



CITY OF MISSISSAUGA

5-YEAR ENERGY CONSERVATION PLAN

2019 - 2023



EXECUTIVE SUMMARY

Since 2001, the City of Mississauga (the City) has implemented three successful Energy Conservation Plans, encompassing the electricity and natural gas consumption in City-owned and operated facilities. This new 5 Year Energy Conservation Plan (2019-2023) is now the fourth and builds on the successes of the previous plans. It targets a 1% reduction in energy use and greenhouse gas emissions (GHGs) per year for facilities, over the next five years.

THE OLD 5 YEAR ENERGY MANAGEMENT PLAN (2014-2019)

The City embarked on the plan by first planning, then requesting funding, and finally executing projects over this period. During the five (5) year period, the City was able to execute both capital-intensive projects such as Energy Upgrades for Lifecycle Replacements, Lighting Upgrades, Controls Upgrades etc. and low/no-cost improvements such as Operation Optimization. The executed projects over this period are shown on the next page.

As a result of these projects, the City was able to achieve incredible results over the 2014 – 2018 period, as summarized below:

- Energy Use Intensity and GHG Emissions dropped by 9.3% and 8.1% respectively
- A total utility costs of \$1,306,550 were avoided
- A total incentives of \$1,199,505 were received from utilities as a result of the savings achieved from the projects and initiatives





The results showcase City's commitment and leadership in energy conservation and its continual actions towards a sustainable Mississauga

AWARDS AND ACHIEVEMENTS

- Living City Energy Efficiency award for Mississauga City Hall for three years in a row (2016, 2017, 2018)
- Best Municipality/University/School/Hospital (MUSH) 1MW+ Customer award
- 2015 Town Hall Challenge award for Mississauga City Hall
- ENERGY STAR® certification for Mississauga City Hall for 2018



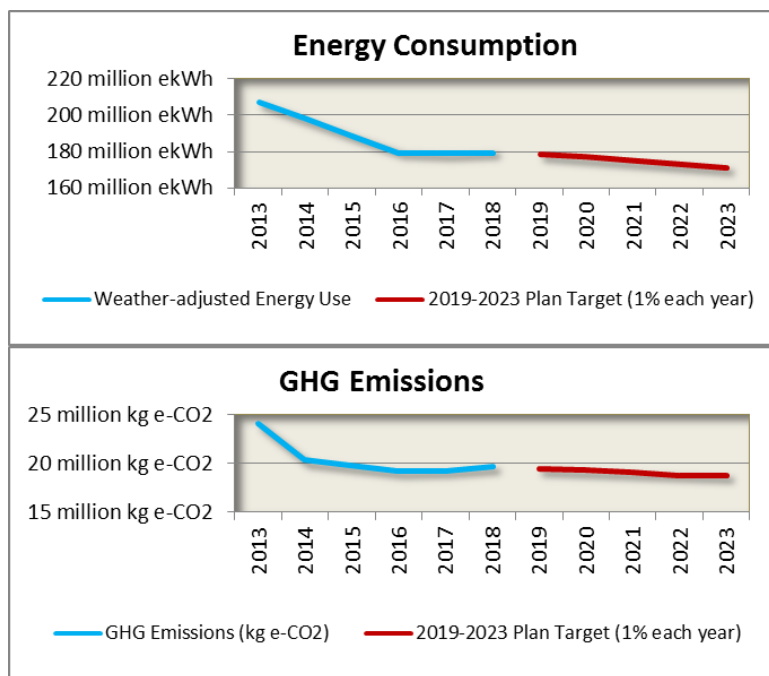
Energy Measure Implementation for City Facilities

Energy Measure	2014				2015				2016				2017				2018			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Energy Upgrades for Lifecycle Replacements																				
Administration and Offices																				
Indoor Ice Arenas																				
Community Centres & Multi-Purpose Facilities																				
Transit & Associated Facilities																				
Controls Upgrades																				
Indoor Ice Arenas																				
Community Centres & Multi-Purpose Facilities																				
Metering & Sub-metering Equipment																				
Administration and Offices																				
Indoor Ice Arenas																				
Community Centres & Multi-Purpose Facilities																				
Transit & Associated Facilities																				
Operation Optimization																				
Administration and Offices																				
Indoor Ice Arenas																				
Community Centres & Multi-Purpose Facilities																				
Lighting Upgrades																				
Administration and Offices																				
Indoor Ice Arenas																				
Community Centres & Multi-Purpose Facilities																				
Transit & Associated Facilities																				
Renewable Energy Generation																				
Outdoor Pool Buildings																				
Parks & Sports Fields																				
Planned Implementation  Scheduled Implementation  Cancelled Implementation																	Q1 = Jan-Mar			
Actual Implementation  Status = Completed  Status = Underway																	Q3 = Jul-Sep			

THE NEW 5 YEAR ENERGY CONSERVATION PLAN (2019-2023)

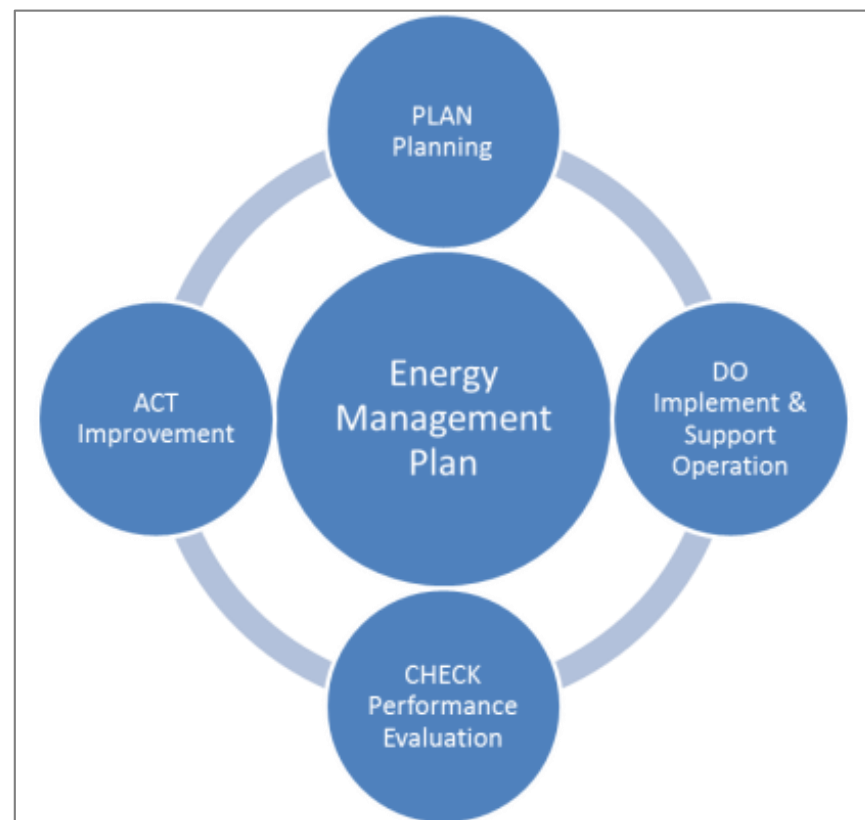
The City will be following the principles of ISO 50001 and its Plan-Do-Check-Act continual improvement framework for the new 5 Year Energy Conservation Plan (2019-2023). City staff will:

- **PLAN:** Have set a target of 1% reduction in energy consumption and greenhouse gas (GHG) emissions each year over the energy consumption of 2018. Planned a list of projects and initiatives in order to achieve the target.



- **DO:** Will request funding each year and execute the planned projects noted below during the five (5) period.

- **CHECK:** Will utilize the real-time utility metering and select sub-metering (eg: ice plant) systems in larger facilities to track the performance of the projects and improvements.
- **ACT:** Will improve energy performance in the facilities further by using the data from the real-time utility metering and select sub-metering (eg: ice plant) systems to continually drive energy performance



Under this plan, the City will meet its conservation targets by:

- Implementing **Pool Heat Recovery** to recover heat from pool drain and transfer to fresh water supply;
- Implementing **Ice Plant Energy Upgrades** that includes a robust ice plant controls and cold water ice resurfacing capabilities;
- Implementing **Pool Dehumidification Energy Upgrades** that includes optimized controls for the dehumidification equipment in the pool;
- Piloting an **Energy Management Information System** that collects, manages, and analyzes data from various building systems for load profiling, facility benchmarking, asset performance tracking, fault detection, and creating energy dashboard;
- Implementing **Energy Upgrades** as part of the **Lifecycle Replacements**;
- Implementing **Controls Upgrades** at facilities with building automation system to optimize equipment operation further;







- Installing **Metering & Sub-metering Equipment** to utilize real-time data for making smarter operational decisions;
- Implementing **Electrical Upgrades** like voltage regulation and power factor correction devices to reduce wastages in distribution;
- Implementing **Lighting Upgrades** to newer and efficient technologies, including efficient controls to match occupancy and natural daylight;
- Increasing and promoting energy awareness through programs such as **Operation Optimization**; and
- Analyzing opportunities for **Renewable Energy Generation**, wherever feasibly possible.

The new plan builds on a strong record of reducing energy consumption for positive social, financial, and environmental results. The implementation plan for this plan is shown on the next page.

Energy Measure Implementation for City Facilities

Energy Measure	2019				2020				2021				2022				2023			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Pool Heat Recovery																				
Community Centres & Multi-Purpose Facilities																				
Ice Plant Energy Upgrades																				
Indoor Ice Arenas																				
Community Centres & Multi-Purpose Facilities																				
Pool Dehumidification Energy Upgrades																				
Community Centres & Multi-Purpose Facilities																				
Building Analytics and Energy Dashboard																				
Community Centres & Multi-Purpose Facilities																				
Energy Upgrades for Lifecycle Replacements																				
Indoor Ice Arenas																				
Community Centres & Multi-Purpose Facilities																				
Libraries																				
Controls Upgrades																				
Administration and Offices																				
Indoor Ice Arenas																				
Community Centres & Multi-Purpose Facilities																				
Transit & Associated Facilities																				
Metering & Sub-metering Equipment																				
Indoor Ice Arenas																				
Community Centres & Multi-Purpose Facilities																				

Energy Measure Implementation for City Facilities

Energy Measure	2019				2020				2021				2022				2023			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Electrical Upgrades																				
Administration and Offices																				
Indoor Ice Arenas																				
Community Centres & Multi-Purpose Facilities																				
Lighting Upgrades																				
Indoor Ice Arenas																				
Community Centres & Multi-Purpose Facilities																				
Fire Stations & Emergency Services																				
Service Yards & Maintenance Depots																				
Operation Optimization																				
Administration and Offices																				
Indoor Ice Arenas																				
Community Centres & Multi-Purpose Facilities																				
Transit & Associated Facilities																				
Renewable Energy Generation																				
Transit & Associated Facilities																				
Planned Implementation  Scheduled Implementation  Cancelled Implementation 																	Q1 = Jan-Mar			
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1.0 INTRODUCTION

The City of Mississauga (the City) is dedicated to finding new ways to conserve energy, and help reduce our electricity and fossil fuel-related emissions.

The new **5 Year Energy Conservation Plan (2019-2023)** is the third iteration of the plan, which was first created in 2009 and builds on the successes of two previous plans, created in 2009 and 2014.

1.1 VISION

To steward the collaborative effort with stakeholders creating a lasting legacy of a sustainable City of Mississauga.

1.2 MISSION

The Energy Management team is committed to consistently reduce utility consumption and costs by setting targets, measuring performance, and implementing best practices.

1.3 BACKGROUND

In 2009, the City introduced its first Energy Conservation Plan. New developments – like the Green Pillar of the City’s Strategic Plan, the goal of being a net-zero carbon city, and the Province’s *Green Energy Act, 2009* – necessitated a more aggressive approach compared to previous years.

The main objectives of each plan have been to identify energy and water saving opportunities that will lower utility costs, improve operational efficiency, and contribute to the City’s overall Environmental Management Plan. Improved energy procurement in a deregulated market was another important objective.

1.4 ELECTRICITY ACT

The old **5 Year Energy Conservation Plan (2014-2019)** was developed, in part, in response to the requirements of Regulation 397/11 of the Green Energy Act. While the Green Energy Act has since been repealed, effective January 1, 2019, the requirements of the Regulation 397/11 have now been carried in the Electricity Act, under Regulation 507/18.

1.4.1 REGULATION 507/18

Under the Act, Ontario Regulation 507/18 requires broader public agencies – municipalities, municipal service boards, school boards, universities, colleges and hospitals – to:

- report on their energy consumption and greenhouse gas (GHG) emissions annually beginning in 2019; and
- to develop and implement energy Conservation and Demand Management (CDM) plans starting in 2019.

The regulation requires that the public agency develop, and make public, the CDM plan by July 1st, 2019. Public agencies must also update the plan every 5 years beginning in 2019.

Information:

More information on Regulation 507/18, including a copy of the regulation, can be found at:

<https://www.ontario.ca/laws/regulation/180507>

1.5 2019 PLAN AND COMMITMENT

The new **5 Year Energy Conservation Plan (2019-2023)** is the third iteration of the plan and builds on the old **Plan (2014-2018)**. Similar to the previous plan, this plan will target a 1% reduction in energy use and greenhouse gas emissions (GHGs) per year, over the next five years by

The plan includes the following:

- The City’s vision and mission relating to energy efficiency and GHG emissions.
- A summary of the goals and performance of the old plan, covering 2014 to 2018
- Establishment of the targets and baseline of the new plan, covering 2019 to 2023
- Baseline Energy Use breakdown for city-wide, facility group types, and each facility
- A summary of the implementation plan to achieve the goals of the new plan, covering 2019 to 2023
- A summary of the method to measure, verify, and report on savings
- An outline of the team responsible for energy efficiency and energy procurement for the City of Mississauga.

1.6 LINK TO OTHER PLANS AND POLICIES

The City has already put plans and policies in motion to place sustainability and climate change mitigation and adaptation as a priority. It is these plans and policies that the **5 Year Energy Conservation Plan (2019-2023)** takes its vision and goals.

1.6.1 STRATEGIC PLAN

The Strategic Plan is Mississauga’s vision document, which since 2009, has set priorities and shaped decision-making for the City. The five

Strategic Pillars for Change are Move, Belong, Connect, Prosper and Green. The Green pillar provides the long-term goal of a “zero carbon” City.

1.6.2 LIVING GREEN MASTER PLAN

The Living Green Master Plan (LGMP) is Mississauga’s first environmental master plan. It prioritizes City policies and programs into 49 actions, over 10 years, to meet the environmental objectives of the Strategic Plan.

Information:

For more information on the City of Mississauga’s Strategic Plan, see:

<http://www.mississauga.ca/portal/strategicplan>.

Copies of the Strategic Plan and Action Plan can be downloaded from:

<http://www.mississauga.ca/portal/strategicplan/plan>

Information:

For more information on the Living Green Master Plan, see:

http://www5.mississauga.ca/marketing/websites/livinggreen/downloads/LGMP2012_Final.pdf

1.6.3 CLIMATE CHANGE ACTION PLAN

The Climate Change Action Plan will be Mississauga’s first action plan on climate change and will contain specific actions under five main Action Pathways: Building and Clean Energy, Resiliency, Accelerating Discovery and Innovation, Low Emissions Mobility, and Engagement

and Partnerships. It will require municipal buildings to reduce its energy by 25% below 2008 levels by 2030.

1.6.4 SUSTAINABLE PROCUREMENT POLICY

The City's Sustainable Procurement Policy commits the City to consider a range of sustainability aspects into procurement, including for services and technologies for lifecycle replacements in existing buildings and for new building and facility construction. It requires the City to purchase goods and services from suppliers that: reduce material use, waste and packaging, promote reuse, recycled content, maximize energy efficiency, reduce GHG emissions, conserve water and improve water quality, eliminate use of toxins, and contribute to biodiversity preservation.

Information:

For more information on the Sustainable Procurement Policy, see:

<https://web.mississauga.ca/publication/sustainable-procurement-policy/>

2.0 CITY WIDE FACILITIES

2.1 SCOPE AND BOUNDARY

This section covers All City Facilities. Later Sections will provide information for each group type of facilities in the City. The different Facility Group Types that will be covered include:

- Administration and Offices (2 facilities/locations)
- Indoor Ice Arenas (7 facilities/locations)
- Community Centres and Multi-Purpose Facilities (15 facilities/locations)
- Cultural and Performing Arts (8 facilities/locations)
- Fire Stations and Emergency Services (27 facilities/locations)
- Golf Courses and Associated Facilities (7 facilities/locations)
- Heritage Buildings (6 facilities/locations)
- Leased Facilities and Properties (9 facilities/locations)
- Libraries (11 facilities/locations)
- Community Halls, Marinas, and Animal Services (16 facilities/locations)
- Outdoor Pool Buildings (7 facilities/locations)
- Parks and Sports Fields (242 facilities/locations)
- Traffic and Street Lighting (7 facilities/locations)
- Transit and Associated Facilities (17 facilities/locations)
- Service Yards, Central Stores, and Maintenance Facilities (7 facilities/locations)

City Facilities have a total floor area of approximately 465,700 square meters.

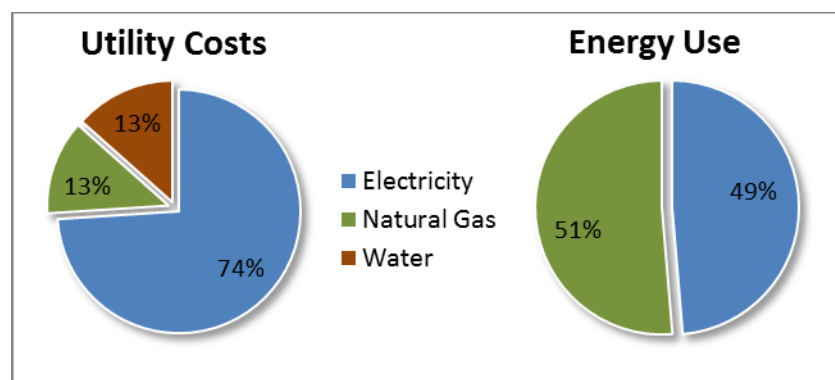
2.2 BASELINE

2.2.1 ENERGY USE

The energy use (combined electricity and natural gas) for **City Wide Facilities** was 181,266,000 equivalent kilowatt hours in 2018. Following are the key takeaways for the energy usage in 2018:

- 49% of the total energy usage was due to electricity use, which has dropped by 23.5% since 2013
- 51% of the total energy usage was due to natural gas use, which has remained consistent since 2013
- A total of \$17,998,000 in utility costs was incurred, out of which 74% is attributed to electricity, 13% to natural gas, and 13% to water

Figure 2-1: Utility Costs and Energy Use Breakdown for City Wide Facilities



2.2.2 ENERGY USE INTENSITY

Energy Use Intensity (EUI) is a measurement that expresses a building's energy use as a function of its size or other characteristic. It is used to give a better picture of the energy efficiency of a facility. The lower the EUI, the more efficient the facility is.

When reviewing EUI, the facility operation type and hours should be taken into account. For example, a facility that operates 24 hours a day will most likely have a higher EUI than a similar one that operates 8 hours a day. Similarly, a facility that has high energy using systems that do not contribute to the building area, such as an outdoor pool or outdoor ice rink, will have a higher EUI than a facility where those

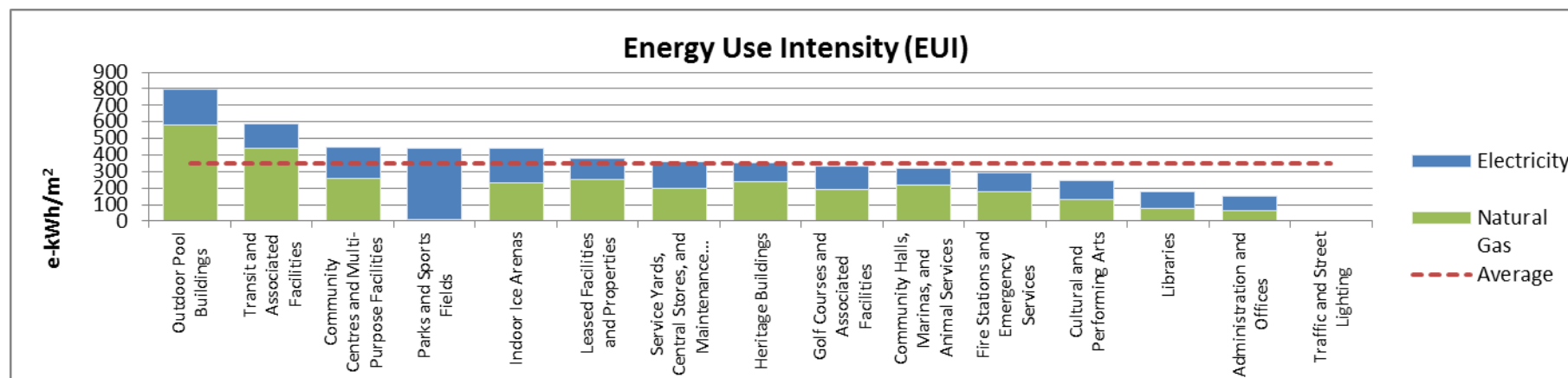
systems are located within the facility, as they would add to the facility's area footprint.

For **City Wide Facilities** the average EUI in 2018 was 351.9 e-kWh/m².

The following chart shows the EUI for each group within **City Wide Facilities**, and compares it to the average for all facilities.

Note: The Average EUI value is calculated by taking the total energy use of all facilities, and dividing by the total area of the facilities. As such, a larger facility would have a bigger impact on the average than a smaller facility.

Figure 2-3: Energy Use Intensity for City Wide Facilities

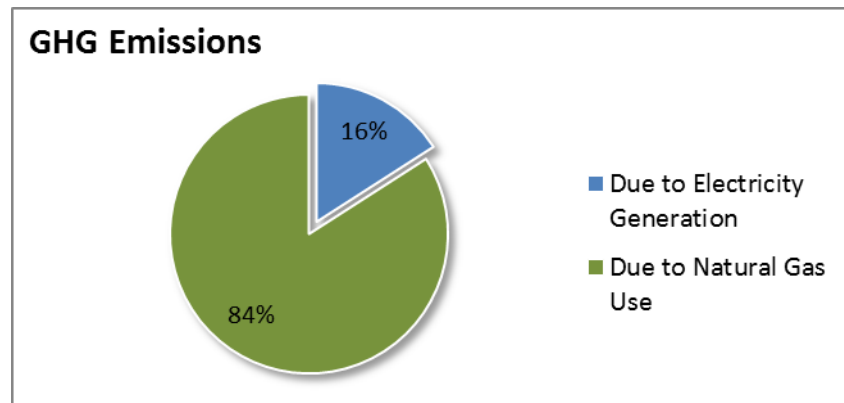


2.2.3 GREENHOUSE GAS (GHG) EMISSIONS

For 2018, **City Wide Facilities** emitted 19,928,800 kg (or 19,929 tonnes) of CO₂. 15.1% of these emissions were due to the generation of electricity, while the use of natural gas accounted for the remaining 84.1%.

Did you know...?

19,927 tonnes of CO₂ is equivalent to the annual emissions of 3,900 automobiles.

