,246	131,200	53,302	1,330,700
2020	6,791	169,800	60,093	1,500,500

As a result of London having joined the Compact of Mayors in 2015, nitrous oxide (N_2O) 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 Plant sludge incinerator has included the measurement to nitrous oxide alongside other air pollutants. Table 6 summarizes the nitrous oxide stack test results.

Table 6- Summary of 2008 – 2017 Stack Test Results for N_2O Emissions from the Greenway WWTP Sewage Sludge Incinerator

Year	Measured average N_2O emissions g/s	Measured average N_2O emissions kg/h	Estimated annual N_2O emissions tonnes/y	Estimated annual CO2e tonnes/y
2008	0.1	0.4	4	1,200
2009	1.1	3.9	34	10,700
2010	1.1	3.9	34	10,600
2011	1.2	4.4	39	12,000
2012	1.0	3.5	31	9,600
2013	0.2	0.6	5	1,700
2014	1.1	4.1	36	11,000
2015	1.0	3.7	32	10,000
2016	0.3	1.1	9	2,900
2017	2.4	8.6	65	20,200
2018	1.7	6.0	43	13,200
2019	1.5	5.5	33	10,200
2020	0.8	3.0	16	5,100

As can be seen from the table above, measured emissions of nitrous oxide can vary from year to year.

As Environment and Climate Change Canada has reduced the reporting threshold for facility emissions to 10,000 tonnes per year of carbon dioxide equivalent emissions for the 2017 reporting year, the Greenway Wastewater Treatment Plant is now required to report its emissions.

6.4.3 Total Corporate Greenhouse Gas Emissions by Employee Travel

City staff have estimated the greenhouse gas emissions impact associated with employees commuting to work as well as work-related travel in 2017. These types of greenhouse gas emissions indirectly induced by an organization are referred to as "Scope 3" greenhouse gas emissions, with Scope 1 being greenhouse gas emissions directly from corporate activities and Scope 2 being greenhouse gas emissions from the generation of electricity used in corporate activities:

> *Scope 3: Other indirect emissions, such as the extraction and production of purchased materials and fuels, transport-related activities in vehicles not owned or controlled by the reporting entity, electricity-related activities (e.g.,*

transmission & distribution losses) not covered in Scope 2, outsourced activities, waste disposal, etc.

Greenhouse gas emissions have been estimated for the following:

- Car allowance reimbursements – based on 2017 reimbursement expenditures from Finance, a $0.50/km mileage reimbursement rate, and an assumed 10L/100km average passenger vehicle fuel economy:

- Corporate travel – based on 2017 total travel and convention expenditures from Finance, an assumption of one-third of these costs being air travel costs, published data an average airfare cost per kilometre travelled, and published air travel greenhouse gas emissions per passenger-kilometre travelled; and

- Employee commuting – based on the 2014 City of London Mobility Survey results, average commuting distance based on employee home postal codes, and an assumed 10L/100km average passenger vehicle fuel economy.

Table 7: Summary of 2017 Employee Travel Greenhouse Gas Emissions

Activity	Cost	Estimated fuel use (L/year)	Estimated greenhouse gas Emissions (tonnes CO_2e/year)
Car allowance	$255,000	51,000	110
Air travel (estimated)	$240,000	not applicable	460
Employee commuting	not applicable	1,200,000	2,500
Total	**$495,000**		**3,500**

These provide an order-of-magnitude estimate of the significance of these activities and will be used to help set priorities, particularly for promoting transportation demand management activities (e.g., carpooling, cycling, telecommuting, and transit) for City of London employee commuting.

Given that about 870 City employees were working from home as of March 2020, it is estimated that commuting related greenhouse gas emissions decreased by about 750 tonnes in 2020.

6.5 Water Consumption

Water is the second highest utility cost for the City. In 2020 alone, water cost was $2 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. The majority 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 plants is identified in the graph.

Figure 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.
- 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.
- Wastewater operations water consumption is stable year over year since the past six years.

