

TO:	CHAIR AND MEMBERS CIVIC WORKS COMMITTEE MEETING ON OCTOBER 22, 2019
FROM:	KELLY SCHEER, P.ENG., MBA, FEC MANAGING DIRECTOR, ENVIRONMENTAL & ENGINEERING SERVICES & CITY ENGINEER & ANNA LISA BARBON, CPA, CGA MANAGING DIRECTOR, CORPORATE SERVICES & CITY TREASURER, CHIEF FINANCIAL OFFICER
SUBJECT:	2019-2023 CORPORATE ENERGY CONSERVATION AND DEMAND MANAGEMENT (CDM) PLAN

RECOMMENDATION

That on the recommendation of the Managing Director, Environment & Engineering Services & City Engineer and Managing Director, Corporate Services & City Treasurer, Chief Financial Officer, the 2019-2023 Corporate Energy Conservation and Demand Management (CDM) Plan **BE APPROVED** and posted on the City's Corporate Energy Management website as per the requirements of the Ontario Ministry of Energy, Northern Development and Mines under the *Electricity Act, 1998 (Former Green Energy Act, 2009)*.

PREVIOUS REPORTS PERTINENT TO THIS MATTER

Relevant reports that can be found at www.london.ca under City Hall (Meetings) include:

- Corporate Energy Management Program Update (August 13th, 2018 meeting of the Civic Works committee, Agenda Item # 2.7)
- Updates: Corporate Energy Management Program and Conservation and Demand Management (CDM) Plan (July 21st, 2014 meeting of the Civic Works Committee, Agenda Item # 17)

STRATEGIC PLAN 2019-2023

Municipal Council has recognized 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 ([2019 – 2023 Strategic Plan](#)). Providing corporate energy use and associated greenhouse gas emissions data supports three of the five Areas of Focus as follows:

Building a Sustainable City

- Conserve energy and increase actions to respond to climate change and severe weather
- Build infrastructure to support future development and protect the environment
- Improve London's resiliency to respond to potential future challenges

Growing Our Economy

- Increase partnerships that promote collaboration, innovation, and investment

Leading in Public Services

- Increase the use of technology to improve service delivery
- Enhance the ability to respond to new and emerging technologies and best practices

BACKGROUND

PURPOSE

The purpose of this report is to provide the Civic Works Committee and Council with a copy of the proposed new 2019-2023 Corporate Energy Conservation and Demand Management (CDM) Plan required by the Ontario Ministry of Energy, Northern Development & Mines under the *Electricity Act 1998 (Former Green Energy Act, 2009)* and *Ontario Regulation 507/18* including:

- Results from the 2014-2018 CDM Plan:
 - Total corporate energy use performance compared to plan targets, and
 - Description of actions taken in the last five years which assisted in energy and greenhouse gas emission reductions.
- A revised forecast of future energy use and updated targets by:
 - establishing baselines for past and current energy management activities; and
 - creating a strategy for energy reduction targets towards the five year CDM Plan

CONTEXT

Provincial Requirements for Energy Management in the Public Sector

In August 2011, the provincial government introduced *Ontario Regulation 397/11* under the *Green Energy Act, 2009*. This regulation requires municipalities, municipal service boards, school boards, universities, colleges and hospitals to report on their energy consumption and associated greenhouse gas (GHG) emissions annually beginning in 2013. The affected public agencies were also required to develop and implement five-year CDM plans starting in 2014. The intent of the regulation was to help broader public sector organizations better understand their energy consumption, to help them benchmark energy use and to encourage energy conservation and demand management activities within them.

In order to comply with the requirements, the City was required to submit annual energy consumption and greenhouse gas emissions for each calendar year in buildings or facilities the public agency owns or leases that:

- a) Are heated or cooled and in respect of which the public agency is issued the invoices and is responsible for making the payments for the energy consumptions; or
- b) Are related to the treatment or pumping of water or sewage and in respect of which the public agency is issued the invoices and is responsible for making the payments for the energy consumptions.

On July 1st, 2013, the City prepared and submitted the first Annual Energy Consumption and GHG Emissions Report to the Ministry of Energy and has been doing so annually since. These submissions can be found on the City's [open data catalogue](#). The City also prepared and posted its 2014-2018 CDM Plan to encourage energy conservation and demand management activities by outlining a strategy for energy reduction targets and identifying future conservation potentials and measures in July 2014. In July 2018, the new provincial government moved these requirements under *Electricity Act 1998, O.Reg 507/18*.

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 Corporate Energy Conservation and Demand Management (CDM) Plan from 2014-2018 and the proposed 2019-2023 contain actions that reduce energy use, in particular fossil fuel energy use, and other actions that address the declaration including future work to move the Corporation towards net-zero energy.

DISCUSSION

This report contains details in three parts highlighted below:

- **PART A - 2014-2018 CDM Plan Results** – an update on the results of the plan compared to targets set in 2014, with highlights of the key energy projects in the last five years. Detailed annual reports on previous energy consumption and energy management activities within Corporation are available on the [Corporate Energy Management](#) website.
- **PART B - 2019-2023 Corporate Energy Conservation and Demand Management (CDM) Plan** – this is a follow up to the 2014-2018 CDM Plan, which is required to be updated every five years to meet the reporting requirements of the Ontario Ministry of Energy, Northern Development & Mines.
- **PART C – Overall Results from 2007 and Future Direction** – this part highlights progress made since 2007 for the purpose of illustrating how past commitments and actions have continued to be an important part of where we are today and where we have to go in the near future.

PART A – 2014-2018 CDM Plan Results

The City's Corporate Energy Management Program was expanded in 2007 and is based on six key focus areas:

1. Tracking & monitoring energy consumption;
2. Renewable energy and feasibility projects;
3. Leadership in Energy and Environmental Design (LEED) Buildings;
4. Energy conservation and demand management projects;
5. Energy procurement; and
6. Creating a corporate "culture of conservation".