Figure 2-4: GHG Emissions Breakdown for City Wide Facilities

2.3 ENERGY AND GHG BREAKDOWN FOR CITY WIDE FACILITIES

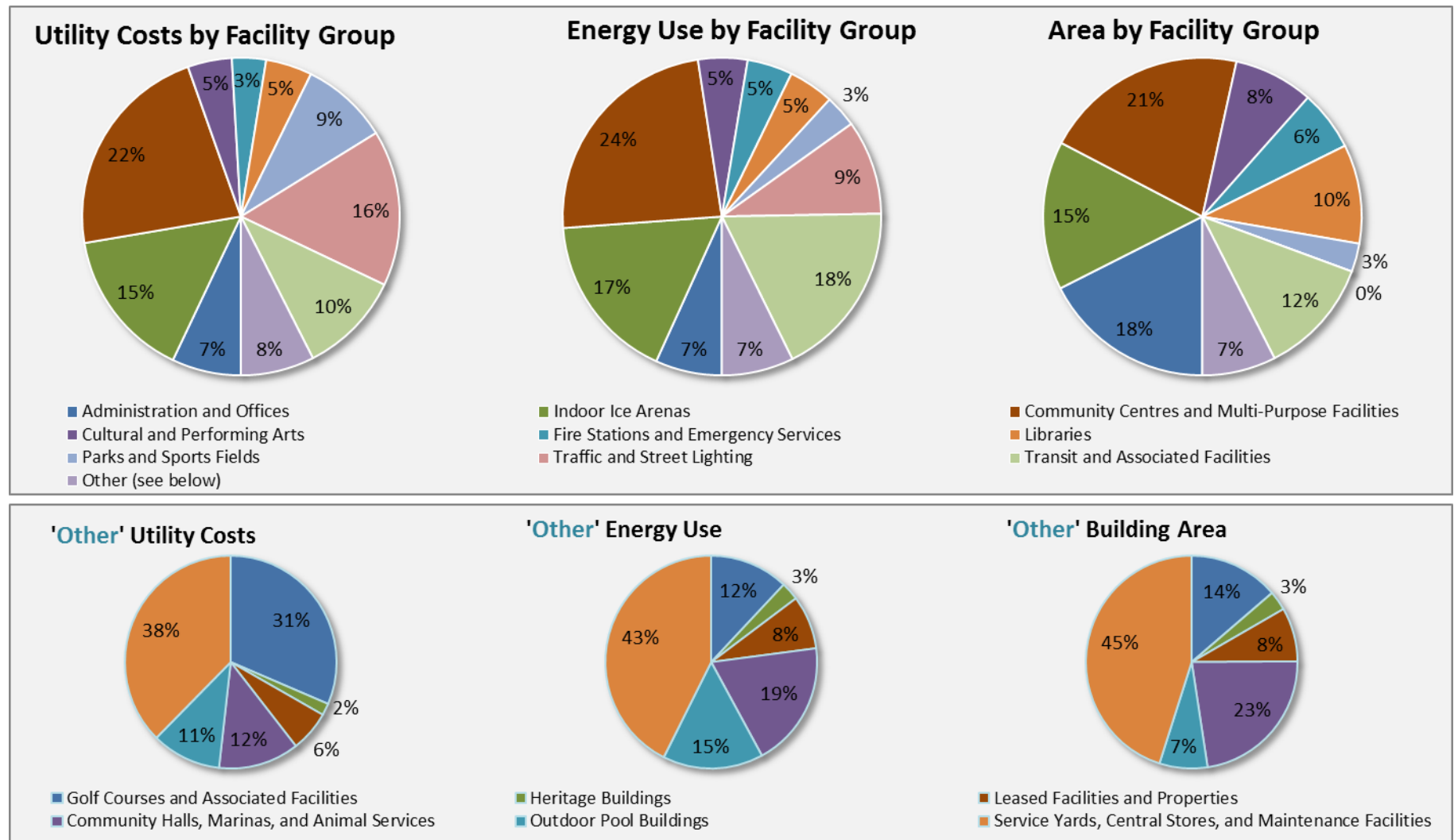
This section provides a brief overview/recap of the Utility and GHG data for all City Facility Groups. The figure below shows the breakdown of utility costs and energy use by Facility Group for 2018. Note: Facility Groups subtotaled under 'Other' are further broken down in the smaller charts.

The table summarizes the utility (electricity, natural gas, and water) costs and emissions, as well as GHG emissions, for the various Facility Group types.

Following are the key takeaways from the breakdowns

- Transit and Associated Facilities (*13 facilities/locations*)
 - Indoor Ice Arenas (*5 facilities/locations*)
 - Administration and Offices (*2 facilities/locations*)
- The next three facility groups by floor area consume 15% of the City's total energy; it includes the following:
 - Libraries (*11 facilities/locations*)
 - Fire Stations and Emergency Services (*21 facilities/locations*)
 - Cultural and Performing Arts (*8 facilities/locations*)
- 12% of the City's energy is consumed by facility groups that do not have an associated building/floor area:
 - Traffic and Street Lighting
 - Parks and Sports Fields
- Remaining 7% of the City's energy is consumed by facility groups that add up to 7% of the total floor area in the City; it includes the following:
 - Service Yards, Central Stores, and Maintenance Facilities (*6 facilities/locations*)
 - Community Halls, Marinas, and Animal Services (*13 facilities/locations*)
 - Outdoor Pool Buildings (*7 facilities/locations*)
 - Golf Courses and Associated Facilities (*6 facilities/locations*)
 - Leased Facilities and Properties (*9 facilities/locations*)
 - Heritage Buildings (*4 facilities/locations*)
- Top four facility groups by floor area consume 66% of the City's total energy; it includes the following:
 - Community Centres and Multi-Purpose Facilities (*13 facilities/locations*)

Figure 2-5: Utility Costs and Energy Use Breakdown by Facility Groups



2018 Annual Report for All City Facilities

Facility	# Facilities	Area m ²	Electricity kWh \$	Natural Gas m ³ \$	Total Energy e-kWh	Water m ³ \$	Total Costs \$	GHG Emissions kg
Administration and Offices	2	81,795	7,019,486 \$1,051,917	503,430 \$120,856	12,305,504	39,609 \$97,023	\$1,269,796	1,204,688
Indoor Ice Arenas	7	70,274	14,842,160 \$2,198,481	1,531,296 \$375,091	30,920,765	87,901 \$174,596	\$2,748,168	3,429,998
Community Centres and Multi-Purpose Facilities	15	96,903	17,708,808 \$2,702,407	2,407,967 \$604,635	42,992,457	293,050 \$696,778	\$4,003,820	5,190,982
Cultural and Performing Arts	8	37,718	4,234,268 \$638,057	465,125 \$120,508	9,118,080	20,984 \$51,349	\$809,915	1,031,985
Fire Stations and Emergency Services	27	28,473	3,220,540 \$435,700	488,035 \$141,274	8,344,910	19,436 \$47,170	\$624,144	1,038,814
Golf Courses and Associated Facilities	7	4,780	667,834 \$108,368	87,446 \$28,094	1,586,018	195,575 \$287,287	\$423,749	189,403
Heritage Buildings	6	1,036	115,384 \$13,927	23,796 \$8,507	365,240	1,337 \$2,018	\$24,451	49,152
Leased Facilities and Properties	9	2,873	405,065 \$47,886	68,416 \$21,303	1,123,436	10,736 \$19,363	\$88,551	143,957
Libraries	11	46,841	4,768,404 \$692,109	344,914 \$91,375	8,389,998	27,009 \$66,356	\$849,840	823,894
Community Halls, Marinas, and Animal Services	16	7,938	828,133 \$79,992	163,101 \$60,319	2,540,691	10,214 \$25,104	\$165,415	338,236
Outdoor Pool Buildings	7	2,548	539,474 \$60,967	141,429 \$39,345	2,024,476	17,214 \$42,378	\$142,690	286,863
Parks and Sports Fields	242	13,458	5,821,686 \$897,706	11,409 \$4,397	5,941,479	398,642 \$702,081	\$1,604,185	231,155
Traffic and Street Lighting	7	0	17,388,450 \$2,855,134	0 \$0	17,388,450	0 \$0	\$2,855,134	625,984
Transit and Associated Facilities	17	55,364	8,183,840 \$1,175,040	2,323,236 \$567,376	32,577,821	58,581 \$138,618	\$1,881,034	4,687,858
Service Yards, Central Stores, and Maintenance Facilities	7	15,748	2,505,868 \$360,171	299,115 \$80,326	5,646,574	27,195 \$66,485	\$506,983	655,837
Totals	388	465,749	88,249,400 \$13,317,862	8,858,714 \$2,263,405	181,265,899	1,207,482 \$2,416,607	\$17,997,875	19,928,807
Usage / Costs per m²:			152.1 \$22.5	19.0 \$4.9	352	2.6 \$5.2	\$32.5	41.4

2.4 ACTION PLAN

An action plan has been identified with the goal to save on electricity, natural gas, oil, and/or other form of energy consumption within a facility or location.

The following figure shows the various projects and initiatives that have been planned for **City Wide Facilities**. The chart shows what projects have been planned, when they are planned to be implemented, and the progress of implementation (if applicable). A brief description of each project has been noted below:

- **Pool Heat Recovery:** Includes recovering heat from the pool drain and transferring the recovered heat to the fresh water supply to the pool, reducing the heat load on the pool boilers
- **Ice Plant Energy Upgrades:** Includes a robust ice plant controls with the ability to modulate the equipment and reset setpoints based on varying loads and outside conditions, and cold water ice resurfacing
- **Pool Dehumidification Energy Upgrades:** Includes optimized controls for the dehumidification equipment in the pool with better modulation capabilities
- **Building Analytics and Energy Dashboard:** Is being piloted to collect, manage, and analyse data from various building systems with the capabilities of energy analysis, load profiling, facility benchmarking, asset performance tracking, fault detection, and creating energy dashboards
- **Electrical Upgrades:** Includes devices reduce the wastages associated with the distribution of the electrical feed like voltage regulation, power factor correction, efficient transformers
- **Energy Upgrades for Lifecycle Replacements:** Includes energy upgrades for high capital assets that show economic paybacks

only at the time of replacement like envelope and HVAC equipment

- **Controls Upgrades:** Includes controller upgrades, optimized sequence of operations, and additional points to better manage and control building systems
- **Metering & Sub-metering:** Includes real-time monitoring of building and select components to provide the ability to analyze consumption data, identify solutions to conserve energy, and conduct measurement & verification
- **Lighting Upgrades:** Includes replacement of existing lighting technologies to newer technologies like LEDs, and better controls through localized sensors and BAS scheduling
- **Renewable Energy Generation:** Includes energy generation from renewable sources like solar photovoltaics, solar hot water heating, solar lighting

For the chart below, the **Purple** coloured bars represent the original planned start and completion of a Measure type. The **Green** bar beneath shows the actual start and completion times for a completed measure, while the **Blue** bar shows the actual start time of a Measure that is currently being implemented, but not yet complete. Some Notes:

- A Single Measure timeline may include more than one implementation of that measure (example: In different facilities).
- Due to changing circumstances (change in operations, budget changes, new technology, etc.), a planned measure may be cancelled. These would be indicated by a **Red** plan bar on the chart.

Figure 2-6: Energy Measure Implementation Plan for City Wide Facilities

Energy Measure	2019				2020				2021				2022				2023			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Pool Heat Recovery																				
Ice Plant Energy Upgrades																				
Pool Dehumidification Energy Upgrades																				
Building Analytics and Energy Dashboard																				
Electrical Upgrades																				
Energy Upgrades for Lifecycle Replacements																				
Controls Upgrades																				
Metering & Sub-metering Equipment																				
Operation Optimization																				
Lighting Upgrades																				
Renewable Energy Generation																				

Planned Implementation

Scheduled Implementation

Cancelled Implementation

Actual Implementation

Status = Completed

Status = Underway

Q1 = Jan-Mar

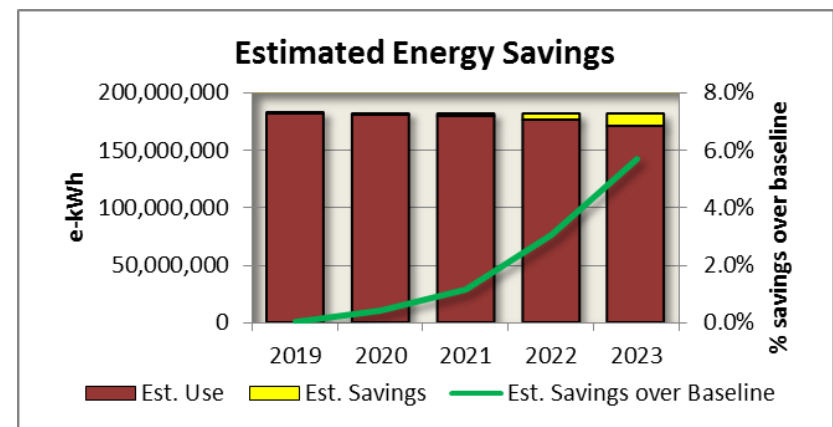
Q3 = Jul-Sep

2.5 ESTIMATED SAVINGS

At the end of the plan, **City Wide Facilities** are expected to save 5.7% over the base year of 2018, which amounts to a total of \$1,352,750 from all the projects.

See the chart below for the expected annual savings in the 5-Year Energy Conservation Plan.

Figure 2-7: Energy Measure Annual Savings for City Wide Facilities



2.6 REPORTING AND PROGRESS TO TARGETS

As per the 5-Year Energy Conservation Plan, the City is targeting a 1.0% reduction in energy use per year in facilities. By 2023, this should result in a 5.0% reduction over the base year, 2018.

The reporting of energy consumption data and savings for **City Wide Facilities** will be based on utility meters and assembled annually. Since utility meters monitor energy consumption for the entire facility, the measurement boundary will encompass all parts of the facility. To determine the savings and fairly compare year-to-year energy consumption data, it is important to account for independent variables such as weather and occupancy and apply regression analysis to consumption data. Therefore, actual consumption data for each year starting 2019 will be adjusted to match the weather and occupancy of 2018. The figures below show the updated progress for each year against the set target.

Figure 2-8: Annual Energy Use vs Targeted Energy Use for City Wide Facilities

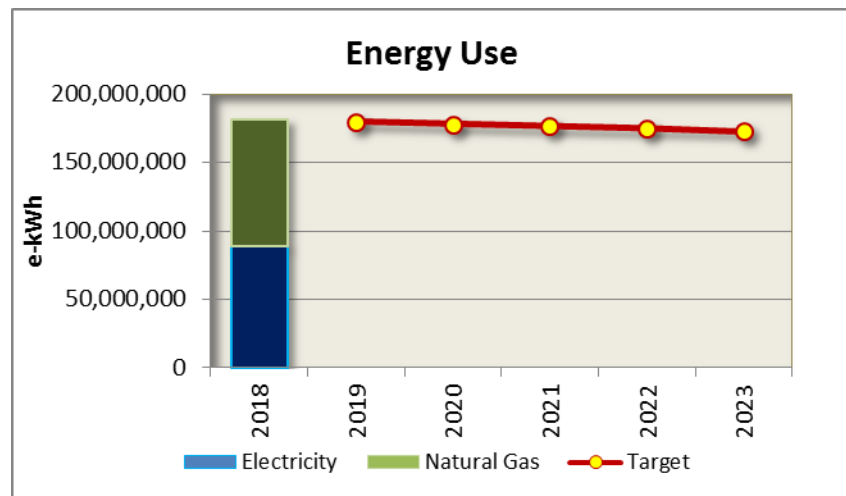
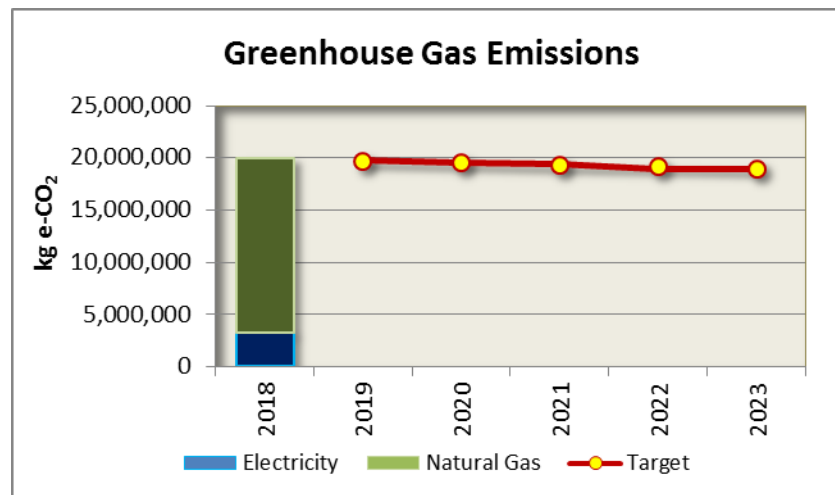


Figure 2-9: Annual GHG Emissions vs Targets for City Wide Facilities



2.7 ENERGY CONSUMPTION REPORTING FOR FACILITIES OUTSIDE THE BASELINE SCOPE

As population grows in the City, so does the need to expand the City's services and facilities. Since it would be unfair to compare year-to-year energy consumption as significant deviations in operations occur, such deviations/anomalies will not be reported in the previous sections.

Therefore, this section will track energy consumption in **City Wide Facilities** that either did not exist, did not operate, or its operations significantly deviated from the base year, 2018.

3.0 ADMINISTRATION AND OFFICES

3.1 SCOPE AND BOUNDARY

Administration and Offices facilities include all the City's non-transit buildings that consist primarily of offices and administration types operations.

For the purposes of this report, the City of Mississauga has 2 facilities/locations that fall under this category. They include:

- Mississauga City Hall
- Ontario Court of Justice

The above listed locations have a total floor area of approximately 81,800 square meters. This would account for 17.6% of the total building area for City of Mississauga facilities included in this Plan.

3.2 BASELINE

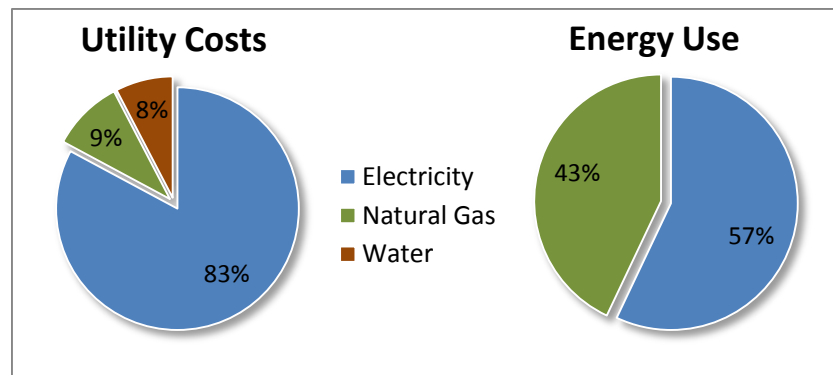
3.2.1 ENERGY USE

The energy use (combined electricity and natural gas) for **Administration and Offices** was 12,306,000 equivalent kilowatt hours in 2018. Following are the key takeaways for the energy usage in 2018:

- 57% of the total energy usage was due to electricity use, which has dropped by 14.0% since 2013
- 43% of the total energy usage was due to natural gas use, which has dropped by 10.2% since 2013
- A total of \$1,270,000 in utility costs was incurred, out of which 83% is attributed to electricity, 9% to natural gas, and 8% to water

Administration and Offices accounted for 7.1% of the City's total utility budget for 2018.

Figure 3-1: Utility Costs and Energy Use Breakdown for Administration and Offices



3.2.2 ENERGY USE INTENSITY

Energy Use Intensity (EUI) is a measurement that expresses a building's energy use as a function of its size or other characteristic. It is used to give a better picture of the energy efficiency of a facility. The lower the EUI, the more efficient the facility is.

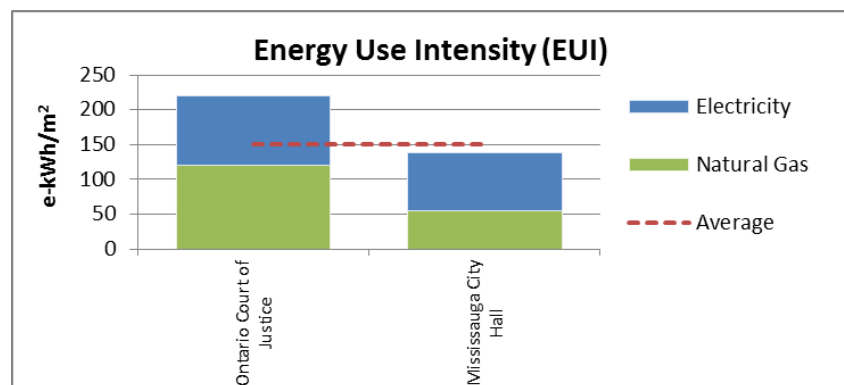
When reviewing EUI, the facility operation type and hours should be taken into account. For example, a facility that operates 24 hours a day will most likely have a higher EUI than a similar one that operates 8 hours a day. Similarly, a facility that has high energy using systems that do not contribute to the building area, such as an outdoor pool or outdoor ice rink, will have a higher EUI than a facility where those systems are located within the facility, as they would add to the facility's area footprint.

For **Administration and Offices** the average EUI in 2018 was 150.4 e-kWh/m².

The following chart shows the EUI for each facility within Administration and Offices, and compares it to the average for the group.

Note: The Average EUI value is calculated by taking the total energy use of all facilities, and dividing by the total area of the facilities. As such, a larger facility would have a bigger impact on the average than a smaller facility.

Figure 3-2: Energy Use Intensity for Administration and Offices

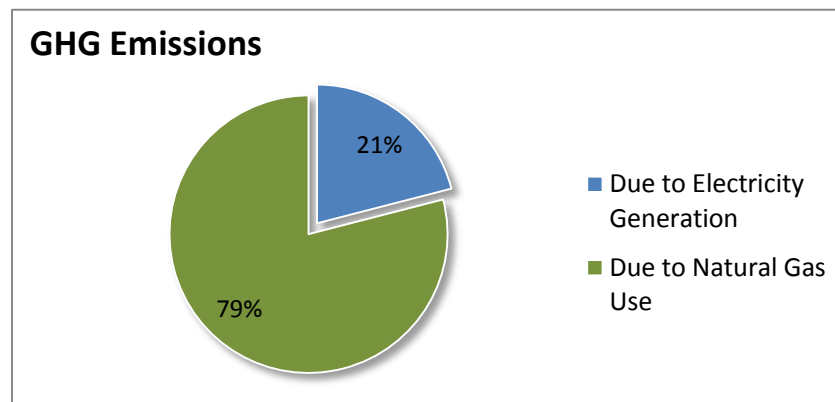


3.2.3 GREENHOUSE GAS (GHG) EMISSIONS

Administration and Offices emitted 1,204,700 kg (or 1,205 tonnes) of CO₂ in 2018. 21.0% of these emissions were due to the generation of electricity, while the use of natural gas accounted for the remaining 79.0%.

Administration and Offices accounted for 6.0% of the City's total GHG emissions for facilities included in the plan.

Figure 3-3: GHG Emissions Breakdown for Administration and Offices

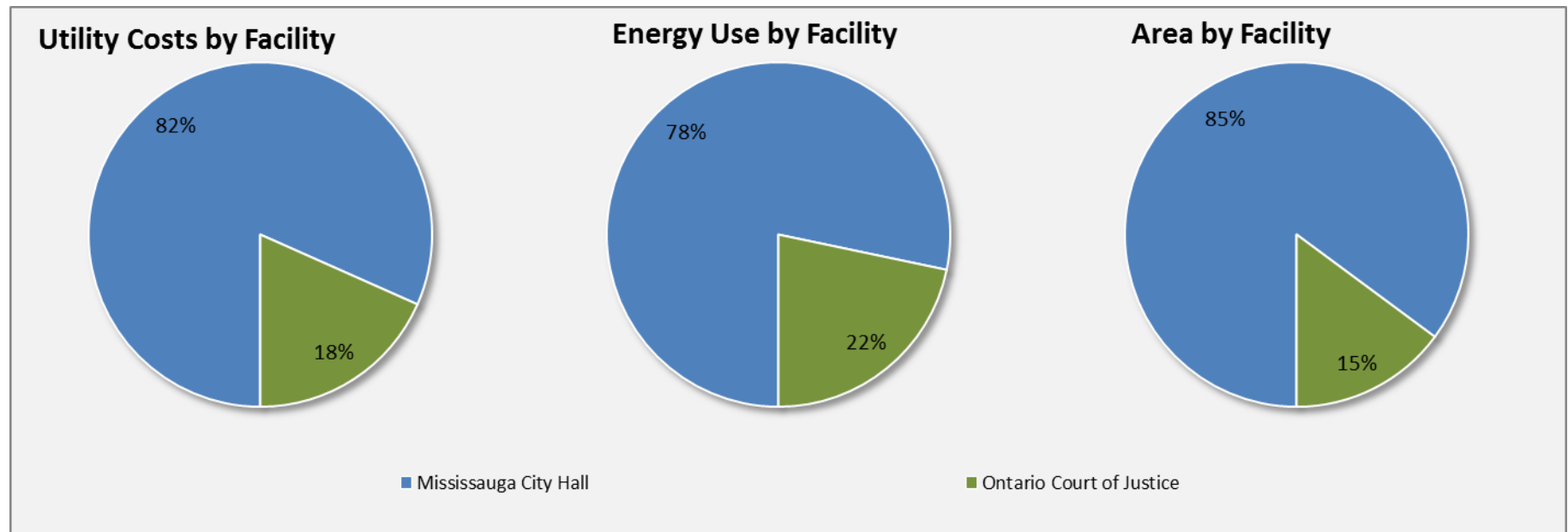


3.3 ENERGY AND GHG BREAKDOWN FOR ADMINISTRATION AND OFFICES

This section provides a brief overview/recap of the Utility and GHG data for **Administration and Offices**. The table below summarizes, by facility, the utility usage and GHG emissions for 2018. Following are the key takeaways:

- Mississauga City Hall is the largest facility by area in this group, representing 85% of the total area
- Mississauga City Hall is also the largest consumer of energy in this group, representing 78% of the total energy consumption
- Electrical loads like lighting, cooling, fans, and motors are a much larger portion of the energy use and utility use (57% and 83% respectively) in this group
- For this reason, priority was given to projects reducing electricity usage for previous and future planned projects

Figure 3-4: Utility Costs and Energy Use Breakdown by Facility Groups



2014 Annual Utility Report for Administration and Offices

Facility	Area m ²	Electricity		Natural Gas		Total Energy e-kWh	Water		Total Costs \$	GHG Emissions kg
		kWh	\$	m ³	\$		m ³	\$		
Mississauga City Hall	69,621	6,455,825	\$795,213	360,370	\$81,641	10,239,710	29,081	\$54,618	\$931,472	1,178,558
Ontario Court of Justice	12,174	1,135,783	\$144,837	170,657	\$39,619	2,927,682	3,266	\$6,162	\$190,618	410,168
Totals	81,795	7,591,608	\$940,050	531,027	\$121,260	13,167,392	32,347	\$60,780	\$1,122,090	1,588,726
Usage / Costs per m²:		92.8	\$11.5	6.5	\$1.5	161	0.4	\$0.7	\$13.7	19.4

3.4 ACTION PLAN

An action plan has been identified with the goal to save on electricity, natural gas, oil, and/or other form of energy consumption within a facility or location.