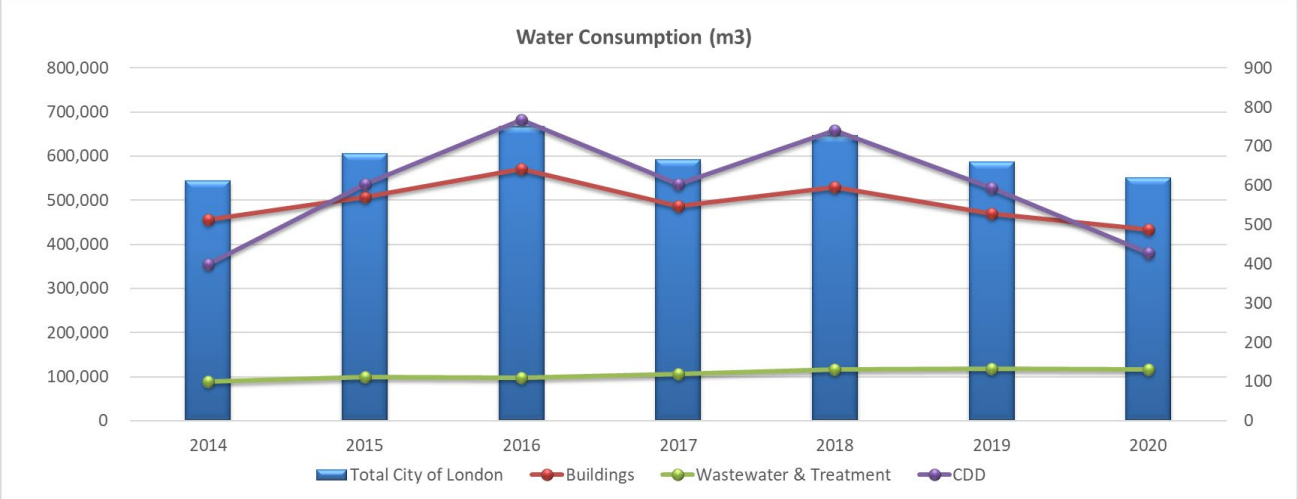


Figure 6 – Total Water Consumption (m3)

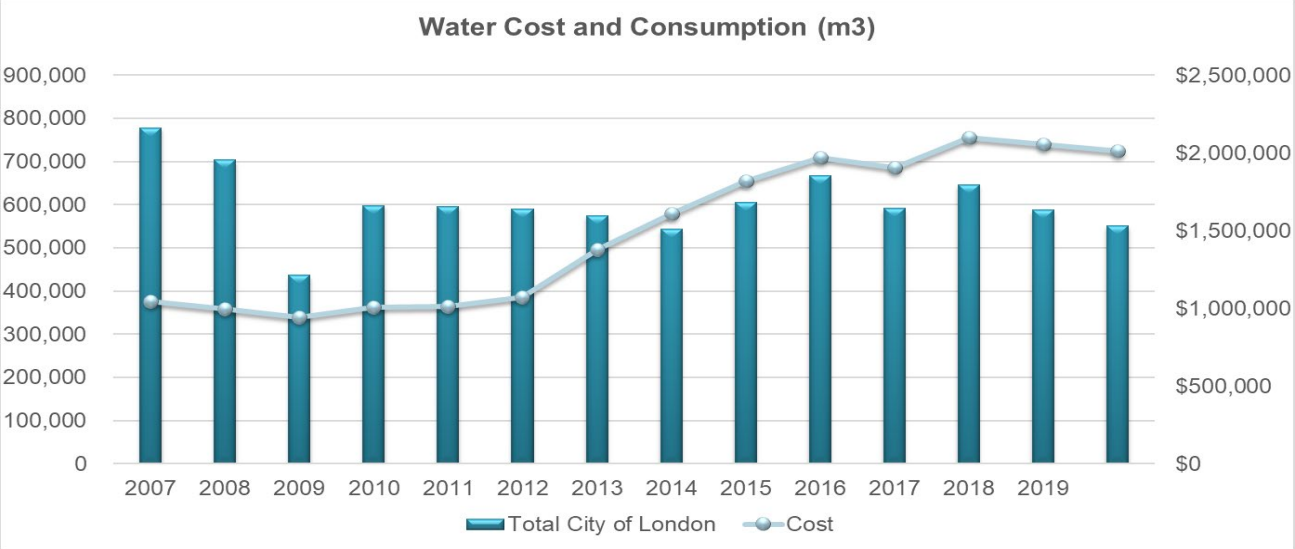


Figure 7 – Water Cost and Consumption (m3)

Figure 7 shows how water consumption has been reduced by 29 per cent from 2007 to 2020. During the same period, water cost increased by double due to the changes made to water billing between 2012 and 2014.