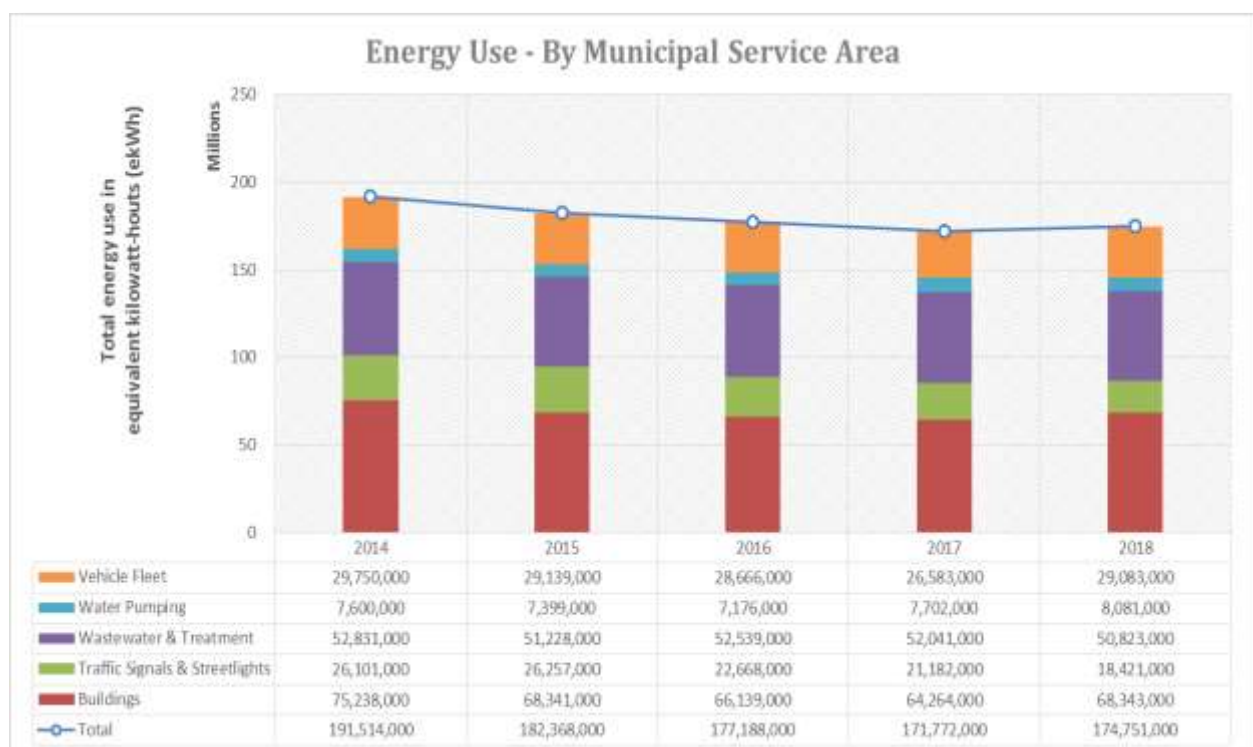
The primary goal for the 2014-2018 CDM Plan was to achieve a ten percent reduction in total annual corporate energy use by 2020, using 2014 as the baseline year. Tied to this primary goal were three secondary goals:

- 15 percent reduction in corporate energy per capita (i.e., energy efficiency for service delivery);
- 15 percent reduction in corporate energy-related GHG emissions (i.e., excluding landfill gas methane emissions and sewage incineration nitrous oxide emissions); and
- Maintain annual utility costs below \$22.7 million per year by 2020.

Complete details can be found in the [2014 Corporate Energy Conservation and Demand Management \(CDM\) Plan](#) on the Corporate Energy Management Program page on the City of London's website. Some of the highlights of the results achieved include:

- **The City achieved a nine percent reduction in total annual energy use as of 2018** (see Figure 1). With current energy reduction measures in place, City staff are confident that corporate energy use will meet and exceed the ten percent reduction goal by 2020.

Figure 1 – Total Corporate Energy Use Since 2014 by Service Area



- **Energy use per capita have been reduced by 15 percent** since 2014. Dividing the Corporation's total energy use by London's population provides an indication of improvement in energy efficiency for service delivery:
 - Wastewater treatment energy use per person has decreased by 8%
 - Building energy use per person has decreased by 14%
 - Vehicle Fleet energy use per person decreased by 6%
 - Streetlights energy use per person decreased by 32%

- **Energy costs have been reduced by five percent** (see Figure 2). Most of these reductions flow from the former provincial government's Fair Hydro Plan and eight percent price reduction from the Ontario Rebate for Electricity Consumers Act, effective July 2017. The fluctuations on costs per energy consumed (\$/kWh) are not entirely under the City's control, but energy consumption is under the Corporation's control.
 - Energy costs would have been \$3 million higher in 2018 if the energy efficiency improvements/programs were not in place.
 - \$12.5 million in total energy cost avoidance over the last five years.

- **Energy-related GHG emissions have been reduced by 13 percent** since 2014 (see Figure 3).
 - GHG emissions from facility and infrastructure energy use had dropped 25% between 2014 and 2017. Most of this decrease was due to increased conservation efforts and cleaner sources of energy used to generate electricity in Ontario.
 - However, total energy-related GHG emissions in 2018 were 11% higher than in 2017 due to the combination of the following:
 - Colder weather in the winter and spring seasons of 2018, compared to 2017, resulted in an increase in demand for natural gas for space heating.
 - Hotter summer temperatures in 2018, compared to 2017, increased demand for electricity for air conditioning. This increased demand was met by Ontario's natural gas fuelled power plants, which resulted in higher emissions associated with electricity use.