The following figure shows the various projects and initiatives that have been planned for **Administration and Offices**. The chart shows what projects have been planned, when they are planned to be implemented, and the progress of implementation (if applicable). A brief description of each project has been noted below:

- **Electrical Upgrades:** Includes devices reduce the wastages associated with the distribution of the electrical feed like voltage regulation, power factor correction, efficient transformers
- **Controls Upgrades:** Includes controller upgrades, optimized sequence of operations, and additional points to better manage and control building systems

For the chart below, the **Purple** coloured bars represent the original planned start and completion of a Measure type. The **Green** bar beneath shows the actual start and completion times for a completed measure, while the **Blue** bar shows the actual start time of a Measure that is currently being implemented, but not yet complete. Some Notes:

- A Single Measure timeline may include more than one implementation of that measure (example: In different facilities).
- Due to changing circumstances (change in operations, budget changes, new technology, etc.), a planned measure may be cancelled. These would be indicated by a **Red** plan bar on the chart.

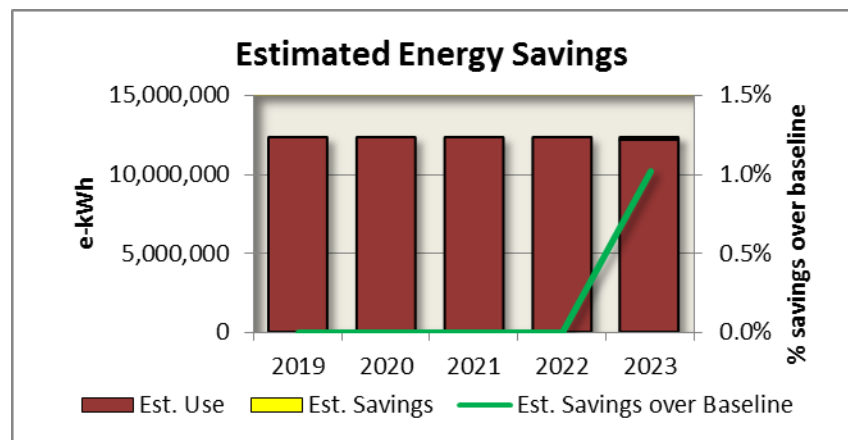
Figure 3-5: Energy Measure Implementation Plan for Administration and Offices

Energy Measure	2019				2020				2021				2022				2023			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Electrical Upgrades																				
Controls Upgrades																				
Planned Implementation  Scheduled Implentation  Cancelled Implementation  Status = Completed  Status = Underway																	Q1 = Jan-Mar			
																	Q3 = Jul-Sep			

3.5 ESTIMATED SAVINGS

At the end of the plan, **Administration and Offices** are expected to save 1.0% over the base year of 2018, which amounts to a total of \$17,000 from all the projects.

Figure 3-6: Energy Measure Annual Savings for Administration and Offices



3.6 PROGRESS TO TARGETS

The City is targeting a 1.0% reduction in energy use in **Administration and Offices** by 2023 over the base year, 2018. The reporting of energy consumption data and savings for **Administration and Offices** will be based on utility meters and assembled annually. Since utility meters monitor energy consumption for the entire facility, the measurement boundary will encompass all parts of the facility. To determine the savings and fairly compare year-to-year energy consumption data, it is important to account for independent variables such as weather and occupancy and apply regression analysis to consumption data. Therefore, actual consumption data for each year starting 2019 will be

adjusted to match the weather and occupancy of 2018. The figures below show the updated progress for each year against the set target.

Figure 3-7: Annual Energy Use vs Targeted Energy Use for Administration and Offices

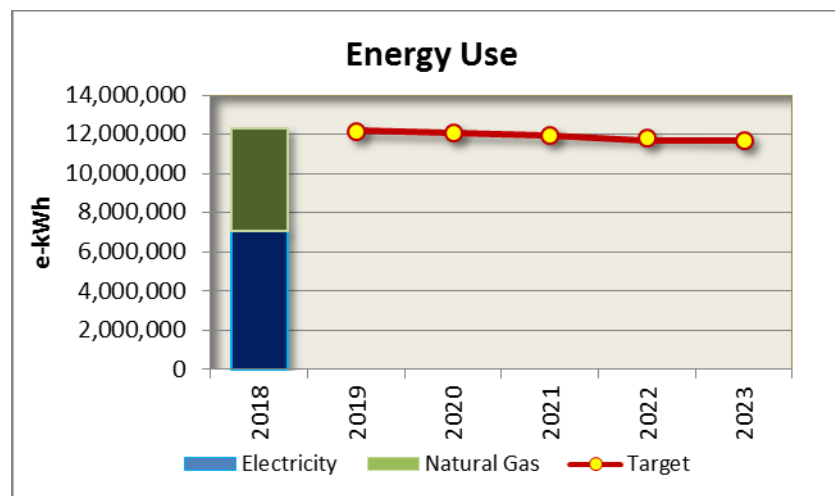
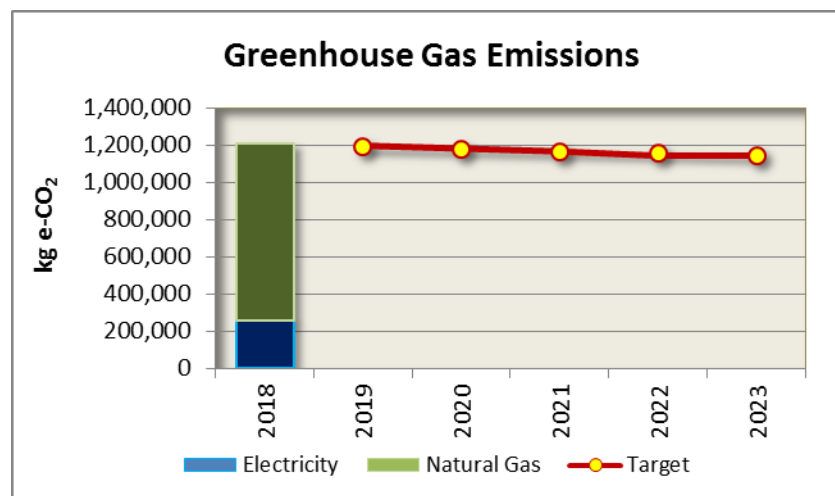












Figure 3-8: Annual GHG Emissions vs Targets for Administration and Offices



3.7 FACILITY INFORMATION FOR ADMINISTRATION AND OFFICES

Facility:		Mississauga City Hall			
Address	300 City Centre Drive, L5B 3C1				
Area (m ²):	69,621	Area (ft ²):	749,394		
Year Built:	1987	Hours per Week :	55		
Facility Group:	Admin				
Building Components:	Council Chambers; Day Care; Offices and Meeting Rooms; Underground Parking				
Historical Energy and GHG Data					Energy Measures Energy Upgrades for Lifecycle Replacements Controls Upgrades Metering & Sub-metering Equipment Lighting Upgrades
Year:	2016	2017	2018		
Electricity (kWh)	6,307,725	6,080,808	5,818,052		
Electricity (\$)	\$977,467	\$932,697	\$863,617		
Natural Gas (m ³)	291,142	340,287	363,282		
Natural Gas (\$)	\$69,317	\$85,402	\$86,623		
Water (m ³)	47,673	37,332	35,274		
Water (\$)	\$104,287	\$85,058	\$86,398		
Total Costs (\$)	\$1,151,071	\$1,103,156	\$1,036,638		
Total e-kWh	9,364,717	9,653,816	9,632,510		
Total e-kWh/m ²	134.5	138.7	138.4		
GHG (kg/Yr)	777,628	862,391	896,416		
GHG (kg/Yr/m ²)	11	12	13		

Facility: Ontario Court of Justice

Address 950 Burnhamthorpe Road W, L5C 3B4










Area (m²): 12,174 Area (ft²): 131,040

Year Built: 1977 Hours per Week : 70

Facility Group: Admin

Building Components: Courthouse; Offices and Meeting Rooms

**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	1,108,701	1,134,483	1,201,435	
Electricity (\$)	\$188,254	\$184,593	\$188,300	
Natural Gas (m ³)	133,190	136,772	140,149	
Natural Gas (\$)	\$31,577	\$34,713	\$34,232	
Water (m ³)	3,724	3,451	4,335	
Water (\$)	\$8,161	\$7,908	\$10,626	
Total Costs (\$)	\$227,992	\$227,214	\$233,158	
Total e-kWh	2,507,198	2,570,584	2,672,994	
Total e-kWh/m ²	205.9	211.2	219.6	
GHG (kg/Yr)	291,776	299,476	308,273	
GHG (kg/Yr/m ²)	24	25	25	

Energy Measures

Electrical Upgrades

4.0 INDOOR ICE ARENAS

4.1 SCOPE AND BOUNDARY

The City's Indoor Ice Arenas are facilities where the primary (only) operation is that of an arena (i.e. the facility does not have any other major recreational operations such as a gymnasium or pool).

A few of the City's arenas have year-round ice, where the remaining arenas only have ice during the fall/winter seasons (generally August/September to April/May). When no ice is in place, the arenas are still used for other activities.

For the purposes of this report, the City of Mississauga has 7 facilities/locations that fall under this category. They include:

- Erin Mills Twin Arena
- Iceland Arena
- Paul Coffey Arena
- Meadowvale 4 Rinks
- Paramount Fine Foods Centre - Main Bowl and Community Rinks
- Port Credit Arena
- Tomken Twin Arena

The above listed locations have a total floor area of approximately 70,300 square meters. This would account for 15.1% of the total building area for City of Mississauga facilities included in this Plan.

4.2 BASELINE

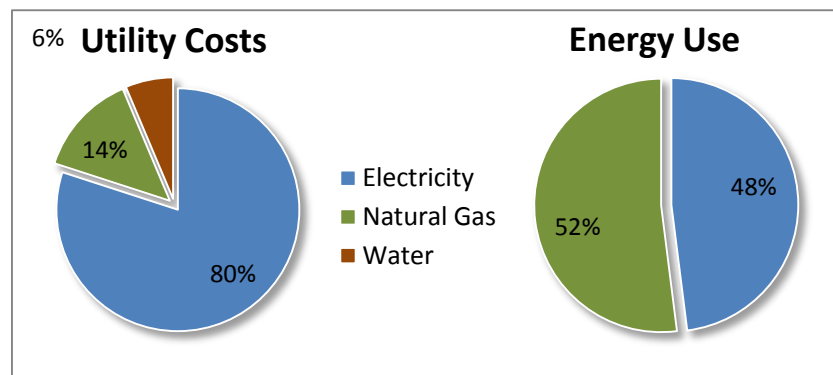
4.2.1 ENERGY USE

The energy use (combined electricity and natural gas) for **Indoor Ice Arenas** was 30,921,000 equivalent kilowatt hours in 2018. Following are the key takeaways for the energy usage in 2018:

- 48% of the total energy usage was due to electricity use, which has dropped by 23.5% since 2013
- 52% of the total energy usage was due to natural gas use, which has remained consistent since 2013
- A total of \$2,748,000 in utility costs was incurred, out of which 80% is attributed to electricity, 14% to natural gas, and 6% to water

Indoor Ice Arenas accounted for 15.3% of the City's total utility budget for 2018.

Figure 4-1: Utility Costs and Energy Use Breakdown for Indoor Ice Arenas

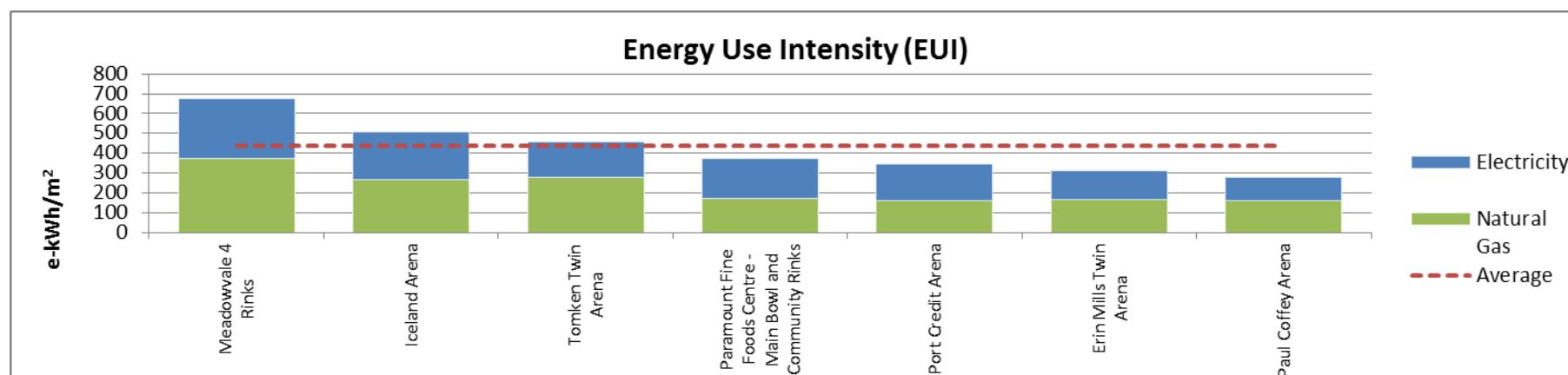


4.2.2 ENERGY USE INTENSITY

Energy Use Intensity (EUI) is a measurement that expresses a building's energy use as a function of its size or other characteristic. It is used to give a better picture of the energy efficiency of a facility. The lower the EUI, the more efficient the facility is.

When reviewing EUI, the facility operation type and hours should be taken into account. For example, a facility that operates 24 hours a day will most likely have a higher EUI than a similar one that operates 8 hours a day. Similarly, a facility that has high energy using systems that do not contribute to the building area, such as an outdoor pool or outdoor ice rink, will have a higher EUI than a facility where those systems are located within the facility, as they would add to the facility's area footprint.

Figure 4-2: Energy Use Intensity for Indoor Ice Arenas



For **Indoor Ice Arenas** the average EUI in 2018 was 440.0 e-kWh/m².

The following chart shows the EUI for each facility within **Indoor Ice Arenas**, and compares it to the average for the group.

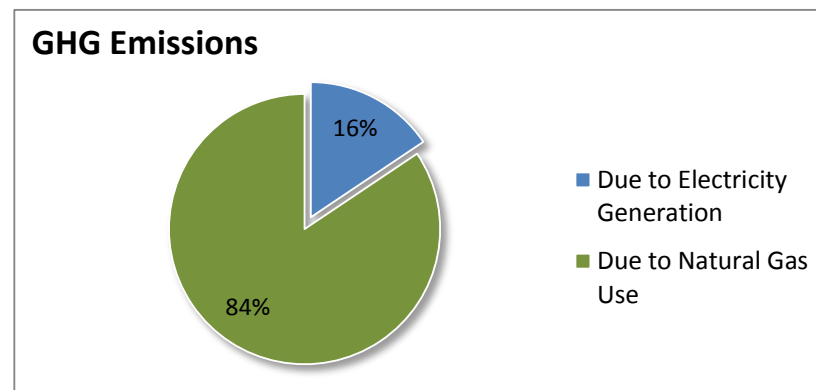
Note: The Average EUI value is calculated by taking the total energy use of all facilities, and dividing by the total area of the facilities. As such, a larger facility would have a bigger impact on the average than a smaller facility.

4.2.3 GREENHOUSE GAS (GHG) EMISSIONS

For 2018, **Indoor Ice Arenas** emitted 3,430,000 kg (or 3,430 tonnes) of CO₂ in 2018. 15.6% of these emissions were due to the generation of electricity, while the use of natural gas accounted for the remaining 84.4%.

Indoor Ice Arenas accounted for 17.2% of the City's total GHG emissions for facilities included in the plan.

Figure 4-3: GHG Emissions Breakdown for Administration and Offices



4.3 ENERGY AND GHG BREAKDOWN FOR INDOOR ICE ARENAS

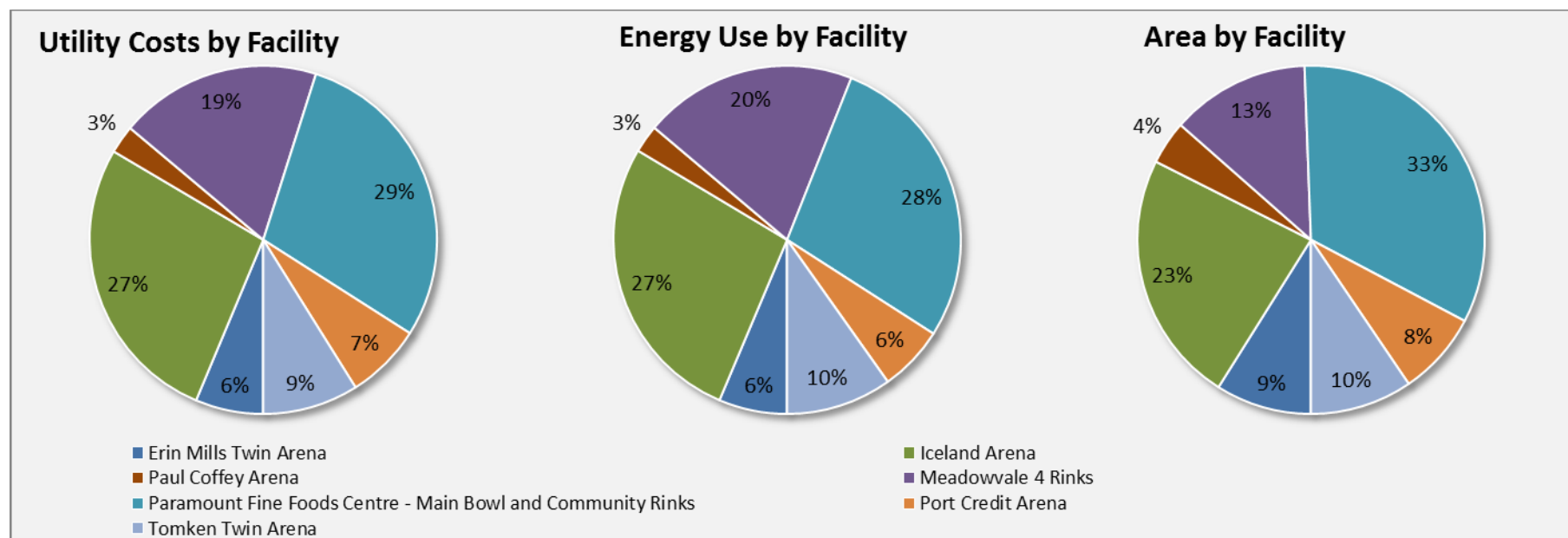
This section provides a brief overview/recap of the Utility and GHG data for **Indoor Ice Arenas**. The table below summarizes, by facility, the utility usage and GHG emissions for 2018. Following are the key takeaways:

- The 4-Pad Arenas: Paramount Fine Foods Centre, Iceland Arena, Meadowvale 4 Rinks constitute 69% of the total area in this group and contribute towards 75% of the total energy consumption and utility costs in this group
- The twin pads: Tomken Twin Arena and Erin Mills Twin Arena constitute 19% of the total area in this group and contribute

towards 15% of the total energy consumption and utility costs in this group

- The single pads: Port Credit Arena and Paul Coffey Arena constitute 12% of the total area in this group and contribute towards 10% of the total energy consumption and utility costs in this group
- Process loads such as ice plant and de-humidification dominate the energy usage in this group; especially for facilities that operate year-round like Iceland Arena, Meadowvale 4 Rinks, Erin Mills Twin Arena (occasionally)
- For this reason, priority was given to projects reducing electricity usage for previous and future planned projects since they greatly reduce utility budget and energy usage

Figure 4-4: Utility Costs and Energy Use Breakdown by Facility



2018 Annual Report for Indoor Ice Arenas

Facility	Area m ²	Electricity		Natural Gas		Total Energy e-kWh	Water		Total Costs \$	GHG Emissions kg
		kWh	\$	m ³	\$		m ³	\$		
Erin Mills Twin Arena	6,287	909,393	\$139,369	101,150	\$25,805	1,971,466	5,083	\$8,712	\$173,886	224,012
Iceland Arena	16,490	4,019,814	\$598,983	417,626	\$100,960	8,404,886	27,109	\$46,095	\$746,039	934,444
Paul Coffey Arena	2,851	343,888	\$60,126	43,359	\$11,766	799,158	0	\$0	\$71,892	94,372
Meadowvale 4 Rinks	9,092	2,744,605	\$402,777	324,050	\$78,734	6,147,127	22,047	\$35,744	\$517,255	711,584
Paramount Fine Foods Centre - Main Bowl and Community Rinks	23,407	4,644,899	\$670,346	383,303	\$91,979	8,669,579	14,466	\$37,298	\$799,623	892,042
Port Credit Arena	5,466	999,430	\$148,999	84,379	\$21,947	1,885,413	9,573	\$23,454	\$194,400	195,541
Tomken Twin Arena	6,681	1,180,131	\$177,881	177,429	\$43,900	3,043,137	9,623	\$23,292	\$245,074	378,003
Totals	70,274	14,842,160	\$2,198,481	1,531,296	\$375,091	30,920,765	87,901	\$174,596	\$2,748,168	3,429,998
Usage / Costs per m²:		211.2	\$31.3	21.8	\$5.3	440	1.3	\$2.6	\$39.1	48.8

4.4 ACTION PLAN

An action plan has been identified with the goal to save on electricity, natural gas, oil, and/or other form of energy consumption within a facility or location.

The following figure shows the various projects and initiatives that have been planned for **Indoor Ice Arenas**. The chart shows what projects have been planned, when they are planned to be implemented, and the progress of implementation (if applicable). A brief description of each project has been noted below:

- **Ice Plant Energy Upgrades:** Includes a robust ice plant controls with the ability to modulate the equipment and reset setpoints based on varying loads and outside conditions, and cold water ice resurfacing
- **Electrical Upgrades:** Includes devices reduce the wastages associated with the distribution of the electrical feed like voltage regulation, power factor correction, efficient transformers
- **Energy Upgrades for Lifecycle Replacements:** Includes energy upgrades for high capital assets that show economic paybacks only at the time of replacement like envelope and HVAC equipment
- **Controls Upgrades:** Includes controller upgrades, optimized sequence of operations, and additional points to better manage and control building systems

- **Metering & Sub-metering:** Includes real-time monitoring of building and select components to provide the ability to analyze consumption data, identify solutions to conserve energy, and conduct measurement & verification
- **Lighting Upgrades:** Includes replacement of existing lighting technologies to newer technologies like LEDs, and better controls through localized sensors and BAS scheduling

For the chart below, the **Purple** coloured bars represent the original planned start and completion of a Measure type. The **Green** bar beneath shows the actual start and completion times for a completed measure, while the **Blue** bar shows the actual start time of a Measure that is currently being implemented, but not yet complete. Some Notes:

- A Single Measure timeline may include more than one implementation of that measure (example: In different facilities).
- Due to changing circumstances (change in operations, budget changes, new technology, etc.), a planned measure may be cancelled. These would be indicated by a **Red** plan bar on the chart.