6.6 Corporate Energy Cost

Total corporate energy costs continue to increase with the price of electricity in Ontario being the major contributor. However, 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.

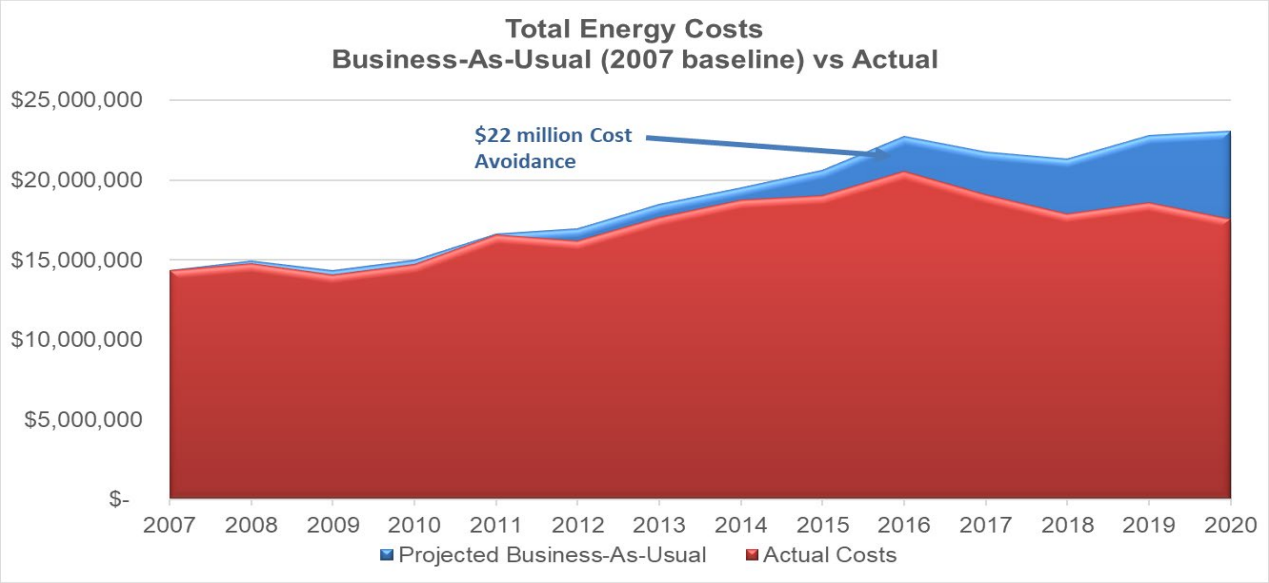
Table 8 – Energy Costs by Commodity

	2007	2018	2020	Change since 2007	Change since 2018
Electricity	$9,289,000	$13,520,000	$14,003,000	51%	4%
Natural Gas	$2,350,000	$1,029,000	$1,251,000	-47%	22%
Steam	$273,000	$192,000	$151,000	-45%	-21%
Chilled Water	$251,000	$277,000	$196,000	-22%	-29%
Diesel Fuel	$1,518,000	$2,133,000	$1,410,000	-7%	-34%
Gasoline	$664,000	$755,000	$587,000	-12%	-22%
Total City of London	$4,345,000	$17,906,000	$17,598,000	23%	-2%

Total energy costs in 2020 were $17.6 million, 23 per cent higher than 2007 and slightly lower by two per cent compared to 2018. As shown in Table 8, electricity price plays a major role in overall commodity costs. Though electricity consumption went down by 17 per cent since 2007, total electricity costs increased by over 50 per cent in the same period.

Figure 8 shows that approximately $5 million in energy costs were avoided in 2020 compared to 2007 levels and more than $22 million in avoided energy costs have been accumulated since 2007.

Figure 8 - Avoided Energy Costs (Accumulated)



The City requires several different initiatives to sustain and/or reduce energy costs. The cost per capita is continuing to drop between 2016 and 2020 (from $54 per person to $42 per person in 2020). 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.

6.6.1 Utility Procurement

The City of London uses energy procurement strategies to mitigate the cost of energy. To assist the City of London in preparing forecasts for long-term budgetary considerations, Blackstone (the City's energy procurement advisor) has provided the following commodity price escalation estimates shown in Table 9. These projections in market forecasts give the City the opportunity to prepare for increased operating costs and to develop additional measures to mitigate some of these financial impacts. Specific notes regarding each commodity follow.