Figure 2 - Total Corporate Energy Costs Since 2014

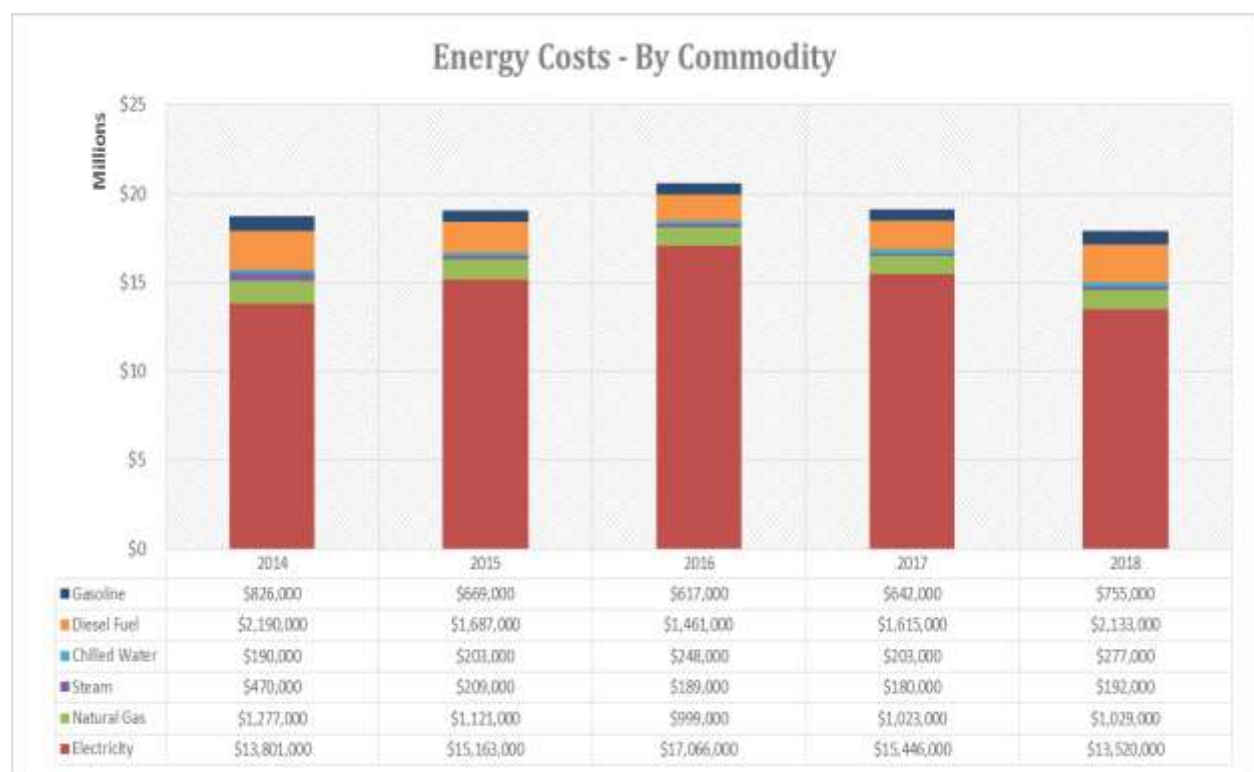
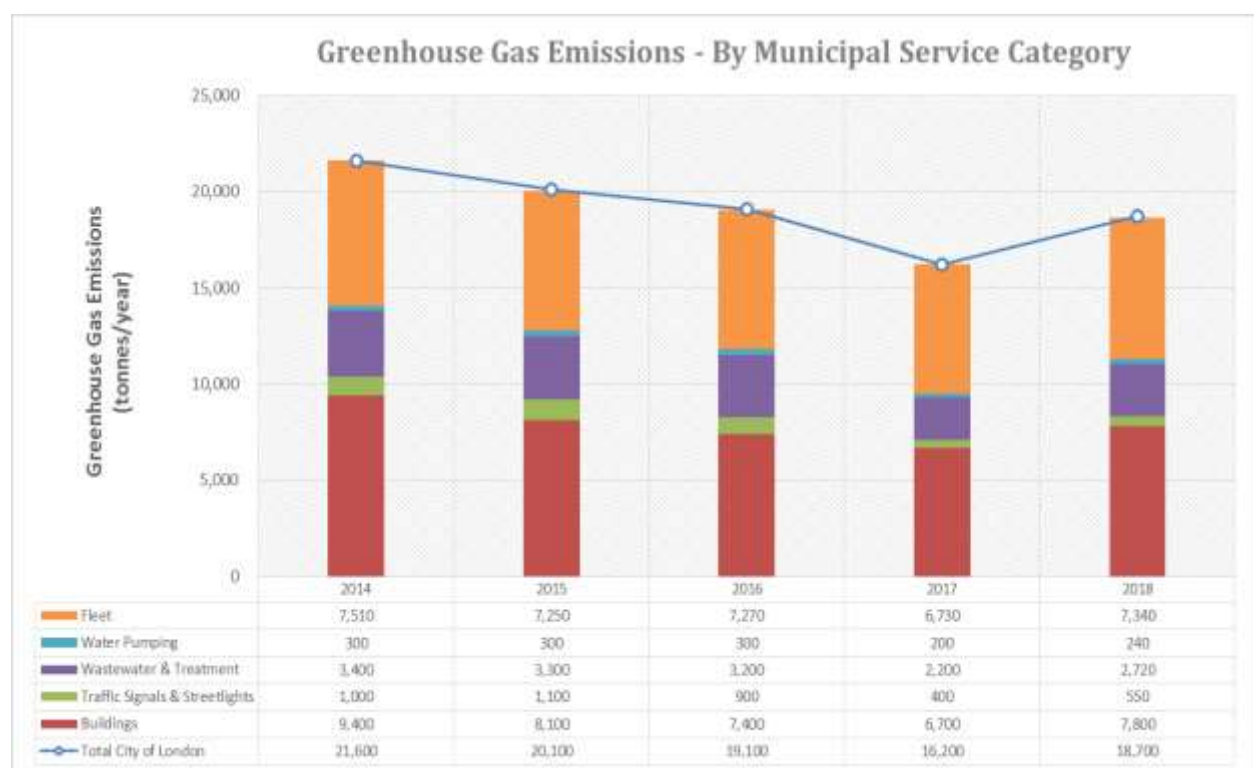


Figure 3 – Total Corporate Greenhouse Gas Emissions Since 2014 by Major Service



Energy Project Highlights

The following is a summary of a few of the key energy initiatives from the last five years which contributed to energy savings. Table 1 also highlights the greenhouse gas emission reductions achieved by avoiding fossil fuel use as a result of these initiatives.

There are two ways of quantifying the greenhouse gas reduction benefits associated with electricity conservation and demand management activities:

- using the Ontario grid-average emission factor, a method that assumes that the electricity savings are allocated evenly across all generating sources such as nuclear, hydro, wind, and natural gas; and

- using the Ontario fossil-on-margin emission factor, a method assumes that the electricity savings are allocated to the natural gas power plants that operate on the margins of demand, ramping up and down in response to power demands.

Both methods are equally valid as they each serve a different purpose. If the purpose is to inventory overall emissions from electricity use, the grid-average emissions factor is used. If the purpose is to quantify impact of an electricity-related action, the fossil-on-margin emissions factor is used. City staff used the electricity-related emissions factors provided by The Atmospheric Fund in their June 2019 report, "[A Clearer View on Ontario's Emissions](#)".