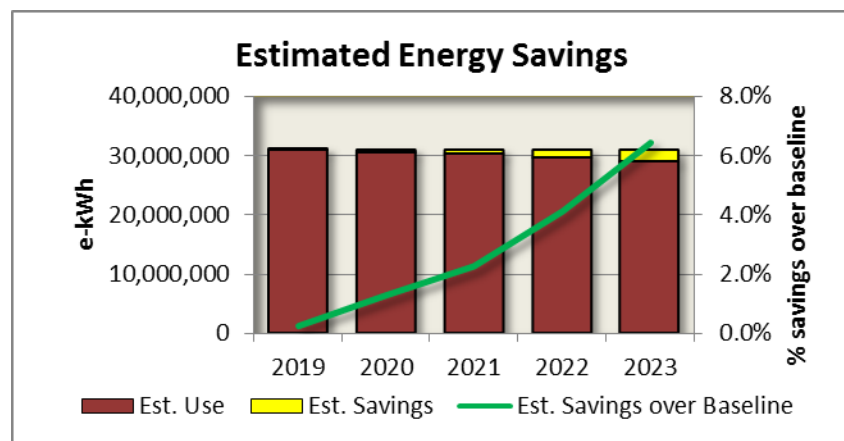
Figure 4-5: Energy Measure Implementation Plan for Indoor Ice Arenas

Energy Measure	2019				2020				2021				2022				2023			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Ice Plant Energy Upgrades																				
Electrical Upgrades																				
Energy Upgrades for Lifecycle Replacements																				
Controls Upgrades																				
Metering & Sub-metering Equipment																				
Lighting Upgrades																				
Planned Implementation Scheduled Implementation Cancelled Implementation Actual Implementation Status = Completed Status = Underway																		Q1 = Jan-Mar		
																		Q3 = Jul-Sep		

4.5 ESTIMATED SAVINGS

At the end of the plan, **Indoor Ice Arenas** are expected to save 6.4% over the base year of 2018, which amounts to a total of \$275,000 from all the projects.

Figure 4-6: Energy Measure Annual Savings for Indoor Ice Arenas



4.6 PROGRESS TO TARGETS

The City is targeting a 6.4% reduction in energy use in **Indoor Ice Arenas** by 2023 over the base year, 2018. The reporting of energy consumption data and savings for **Indoor Ice Arenas** will be based on utility meters and assembled annually. Since utility meters monitor energy consumption for the entire facility, the measurement boundary will encompass all parts of the facility. To determine the savings and fairly compare year-to-year energy consumption data, it is important to account for independent variables such as weather and occupancy and apply regression analysis to consumption data. Therefore, actual consumption data for each year starting 2019 will be adjusted to match the weather and occupancy of 2018. The figures below show the updated progress for each year against the set target.

Figure 4-7: Annual Energy Use vs Targeted Energy Use for Indoor Ice Arenas

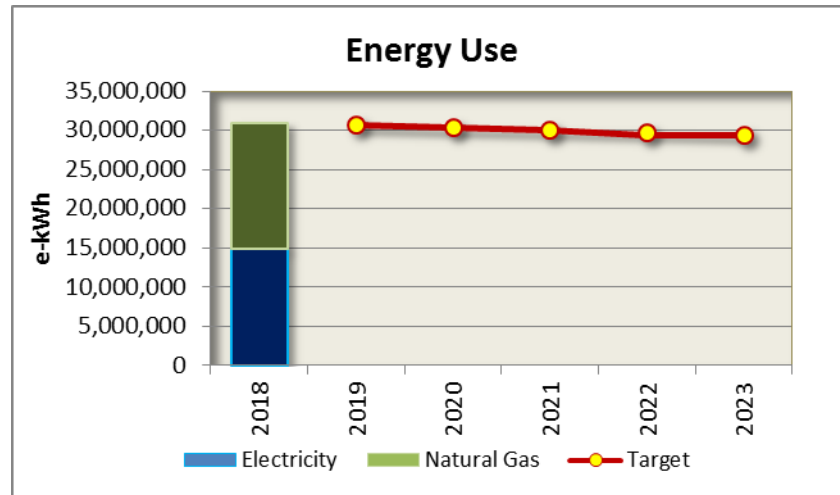
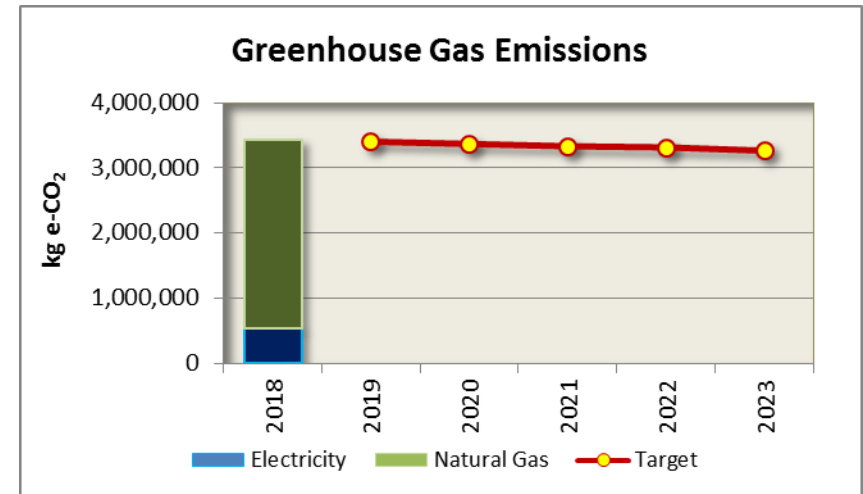


Figure 4-8: Annual GHG Emissions vs Targets for Indoor Ice Arenas



4.7 FACILITY INFORMATION FOR INDOOR ICE ARENAS

Facility: Erin Mills Twin Arena

Address 3205 Unity Dr, L5L 4L5










Area (m²): 6,287 Area (ft²): 67,673

Year Built: 1985 Hours per Week : 125

Facility Group: Arena

Building Components: Ice Rink x 2

**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	1,085,599	1,342,022	909,393	
Electricity (\$)	\$175,140	\$216,120	\$139,369	
Natural Gas (m ³)	103,331	159,192	101,150	
Natural Gas (\$)	\$28,001	\$45,182	\$25,805	
Water (m ³)	6,482	8,142	5,083	
Water (\$)	\$9,798	\$13,835	\$8,712	
Total Costs (\$)	\$212,939	\$275,137	\$173,886	
Total e-kWh	2,170,573	3,013,532	1,971,466	
Total e-kWh/m ²	345.2	479.3	313.6	
GHG (kg/Yr)	234,480	349,344	224,012	
GHG (kg/Yr/m ²)	37	56	36	

Energy Measures

Energy Upgrades for Lifecycle Replacements
 Controls Upgrades
 Metering & Sub-metering Equipment
 Operation Optimization
 Lighting Upgrades

Facility: Iceland Arena

Address 705 Matheson Boulevard East, L4Z 4A6










Area (m²): 16,490 Area (ft²): 177,497

Year Built: 1996 Hours per Week : 125

Facility Group: Arena

Building Components: Olympic Sized Rink, 3 Recreational Sized Rinks

**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	4,434,700	3,895,730	4,019,814	
Electricity (\$)	\$683,704	\$601,728	\$598,983	
Natural Gas (m ³)	435,633	429,301	417,626	
Natural Gas (\$)	\$110,986	\$114,807	\$100,960	
Water (m ³)	30,078	24,738	27,109	
Water (\$)	\$55,917	\$31,600	\$46,095	
Total Costs (\$)	\$850,607	\$748,134	\$746,039	
Total e-kWh	9,008,848	8,403,396	8,404,886	
Total e-kWh/m ²	546.3	509.6	509.7	
GHG (kg/Yr)	983,431	952,055	934,444	
GHG (kg/Yr/m ²)	60	58	57	

Energy Measures

Electrical Upgrades
 Energy Upgrades for Lifecycle Replacements
 Controls Upgrades
 Metering & Sub-metering Equipment
 Operation Optimization
 Lighting Upgrades

Facility: Paul Coffey Arena

Address 3430 Derry Rd E, L4T 1A9

Area (m²): 2,851Area (ft²): 30,688








Year Built: 1968

Hours per Week : 125

Facility Group: Arena

Building Components: Ice Rink

**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	405,131	415,350	343,888	
Electricity (\$)	\$68,118	\$69,464	\$60,126	
Natural Gas (m ³)	44,212	37,593	43,359	
Natural Gas (\$)	\$12,143	\$11,116	\$11,766	
Water (m ³)	0	0	0	
Water (\$)	\$0	\$0	\$0	
Total Costs (\$)	\$80,261	\$80,580	\$71,892	
Total e-kWh	869,354	810,075	799,158	
Total e-kWh/m ²	304.9	284.1	280.3	
GHG (kg/Yr)	98,189	86,041	94,372	
GHG (kg/Yr/m ²)	34	30	33	

Energy Measures

Electrical Upgrades
Lighting Upgrades

Facility: Meadowvale 4 Rinks

Address 2160 Torquay Mews, L5N 1P7










Area (m²): 9,092 Area (ft²): 97,865

Year Built: 1977 Hours per Week : 125

Facility Group: Arena

Building Components: Ice Rink x 4; Offices and Meeting Rooms

**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	3,275,419	2,183,941	2,744,605	
Electricity (\$)	\$495,301	\$330,005	\$402,777	
Natural Gas (m ³)	321,630	288,244	324,050	
Natural Gas (\$)	\$83,262	\$76,937	\$78,734	
Water (m ³)	24,323	26,266	22,047	
Water (\$)	\$33,774	\$36,735	\$35,744	
Total Costs (\$)	\$612,337	\$443,677	\$517,255	
Total e-kWh	6,652,537	5,210,504	6,147,127	
Total e-kWh/m ²	731.7	573.1	676.1	
GHG (kg/Yr)	726,118	623,691	711,584	
GHG (kg/Yr/m ²)	80	69	78	

Energy Measures

Ice Plant Energy Upgrades
 Electrical Upgrades
 Energy Upgrades for Lifecycle Replacements
 Controls Upgrades
 Metering & Sub-metering Equipment
 Operation Optimization
 Lighting Upgrades

Facility: Paramount Fine Foods Centre - Main Bowl and Community Rinks

Address 5500 Rose Cherry Place, L4Z 4B6

Area (m²): 23,407Area (ft²): 251,951









Year Built: 1998

Hours per Week : 125

Facility Group: Arena

Building Components: Ice Rink x 4; Snack Bar/Lounge

**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	4,218,469	4,467,826	4,644,899	
Electricity (\$)	\$681,640	\$697,152	\$670,346	
Natural Gas (m ³)	361,257	327,351	383,303	
Natural Gas (\$)	\$89,178	\$89,290	\$91,979	
Water (m ³)	17,290	17,389	14,466	
Water (\$)	\$30,773	\$31,526	\$37,298	
Total Costs (\$)	\$801,591	\$817,968	\$799,623	
Total e-kWh	8,011,665	7,905,009	8,669,579	
Total e-kWh/m ²	342.3	337.7	370.4	
GHG (kg/Yr)	835,001	779,862	892,042	
GHG (kg/Yr/m ²)	36	33	38	

Energy Measures

Facility: Port Credit Arena

Address 40 Stavebank Rd, L5G 2T8










Area (m²): 5,466 Area (ft²): 53,141

Year Built: 1959 Hours per Week : 125

Facility Group: Arena

Building Components: Ice Rink

**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	986,986	950,719	999,430	
Electricity (\$)	\$152,763	\$149,107	\$148,999	
Natural Gas (m ³)	94,600	97,474	84,379	
Natural Gas (\$)	\$24,813	\$27,117	\$21,947	
Water (m ³)	8,570	7,357	9,573	
Water (\$)	\$18,830	\$18,065	\$23,454	
Total Costs (\$)	\$196,405	\$194,289	\$194,400	
Total e-kWh	1,980,284	1,974,195	1,885,413	
Total e-kWh/m ²	362.3	361.2	344.9	
GHG (kg/Yr)	214,420	218,549	195,541	
GHG (kg/Yr/m ²)	39	40	36	

Energy Measures

Energy Upgrades for Lifecycle Replacements
 Controls Upgrades
 Metering & Sub-metering Equipment
 Operation Optimization
 Lighting Upgrades

Facility: Tomken Twin Arena

Address 4495 Tomken Road, L4W 1J9










Area (m²): 6,681 Area (ft²): 71,914

Year Built: 1990 Hours per Week : 125

Facility Group: Arena

Building Components: Ice Rink x 2

**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	1,374,530	1,288,732	1,180,131	
Electricity (\$)	\$213,759	\$200,859	\$177,881	
Natural Gas (m ³)	182,795	190,975	177,429	
Natural Gas (\$)	\$49,079	\$52,275	\$43,900	
Water (m ³)	15,209	19,233	9,623	
Water (\$)	\$32,898	\$43,561	\$23,292	
Total Costs (\$)	\$295,736	\$296,696	\$245,074	
Total e-kWh	3,293,873	3,293,974	3,043,137	
Total e-kWh/m ²	493.0	493.0	455.5	
GHG (kg/Yr)	395,148	407,529	378,003	
GHG (kg/Yr/m ²)	59	61	57	

Energy Measures

Ice Plant Energy Upgrades
 Controls Upgrades
 Metering & Sub-metering Equipment
 Operation Optimization
 Lighting Upgrades

5.0 COMMUNITY CENTRES AND MULTI-PURPOSE FACILITIES

5.1 SCOPE AND BOUNDARY

Community Centres and Multi-Purpose Facilities are those facilities run by the City that may have any combination of operations, such as:

- Swimming Pool
- Library
- Arena
- Gymnasium
- Fitness Centre
- Multipurpose/meeting rooms

For the purposes of this report, the City of Mississauga has 15 facilities/locations that fall under this category. They include:

- Burnhamthorpe Community Centre & Arena
- Carmen Corbasson Community Centre
- Clarkson Community Centre Library Arena & Pool
- Frank McKechnie Community Centre
- Huron Park Community Centre Pool & Arena
- Malton Community Centre Pool & Library
- Malton Day Care Centre
- Meadowvale Community Centre Pool & Library
- Mississauga Seniors Citizen Centre
- Mississauga Valley Gymnasium
- Mississauga Valley Community Centre
- Paramount Fine Foods Centre - Fieldhouse
- Port Credit Lawn Bowling Building
- River Grove Community Centre & Pool
- South Common Community Centre Pool & Library

The above listed locations have a total floor area of approximately 96,900 square meters. This would account for 20.8% of the total building area for City of Mississauga facilities included in this Plan.

5.2 BASELINE

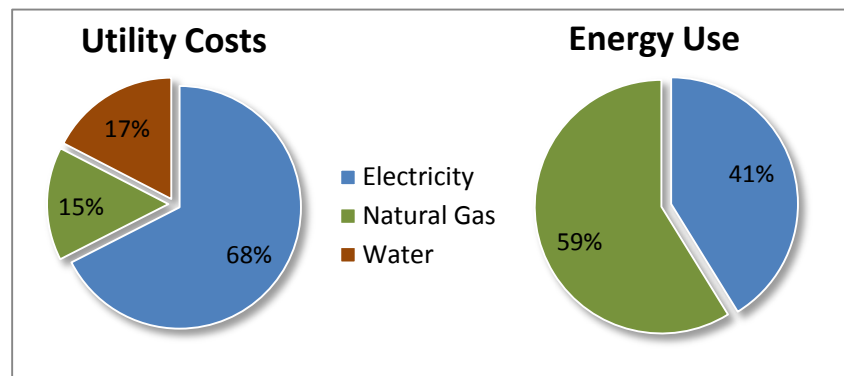
5.2.1 ENERGY USE

The energy use (combined electricity and natural gas) for **Community Centres and Multi-Purpose Facilities** was 42,992,000 equivalent kilowatt hours in 2018. Following are the key takeaways for the energy usage in 2018:

- 41% of the total energy usage was due to electricity use, which has dropped by 23.5% since 2013
- 59% of the total energy usage was due to natural gas use, which has remained consistent since 2013
- A total of \$4,004,000 in utility costs was incurred, out of which 68% is attributed to electricity, 15% to natural gas, and 17% to water

Community Centres and Multi-Purpose Facilities accounted for 20.1% of the City's total utility budget for 2018.

Figure 5-1: Utility Costs and Energy Use Breakdown for Community Centres and Multi-Purpose Facilities



When reviewing EUI, the facility operation type and hours should be taken into account. For example, a facility that operates 24 hours a day will most likely have a higher EUI than a similar one that operates 8 hours a day. Similarly, a facility that has high energy using systems that do not contribute to the building area, such as an outdoor pool or outdoor ice rink, will have a higher EUI than a facility where those systems are located within the facility, as they would add to the facility's area footprint.

For **Community Centres and Multi-Purpose Facilities** the average EUI in 2018 was 444.8 e-kWh/m².

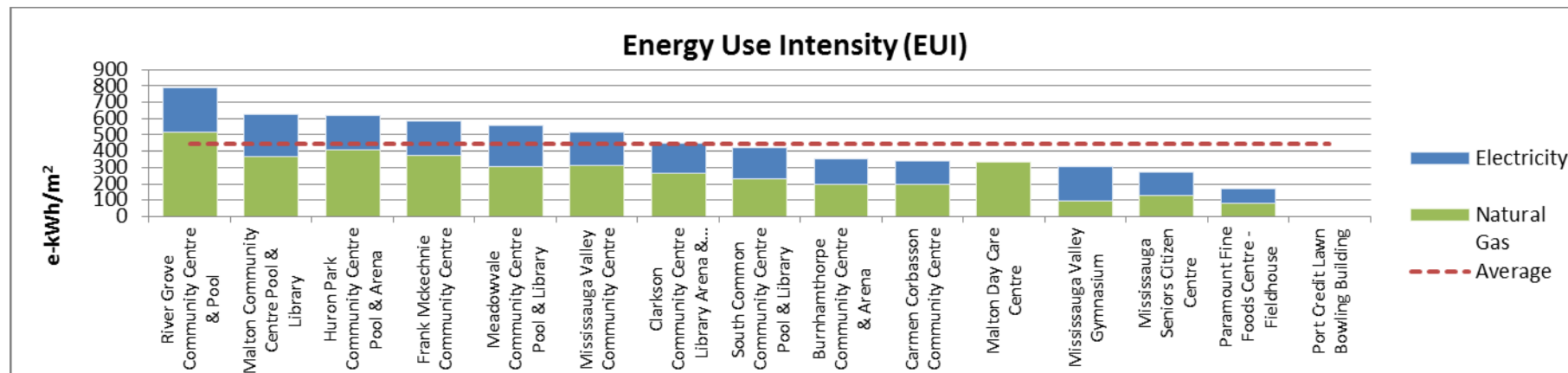
The following chart shows the EUI for each facility within **Community Centres and Multi-Purpose Facilities**, and compares it to the average for the group.

Note: The Average EUI value is calculated by taking the total energy use of all facilities, and dividing by the total area of the facilities. As such, a larger facility would have a bigger impact on the average than a smaller facility.

5.2.2 ENERGY USE INTENSITY

Energy Use Intensity (EUI) is a measurement that expresses a building's energy use as a function of its size or other characteristic. It is used to give a better picture of the energy efficiency of a facility. The lower the EUI, the more efficient the facility is.

Figure 5-2: Energy Use Intensity for Community Centres and Multi-Purpose Facilities

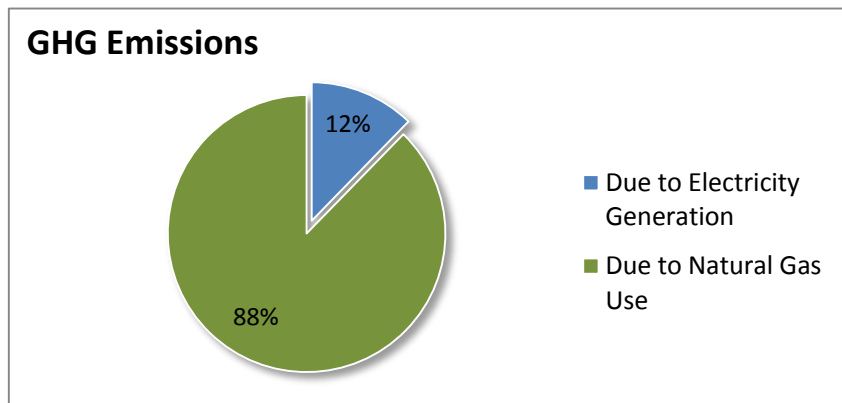


5.2.3 GREENHOUSE GAS (GHG) EMISSIONS

For 2018, **Community Centres and Multi-Purpose Facilities** emitted 5,191,000 kg (or 5,191 tonnes) of CO₂ in 2018. 12.3% of these emissions were due to the generation of electricity, while the use of natural gas accounted for the remaining 87.7%.

Community Centres and Multi-Purpose Facilities accounted for 26.0% of the City's total GHG emissions for facilities included in the plan.