Table 9- Utility Price Forecast - Annual Commodity Escalation Estimates

	2022	2023	2024	2025	2026
Electricity Rates	0.6%	3.0%	2.9%	1.7%	1.8%
Natural Gas Rates	-0.8%	8.9%	10.4%	9.1%	8.4%
Steam	1.3%	3.6%	5.8%	5.1%	4.9%

Electricity:

Ontario is a unique electricity market in that the majority of costs consumers face are outside of the actual wholesale energy price, or Hourly Ontario Energy Price (HOEP). The bulk of costs are paid through Global Adjustment (GA), which covers the cost of building new assets, maintaining existing infrastructure, and delivering conservation and demand management programs. Ontario continues to maintain a diverse grid-connected electricity supply mix with approximately 33 per cent of generation capacity coming from nuclear, 29 per cent from natural gas, 23 per cent from hydro, 12 per cent from wind, solar and small amounts from biofuel. Despite the diverse supply mix, natural gas pricing plays a prominent role in determining HOEP as natural gas generators are often the marginal units setting price in Ontario – particularly in summer and winter.

Blackstone is projecting a significant increase in electricity commodity costs for 2022. This stems from 1) Blackstone's confident natural gas forecast, which would put upward pressure on HOEP, and 2) generally higher forecasted demand in 2022 as the province recovers and the economy re-opens after COVID-19. Beyond 2022, electricity prices continue to rise as additional nuclear generators undergo refurbishment, resulting in a greater reliance on more expensive natural gas generation.

Costs outside of HOEP make up most of the City's costs, particularly in the form of GA. Taking into consideration GA, regulatory, and delivery charges, Blackstone forecasts a moderate decrease in 2022 resulting primarily from 2020 COVID-19 GA deferrals being paid off in 2021. Post-2022, Global Adjustment, as well as utility regulatory and delivery charges are forecasted to steadily rise year-over-year at an inflationary pace.

Natural Gas:

The City currently has its natural gas supply secured at variable index prices until October 2021. Beyond this time, City will work with Blackstone to hedge portions of the City's natural gas supply in future years to take advantage of the current low pricing environment before the price escalations mentioned in Table 9 are fully realized.

So far, 2021 has shown higher commodity costs compared to last year. In contrast, we are in a relatively lower storage environment with less production as well as stronger export and demand expectations. This has created a higher pricing environment which is expected to continue over the winter and into 2022. It is expected that production levels will trend upwards towards highs set in early 2020, but it is still unclear as to how long that will take.

Uncertainty remains around the existing supply/demand balance for the rest of summer 2021. Industrial demand will be a driving factor as the economy begins to recover from COVID-19 shut-downs. Blackstone expects electricity demand to increase as lockdowns are lifted and more jurisdictions reopen, which will drive natural gas demand for electricity generation. Weather is another wildcard, as expectations for cooling demand

change frequently and will cause greater volatility on prices this summer due to lower storage levels.

In 2023-2024 it is expected that overall commodity prices will decrease over time as more production begins to come online, and storage moves towards more favorable levels.

Even though commodity pricing forecasts are lower post-2022, overall costs are projected to increase once escalation of utility delivery fees and carbon charges are factored in. These are the primary drivers of costs in the outer years evaluated, out until 2026. Carbon charges will increase once again in April 2022 from $40 to $50 per tonne, but there is currently legislation before parliament to continue increases out until 2030. It is expected that the carbon price will increase an additional $15/tonne per year out until 2030, reaching $170/tonne.

City will be working with Blackstone in reviewing low carbon alternatives for the City, such as renewable natural gas (RNG).

Steam:

Steam input costs are strongly tied to natural gas, as this is the main input cost for steam. Carbon costs will also factor into steam costs as London District Energy passes on carbon charges to its client base. As a result of these factors and expected costs increases from London District Energy, it is forecasted that costs for steam will rise slowly over the coming years.

7. Energy Conservation

One of the energy reduction strategies the City employs is the completion of energy conservation projects and Culture of Conservation Activities. Upgrades to existing corporate buildings by installing energy efficient lighting and equipment or utilizing new technologies can help to improve operational efficiencies, cost effectiveness, and help meet corporate targets for energy intensity and greenhouse gas reductions. With global attention on climate change, greener public buildings are an expectation by staff and communities and will help move the City toward meetings its strategic and corporate goals.