Table 1 – 2014-2018 Energy Project Highlights

Project	Results
Canada Games Aquatic Centre – Lifecycle Renewal	<ul style="list-style-type: none"> • 20% total energy reduction • 5% peak electricity use reduction • Annual electricity-related GHG emission reduction <ul style="list-style-type: none"> ○ 30 tonnes based on the grid-average emission factor ○ 135 tonnes based on the fossil-on-margin emission factor • Received \$3 million loan from FCM and \$154,000 in incentives from London Hydro and \$35,000 from Union Gas • Co-generation (heat & power) system cost avoidance - \$20,000 annually
Street Lights Conversion to LEDs	<ul style="list-style-type: none"> • Phase 1 – 56% reduction in electricity use, \$690,000 in electricity cost avoidance annually • Phase 2 – 64% reduction in electricity use, \$620,000 in electricity cost avoidance • Annual GHG reduction of 940 tonnes based on the off-peak fossil-on-margin emission factor • Total incentives from London Hydro - \$1.8 million
Aeration Blowers Upgrade at Pollution Control Plants	<ul style="list-style-type: none"> • \$760,000 annual electricity cost avoidance • 14% reduction in wastewater electricity reduction and 6% reduction in total City's electricity use • Annual electricity-related GHG emission reduction <ul style="list-style-type: none"> ○ 200 tonnes based on the grid-average emission factor ○ 850 tonnes based on the fossil-on-margin emission factor • \$2.1 million in incentives from London Hydro
Pump Optimization at Elgin-Middlesex Pump Station	<ul style="list-style-type: none"> • 850,000 kWh savings annually • \$100,000 in electricity savings annually • Annual electricity-related GHG emission reduction <ul style="list-style-type: none"> ○ 25 tonnes based on the grid-average emission factor ○ 110 tonnes based on the fossil-on-margin emission factor • \$420,000 in incentives from Hydro One • City received "Excellence in Energy Conservation" plaque from Hydro One in March 2019
Southeast Reservoir Pumping Station	<ul style="list-style-type: none"> • constructed to LEED silver standard; consumes 25% less energy compared to similar building • A green roof to reduce stormwater runoff • Exterior lighting that does not contribute to light pollution • Water use reduction measures in plumbing fixtures

Project	Results
Various Facility energy retrofits	<ul style="list-style-type: none"> • Savings over the last five years: <ul style="list-style-type: none"> ○ 10,300,000 kWh electricity savings ○ 52,000 m³ natural gas savings • Annual electricity-related GHG emission reduction <ul style="list-style-type: none"> ○ 320 tonnes based on the grid-average emission factor ○ 1,200 tonnes based on the fossil-on-margin emission factor • Annual natural gas-related GHG emissions reductions of 100 tonnes
Solar Roof Top Sections	<ul style="list-style-type: none"> • Policy to construct all new buildings to be “solar ready“
Various Green Fleet measures	<ul style="list-style-type: none"> • Reduced fleet consumption by 2% in the last five years • Annual fuel-related GHG reduction of 170 tonnes • \$127,000 savings in the last five years

PART B – City of London Corporate Energy 2019-2023 CDM Plan

Requirements of the CDM Plan

City staff have prepared the 2019-2023 CDM Plan as a step towards addressing the climate change for activities at City buildings, utilities and operations. This plan also meets requirements of:

- Council’s 2019-2023 Strategic Plan, with area of focus on “Building a Sustainable City”; and
- The Ontario *Electricity Act 1998, O.Reg. 507/18*

2019-2023 CDM Plan Development Strategy

The City initiated the 2019-2023 CDM Plan development as an interdepartmental exercise that included a review of the City’s current approach to energy management, review of the City’s 2014-2018 CDM Plan with other municipalities in southern Ontario, the City’s energy consumption and GHG emissions over the 2014-2018 period, and series of staff meetings with major service areas. This resulted in a list of energy projects, initiatives and activities that can be undertaken in the next five years.

Highlights of the 2019-2023 CDM Plan

Complete details can be found in the 2019-2023 CDM Plan report on the Corporate Energy Management Program page on the City of London’s website.

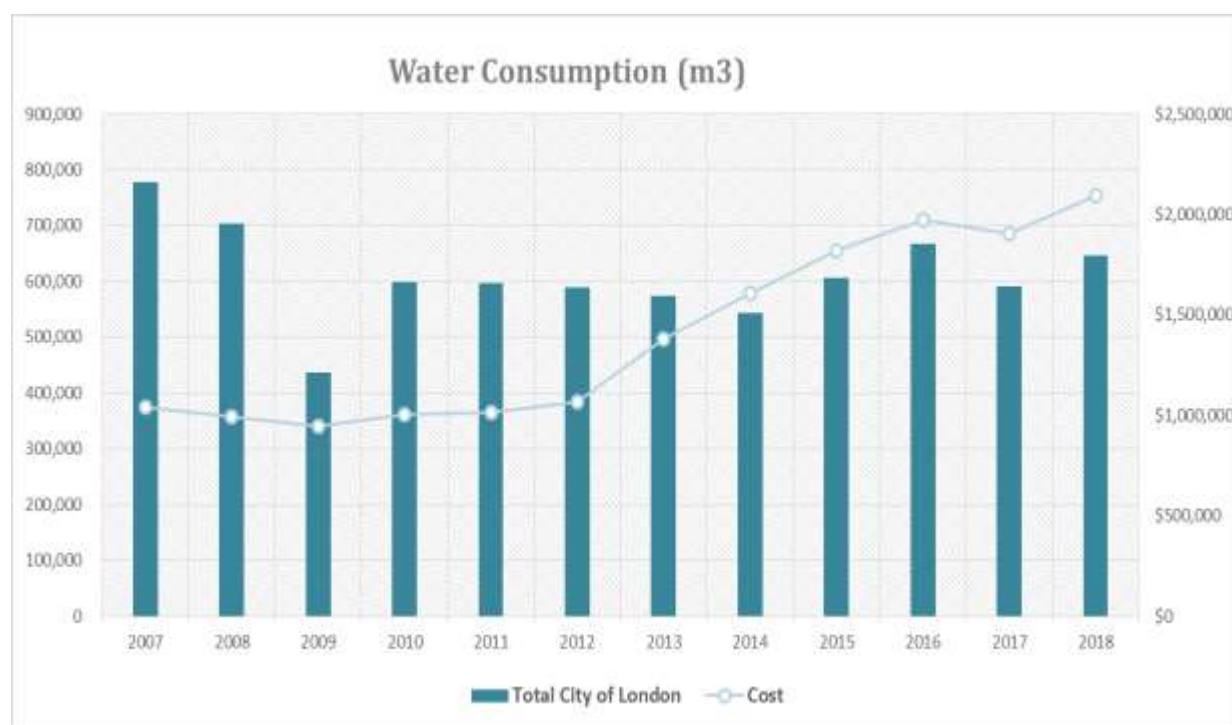
The 2019-2023 CDM Plan is built upon the successful foundation provided by City’s 2014-2018 CDM Plan. Goals developed in the 2019-2023 CDM Plan will also support London’s 2019-2023 Community Energy Action Plan (CEAP).