Figure 5-3: GHG Emissions Breakdown for Community Centres and Multi-Purpose Facilities

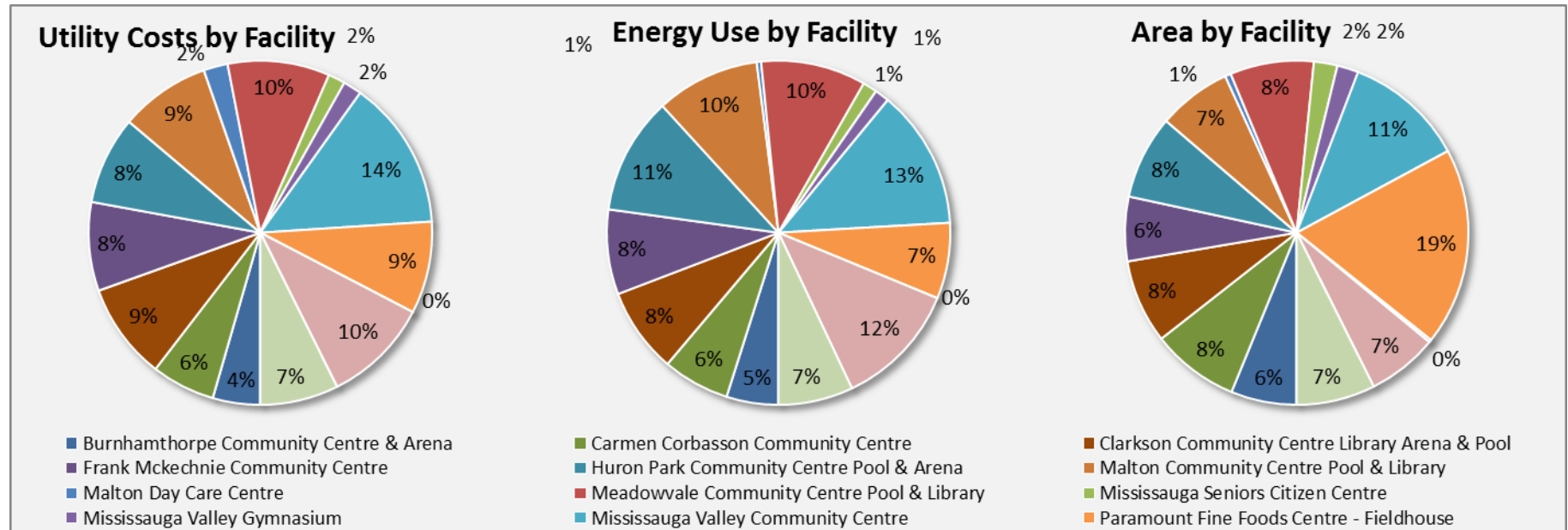


5.3 ENERGY AND GHG BREAKDOWN FOR COMMUNITY CENTRES AND MULTI-PURPOSE FACILITIES

This section provides a brief overview/recap of the Utility and GHG data for **Community Centres and Multi-Purpose Facilities**. The table below summarizes, by facility, the utility usage and GHG emissions for 2018. Following are the key takeaways:

- The top two facilities: Paramount Fine Foods Centre Fieldhouse and Mississauga Valley Community Centre in this group by area (30%) contribute towards 20% and 23% of the group's total energy consumption and utility costs respectively
- Nine (9) facilities with approximately similar areas in this group together contribute towards 77% and 71% of the group's total energy consumption and utility costs respectively
- Process loads such as ice plant, pool hot water plant, and de-humidification dominate the energy usage in this group
- For this reason, priority was given to heat recovery and electricity reduction projects for previous and future planned projects since they greatly reduce utility budget and energy usage

Figure 4-4: Utility Costs and Energy Use Breakdown by Facility



2018 Annual Report for Community Centres and Multi-Purpose Facilities

Facility	Area m ²	Electricity		Natural Gas		Total Energy e-kWh	Water		Total Costs \$	GHG Emissions kg
		kWh	\$	m ³	\$		m ³	\$		
Burnhamthorpe Community Centre & Arena	6,008	904,190	\$140,464	114,424	\$28,436	2,105,641	4,306	\$10,471	\$179,371	248,926
Carmen Corbasson Community Centre	7,993	1,121,536	\$170,192	151,050	\$37,839	2,707,560	12,983	\$31,467	\$239,498	326,011
Clarkson Community Centre Library Arena & Pool	7,639	1,430,977	\$216,928	191,767	\$55,135	3,444,534	37,348	\$91,457	\$363,520	414,147
Frank McKechnie Community Centre	5,863	1,228,811	\$200,023	209,302	\$52,139	3,426,483	30,715	\$81,433	\$333,596	440,027
Huron Park Community Centre Pool & Arena	7,626	1,604,010	\$239,401	298,177	\$72,995	4,734,869	7,811	\$18,946	\$331,341	621,597
Malton Community Centre Pool & Library	6,708	1,751,102	\$261,777	233,394	\$57,763	4,201,736	14,964	\$21,305	\$340,845	504,387
Malton Day Care Centre	535	0	\$0	16,923	\$5,156	177,695	34,793	\$85,915	\$91,070	32,002
Meadowvale Community Centre Pool & Library	7,636	1,934,661	\$286,262	220,790	\$53,672	4,252,951	18,358	\$44,657	\$384,590	487,161
Mississauga Seniors Citizen Centre	2,149	305,584	\$49,689	25,981	\$7,455	578,383	2,787	\$6,762	\$63,907	60,131
Mississauga Valley Gymnasium	1,939	403,243	\$62,875	17,468	\$5,446	586,652	679	\$1,652	\$69,973	47,548
Mississauga Valley Community Centre	10,955	2,235,334	\$343,734	323,547	\$78,794	5,632,581	60,086	\$141,337	\$563,865	692,300

Paramount Fine Foods Centre - Fieldhouse	18,000	1,651,181	\$264,235	134,646	\$33,563	3,064,964	20,131	\$48,866	\$346,664	314,058
Port Credit Lawn Bowling Building	250	0	\$0	0	\$0	0	0	\$0	\$0	0
River Grove Community Centre & Pool	6,428	1,750,838	\$259,987	314,731	\$77,094	5,055,515	26,180	\$63,645	\$400,726	658,187
South Common Community Centre Pool & Library	7,174	1,387,341	\$206,839	155,767	\$39,150	3,022,894	21,910	\$48,866	\$294,855	344,499
Totals	96,903	17,708,808	\$2,702,407	2,407,967	\$604,635	42,992,457	293,050	\$696,778	\$4,003,820	5,190,982
Usage / Costs per m²:		184.2	\$28.1	24.9	\$6.3	445	3.0	\$7.2	\$41.4	53.7

5.4 ACTION PLAN

An action plan has been identified with the goal to save on electricity, natural gas, oil, and/or other form of energy consumption within a facility or location.

The following figure shows the various projects and initiatives that have been planned for **Community Centres and Multi-Purpose Facilities**. The chart shows what projects have been planned, when they are planned to be implemented, and the progress of implementation (if applicable). A brief description of each project has been noted below:

- **Pool Heat Recovery:** Includes recovering heat from the pool drain and transferring the recovered heat to the fresh water supply to the pool, reducing the heat load on the pool boilers
- **Ice Plant Energy Upgrades:** Includes a robust ice plant controls with the ability to modulate the equipment and reset setpoints based on varying loads and outside conditions, and cold water ice resurfacing
- **Pool Dehumidification Energy Upgrades:** Includes optimized controls for the dehumidification equipment in the pool with better modulation capabilities
- **Building Analytics and Energy Dashboard:** Is being piloted to collect, manage, and analyse data from various building systems with the capabilities of energy analysis, load profiling, facility benchmarking, asset performance tracking, fault detection, and creating energy dashboards
- **Electrical Upgrades:** Includes devices reduce the wastages associated with the distribution of the electrical feed like voltage regulation, power factor correction, efficient transformers

- **Energy Upgrades for Lifecycle Replacements:** Includes energy upgrades for high capital assets that show economic paybacks only at the time of replacement like envelope and HVAC equipment
- **Controls Upgrades:** Includes controller upgrades, optimized sequence of operations, and additional points to better manage and control building systems
- **Metering & Sub-metering:** Includes real-time monitoring of building and select components to provide the ability to analyze consumption data, identify solutions to conserve energy, and conduct measurement & verification
- **Lighting Upgrades:** Includes replacement of existing lighting technologies to newer technologies like LEDs, and better controls through localized sensors and BAS scheduling

For the chart below, the **Purple** coloured bars represent the original planned start and completion of a Measure type. The **Green** bar beneath shows the actual start and completion times for a completed measure, while the **Blue** bar shows the actual start time of a Measure that is currently being implemented, but not yet complete. Some Notes:

- A Single Measure timeline may include more than one implementation of that measure (example: In different facilities).
- Due to changing circumstances (change in operations, budget changes, new technology, etc.), a planned measure may be cancelled. These would be indicated by a **Red** plan bar on the chart.

Figure 5-5: Energy Measure Implementation Plan for Community Centres and Multi-Purpose Facilities

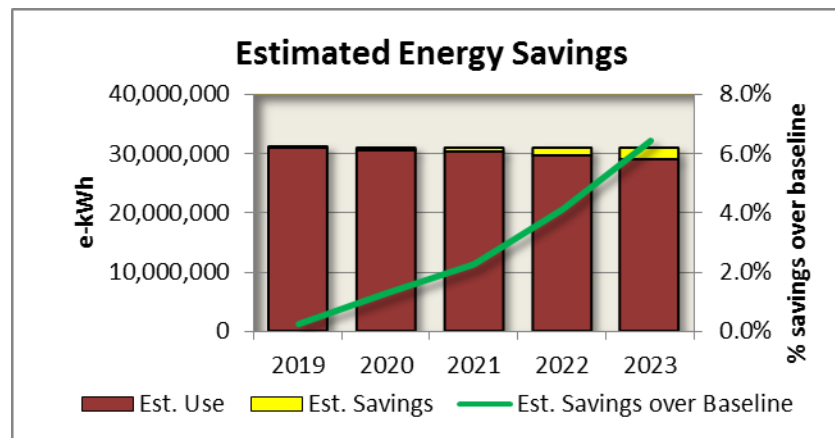
Energy Measure	2019				2020				2021				2022				2023			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Pool Heat Recovery																				
Ice Plant Energy Upgrades																				
Pool Dehumidification Energy Upgrades																				
Building Analytics and Energy Dashboard																				
Electrical Upgrades																				
Energy Upgrades for Lifecycle Replacements																				
Metering & Sub-metering Equipment																				
Lighting Upgrades																				

Planned Implementation	Scheduled Implementation	Cancelled Implementation	Q1 = Jan-Mar
Actual Implementation	Status = Completed	Status = Underway	Q3 = Jul-Sep

5.5 ESTIMATED SAVINGS

At the end of the plan, **Community Centres and Multi-Purpose Facilities** are expected to save 5.2% over the base year of 2018, which amounts to a total of \$102,500 from all the projects.

Figure 5-6: Energy Measure Annual Savings for Community Centres and Multi-Purpose Facilities



5.6 PROGRESS TO TARGETS

The City is targeting a 5.2% reduction in energy use in **Community Centres and Multi-Purpose Facilities** by 2023 over the base year, 2018. The reporting of energy consumption data and savings for **Community Centres and Multi-Purpose Facilities** will be based on utility meters and assembled annually. Since utility meters monitor energy consumption for the entire facility, the measurement boundary will encompass all parts of the facility. To determine the savings and fairly compare year-to-year energy consumption data, it is important to account for independent variables such as weather and occupancy and apply regression analysis to consumption data. Therefore, actual consumption data for each year starting 2019 will be adjusted to match the weather and occupancy of 2018. The figures below show the updated progress for each year against the set target.

Figure 5-7: Annual Energy Use vs Targeted Energy Use for Community Centres and Multi-Purpose Facilities

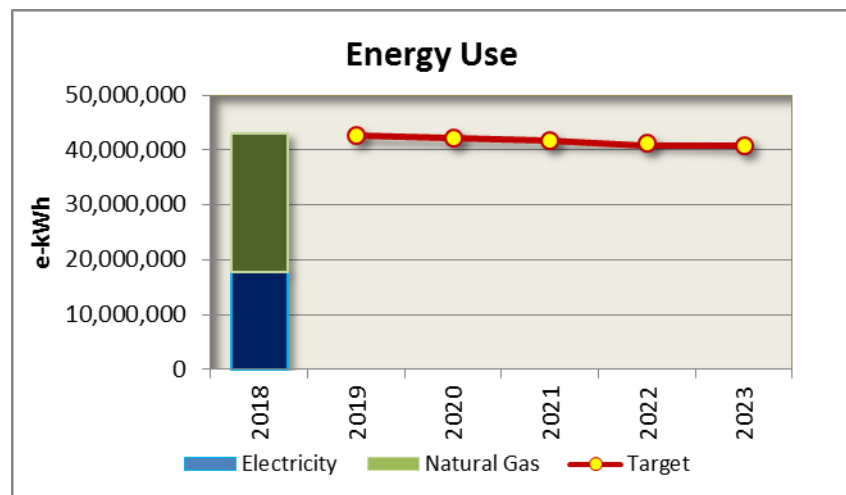
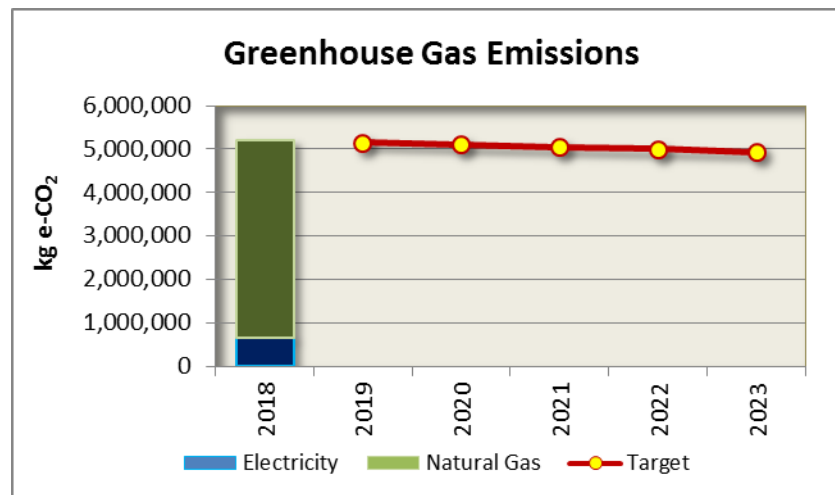


Figure 5-8: Annual GHG Emissions vs Targets for Community Centres and Multi-Purpose Facilities



5.7 FACILITY INFORMATION FOR COMMUNITY CENTRES AND MULTI-PURPOSE FACILITIES

Facility: Burnhamthorpe Community Centre & Arena










Address 1500 Gulleden Dr, L4X 2T7

Area (m²): 6,008 Area (ft²): 64,670

Year Built: 1974 Hours per Week : 125

Facility Group: Community Centre

Building Components: Gymnasium; Ice Rink; Ice Rink (Outdoor); Multipurpose Rooms;
Offices and Meeting Rooms**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	1,233,115	1,051,837	904,190	
Electricity (\$)	\$192,493	\$165,898	\$140,464	
Natural Gas (m ³)	92,671	96,233	114,424	
Natural Gas (\$)	\$23,557	\$26,082	\$28,436	
Water (m ³)	5,189	6,190	4,306	
Water (\$)	\$11,260	\$14,178	\$10,471	
Total Costs (\$)	\$227,310	\$206,158	\$179,371	
Total e-kWh	2,206,158	2,062,281	2,105,641	
Total e-kWh/m ²	367.2	343.3	350.5	
GHG (kg/Yr)	219,632	219,842	248,926	
GHG (kg/Yr/m ²)	37	37	41	

Energy Measures

Energy Upgrades for Lifecycle Replacements
 Metering & Sub-metering Equipment
 Operation Optimization
 Lighting Upgrades

Facility: Carmen Corbasson Community Centre

Address 1399 Cawthra Rd, L5J 4L1










Area (m²): 7,993 Area (ft²): 86,036

Year Built: 1972 Hours per Week : 125

Facility Group: Community Centre

Building Components: Gymnasium; Ice Rink x 2; Multipurpose Rooms; Offices and Meeting Rooms

**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	1,424,765	1,176,052	1,121,536	
Electricity (\$)	\$218,786	\$187,944	\$170,192	
Natural Gas (m ³)	140,238	157,312	151,050	
Natural Gas (\$)	\$37,239	\$41,666	\$37,839	
Water (m ³)	15,991	14,392	12,983	
Water (\$)	\$36,754	\$27,825	\$31,467	
Total Costs (\$)	\$292,778	\$257,434	\$239,498	
Total e-kWh	2,897,259	2,827,833	2,707,560	
Total e-kWh/m ²	362.5	353.8	338.7	
GHG (kg/Yr)	316,481	339,816	326,011	
GHG (kg/Yr/m ²)	40	43	41	

Energy Measures

Ice Plant Energy Upgrades
 Energy Upgrades for Lifecycle Replacements
 Controls Upgrades
 Metering & Sub-metering Equipment
 Operation Optimization
 Lighting Upgrades

Facility: Clarkson Community Centre Library Arena & Pool

Address 2475 Truscott Dr, L5J 2B5

Area (m²): 7,639Area (ft²): 82,226










Year Built: 1970

Hours per Week : 72

Facility Group: Community Centre

Building Components: Gymnasium; Ice Rink; Library; Multipurpose Rooms; Offices and Meeting Rooms; Pool

**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	1,559,329	1,474,631	1,430,977	
Electricity (\$)	\$244,133	\$234,247	\$216,928	
Natural Gas (m ³)	177,130	176,160	191,767	
Natural Gas (\$)	\$44,192	\$47,960	\$55,135	
Water (m ³)	38,702	31,683	37,348	
Water (\$)	\$89,016	\$72,664	\$91,457	
Total Costs (\$)	\$377,341	\$354,870	\$363,520	
Total e-kWh	3,419,193	3,324,308	3,444,534	
Total e-kWh/m ²	447.6	435.2	450.9	
GHG (kg/Yr)	391,089	386,205	414,147	
GHG (kg/Yr/m ²)	51	51	54	

Energy Measures

Pool Heat Recovery
 Ice Plant Energy Upgrades
 Pool Dehumidification Energy Upgrades
 Electrical Upgrades
 Energy Upgrades for Lifecycle Replacements
 Controls Upgrades
 Metering & Sub-metering Equipment
 Operation Optimization
 Lighting Upgrades

Facility: Frank McKechnie Community Centre

Address 310 Bristol Road East, L4Z 3V5










Area (m²): 5,863 Area (ft²): 63,109

Year Built: 2000 Hours per Week : 72

Facility Group: Community Centre

Building Components: Gymnasium; Library; Multipurpose Rooms; Offices and Meeting Rooms; Pool

**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	1,377,593	1,299,277	1,228,811	
Electricity (\$)	\$215,726	\$205,907	\$200,023	
Natural Gas (m ³)	218,755	224,128	209,302	
Natural Gas (\$)	\$56,903	\$61,402	\$52,139	
Water (m ³)	39,761	39,273	30,715	
Water (\$)	\$66,701	\$83,391	\$81,433	
Total Costs (\$)	\$339,330	\$350,700	\$333,596	
Total e-kWh	3,674,518	3,652,617	3,426,483	
Total e-kWh/m ²	626.7	623.0	584.4	
GHG (kg/Yr)	463,258	470,599	440,027	
GHG (kg/Yr/m ²)	79	80	75	

Energy Measures

Pool Heat Recovery
 Energy Management Information System
 Energy Upgrades for Lifecycle Replacements
 Metering & Sub-metering Equipment
 Operation Optimization
 Lighting Upgrades

Facility: Huron Park Community Centre Pool & Arena










Address 830 Paisley Blvd W, L5C 3P5

Area (m²): 7,626 Area (ft²): 82,086

Year Built: 1967 Hours per Week : 125

Facility Group: Community Centre

Building Components: Fitness Centre; Gymnasium; Ice Rink; Multipurpose Rooms;
Offices and Meeting Rooms; Pool**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	1,608,797	1,488,365	1,604,010	
Electricity (\$)	\$247,820	\$231,090	\$239,401	
Natural Gas (m ³)	316,674	294,417	298,177	
Natural Gas (\$)	\$81,827	\$79,444	\$72,995	
Water (m ³)	10,973	9,682	7,811	
Water (\$)	\$28,552	\$22,121	\$18,946	
Total Costs (\$)	\$358,199	\$332,655	\$331,341	
Total e-kWh	4,933,875	4,579,747	4,734,869	
Total e-kWh/m ²	647.0	600.5	620.9	
GHG (kg/Yr)	656,747	610,324	621,597	
GHG (kg/Yr/m ²)	86	80	82	

Energy Measures

Pool Heat Recovery
Ice Plant Energy Upgrades
Pool Dehumidification Energy Upgrades
Energy Upgrades for Lifecycle Replacements
Controls Upgrades
Metering & Sub-metering Equipment
Operation Optimization
Lighting Upgrades

Facility: Malton Community Centre Pool & Library

Address 3540 Morningstar Dr, L4T 1Y2

Area (m²): 6,708Area (ft²): 80,772










Year Built: 1977

Hours per Week : 125

Facility Group: Community Centre

Building Components: Fitness Centre; Gymnasium; Library; Multipurpose Rooms; Offices and Meeting Rooms; Pool

**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	1,857,449	1,970,007	1,751,102	
Electricity (\$)	\$288,263	\$289,203	\$261,777	
Natural Gas (m ³)	221,285	216,424	233,394	
Natural Gas (\$)	\$57,642	\$59,513	\$57,763	
Water (m ³)	13,663	13,201	14,964	
Water (\$)	\$16,936	\$17,292	\$21,305	
Total Costs (\$)	\$362,840	\$366,008	\$340,845	
Total e-kWh	4,180,940	4,242,455	4,201,736	
Total e-kWh/m ²	623.3	632.4	626.4	
GHG (kg/Yr)	485,318	480,177	504,387	
GHG (kg/Yr/m ²)	72	72	75	

Energy Measures

Facility: Malton Day Care Centre

Address 3500 Morningstar Dr, L4T 1Y2








Area (m²): 535 Area (ft²): 5,759

Year Built: 1977 Hours per Week : 55

Facility Group: Community Centre

Building Components: Day Care

**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	0	0	0	
Electricity (\$)	\$0	\$0	\$0	
Natural Gas (m ³)	16,860	15,299	16,923	
Natural Gas (\$)	\$5,164	\$4,697	\$5,156	
Water (m ³)	38,831	33,865	34,793	
Water (\$)	\$85,873	\$78,156	\$85,915	
Total Costs (\$)	\$91,036	\$82,854	\$91,070	
Total e-kWh	177,032	160,637	177,695	
Total e-kWh/m ²	330.9	300.3	332.1	
GHG (kg/Yr)	31,883	28,930	32,002	
GHG (kg/Yr/m ²)	60	54	60	

Energy Measures

Facility: Meadowvale Community Centre Pool & Library

Address 6655 Glen Erin Dr, L5N 3L4










Area (m²): 7,636Area (ft²): 82,163

Year Built: 2016

Hours per Week :

Facility Group: Community Centre

Building Components: Fitness Centre; Multipurpose Rooms; Offices and Meeting Rooms;
Pool**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	925,304	1,965,207	1,934,661	
Electricity (\$)	\$148,254	\$293,065	\$286,262	
Natural Gas (m ³)	148,353	246,903	220,790	
Natural Gas (\$)	\$34,763	\$61,269	\$53,672	
Water (m ³)	5,812	20,799	18,358	
Water (\$)	\$12,709	\$47,819	\$44,657	
Total Costs (\$)	\$195,726	\$402,153	\$384,590	
Total e-kWh	2,483,008	4,557,689	4,252,951	
Total e-kWh/m ²	325.2	596.9	557.0	
GHG (kg/Yr)	313,846	537,641	487,161	
GHG (kg/Yr/m ²)	41	70	64	

Energy Measures

Facility: Mississauga Seniors Citizen Centre

Address 1389 Cawthra Rd, L5J 4L1

Area (m²): 2,149Area (ft²): 23,132










Year Built:

Hours per Week :

Facility Group: Community Centre

Building Components:

**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	241,974	284,650	305,584	
Electricity (\$)	\$42,262	\$47,800	\$49,689	
Natural Gas (m ³)	25,241	24,619	25,981	
Natural Gas (\$)	\$7,119	\$7,313	\$7,455	
Water (m ³)	1,239	1,606	2,787	
Water (\$)	\$2,704	\$3,675	\$6,762	
Total Costs (\$)	\$52,086	\$58,788	\$63,907	
Total e-kWh	507,005	543,150	578,383	
Total e-kWh/m ²	235.9	252.7	269.1	
GHG (kg/Yr)	56,442	56,802	60,131	
GHG (kg/Yr/m ²)	26	26	28	

Energy Measures

Facility: Mississauga Valley Gymnasium

Address 1395 Mississauga Valley Blvd, L5A 3R8










Area (m²): 1,939 Area (ft²): 20,871

Year Built: 1984 Hours per Week : 98

Facility Group: Community Centre

Building Components: Gymnasium

**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	352,958	383,438	403,243	
Electricity (\$)	\$60,596	\$62,933	\$62,875	
Natural Gas (m ³)	18,724	17,593	17,468	
Natural Gas (\$)	\$5,459	\$5,595	\$5,446	
Water (m ³)	2,289	928	679	
Water (\$)	\$5,023	\$2,119	\$1,652	
Total Costs (\$)	\$71,078	\$70,646	\$69,973	
Total e-kWh	549,560	568,167	586,652	
Total e-kWh/m ²	283.4	293.0	302.6	
GHG (kg/Yr)	48,114	47,073	47,548	
GHG (kg/Yr/m ²)	25	24	25	

Energy Measures

Facility: Mississauga Valley Community Centre

Address 1275 Mississauga Valley Blvd, L5A 3R8










Area (m²): 10,955Area (ft²): 117,919

Year Built: 1977

Hours per Week : 138

Facility Group: Community Centre

Building Components: Day Care; Fitness Centre; Ice Rink; Library; Multipurpose Rooms;
Offices and Meeting Rooms; Pool**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	2,323,570	2,160,932	2,235,334	
Electricity (\$)	\$380,756	\$354,502	\$343,734	
Natural Gas (m ³)	297,755	299,508	323,547	
Natural Gas (\$)	\$75,424	\$80,303	\$78,794	
Water (m ³)	63,873	52,296	60,086	
Water (\$)	\$135,487	\$115,968	\$141,337	
Total Costs (\$)	\$591,667	\$550,772	\$563,865	
Total e-kWh	5,449,996	5,305,762	5,632,581	
Total e-kWh/m ²	497.5	484.3	514.2	
GHG (kg/Yr)	646,703	644,163	692,300	
GHG (kg/Yr/m ²)	59	59	63	

Energy Measures

Ice Plant Energy Upgrades
 Pool Dehumidification Energy Upgrades
 Electrical Upgrades
 Controls Upgrades
 Metering & Sub-metering Equipment
 Operation Optimization
 Lighting Upgrades

Facility: Paramount Fine Foods Centre - Fieldhouse

Address 5600 Rose Cherry Place, L4Z 4B6










Area (m²): 18,000 Area (ft²): 193,750

Year Built: 2007 Hours per Week : 125

Facility Group: Community Centre

Building Components: Fitness Centre; Gymnasium; Gymnastics Centre; Snack Bar/Lounge; Soccer Field (Indoor)