The City’s corporate energy team work closely with various service areas within the City, utility personnel and industry experts to retrofit existing buildings, construct new buildings, and upgrade equipment and processes. An important part of the process also involves securing incentives and funding opportunities and post project monitoring and verification of savings. The City tracks the energy savings achieved from projects once they are complete. The 2020 contribution from project savings was $200,000 and $160,000 in incentives. Cumulatively, a total of $5.7 million in savings since 2010 for projects and incentives.

2020 Highlights:

Electric Zambonis:

- In 2020, City made an important decision to replace all compressed natural gas (CNG) ice resurfaces with electric resurfaces. Four ice resurfacers are now ready to go into service (when arenas re-open) and four additional units planned for the 2021/2022 arena season.
- London was one of the first cities in North America to make this move.
- This project will result in 290 tonnes of greenhouse gas savings annually.

Renewable Energy

- Facilities conducted net-zero energy study of the A.J. Tyler Operations Centre and 15 other buildings with Ameresco with a focus on PV generation.
- Wastewater Operations is investigating wastewater heat recovery technology at its new Dingman Creek pumping station.
- Solar Photovoltaic (PV) opportunities and challenges were identified at wastewater treatment plants and water supply plants in 2020. Further work is underway.

Insulation Upgrades:

- Facilities replaced arena glass walls with insulated panels at Bostwick Community Centre.
- This project resulted in $35,000 in savings per year.

Electric Vehicle Charging:

- Installation of electric vehicle chargers at nine community locations, such as community centers and arenas, are currently underway through the land-lease agreement with ChargeCrew signed in 2020.
- City installed seven chargers for employees and public use at A.J. Tyler Operations Centre and City Hall.

Aeration Blower Upgrades

- Continuation of upgrades to all aeration blowers at wastewater treatment plants to new efficient turbo blowers was completed in 2020.
- This project will result in $600,000 in energy savings annually.
- Over $1 million in incentives from IESO have been identified at this time (monitoring and verification is still in progress).

Smart Lights Retrofit Project

- LED lights with individual dimming capability were installed at J. Allen Taylor building.
- This will result in $10,000 in annual savings.
- $4,000 in incentives from IESO have been received.

Organic Rankine Cycle Engine (ORC) Project

- The City completed most of the installation of the ORC engine for waste heat recovery for power generation at Greenway Wastewater Treatment Facility in 2020.
- When this starts operating in 2021, this will offset 475 kilowatts of electrical grid consumption, representing over 12 per cent of the City's overall goal for energy reduction by 2023.

Demand Response Program

- The City's Arva pumping station and South East Reservoir Pumping Station (SERPS) enrolled into 2020 Demand Response (DR) program from IESO to avoid blackouts during high energy demands in Ontario.
- Both the facilities together received $10,000 in incentives for actively participating and reducing demand during peak hours in 2020.

Green Fleet

- City commissioned four CNG packers for waste collection as part if its fuel switching project from diesel to CNG. Fuel switching to CNG reduces emissions and noise, removes toxic pollutants from the air and enhances the lifecycle of the asset.
- In 2020, contracts were signed to switch more municipal fleet light duty vehicles to hybrids and electric vehicles.
- In 2020 Fleet approved purchasing of Hydraulic Bush Chippers for forestry use. Replacement of the diesel engines currently used with gasoline powered engine units will provide environmental benefits. Gasoline powered engines have an idle down control system which reduce the RPM of the engine to an idle position when high power demands are not required resulting in both reduced greenhouse gas emissions, fuel consumption and reduce costs compared to diesel engines.

Indoor/Outdoor Lighting Upgrades

- Facilities installed LEDs at Canada Games Aquatic Centre, Dearness Home, Adelaide operations Centre, and Fire Hall 9.
- This project will result in annual savings of $16,000.
- $9,000 in incentives from IESO have been received.

Heating, Ventilation and Air Conditioning Upgrades

- HVAC optimization at Dearness home and Eldon House.
- $10,500 per year in energy savings annually will be achieved.

Greenway lighting upgrades

- As part of continuous lighting upgrades to LEDs, greenway wastewater treatment plants aeration blower building replaced its building lights to LEDs in 2020.
- $3,000 in energy savings annually will be achieved.
- $2,000 in incentives from IESO have been received.