The 2019-2023 CDM Plan will be a “living document” in that the actions taken towards conservation and demand management activities are designed to build year-by-year for the five year period. The highlights of the 2019-2023 CDM Plan are as follows:

- Using 2018 as the baseline year for the new 2019-2023 Plan, the proposed new primary goals for 2023 include:
 - Five percent reduction target for total annual energy use (or 8,100,000 ekWh per year) by 2023,
 - Ten percent decrease (42 ekWh per person) in energy use per capita, and
 - Keep annual total energy cost increases within five percent.

- Many municipalities in Ontario are also selecting a five percent total energy reduction target for their plans after using a ten percent energy reduction in their previous plans.
- Achieving the goals above would avoid around 900 tonnes per year of GHG emissions by 2023.
- The 2019-2023 CDM Plan has also identified long term secondary goals to monitor and track the City's corporate water consumption starting 2018. Water consumption contributes to second highest utility cost to the City. Figure 4 illustrates that the City's cost for water use has been increasing year over year.

Figure 4 – City of London Total Water Consumption (m³) from 2007 to 2018



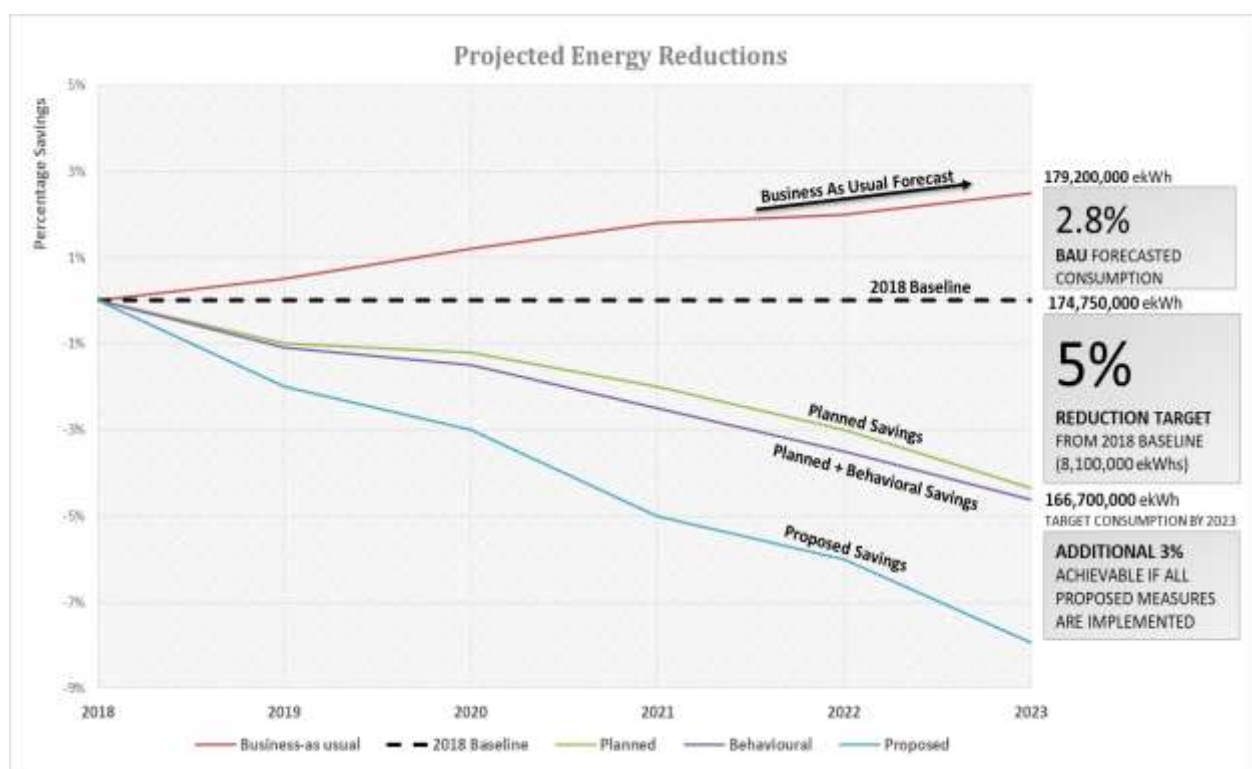
- The 2019-2023 CDM Plan will investigate possible pathways for City buildings, utilities and operations to reach net zero greenhouse gas emissions by 2050, or possibly sooner. Current corporate GHG emission trends and the 2019-2023 Strategic Plan targets are on track and build momentum towards achieving net zero emissions by 2050.

2019-2023 Energy Management initiatives

The 2019-2023 CDM Plan will be implemented by undertaking Planned, Behavioral and Proposed initiatives, as discussed below. The impact of these initiatives on the five percent target are graphically represented in Figure 5 below.

- **Planned initiatives** – those that have already been identified by service areas and already approved by Council. These measures are included in existing capital and operating forecasts. All of these measures are near-term actions within each area by 2023. These initiatives are expected to reduce corporate energy use by 4.3% from the 2018 baseline level. The City is planned to spend over \$15 million towards planned energy initiatives in the coming five years.
- **Behavioural initiatives** – are “low cost” or “no cost” initiatives for the City. They are the center of the overall strategy to reduce energy use and associated GHG emissions within City buildings. Behavioral initiatives in the current report include employee engagement activities which have an impact on energy consumption. These initiatives are expected to reduce corporate energy use by an additional 0.5%.

Figure 5 – Projected Corporate Energy Use Reductions



- Proposed initiatives** – are built upon the planned measures and initiatives, and will require new business cases to justify the project funding. Funding for these initiatives could come from sources such as the Efficiency, Effectiveness & Economy (EEE) Reserve Fund or from Business Cases as part of the multi-year budget. If all these initiatives are implemented, there is the potential for an additional 3% reduction in corporate energy use, which would result in an overall reduction in corporate energy use approaching 8% from the 2018 baseline level.
- All the energy reduction initiatives are categorized into the following services:

 - Facilities buildings
 - Wastewater Operations
 - Water Operations
 - Fleet Operations
 - Traffic and Streetlights operations
- The City's approach to energy efficiency improvements to meet the goals identified in the 2019-2023 CDM Plan will be achieved by maximizing the current budgets assigned and by pursuing incentive opportunities made available by provincial, federal governments and local agencies.
- As noted above under Proposed initiatives, as part of the 2020-2023 Multi-Year Budget deliberations, funding through Business Cases has been identified for proposed additional actions as follows:

 - Feasibility studies that identifying and assess new projects for carbon curtailment
 - Culture of Conservation employee engagement activities
 - Improving energy efficiency performance measurement & reporting
 - Electric vehicle charging stations, with cost recovery for the operations, maintenance and lifecycle replacement costs of these chargers

The current five percent reduction is achievable even if the above Business Cases are altered or not approved due to other City of London priorities.