**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	2,391,101	2,171,313	1,651,181	
Electricity (\$)	\$395,339	\$349,733	\$264,235	
Natural Gas (m ³)	121,396	142,257	134,646	
Natural Gas (\$)	\$30,245	\$37,652	\$33,563	
Water (m ³)	13,540	19,296	20,131	
Water (\$)	\$29,832	\$41,047	\$48,866	
Total Costs (\$)	\$455,415	\$428,431	\$346,664	
Total e-kWh	3,665,758	3,665,007	3,064,964	
Total e-kWh/m ²	203.7	203.6	170.3	
GHG (kg/Yr)	315,639	347,174	314,058	
GHG (kg/Yr/m ²)	18	19	17	

Energy Measures

Facility: Port Credit Lawn Bowling Building

Address 1389 Cawthra Rd, L5J 4L1

Area (m²): 250 Area (ft²): 2,691

Year Built: 1992 Hours per Week : 72

Facility Group: Community Centre

Building Components:

**Historical Energy and GHG Data**

Year:	2016	2017	2018
Electricity (kWh)	0	0	0
Electricity (\$)	\$0	\$0	\$0
Natural Gas (m ³)	0	0	0
Natural Gas (\$)	\$0	\$0	\$0
Water (m ³)	0	0	0
Water (\$)	\$0	\$0	\$0
Total Costs (\$)	\$0	\$0	\$0
Total e-kWh	0	0	0
Total e-kWh/m ²	0.0	0.0	0.0
GHG (kg/Yr)	0	0	0
GHG (kg/Yr/m ²)	0	0	0

Energy Measures

Facility: River Grove Community Centre & Pool

Address 5800 River Grove Avenue, L5M 4R8










Area (m²): 6,428 Area (ft²): 68,200

Year Built: 1996 Hours per Week : 100

Facility Group: Community Centre

Building Components: Fitness Centre; Gymnasium; Multipurpose Rooms; Offices and Meeting Rooms; Pool

**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	2,032,046	1,792,662	1,750,838	
Electricity (\$)	\$314,410	\$279,605	\$259,987	
Natural Gas (m ³)	329,800	305,325	314,731	
Natural Gas (\$)	\$83,340	\$85,420	\$77,094	
Water (m ³)	28,294	29,948	26,180	
Water (\$)	\$61,618	\$68,448	\$63,645	
Total Costs (\$)	\$459,368	\$433,473	\$400,726	
Total e-kWh	5,494,948	4,998,570	5,055,515	
Total e-kWh/m ²	854.8	777.6	786.5	
GHG (kg/Yr)	696,806	641,904	658,187	
GHG (kg/Yr/m ²)	108	100	102	

Energy Measures

Pool Heat Recovery
 Pool Dehumidification Energy Upgrades
 Electrical Upgrades
 Controls Upgrades
 Metering & Sub-metering Equipment
 Operation Optimization
 Lighting Upgrades

Facility: South Common Community Centre Pool & Library

Address 2233 South Millway Dr, L5L 3H7










Area (m²): 7,174 Area (ft²): 70,482

Year Built: 1981 Hours per Week : 100

Facility Group: Community Centre

Building Components: Fitness Centre; Gymnasium; Library; Multipurpose Rooms; Offices and Meeting Rooms; Pool

**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	1,417,809	1,375,795	1,387,341	
Electricity (\$)	\$224,529	\$208,893	\$206,839	
Natural Gas (m ³)	162,626	169,643	155,767	
Natural Gas (\$)	\$44,259	\$46,180	\$39,150	
Water (m ³)	20,682	23,407	21,910	
Water (\$)	\$36,815	\$52,429	\$48,866	
Total Costs (\$)	\$305,603	\$307,502	\$294,855	
Total e-kWh	3,125,379	3,157,050	3,022,894	
Total e-kWh/m ²	435.7	440.1	421.4	
GHG (kg/Yr)	358,566	370,324	344,499	
GHG (kg/Yr/m ²)	50	52	48	

Energy Measures

6.0 CULTURAL AND PERFORMING ARTS

6.1 SCOPE AND BOUNDARY

For the purposes of this report, the City of Mississauga has 8 facilities/locations that fall under this category. They include:

- Benares Estate - House
- Benares Estate - Visitor Centre
- Bradley Museum - Barn
- Bradley Museum - Log Cabin
- Bradley Museum - Museum
- Bradley Museum - The Anchorage
- Living Arts Centre
- Meadowvale Community Theatre

The above listed locations have a total floor area of approximately 37,700 square meters. This would account for 8.1% of the total building area for City of Mississauga facilities included in this Plan.

6.2 BASELINE

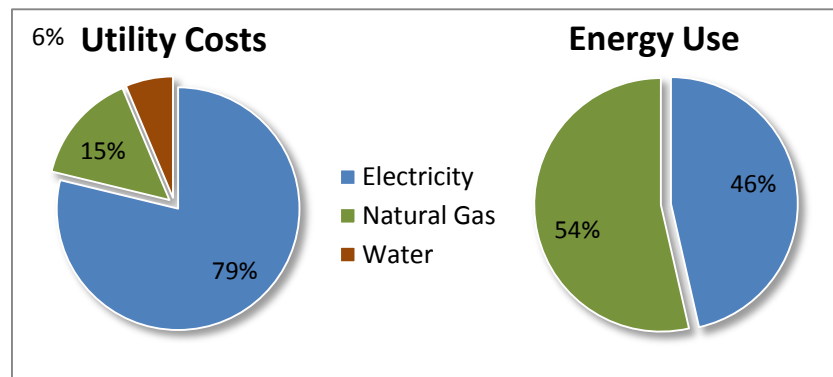
6.2.1 ENERGY USE

The energy use (combined electricity and natural gas) for **Cultural and Performing Arts** was 9,118,000 equivalent kilowatt hours in 2018. Following are the key takeaways for the energy usage in 2018:

- 46% of the total energy usage was due to electricity use, which has increased by 5.6% since 2013
- 54% of the total energy usage was due to natural gas use, which has dropped by 7.3% since 2013
- A total of \$810,000 in utility costs was incurred, out of which 79% is attributed to electricity, 15% to natural gas, and 6% to water

Cultural and Performing Arts accounted for 4.5% of the City's total utility budget for 2018.

Figure 6-1: Utility Costs and Energy Use Breakdown for Community Centres and Multi-Purpose Facilities



6.2.2 ENERGY USE INTENSITY

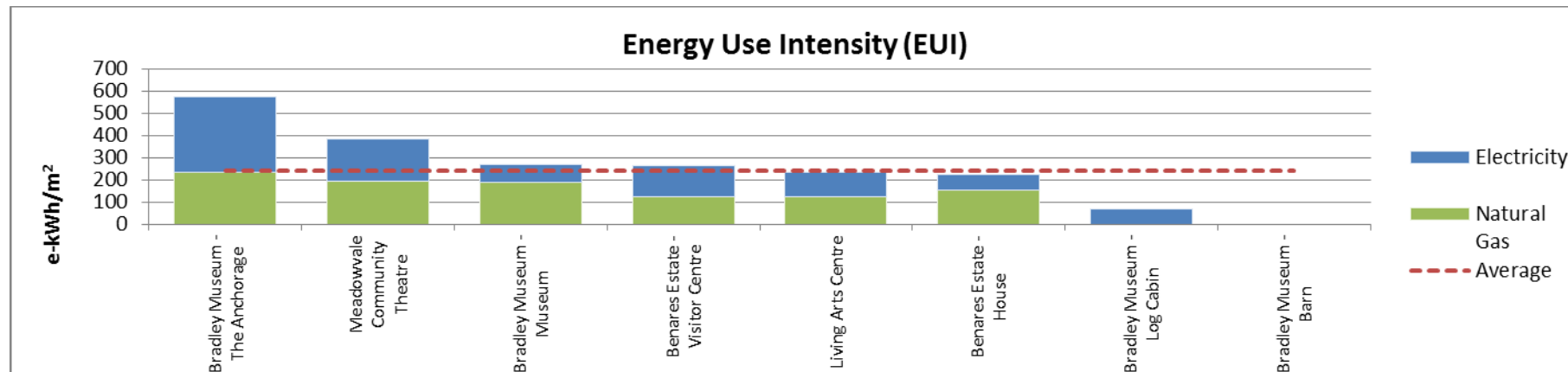
Energy Use Intensity (EUI) is a measurement that expresses a building's energy use as a function of its size or other characteristic. It is used to give a better picture of the energy efficiency of a facility. The lower the EUI, the more efficient the facility is.

When reviewing EUI, the facility operation type and hours should be taken into account. For example, a facility that operates 24 hours a day will most likely have a higher EUI than a similar one that operates 8 hours a day. Similarly, a facility that has high energy using systems that do not contribute to the building area, such as an outdoor pool or outdoor ice rink, will have a higher EUI than a facility where those systems are located within the facility, as they would add to the facility's area footprint.

For **Cultural and Performing Arts** the average EUI in 2018 was 241.1 e-kWh/m².

The following chart shows the EUI for each facility within **Cultural and Performing Arts**, and compares it to the average for the group.

Figure 6-2: Energy Use Intensity for Cultural and Performing Arts



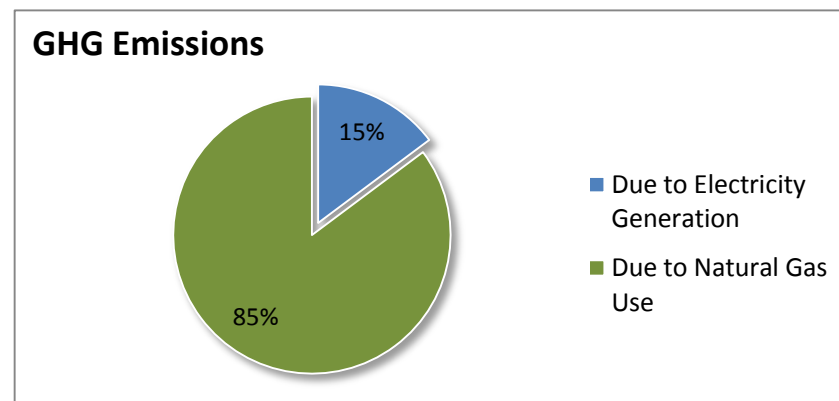
Note: The Average EUI value is calculated by taking the total energy use of all facilities, and dividing by the total area of the facilities. As such, a larger facility would have a bigger impact on the average than a smaller facility.

6.2.3 GREENHOUSE GAS (GHG) EMISSIONS

For 2018, **Cultural and Performing Arts** emitted 1,032,000 kg (or 1,032 tonnes) of CO₂ in 2018. 14.8% of these emissions were due to the generation of electricity, while the use of natural gas accounted for the remaining 85.2%.

Cultural and Performing Arts accounted for 5.2% of the City's total GHG emissions for facilities included in the plan.

Figure 6-3: GHG Emissions Breakdown for Cultural and Performing Arts



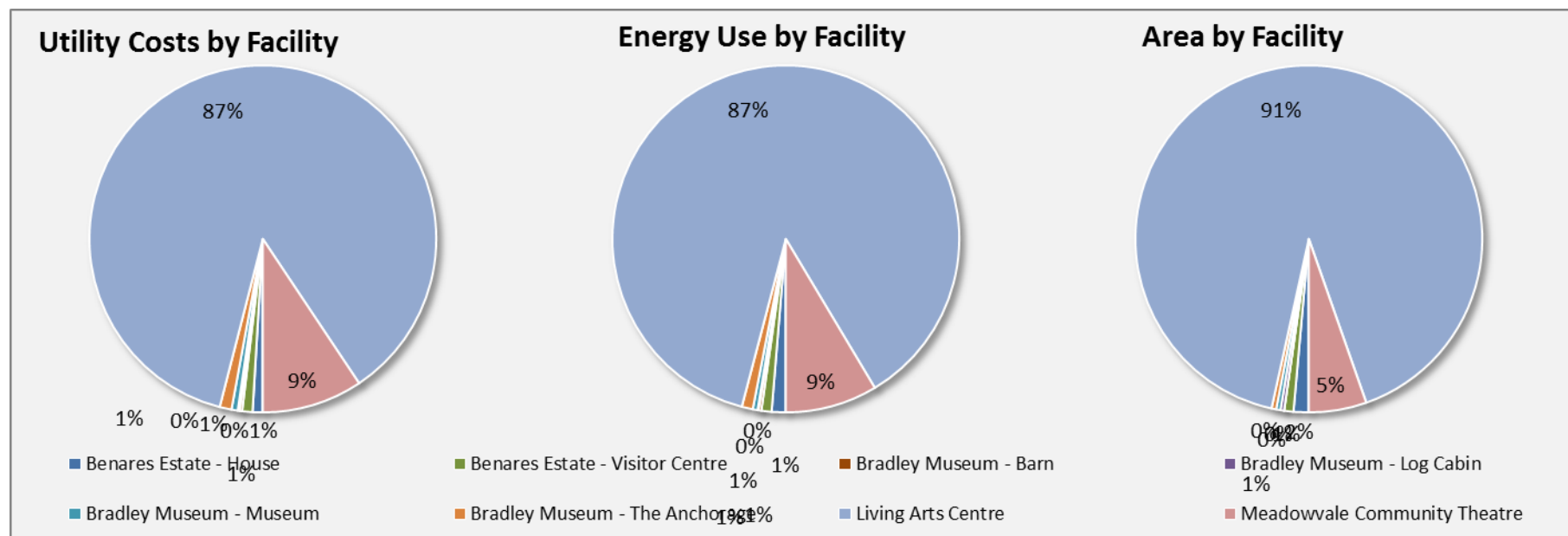
6.3 ENERGY AND GHG BREAKDOWN FOR CULTURAL AND PERFORMING ARTS

This section provides a brief overview/recap of the Utility and GHG data for **Cultural and Performing Arts**. The table below summarizes, by facility, the utility usage and GHG emissions for 2018. Following are the key takeaways:

- Living Arts Centre is the largest facility by area in the group and contributes towards 87% of the energy consumption and utility costs in the group

- Meadowvale Community Theatre is the second largest facility and only contributes towards 9% of the energy consumption and utility costs in the group
- For this reason, priority was given to electricity reduction projects at Living Arts Centre for previous and future planned projects since they greatly reduce utility budget and energy usage

Figure 4-4: Utility Costs and Energy Use Breakdown by Facility



2018 Annual Report for Cultural and Performing Arts

Facility	Area m ²	Electricity		Natural Gas		Total Energy e-kWh	Water		Total Costs \$	GHG Emissions kg
		kWh	\$	m ³	\$		m ³	\$		
Benares Estate - House	535	37,477	\$4,584	7,852	\$2,992	119,921	35	\$81	\$7,656	16,197
Benares Estate - Visitor Centre	327	45,615	\$5,531	3,853	\$2,002	86,074	114	\$277	\$7,810	8,929
Bradley Museum - Barn	0	3,942	\$524	1,873	\$1,311	23,611	0	\$0	\$1,835	3,684
Bradley Museum - Log Cabin	126	8,734	\$1,466	0	\$0	8,734	0	\$0	\$1,466	314
Bradley Museum - Museum	151	12,084	\$1,807	2,701	\$1,606	40,439	527	\$1,290	\$4,703	5,542
Bradley Museum - The Anchorage	164	55,963	\$7,080	3,629	\$1,862	94,064	0	\$0	\$8,942	8,877
Living Arts Centre	34,387	3,678,408	\$553,264	408,025	\$100,590	7,962,667	19,498	\$47,747	\$701,601	903,997
Meadowvale Community Theatre	2,028	392,046	\$63,802	37,193	\$10,145	782,569	809	\$1,954	\$75,901	84,445
Totals	37,718	4,234,268	\$638,057	465,125	\$120,508	9,118,080	20,984	\$51,349	\$809,915	1,031,985
Usage / Costs per m²:		112.2	\$16.9	12.3	\$3.2	241	0.6	\$1.4	\$21.4	27.3

6.4 ACTION PLAN

An action plan has been identified with the goal to save on electricity, natural gas, oil, and/or other form of energy consumption within a facility or location.

The following figure shows the various projects and initiatives that have been planned for **Cultural and Performing Arts**. The chart shows what projects have been planned, when they are planned to be implemented, and the progress of implementation (if applicable). A brief description of each project has been noted below:

- **Electrical Upgrades:** Includes devices reduce the wastages associated with the distribution of the electrical feed like voltage regulation, power factor correction, efficient transformers
- **Energy Upgrades for Lifecycle Replacements:** Includes energy upgrades for high capital assets that show economic paybacks

only at the time of replacement like envelope and HVAC equipment

For the chart below, the **Purple** coloured bars represent the original planned start and completion of a Measure type. The **Green** bar beneath shows the actual start and completion times for a completed measure, while the **Blue** bar shows the actual start time of a Measure that is currently being implemented, but not yet complete. Some Notes:

- A Single Measure timeline may include more than one implementation of that measure (example: In different facilities).
- Due to changing circumstances (change in operations, budget changes, new technology, etc.), a planned measure may be cancelled. These would be indicated by a **Red** plan bar on the chart.

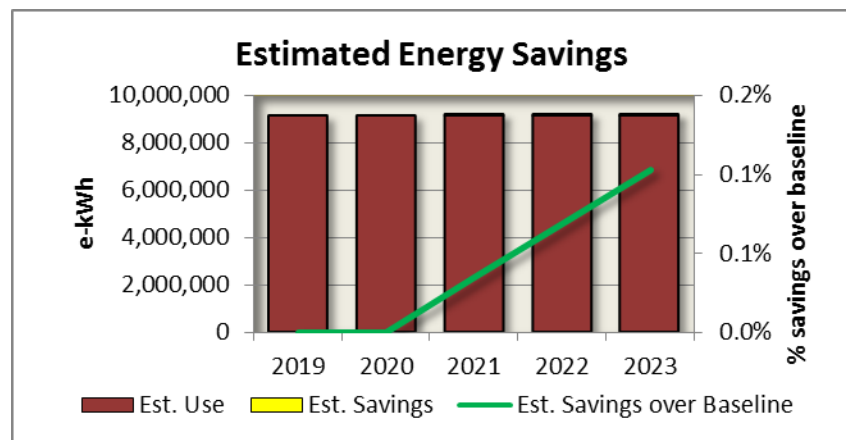
Figure 6-5: Energy Measure Implementation Plan for Cultural and Performing Arts

Energy Measure	2019				2020				2021				2022				2023			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Electrical Upgrades																				
Energy Upgrades for Lifecycle Replacements																				
Planned Implementation	Scheduled Implementation				Cancelled Implementation												Q1 = Jan-Mar			
Actual Implementation	Status = Completed				Status = Underway												Q3 = Jul-Sep			

6.5 ESTIMATED SAVINGS

At the end of the plan, **Cultural and Performing Arts** are expected to save 0.1% over the base year of 2018, which amounts to a total of \$250 from all the projects.

Figure 6-6: Energy Measure Annual Savings for Cultural and Performing Arts



6.6 PROGRESS TO TARGETS

The City is targeting a 0.1% reduction in energy use in **Cultural and Performing Arts** by 2023 over the base year, 2018. The reporting of energy consumption data and savings for **Cultural and Performing Arts** will be based on utility meters and assembled annually. Since utility meters monitor energy consumption for the entire facility, the measurement boundary will encompass all parts of the facility. To determine the savings and fairly compare year-to-year energy consumption data, it is important to account for independent variables such as weather and occupancy and apply regression analysis to consumption data. Therefore, actual consumption data for each year starting 2019 will be adjusted to match the weather and occupancy of

2018. The figures below show the updated progress for each year against the set target.

Figure 6-7: Annual Energy Use vs Targeted Energy Use for Cultural and Performing Arts

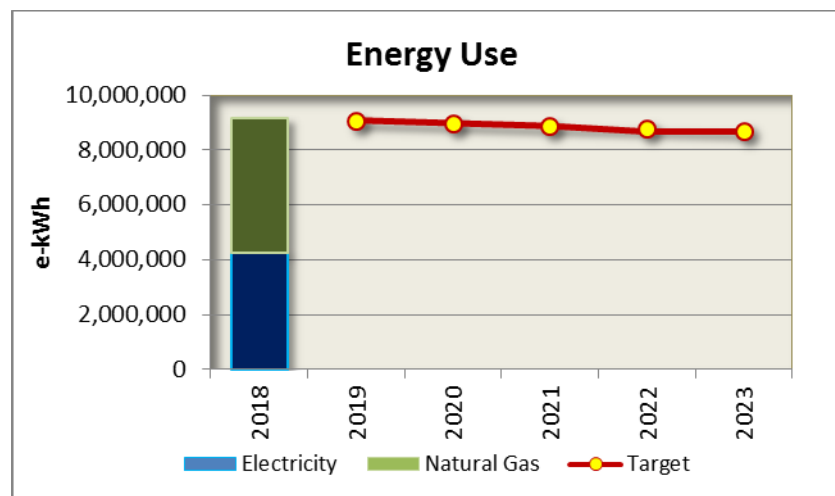
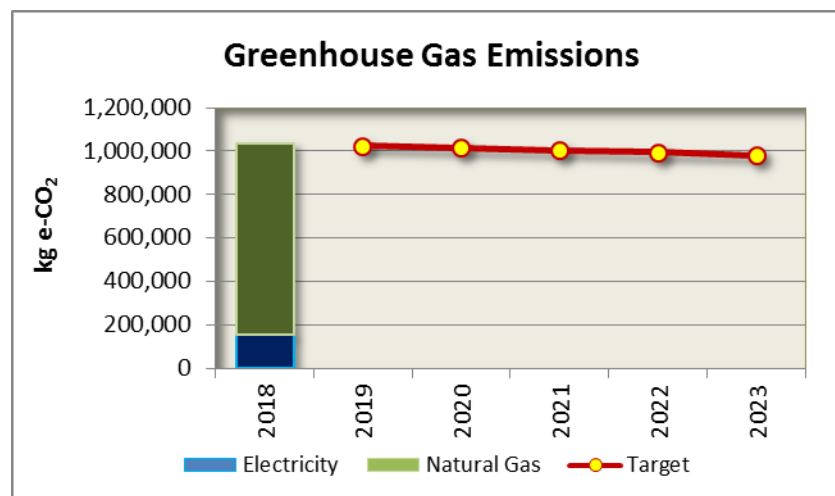


Figure 6-8: Annual GHG Emissions vs Targets for Cultural and Performing Arts



6.7 FACILITY INFORMATION FOR CULTURAL AND PERFORMING ARTS

Facility: Benares Estate - House

Address 1503 Clarkson Rd, L5J 2W8










Area (m²): 535 Area (ft²): 5,759

Year Built: 1857 Hours per Week : 50

Facility Group: Culture

Building Components:

**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	32,504	34,416	37,477	
Electricity (\$)	\$5,510	\$5,210	\$4,584	
Natural Gas (m ³)	8,581	7,397	7,852	
Natural Gas (\$)	\$2,570	\$2,920	\$2,992	
Water (m ³)	863	367	35	
Water (\$)	\$1,782	\$793	\$81	
Total Costs (\$)	\$9,862	\$8,922	\$7,656	
Total e-kWh	122,599	112,086	119,921	
Total e-kWh/m ²	229.2	209.5	224.2	
GHG (kg/Yr)	17,396	15,227	16,197	
GHG (kg/Yr/m ²)	33	28	30	

Energy Measures

Facility: Benares Estate - Visitor Centre

Address 1507 Clarkson Rd, L5J 2W8










Area (m²): 327 Area (ft²): 3,520

Year Built: 1995 Hours per Week : 50

Facility Group: Culture

Building Components:

**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	48,151	48,533	45,615	
Electricity (\$)	\$8,187	\$6,013	\$5,531	
Natural Gas (m ³)	3,825	3,086	3,853	
Natural Gas (\$)	\$1,882	\$1,718	\$2,002	
Water (m ³)	214	232	114	
Water (\$)	\$477	\$533	\$277	
Total Costs (\$)	\$10,546	\$8,264	\$7,810	
Total e-kWh	88,309	80,935	86,074	
Total e-kWh/m ²	270.1	247.5	263.2	
GHG (kg/Yr)	8,966	7,583	8,929	
GHG (kg/Yr/m ²)	27	23	27	

Energy Measures

Energy Upgrades for Lifecycle Replacements

Facility: Bradley Museum - Barn

Address 1620 Orr Rd, L5J 4T2

Area (m²):Area (ft²):