7.1 Development of the Climate Lens Process

The Climate Lens Process was designed to ensure that climate emergency issues are part of the decision-making processes throughout the Corporation. To date, it has been considered in a number of areas of the Corporation. The Climate Lens Process will take this experience and new knowledge to significantly increase climate emergency activities and actions. The objectives associated with the creation and use of the Climate Lens Process are to:

1. Ensure climate emergency issues are included in decision-making and evaluation of existing plans, programs, and projects.
2. Establish a clear process for accountability and tracking of climate emergency issues including collection of information on decision outcomes and tracking the progress of projects/programs implemented.
3. Elevate understanding of the importance of climate emergency issues in decision-making across the Corporation.

The Climate Lens Process 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. Annual Budget Updates & Multi-year Budgets
5. Building Climate Change Capacity

The Climate Emergency Screening Tool (CEST) can be used in the Climate Lens Process especially when it is customized for an area. The customized CEST is used to guide the screening of projects and programs for key climate emergency issues and opportunities for improvement.

The development of the Climate Lens Process in 2020 and 2021 has increased the visibility and awareness of the need for energy conservation measures for City facilities, programs, projects, and operations.

8. Conclusion

Overall, 2020 saw a large shift in focus from making decisions based on the reduction of energy usage to decision-making with a climate change perspective, particularly as it related to projects and funding opportunities for projects. Many internal studies are underway to identify net-zero opportunities at individual facilities.

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 along with energy project incentives are listed in Appendix A and B.

Appendix A – Energy Consumption and Cost Tables

Total Energy Consumption

Table A-1 – Consumption by Commodity 2018-2020 (2019-2023 CDM Plan baseline tracking)

Energy Consumption (ekWh)	2018	2020	Change since 2018	% Change
Electricity	98,448,000	89,893,000	(8,555,000)	-9%
Natural Gas	42,430,000	40,889,000	(1,541,000)	-4%
Steam	3,269,000	2,093,000	(1,176,000)	-36%
Chilled Water	1,521,000	913,000	(608,000)	-40%
Diesel Fuel	22,194,000	20,306,000	(1,888,000)	-9%
Gasoline	6,889,000	6,667,000	(222,000)	-3%
Total City of London	174,751,000	160,761,000	(13,990,000	-8%

Table A-2 – Energy Consumption by Commodity 2007 – 2020

Energy Consumption (ekWh)	2007	2020	Change since 2007	% Change
Electricity	108,328,000	89,893,000	(18,435,000)	-17%
Natural Gas	58,682,000	40,889,000	(17,793,000)	-30%
Steam	3,499,000	2,093,000	(1,406,000)	-40%
Chilled Water	1,759,000	913,000	(846,000)	-48%
Diesel Fuel	20,129,000	20,306,000	177,000	0.88%
Gasoline	6,718,000	6,667,000	(51,000)	-1%
Total City of London	199,115,000	160,761,000	(38,354,000)	-19%

Energy Consumption by Municipal Service Categories

Table A-3 Consumption by Municipal Service Categories 2018 – 2020

Energy Consumption (ekWh)	2018	2020	Change since 2018	% Change
Buildings	67,659,000	62,576,000	(5,083,000)	-8%
Traffic Signals & Streetlights	18,421,000	17,773,000	(648,000)	-4%
Wastewater & Treatment	50,823,000	44,535,000	(6,288,000)	-12%
Water Pumping	8,764,000	8,903,000	139,000	2%
Vehicle Fleet	29,083,000	26,973,000	(2,110,000)	-7%
Total City of London	174,750,000	160,760,000	(13,990,000)	-8%

Table A - 4 – Energy Consumption by Municipal Service Categories 2007 – 2019

Energy Consumption (ekWh)	2007	2020	Change since 2007	% Change
Buildings	73,225,000	62,576,000	(10,649,000)	-15%
Traffic Signals & Streetlights	24,762,000	17,773,000	(6,989,000)	-28%
Wastewater & Treatment	65,594,000	44,535,000	(21,059,000)	-32%
Water Pumping	8,687,000	8,903,000	216,000	2%
Vehicle Fleet	26,847,000	26,973,000	126,000	0%
Total City of London	199,115,000	160,760,000	(38,355,000)	-19%