The success of the 2019-2023 CDM Plan will also depend on the level of commitment by Council, senior management and staff at the City of London. Leadership and a deeper understanding of the culture of conservation for energy (and many other related matters) is key to overall success. The five percent energy use reduction target will be reviewed on an annual basis and may be subject to change if endorsement changes.

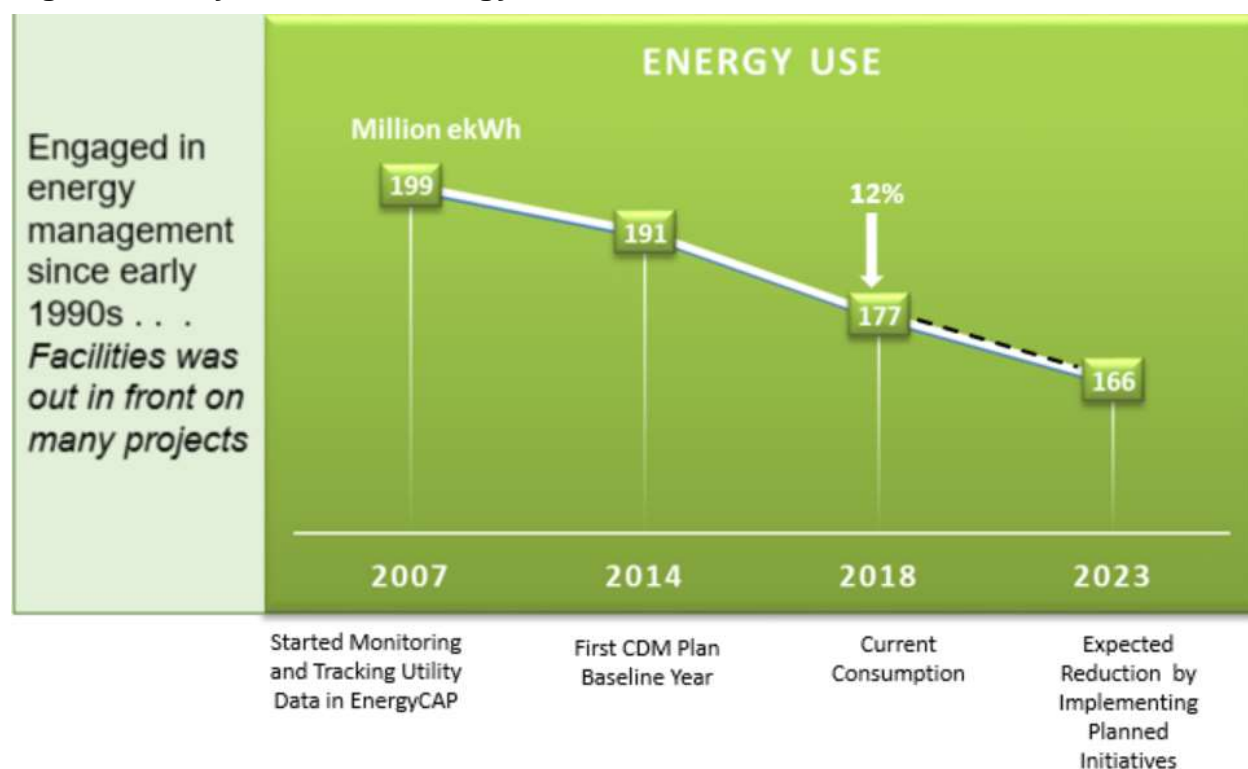
PART C – Overall Results from 2007 and Future Direction

The City of London has been engaged in corporate energy management since the 1990s. In order to understand where the City actually stands today and set a future pathway, it is important to capture the impact that past energy initiatives have had on energy consumption. All the past activities are captured in detail under various reports on the City's [Corporate Energy Management webpage](#).

The City of London first started tracking and monitoring its energy consumption data in 2007 through the use of the EnergyCAP software. Some of the highlights in energy consumption since 2007 are as follows:

- **Total annual energy use has been reduced by 12 percent since 2007**, with highest reductions seen in natural gas consumption at 28 percent lower compared to 2007 followed by chilled water at 14 percent. Various facility upgrade projects along with Slurry Heat Recovery project at the Greenway Wastewater Treatment Plant contributed to the reduction of natural gas use and associated GHG emissions related to natural gas use. Total energy consumption since 2007 is shown in Figure 6 along with expected reductions by 2023 by implementing Planned CDM initiatives.