Year Built: 1830

Hours per Week : 50

Facility Group: Culture

Building Components:

**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	3,965	3,942	3,942	
Electricity (\$)	\$693	\$623	\$524	
Natural Gas (m ³)	3,325	2,676	1,873	
Natural Gas (\$)	\$1,745	\$1,604	\$1,311	
Water (m ³)	0	0	0	
Water (\$)	\$0	\$0	\$0	
Total Costs (\$)	\$2,437	\$2,227	\$1,835	
Total e-kWh	38,881	32,044	23,611	
Total e-kWh/m ²	N/A	N/A	N/A	
GHG (kg/Yr)	6,431	5,203	3,684	
GHG (kg/Yr/m ²)	N/A	N/A	N/A	

Energy Measures

Facility: Bradley Museum - Log Cabin

Address 1600 Orr Rd, L5J 4T2






Area (m²): 126 Area (ft²): 0

Year Built: 1830 Hours per Week : 50

Facility Group: Culture

Building Components:

**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	12,068	11,100	8,734	
Electricity (\$)	\$2,404	\$1,928	\$1,466	
Natural Gas (m ³)	0	0	0	
Natural Gas (\$)	\$0	\$0	\$0	
Water (m ³)	0	0	0	
Water (\$)	\$0	\$0	\$0	
Total Costs (\$)	\$2,404	\$1,928	\$1,466	
Total e-kWh	12,068	11,100	8,734	
Total e-kWh/m ²	95.8	88.1	69.3	
GHG (kg/Yr)	434	400	314	
GHG (kg/Yr/m ²)	3	3	2	

Energy Measures

Facility: Bradley Museum - Museum

Address 1620 Orr Rd, L5J 4T2

Area (m²): 151Area (ft²): 0










Year Built: 1825

Hours per Week : 50

Facility Group: Culture

Building Components:

**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	12,005	11,308	12,084	
Electricity (\$)	\$2,320	\$2,029	\$1,807	
Natural Gas (m ³)	2,721	2,737	2,701	
Natural Gas (\$)	\$1,580	\$1,614	\$1,606	
Water (m ³)	1,126	631	527	
Water (\$)	\$2,477	\$1,453	\$1,290	
Total Costs (\$)	\$6,376	\$5,095	\$4,703	
Total e-kWh	40,580	40,042	40,439	
Total e-kWh/m ²	268.7	265.2	267.8	
GHG (kg/Yr)	5,578	5,582	5,542	
GHG (kg/Yr/m ²)	37	37	37	

Energy Measures

Facility: Bradley Museum - The Anchorage

Address 1610 Orr Rd, L5J 4T2

Area (m²): 164Area (ft²): 0








Year Built: 1830

Hours per Week : 50

Facility Group: Culture

Building Components:

**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	55,903	62,310	55,963	
Electricity (\$)	\$9,059	\$9,214	\$7,080	
Natural Gas (m ³)	4,351	4,641	3,629	
Natural Gas (\$)	\$2,027	\$2,198	\$1,862	
Water (m ³)	0	0	0	
Water (\$)	\$0	\$0	\$0	
Total Costs (\$)	\$11,086	\$11,412	\$8,942	
Total e-kWh	101,590	111,039	94,064	
Total e-kWh/m ²	619.5	677.1	573.6	
GHG (kg/Yr)	10,241	11,019	8,877	
GHG (kg/Yr/m ²)	62	67	54	

Energy Measures

Facility: Living Arts Centre

Address 4141 Living Arts Dr, L5B 4B8

Area (m²): 34,387Area (ft²): 370,139










Year Built: 1997

Hours per Week : 98

Facility Group: Culture

Building Components: Offices and Meeting Rooms; Restaurant; Theatre; Underground Parking

**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	3,602,374	3,553,875	3,678,408	
Electricity (\$)	\$572,625	\$552,096	\$553,264	
Natural Gas (m ³)	526,798	488,348	408,025	
Natural Gas (\$)	\$125,142	\$125,831	\$100,590	
Water (m ³)	19,436	16,058	19,498	
Water (\$)	\$42,533	\$36,745	\$47,747	
Total Costs (\$)	\$740,300	\$714,673	\$701,601	
Total e-kWh	9,133,748	8,681,528	7,962,667	
Total e-kWh/m ²	265.6	252.5	231.6	
GHG (kg/Yr)	1,125,860	1,051,405	903,997	
GHG (kg/Yr/m ²)	33	31	26	

Energy Measures

Metering & Sub-metering Equipment
 Operation Optimization
 Lighting Upgrades

Facility: Meadowvale Community Theatre

Address 6315 Montevideo Rd, L5N 4G7










Area (m²): 2,028 Area (ft²): 21,829

Year Built: 1981 Hours per Week : 40

Facility Group: Culture

Building Components: Theatre

**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	414,977	440,452	392,046	
Electricity (\$)	\$71,430	\$70,531	\$63,802	
Natural Gas (m ³)	47,424	36,884	37,193	
Natural Gas (\$)	\$9,955	\$10,883	\$10,145	
Water (m ³)	887	1,035	809	
Water (\$)	\$1,922	\$2,363	\$1,954	
Total Costs (\$)	\$83,307	\$83,777	\$75,901	
Total e-kWh	912,925	827,729	782,569	
Total e-kWh/m ²	450.2	408.2	385.9	
GHG (kg/Yr)	104,617	85,603	84,445	
GHG (kg/Yr/m ²)	52	42	42	

Energy Measures

Electrical Upgrades

7.0 FIRE STATIONS AND EMERGENCY SERVICES

7.1 SCOPE AND BOUNDARY

This group consist of the City of Mississauga's fire stations. Some of the fire stations would also include ambulance services as well. For the purposes of this report, the City of Mississauga has 27 facilities/locations that fall under this category. They include:

- Fire Station 101 (HQ)
- Fire Station 102 (Lakeview)
- Fire Station 103 (Clarkson)
- Fire Station 104 (Port Credit)
- Fire Station 105 (Malton)
- Fire Station 106 (Dixie)
- Fire Station 106 (Winding Trail)
- Fire Station 107 (Erindale)
- Fire Station 108 (Streetsville)
- Fire Station 109 (Training)
- Fire Station 110 (Queensway)
- Fire Station 111 (Meadowvale)
- Fire Station 112 (Creditview)
- Fire Station 114 (Heartland)
- Fire Station 115 (Erin Mills)
- Fire Station 116 (Old West Malton)
- Fire Station 116 (West Malton) & Peel Ambulance Reporting Centre
- Fire Station 117 (North Dixie)
- Fire Station 118 (East Credit)
- Fire Station 119 (Airport-Leased)
- Fire Station 121 (Meadowvale Village)
- Fire Station 122 (Churchill Meadows)

- Garry W Morden Centre
- Garry W Morden Training Centre - Burn Building
- Garry W Morden Training Centre - Field Shelter
- Garry W Morden Training Centre - Smoke Tower
- Fire Station 119

The above listed locations have a total floor area of approximately 28,500 square meters. This would account for 6.1% of the total building area for City of Mississauga facilities included in this Plan.

7.2 BASELINE

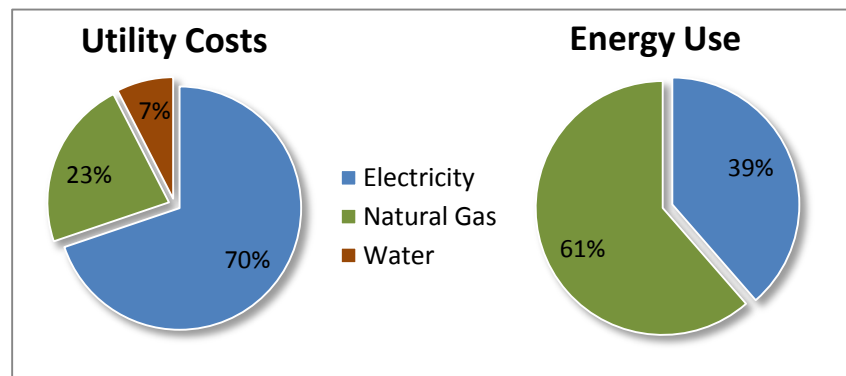
7.2.1 ENERGY USE

The energy use (combined electricity and natural gas) for **Fire Stations and Emergency Services** was 8,345,000 equivalent kilowatt hours in 2018. Following are the key takeaways for the energy usage in 2018:

- 39% of the total energy usage was due to electricity use, which has remained consistent since 2013
- 61% of the total energy usage was due to natural gas use, which has dropped by 3.9% since 2013
- A total of \$624,000 in utility costs was incurred, out of which 70% is attributed to electricity, 23% to natural gas, and 7% to water

Fire Stations and Emergency Services accounted for 3.5% of the City's total utility budget for 2018.

Figure 7-1: Utility Costs and Energy Use Breakdown for Fire Stations and Emergency Services



When reviewing EUI, the facility operation type and hours should be taken into account. For example, a facility that operates 24 hours a day will most likely have a higher EUI than a similar one that operates 8 hours a day. Similarly, a facility that has high energy using systems that do not contribute to the building area, such as an outdoor pool or outdoor ice rink, will have a higher EUI than a facility where those systems are located within the facility, as they would add to the facility's area footprint.

For **Fire Stations and Emergency Services** the average EUI in 2018 was 329.0 e-kWh/m².

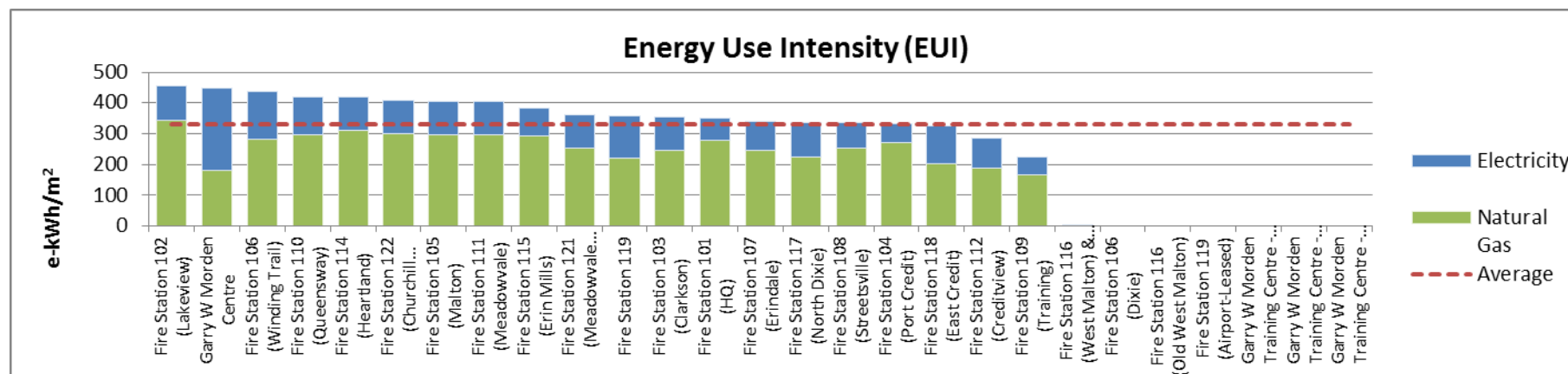
The following chart shows the EUI for each facility within **Fire Stations and Emergency Services**, and compares it to the average for the group.

Note: The Average EUI value is calculated by taking the total energy use of all facilities, and dividing by the total area of the facilities. As such, a larger facility would have a bigger impact on the average than a smaller facility.

7.2.2 ENERGY USE INTENSITY

Energy Use Intensity (EUI) is a measurement that expresses a building's energy use as a function of its size or other characteristic. It is used to give a better picture of the energy efficiency of a facility. The lower the EUI, the more efficient the facility is.

Figure 7-2: Energy Use Intensity for Fire Stations and Emergency Services

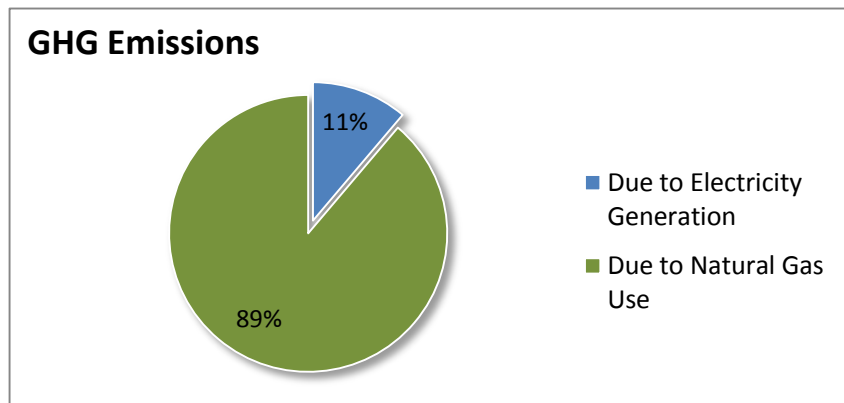


7.2.3 GREENHOUSE GAS (GHG) EMISSIONS

For 2018, **Fire Stations and Emergency Services** emitted 1,038,800 kg (or 1,039 tonnes) of CO₂ in 2018. 11.2% of these emissions were due to the generation of electricity, while the use of natural gas accounted for the remaining 88.8%.

Fire Stations and Emergency Services accounted for 5.2% of the City's total GHG emissions for facilities included in the plan.

Figure 7-3: GHG Emissions Breakdown for Fire Stations and Emergency Services

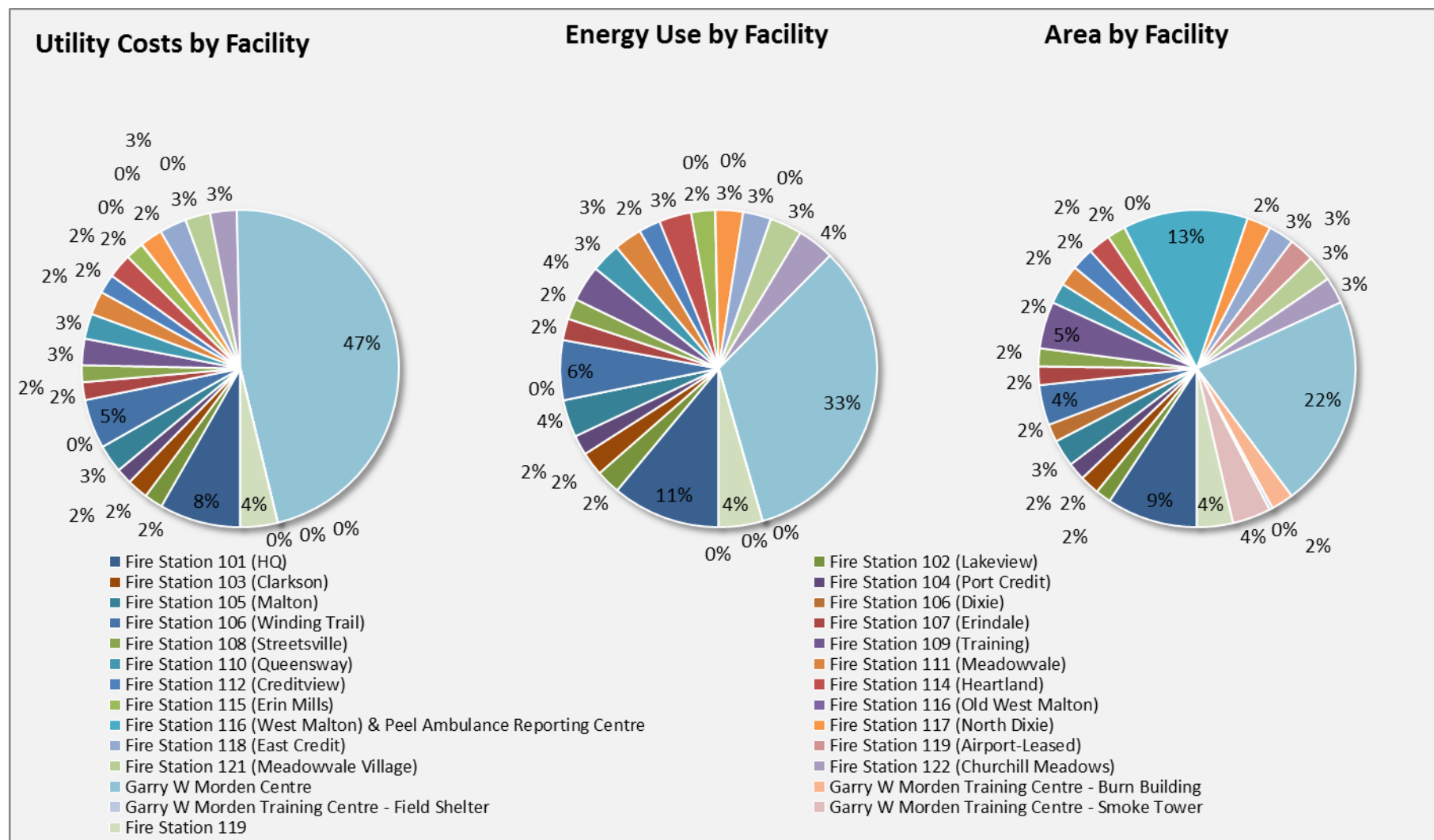


7.3 ENERGY AND GHG BREAKDOWN FOR FIRE STATIONS AND EMERGENCY SERVICES

This section provides a brief overview/recap of the Utility and GHG data for **Fire Stations and Emergency Services**. The table below summarizes, by facility, the utility usage and GHG emissions for 2018. Following are the key takeaways:

- Gary W. Morden Centre is the largest facility by area in the group and contributes towards 33% and 47% of the energy consumption and utility costs respectively in the group
- Fire Station 101 (HQ) is the second largest facility and contributes towards 11% and 8% of the energy consumption and utility costs respectively in the group
- All remaining fire stations are approximately similar in area and contribute equally to the energy consumption and utility costs in the group

Figure 7-4: Utility Costs and Energy Use Breakdown by Facility



2018 Annual Report for Fire Stations and Emergency Services – Part 1 of 2

Facility	Area m ²	Electricity		Natural Gas		Total Energy e-kWh	Water		Total Costs \$	GHG Emissions kg
		kWh	\$	m ³	\$		m ³	\$		
Fire Station 101 (HQ)	2,646	186,981	\$29,667	70,176	\$18,255	923,830	1,593	\$3,878	\$51,800	139,434
Fire Station 102 (Lakeview)	452	50,708	\$6,065	14,803	\$4,783	206,135	389	\$941	\$11,788	29,817
Fire Station 103 (Clarkson)	568	61,142	\$7,193	13,346	\$4,338	201,274	737	\$1,776	\$13,307	27,438
Fire Station 104 (Port Credit)	513	30,399	\$3,802	13,266	\$4,404	169,693	745	\$1,896	\$10,102	26,181
Fire Station 105 (Malton)	782	86,274	\$9,908	21,996	\$6,601	317,236	545	\$1,323	\$17,833	44,701
Fire Station 106 (Dixie)	518	0	\$0	0	\$0	0	0	\$0	\$0	0
Fire Station 106 (Winding Trail)	1,164	181,949	\$20,195	31,186	\$8,795	509,399	1,026	\$2,317	\$31,307	65,522
Fire Station 107 (Erindale)	537	51,997	\$6,187	12,477	\$4,212	183,000	374	\$909	\$11,308	25,465
Fire Station 108 (Streetsville)	524	42,525	\$5,145	12,642	\$4,247	175,269	542	\$1,320	\$10,712	25,437
Fire Station 109 (Training)	1,362	79,947	\$9,664	21,533	\$6,412	306,048	313	\$760	\$16,836	43,598
Fire Station 110 (Queensway)	596	74,213	\$8,621	16,810	\$5,306	250,720	842	\$2,045	\$15,971	34,460
Fire Station 111 (Meadowvale)	588	63,121	\$7,380	16,636	\$5,248	237,794	961	\$2,338	\$14,967	33,730
Fire Station 112 (Creditview)	649	62,685	\$7,365	11,608	\$3,975	184,564	355	\$862	\$12,202	24,206
Fire Station 114 (Heartland)	653	70,728	\$8,233	19,405	\$5,939	274,482	550	\$1,328	\$15,500	39,241
Fire Station 115 (Erin Mills)	534	47,971	\$5,760	14,932	\$4,816	204,756	423	\$1,025	\$11,601	29,963

2018 Annual Report for Fire Stations and Emergency Services – Part 2 of 2

Facility	Area m ²	Electricity		Natural Gas		Total Energy	Water		Total Costs	GHG Emissions
		kWh	\$	m ³	\$	e-kWh	m ³	\$	\$	kg
Fire Station 116 (West Malton) & Peel Ambulance Reporting Centre	3,627	168	\$282	0	\$0	168	0	\$0	\$282	6
Fire Station 117 (North Dixie)	697	79,376	\$9,020	14,850	\$3,999	235,297	509	\$1,235	\$14,255	30,938
Fire Station 118 (East Credit)	733	90,073	\$10,277	14,231	\$4,630	239,493	962	\$2,321	\$17,227	30,152
Fire Station 119 (Airport-Leased)	729	0	\$0	0	\$0	0	0	\$0	\$0	0
Fire Station 121 (Meadowvale Village)	760	81,113	\$9,275	18,340	\$5,719	273,679	380	\$921	\$15,915	37,600
Fire Station 122 (Churchill Meadows)	769	84,015	\$9,577	21,869	\$6,578	313,640	323	\$783	\$16,939	44,379
Garry W Morden Centre	6,174	1,651,085	\$245,981	106,154	\$26,546	2,765,699	7,424	\$18,109	\$290,636	260,176
Fire Station 119	1,040	144,072	\$16,102	21,778	\$6,472	372,735	446	\$1,084	\$23,659	46,368
Totals	28,473	3,220,540	\$435,700	488,035	\$141,274	8,344,910	19,436	\$47,170	\$624,144	1,038,814
Usage / Costs per m²:		127.0	\$17.2	22.4	\$6.5	329	0.9	\$2.2	\$24.6	40.9

7.4 ACTION PLAN

An action plan has been identified with the goal to save on electricity, natural gas, oil, and/or other form of energy consumption within a facility or location.





The following figure shows the various projects and initiatives that have been planned for **Fire Stations and Emergency Services**. The chart shows what projects have been planned, when they are planned to be implemented, and the progress of implementation (if applicable). A brief description of each project has been noted below:

- **Lighting Upgrades:** Includes replacement of existing lighting technologies to newer technologies like LEDs, and better controls through localized sensors and BAS scheduling

For the chart below, the **Purple** coloured bars represent the original planned start and completion of a Measure type. The **Green** bar beneath shows the actual start and completion times for a completed measure, while the **Blue** bar shows the actual start time of a Measure that is currently being implemented, but not yet complete. Some Notes:

- A Single Measure timeline may include more than one implementation of that measure (example: In different facilities).
- Due to changing circumstances (change in operations, budget changes, new technology, etc.), a planned measure may be cancelled. These would be indicated by a **Red** plan bar on the chart.

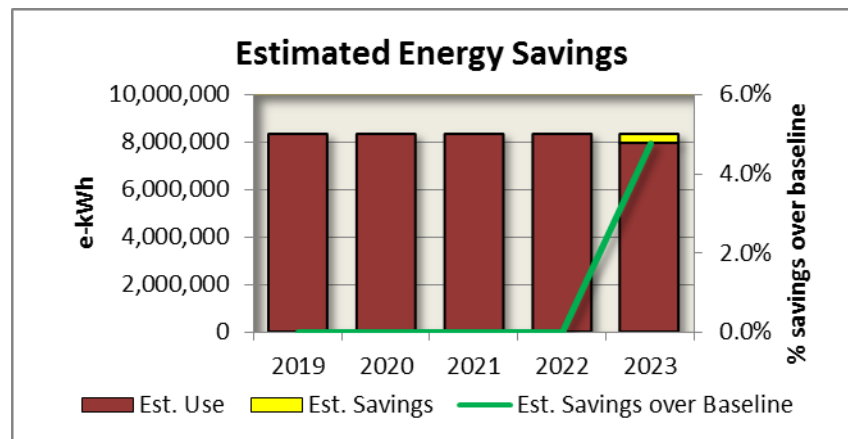
Figure 7-5: Energy Measure Implementation Plan for Fire Stations and Emergency Services

Energy Measure	2019				2020				2021				2022				2023			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Lighting Upgrades																				
Planned Implementation  Scheduled Implementation  Cancelled Implementation  Status = Completed  Status = Underway																	Q1 = Jan-Mar			
Actual Implementation																	Q3 = Jul-Sep			

7.5 ESTIMATED SAVINGS

At the end of the plan, **Fire Stations and Emergency Services** are expected to save 4.8% over the base year of 2018, which amounts to a total of \$55,000 from all the projects.