Total Energy Consumption per Capita by Municipal Service Categories

Table A-5 Energy Consumption Per Capita 2018 – 2020

Energy Consumption (ekWh) by Service Area per person			Change since 2018	Change since 2018
	2018	2020	Variance	% Change
Buildings	169	150	(18.7)	-11.1%
Traffic Signals & Streetlights	46	43	(3.3)	-7.2%
Wastewater & Treatment	127	107	(19.9)	-15.7%
Water Pumping	22	21	(0.5)	-2.3%
Vehicle Fleet	73	65	(7.8)	-10.8%
Total City of London (ekWh/pp)	436	386	(50.3)	-11.5%
London's Population	401,000	417,000	(16,000)	-4%

Table A-6 Energy Consumption Per Capita 2007-2020

Energy Consumption (ekWh) by Service Area per person			Change since 2007	Change since 2007
	2007	2020	Variance	% Change
Buildings	206	150	(56)	-27.2%
Traffic Signals & Streetlights	70	43	(27)	-38.9%
Wastewater & Treatment	185	107	(78)	-42.2%
Water Pumping	24	21	(3)	-12.8%
Vehicle Fleet	76	65	(11)	-14.5%
Total City of London (ekWh/pp)	561	386	(175)	-31.3%
London's Population	355,000	417,000	(65,000)	17.5%

Total Energy Costs per Capita by Municipal Service Categories

Table A-7 – Energy Costs Per Capita 2018- 2020

Energy Costs by End Use per person			Change from 2018	Change from 2018
	2018	2020	Variance	% Change
Buildings	$ 12.90	$ 3.19	$ 0.29	2.2%
Traffic Signals & Streetlights	$ 8.45	$ 8.88	$ 0.44	5.2%
Wastewater & Treatment	$ 13.45	$12.53	$ (0.92)	-6.9%
Water Pumping	$ 2.66	$ 2.82	$ 0.16	6.0%
Fleet	$ 7.20	$ 4.79	$ (2.42)	-33.5%
Total Energy Cost Per Person	$ 44.66	$ 42.20	$ (2.45)	-5.5%
London's Population	401,000	417,000	(16,000)	-4%

Table A-8 – Energy Cost Per Capita 2007- 2020

Energy Costs by End Use per person			Change since 2007	Change since 2007
	2007	2020	Variance	% Change
Buildings	$ 14.31	$ 13.19	$ (1.12)	-7.8%
Traffic Signals & Streetlights	$ 5.29	$ 8.88	$ 3.59	68.0%
Wastewater & Treatment	$ 12.59	$ 12.53	$ (0.07)	-0.5%
Water Pumping	$ 2.07	$ 2.82	$ 0.75	36.2%
Fleet	$ 6.15	$ 4.79	$ (1.36)	-22.1%
Total City of London	$ 40.41	$ 42.20	$ 1.80	4.4%
London's Population	355,000	417,000	(62,000)	17.5%

Appendix B - 2020 Energy Project Incentives

Organization	Project	Year	Incentive	Status
EnelX	Demand Response	2020	$509	Received
EnelX	Demand Response	2020	$946	Received
Enbridge	Bostwick feasibility Study	2020	$4,000	Received
London Hydro	Retrofit lights with LEDs	2020	$2,266	Received
London Hydro	Exterior and Parking lot lights retrofit	2020	$6,218	Received
London Hydro	HVAC controls upgrade	2020	$2,114	Received
London Hydro	Lighting controls & upgrades at AJT	2020	$9,166	Received
London Hydro	Replace glass wall in arena with insulated panels - Bostwick	2020	$32,000	Received
London Hydro	Adelaide ops Centre - lights retrofit	2020	$6,352	Received
London Hydro	Fire hall 9- lights upgrade	2020	$581	Received
London Hydro	Dearness - BAS upgrades	2020	$81,221	Received
London Hydro	Greenway Fluorescent lights	2020	$1,500	Received
Enbridge	Adelaide Ops Centre ERV	2020	$400	Received
Enbridge	Oxford Ops Centre ERV	2020	$500	Received
Enbridge	AJ Tyler Ops Centre ERV	2020	$235	Received
Enbridge	AJ Tyler Bldg. 8 ERV	2020	$350	Received
Enbridge	EROC main ERV	2020	$200	Received
Enbridge	EROC Bldg. 2 ERV	2020	$450	Received
Voltus	Demand Response for SERPS & ARVA	2020	$10,000	Received
			$0	In Process
			$159,007	Total