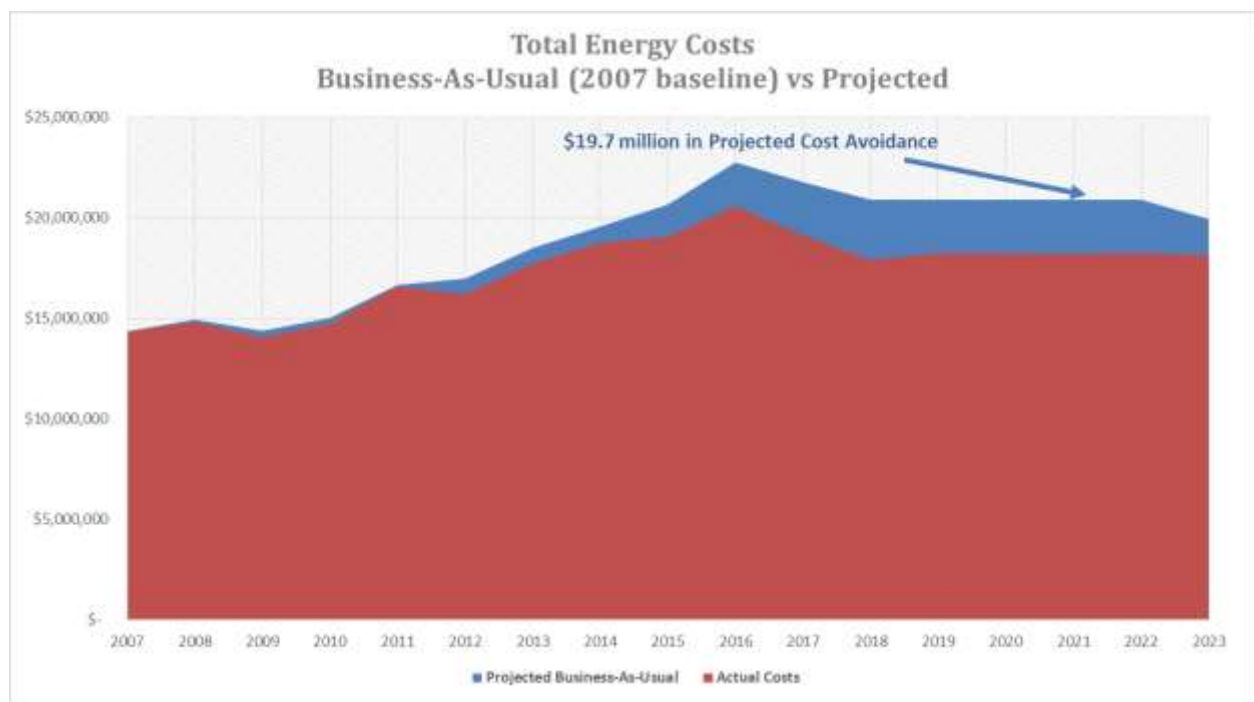
Figure 6 – City of London Energy Use



- **Total per capita energy use also reduced by 22 percent since 2007.** Most of these reductions flow from decreased natural gas use over the years by 34 percent and decrease in electricity use by 20 percent per capita since 2007.
- **Total energy costs for the City have increased by 25 percent since 2007**, with the majority of this is due to the increase in electricity commodity costs, which accounts for over half of the energy used by the City. In the same period, natural gas and steam costs were reduced due to lower natural gas commodity prices.
- **Energy cost is not directly under City's control but energy consumption is.** The City will continue to focus on reducing overall energy consumption along with implementing various procurement strategies to control utility costs within five percent from 2018 baseline year to 2023. Figure 6 illustrates the forecasted impact of the 2019-2023 CDM Plan activities on future energy costs.
 - Currently, about \$2.9 million in avoided energy costs were observed in 2018 and an approximately \$12.5 million in avoided energy costs have been accumulated since 2007 (based on 2007 levels of energy efficiency).

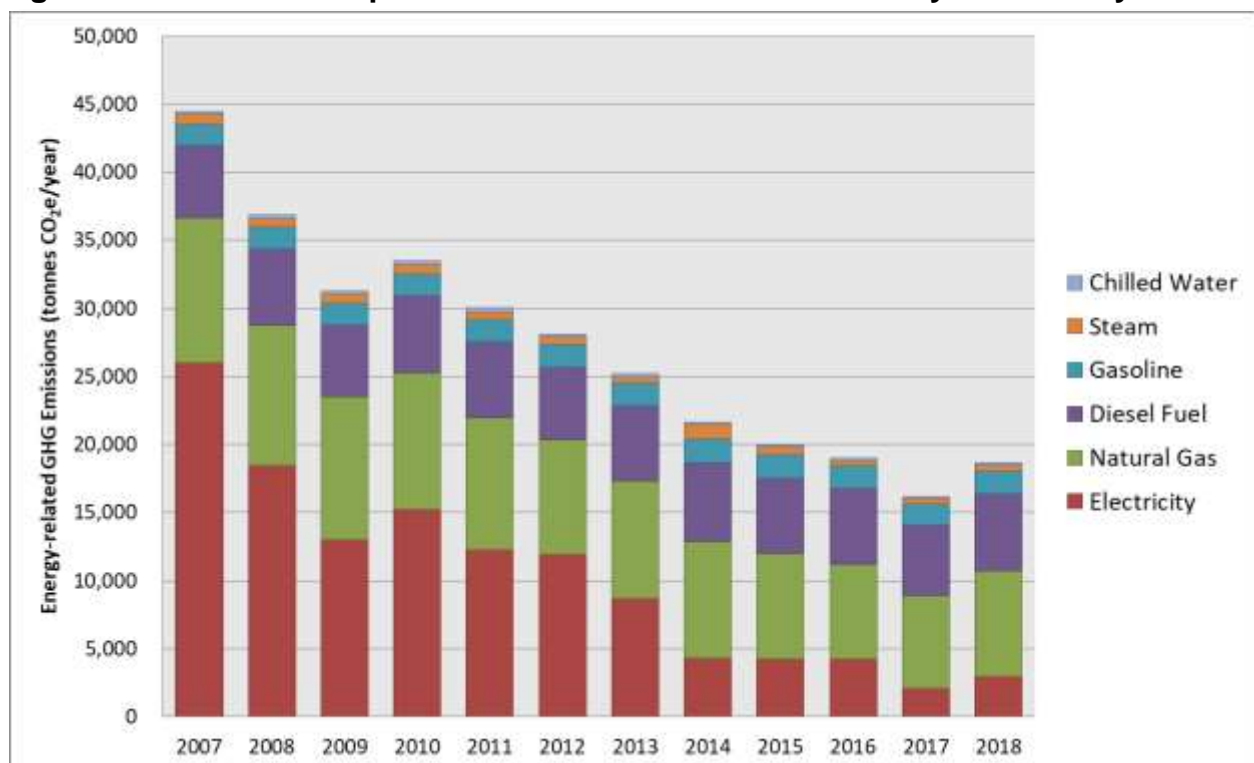
- By implementing all the Planned initiatives identified in 2019-2023 CDM Plan, the projected cumulative cost avoidance would approach \$20 million by 2023 (see Figure 7).

Figure 7 – City of London Projected Energy Cost Avoidance



- **Total GHG emissions have reduced by 58 percent since 2007** (see Figure 8). As mentioned in Part A of this report, the majority of the emission reductions are due to increased conservation efforts and cleaner sources of energy used to generate electricity in Ontario:
 - 90% reduction in electricity-related emissions
 - 34% reduction in steam-related emissions, due solely to corporate actions
 - 27% reduction in natural gas related emissions, due solely to corporate actions

Figure 8 – Trends in Corporate Greenhouse Gas Emissions by Commodity

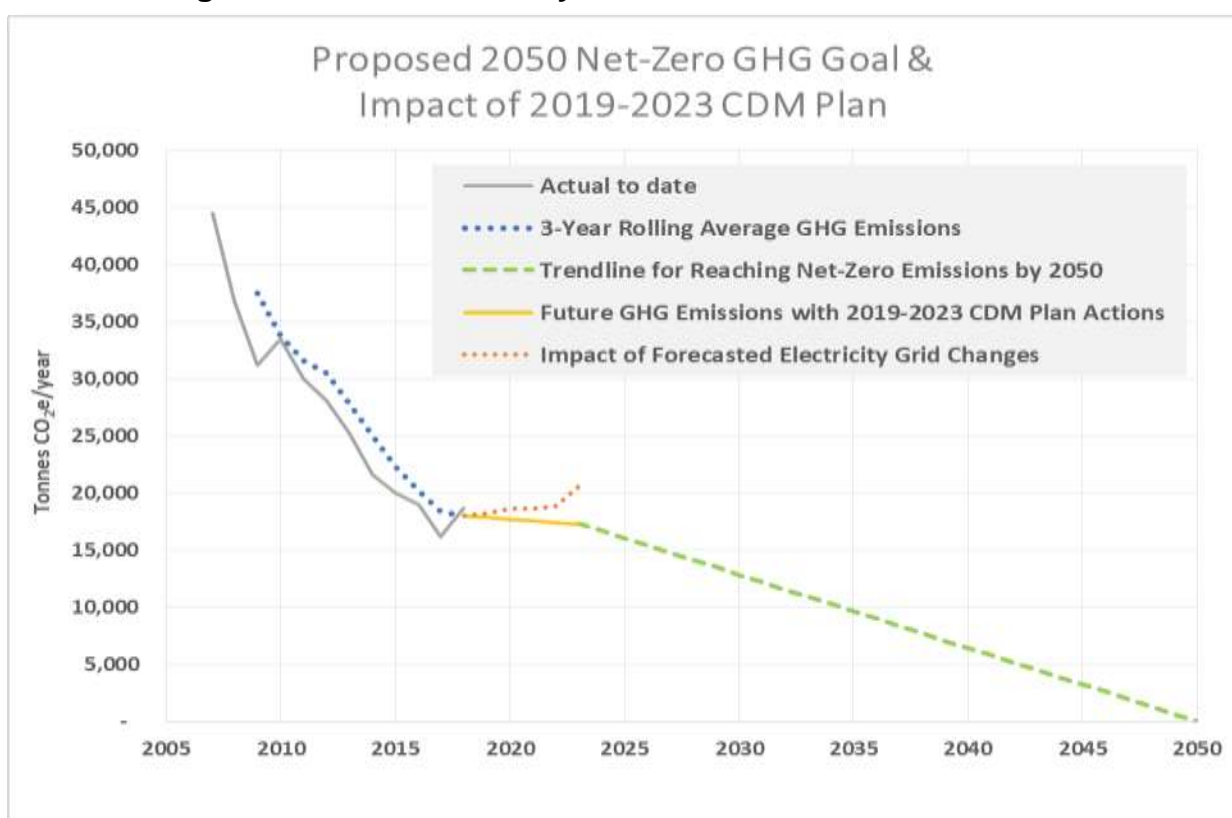


How to Net-Zero GHG Emissions by 2050 or Sooner

The 2019-2023 CDM Plan aspires to set City operations on the path to net zero GHG emissions by 2050, or possibly sooner. Current corporate GHG emission trends and the primary CDM targets listed in this report are on track and build momentum towards achieving net zero emissions by 2050 as shown in Figure 9.

However, based on power supply forecasts provided by Ontario's Independent Electricity System Operator (IESO), The Atmospheric Fund estimates that GHG emission factors for Ontario's electricity grid might increase almost three-fold between 2018 and 2035. This is due to an expected greater reliance on the use of natural gas to meet peak power generation as a result of the planned closure of the Pickering Nuclear Generating Station after 2024 and the Provincial Government's cancellation of the last round of renewable power generation procurement in 2018. If this does occur, this will provide a challenge for reducing GHG emissions.

Figure 9 – Historical GHG Emissions, Emissions Forecast to 2023, and Trend Line for Achieving Net-Zero Emissions By 2050



Reaching net-zero greenhouse gas emission by 2050 or sooner is possible but will require increased changes in energy use, introduction of new technologies, investment in renewable energy, and fuel switching away from fossil fuels. During the next four years, City staff will continue to monitor best practices in other jurisdictions and prepare different scenarios for reaching net zero greenhouse gas emissions by 2030, by 2040, and by 2050.

PREPARED BY:	PREPARED BY:
SNEHA MADUR, M.ENG, CEM CORPORATE ENERGY MANAGEMENT ENGINEER	STEVEN MACDONALD, P.ENG, CEM MANAGER, FACILITIES PLANNING, , ENERGY & ASSETS
PREPARED AND SUBMITTED BY:	PREPARED AND SUBMITTED BY:
JAY STANFORD, M.A., M.P.A. DIRECTOR, ENVIRONMENT, FLEET & SOLID WASTE	TIM WELLHAUSER, C.I.M. DIVISION MANAGER, FACILITIES
RECOMMENDED BY:	RECOMMENDED BY:
KELLY SCHERR, P.ENG. MANAGING DIRECTOR, ENVIRONMENTAL & ENGINEERING SERVICES & CITY ENGINEER	ANNA LISA BARBON, CGA, CPA MANAGING DIRECTOR, CORPORATE SERVICES & CITY TREASURER, CHIEF FINANCIAL OFFICER

\\cfile1\ESPS\$\Shared\Administration\Committee Reports\CWC 2019 08 Corporate Energy CDM Plan.docx

Documents found on the City of London website (www.london.ca):

2019 NEW - 2019-2023 Corporate Energy Conservation and Demand Management (CDM) Plan.

Environmental & Engineering Services

- Scott Mathers, Director Water and Wastewater
- Doug MacRae, Director, Roads & Transportation
- Geordie Gauld, Division Manager, Wastewater Treatment Operations
- Aaron Rozentals, Division Manager, Water Engineering
- Shane Maguire, Division Manager, Road Lighting & Traffic Control
- Jamie Skimming, Manager, Community Energy Initiatives

Finance & Corporate Services

- John Freeman, Manager, Purchasing & Supply
- Adam Trela, Corporate Energy Management Engineer

Parks & Recreation

- Scott Stafford, Managing Director, Parks & Recreation

Planning

- John Fleming, Managing Director, Planning & City Planner