Figure 7-6: Energy Measure Annual Savings for Fire Stations and Emergency Services



7.6 PROGRESS TO TARGETS

The City is targeting a 4.8% reduction in energy use in **Fire Stations and Emergency Services** by 2023 over the base year, 2018. The reporting of energy consumption data and savings for **Fire Stations and Emergency Services** will be based on utility meters and assembled annually. Since utility meters monitor energy consumption for the entire facility, the measurement boundary will encompass all parts of the facility. To determine the savings and fairly compare year-to-year energy consumption data, it is important to account for independent variables such as weather and occupancy and apply regression analysis to consumption data. Therefore, actual consumption data for each year starting 2019 will be adjusted to match the weather and occupancy of 2018. The figures below show the updated progress for each year against the set target.

Figure 7-7: Annual Energy Use vs Targeted Energy Use for Fire Stations and Emergency Services

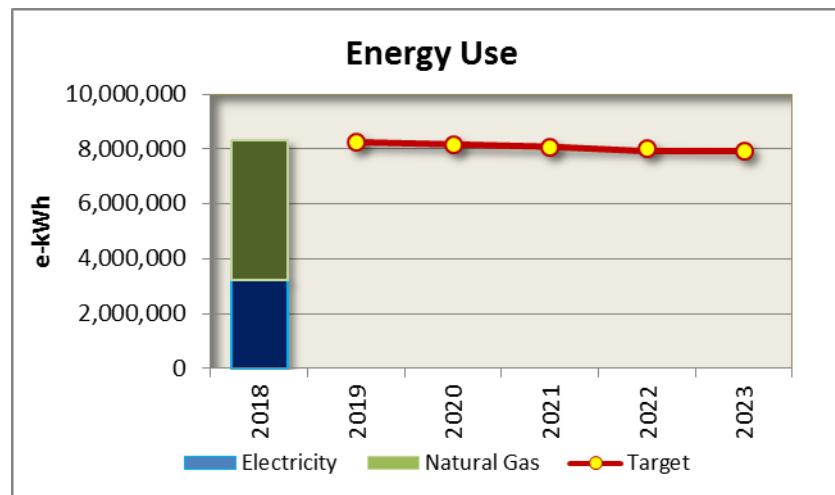
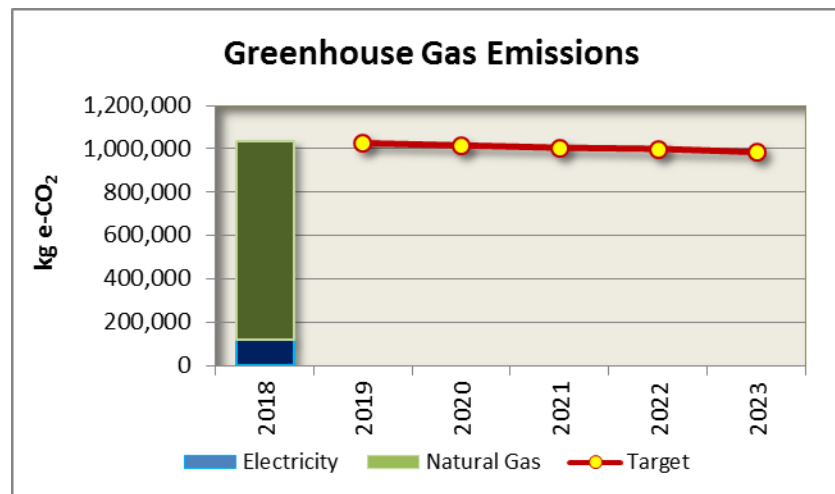


Figure 7-8: Annual GHG Emissions vs Targets for Fire Stations and Emergency Services



7.7 FACILITY INFORMATION FOR FIRE STATIONS AND EMERGENCY SERVICES

Facility: Fire Station 101 (HQ)

Address 15 Fairview Rd W, L5B 1K7










Area (m²): 2,646 Area (ft²): 28,481

Year Built: 1974 Hours per Week : 168

Facility Group: Fire Station

Building Components: Dormitories/Sleeping Quarters; Maintenance Bay; Offices and Meeting Rooms; Truck Bay

**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	231,272	177,958	186,981	
Electricity (\$)	\$38,182	\$29,858	\$29,667	
Natural Gas (m ³)	62,421	61,011	70,176	
Natural Gas (\$)	\$16,309	\$16,728	\$18,255	
Water (m ³)	1,275	1,426	1,593	
Water (\$)	\$2,756	\$3,264	\$3,878	
Total Costs (\$)	\$57,248	\$49,850	\$51,800	
Total e-kWh	886,697	818,577	923,830	
Total e-kWh/m ²	335.1	309.4	349.1	
GHG (kg/Yr)	126,365	121,779	139,434	
GHG (kg/Yr/m ²)	48	46	53	

Energy Measures

Lighting Upgrades

Facility: Fire Station 102 (Lakeview)










Address 710 Third St, L5E 1B9

Area (m²): 452 Area (ft²): 4,865

Year Built: 1979 Hours per Week : 168

Facility Group: Fire Station

Building Components: Dormitories/Sleeping Quarters; Offices and Meeting Rooms;
Truck Bay**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	43,258	48,427	50,708	
Electricity (\$)	\$8,792	\$6,986	\$6,065	
Natural Gas (m ³)	14,633	15,145	14,803	
Natural Gas (\$)	\$4,685	\$5,055	\$4,783	
Water (m ³)	511	372	389	
Water (\$)	\$1,097	\$851	\$941	
Total Costs (\$)	\$14,574	\$12,892	\$11,788	
Total e-kWh	196,899	207,454	206,135	
Total e-kWh/m ²	435.6	459.0	456.1	
GHG (kg/Yr)	29,227	30,383	29,817	
GHG (kg/Yr/m ²)	65	67	66	

Energy Measures

Facility: Fire Station 103 (Clarkson)










Address 2035 Lushes Ave, L5J 1H3

Area (m²): 568 Area (ft²): 6,114

Year Built: 1985 Hours per Week : 168

Facility Group: Fire Station

Building Components: Dormitories/Sleeping Quarters; Offices and Meeting Rooms;
Truck Bay**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	57,462	57,765	61,142	
Electricity (\$)	\$9,735	\$8,430	\$7,193	
Natural Gas (m ³)	15,014	16,260	13,346	
Natural Gas (\$)	\$4,754	\$5,240	\$4,338	
Water (m ³)	742	1,000	737	
Water (\$)	\$1,609	\$2,288	\$1,776	
Total Costs (\$)	\$16,098	\$15,957	\$13,307	
Total e-kWh	215,108	228,492	201,274	
Total e-kWh/m ²	378.7	402.3	354.4	
GHG (kg/Yr)	30,460	32,827	27,438	
GHG (kg/Yr/m ²)	54	58	48	

Energy Measures

Lighting Upgrades

Facility: Fire Station 104 (Port Credit)

Address 62 Port St W, L5H 1E3










Area (m²): 513Area (ft²): 8,826

Year Built: 1950

Hours per Week : 168

Facility Group: Fire Station

Building Components: Dormitories/Sleeping Quarters; Offices and Meeting Rooms;
Truck Bay**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	27,430	27,306	30,399	
Electricity (\$)	\$4,966	\$4,109	\$3,802	
Natural Gas (m ³)	12,207	13,465	13,266	
Natural Gas (\$)	\$4,035	\$4,552	\$4,404	
Water (m ³)	119	1,105	745	
Water (\$)	\$311	\$2,498	\$1,896	
Total Costs (\$)	\$9,312	\$11,158	\$10,102	
Total e-kWh	155,598	168,689	169,693	
Total e-kWh/m ²	303.3	328.8	330.8	
GHG (kg/Yr)	24,070	26,445	26,181	
GHG (kg/Yr/m ²)	47	52	51	

Energy Measures

Lighting Upgrades

Facility: Fire Station 105 (Malton)










Address 7101 Goreway Dr, L4T 2T5

Area (m²): 782 Area (ft²): 8,417

Year Built: 1980 Hours per Week : 168

Facility Group: Fire Station

Building Components: Dormitories/Sleeping Quarters; Offices and Meeting Rooms;
Truck Bay**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	91,319	82,170	86,274	
Electricity (\$)	\$14,686	\$11,468	\$9,908	
Natural Gas (m ³)	20,174	19,136	21,996	
Natural Gas (\$)	\$6,275	\$6,281	\$6,601	
Water (m ³)	630	541	545	
Water (\$)	\$1,366	\$1,235	\$1,323	
Total Costs (\$)	\$22,327	\$18,984	\$17,833	
Total e-kWh	303,143	283,094	317,236	
Total e-kWh/m ²	387.7	362.0	405.7	
GHG (kg/Yr)	41,436	39,144	44,701	
GHG (kg/Yr/m ²)	53	50	57	

Energy Measures

Lighting Upgrades

Facility: Fire Station 106 (Dixie)

Address 3450 Dixie Rd, L4Y 2B2

Area (m²): 518 Area (ft²): 5,576

Year Built: 1979 Hours per Week : 168

Facility Group: Fire Station

Building Components: Dormitories/Sleeping Quarters; Offices and Meeting Rooms;
Truck Bay**Historical Energy and GHG Data**

Year:	2016	2017	2018
Electricity (kWh)	0	0	0
Electricity (\$)	\$0	\$0	\$0
Natural Gas (m ³)	0	0	0
Natural Gas (\$)	\$0	\$0	\$0
Water (m ³)	0	0	0
Water (\$)	\$0	\$0	\$0
Total Costs (\$)	\$0	\$0	\$0
Total e-kWh	0	0	0
Total e-kWh/m ²	0.0	0.0	0.0
GHG (kg/Yr)	0	0	0
GHG (kg/Yr/m ²)	0	0	0

Energy Measures

Facility: Fire Station 106 (Winding Trail)










Address 1355 Winding Trail, L4Y 2V1

Area (m²): 1,164 Area (ft²): 0

Year Built: 1979 Hours per Week : 168

Facility Group: Fire Station

Building Components: Dormitories/Sleeping Quarters; Offices and Meeting Rooms;
Truck Bay**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	156,987	171,995	181,949	
Electricity (\$)	\$25,676	\$23,546	\$20,195	
Natural Gas (m ³)	27,303	30,048	31,186	
Natural Gas (\$)	\$7,516	\$8,743	\$8,795	
Water (m ³)	869	784	1,026	
Water (\$)	\$1,888	\$1,432	\$2,317	
Total Costs (\$)	\$35,081	\$33,721	\$31,307	
Total e-kWh	443,666	487,501	509,399	
Total e-kWh/m ²	381.2	418.8	437.6	
GHG (kg/Yr)	57,281	63,013	65,522	
GHG (kg/Yr/m ²)	49	54	56	

Energy Measures

Facility: Fire Station 107 (Erindale)










Address 1965 Dundas St W, L5K 1R2

Area (m²): 537 Area (ft²): 8,094

Year Built: 1970 Hours per Week : 168

Facility Group: Fire Station

Building Components: Dormitories/Sleeping Quarters; Offices and Meeting Rooms;
Truck Bay**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	51,094	52,669	51,997	
Electricity (\$)	\$8,443	\$7,330	\$6,187	
Natural Gas (m ³)	12,230	11,722	12,477	
Natural Gas (\$)	\$4,075	\$4,074	\$4,212	
Water (m ³)	382	343	374	
Water (\$)	\$827	\$784	\$909	
Total Costs (\$)	\$13,345	\$12,188	\$11,308	
Total e-kWh	179,514	175,747	183,000	
Total e-kWh/m ²	334.3	327.3	340.8	
GHG (kg/Yr)	24,967	24,062	25,465	
GHG (kg/Yr/m ²)	46	45	47	

Energy Measures

Lighting Upgrades

Facility: Fire Station 108 (Streetsville)










Address 2267 Britannia Rd W, L5M 2G6

Area (m²): 524 Area (ft²): 5,457

Year Built: 1980 Hours per Week : 168

Facility Group: Fire Station

Building Components: Dormitories/Sleeping Quarters; Offices and Meeting Rooms;
Truck Bay**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	45,262	41,341	42,525	
Electricity (\$)	\$7,582	\$6,067	\$5,145	
Natural Gas (m ³)	10,915	12,263	12,642	
Natural Gas (\$)	\$3,707	\$4,253	\$4,247	
Water (m ³)	347	366	542	
Water (\$)	\$751	\$837	\$1,320	
Total Costs (\$)	\$12,039	\$11,157	\$10,712	
Total e-kWh	159,869	170,104	175,269	
Total e-kWh/m ²	305.1	324.6	334.5	
GHG (kg/Yr)	22,270	24,678	25,437	
GHG (kg/Yr/m ²)	42	47	49	

Energy Measures

Lighting Upgrades

Facility: Fire Station 109 (Training)










Address 1735 Britannia Rd E, L4W 2A3

Area (m²): 1,362 Area (ft²): 14,660

Year Built: 1976 Hours per Week : 168

Facility Group: Fire Station

Building Components: Dormitories/Sleeping Quarters; Offices and Meeting Rooms;
Truck Bay**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	83,648	80,284	79,947	
Electricity (\$)	\$13,919	\$11,870	\$9,664	
Natural Gas (m ³)	20,176	19,606	21,533	
Natural Gas (\$)	\$5,733	\$6,233	\$6,412	
Water (m ³)	263	367	313	
Water (\$)	\$570	\$840	\$760	
Total Costs (\$)	\$20,223	\$18,943	\$16,836	
Total e-kWh	295,498	286,149	306,048	
Total e-kWh/m ²	217.0	210.1	224.7	
GHG (kg/Yr)	41,164	39,966	43,598	
GHG (kg/Yr/m ²)	30	29	32	

Energy Measures

Facility: Fire Station 110 (Queensway)










Address 2316 Hurontario Street, L5B 1N1

Area (m²): 596 Area (ft²): 6,415

Year Built: 1982 Hours per Week : 168

Facility Group: Fire Station

Building Components: Dormitories/Sleeping Quarters; Offices and Meeting Rooms;
Truck Bay**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	72,198	71,991	74,213	
Electricity (\$)	\$12,070	\$10,408	\$8,621	
Natural Gas (m ³)	16,704	16,268	16,810	
Natural Gas (\$)	\$5,082	\$5,218	\$5,306	
Water (m ³)	947	655	842	
Water (\$)	\$2,064	\$1,496	\$2,045	
Total Costs (\$)	\$19,216	\$17,122	\$15,971	
Total e-kWh	247,589	242,804	250,720	
Total e-kWh/m ²	415.4	407.4	420.7	
GHG (kg/Yr)	34,186	33,354	34,460	
GHG (kg/Yr/m ²)	57	56	58	

Energy Measures

Lighting Upgrades

Facility: Fire Station 111 (Meadowvale)

Address 2740 Derry Rd W, L5N 3N5










Area (m²): 588Area (ft²): 6,329

Year Built: 1983

Hours per Week : 168

Facility Group: Fire Station

Building Components: Dormitories/Sleeping Quarters; Offices and Meeting Rooms;
Truck Bay**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	61,094	60,986	63,121	
Electricity (\$)	\$10,399	\$8,838	\$7,380	
Natural Gas (m ³)	14,015	15,527	16,636	
Natural Gas (\$)	\$4,515	\$5,173	\$5,248	
Water (m ³)	746	954	961	
Water (\$)	\$1,916	\$2,178	\$2,338	
Total Costs (\$)	\$16,831	\$16,189	\$14,967	
Total e-kWh	208,252	224,024	237,794	
Total e-kWh/m ²	354.2	381.0	404.4	
GHG (kg/Yr)	28,702	31,558	33,730	
GHG (kg/Yr/m ²)	49	54	57	

Energy Measures

Lighting Upgrades

Facility: Fire Station 112 (Creditview)










Address 4090 Creditview Rd, L5C 4E3

Area (m²): 649 Area (ft²): 6,986

Year Built: 1984 Hours per Week : 168

Facility Group: Fire Station

Building Components: Dormitories/Sleeping Quarters; Offices and Meeting Rooms;
Truck Bay**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	50,067	61,123	62,685	
Electricity (\$)	\$8,582	\$8,789	\$7,365	
Natural Gas (m ³)	11,147	10,681	11,608	
Natural Gas (\$)	\$3,785	\$3,859	\$3,975	
Water (m ³)	662	322	355	
Water (\$)	\$1,440	\$734	\$862	
Total Costs (\$)	\$13,806	\$13,382	\$12,202	
Total e-kWh	167,109	173,269	184,564	
Total e-kWh/m ²	257.5	267.0	284.4	
GHG (kg/Yr)	22,881	22,397	24,206	
GHG (kg/Yr/m ²)	35	35	37	

Energy Measures

Lighting Upgrades

Facility: Fire Station 114 (Heartland)










Address 5845 Falbourne St., L5R 3L8

Area (m²): 653 Area (ft²): 7,029

Year Built: 1989 Hours per Week : 168

Facility Group: Fire Station

Building Components: Dormitories/Sleeping Quarters; Offices and Meeting Rooms;
Truck Bay**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	67,090	68,495	70,728	
Electricity (\$)	\$11,304	\$9,709	\$8,233	
Natural Gas (m ³)	17,079	19,259	19,405	
Natural Gas (\$)	\$5,278	\$6,164	\$5,939	
Water (m ³)	688	631	550	
Water (\$)	\$1,475	\$1,444	\$1,328	
Total Costs (\$)	\$18,057	\$17,316	\$15,500	
Total e-kWh	246,418	270,718	274,482	
Total e-kWh/m ²	377.4	414.6	420.3	
GHG (kg/Yr)	34,711	38,885	39,241	
GHG (kg/Yr/m ²)	53	60	60	

Energy Measures

Lighting Upgrades

Facility: Fire Station 115 (Erin Mills)










Address 4595 Glen Erin Dr., L5M 4E8

Area (m²): 534 Area (ft²): 5,748

Year Built: 1990 Hours per Week : 168

Facility Group: Fire Station

Building Components: Dormitories/Sleeping Quarters; Offices and Meeting Rooms;
Truck Bay**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	46,794	44,510	47,971	
Electricity (\$)	\$8,068	\$6,582	\$5,760	
Natural Gas (m ³)	15,730	16,165	14,932	
Natural Gas (\$)	\$4,794	\$5,146	\$4,816	
Water (m ³)	433	460	423	
Water (\$)	\$937	\$1,051	\$1,025	
Total Costs (\$)	\$13,799	\$12,779	\$11,601	
Total e-kWh	211,956	214,242	204,756	
Total e-kWh/m ²	396.9	401.2	383.4	
GHG (kg/Yr)	31,429	32,170	29,963	
GHG (kg/Yr/m ²)	59	60	56	

Energy Measures

Lighting Upgrades

Facility: Fire Station 116 (West Malton) & Peel Ambulance Reporting Centre

Address 6825 Tomken Rd, L5T 1N4

 Area (m²): 3,627

 Area (ft²): 39,041

Year Built: 2011

Hours per Week : 168

Facility Group: Fire Station

 Building Components: Dormitories/Sleeping Quarters; Offices and Meeting Rooms;
Truck Bay; Ambulance Services

Historical Energy and GHG Data

Year:	2016	2017	2018
Electricity (kWh)	0	0	168
Electricity (\$)	\$0	\$0	\$282
Natural Gas (m ³)	0	0	0
Natural Gas (\$)	\$0	\$0	\$0
Water (m ³)	0	0	0
Water (\$)	\$0	\$0	\$0
Total Costs (\$)	\$0	\$0	\$282
Total e-kWh	0	0	168
Total e-kWh/m ²	0.0	0.0	0.0
GHG (kg/Yr)	0	0	6
GHG (kg/Yr/m ²)	0	0	0

Energy Measures

Facility: Fire Station 117 (North Dixie)










Address 1090 Nuvik Crt, L4W 5E6

Area (m²): 697 Area (ft²): 7,502

Year Built: 1999 Hours per Week : 168

Facility Group: Fire Station

Building Components: Dormitories/Sleeping Quarters; Offices and Meeting Rooms;
Truck Bay**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	76,280	73,630	79,376	
Electricity (\$)	\$12,151	\$10,215	\$9,020	
Natural Gas (m ³)	12,451	14,824	14,850	
Natural Gas (\$)	\$3,917	\$4,849	\$3,999	
Water (m ³)	642	498	509	
Water (\$)	\$1,382	\$1,136	\$1,235	
Total Costs (\$)	\$17,450	\$16,201	\$14,255	
Total e-kWh	207,011	229,282	235,297	
Total e-kWh/m ²	297.0	329.0	337.6	
GHG (kg/Yr)	26,290	30,683	30,938	
GHG (kg/Yr/m ²)	38	44	44	

Energy Measures

Lighting Upgrades

Facility: Fire Station 118 (East Credit)










Address 1045 Bristol Rd W, L5V 2J8

Area (m²): 733 Area (ft²): 7,890

Year Built: 1996 Hours per Week : 168

Facility Group: Fire Station

Building Components: Dormitories/Sleeping Quarters; Offices and Meeting Rooms;
Truck Bay**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	74,237	71,790	90,073	
Electricity (\$)	\$12,062	\$10,076	\$10,277	
Natural Gas (m ³)	12,834	13,907	14,231	
Natural Gas (\$)	\$4,098	\$4,702	\$4,630	
Water (m ³)	1,342	1,537	962	
Water (\$)	\$2,952	\$3,518	\$2,321	
Total Costs (\$)	\$19,112	\$18,295	\$17,227	
Total e-kWh	208,990	217,813	239,493	
Total e-kWh/m ²	285.1	297.2	326.7	
GHG (kg/Yr)	26,941	28,882	30,152	
GHG (kg/Yr/m ²)	37	39	41	

Energy Measures

Lighting Upgrades

Facility: Fire Station 119 (Airport-Leased)

Address 3201 Elmbank Road, L4V 1A6

Area (m²): 729 Area (ft²): 7,847

Year Built: 2000 Hours per Week : 168

Facility Group: Fire Station

Building Components: Dormitories/Sleeping Quarters; Offices and Meeting Rooms;
Truck Bay**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	8,675	0	0	
Electricity (\$)	\$1,546	\$0	\$0	
Natural Gas (m ³)	14,018	0	0	
Natural Gas (\$)	-\$337	\$0	\$0	
Water (m ³)	71	0	0	
Water (\$)	\$144	\$0	\$0	
Total Costs (\$)	\$1,353	\$0	\$0	
Total e-kWh	155,864	0	0	
Total e-kWh/m ²	213.8	0.0	0.0	
GHG (kg/Yr)	26,820	0	0	
GHG (kg/Yr/m ²)	37	0	0	

Energy Measures

Facility: Fire Station 121 (Meadowvale Village)










Address 6745 Mavis Road, L5W 1L9

Area (m²): 760 Area (ft²): 8,181

Year Built: 2002 Hours per Week : 168

Facility Group: Fire Station

Building Components: Dormitories/Sleeping Quarters; Offices and Meeting Rooms;
Truck Bay**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	79,199	80,334	81,113	
Electricity (\$)	\$12,711	\$11,197	\$9,275	
Natural Gas (m ³)	14,367	16,679	18,340	
Natural Gas (\$)	\$4,505	\$5,487	\$5,719	
Water (m ³)	339	381	380	
Water (\$)	\$734	\$869	\$921	
Total Costs (\$)	\$17,949	\$17,553	\$15,915	
Total e-kWh	230,054	255,467	273,679	
Total e-kWh/m ²	302.7	336.1	360.1	
GHG (kg/Yr)	30,019	34,433	37,600	
GHG (kg/Yr/m ²)	39	45	49	

Energy Measures

Lighting Upgrades

Facility: Fire Station 122 (Churchill Meadows)

Address 3600 Thomas St, L5M 7E2










Area (m²): 769Area (ft²): 8,277

Year Built: 2003

Hours per Week : 168

Facility Group: Fire Station

Building Components: Dormitories/Sleeping Quarters; Offices and Meeting Rooms;
Truck Bay**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	75,955	77,975	84,015	
Electricity (\$)	\$12,600	\$11,039	\$9,577	
Natural Gas (m ³)	18,790	16,725	21,869	
Natural Gas (\$)	\$5,762	\$5,198	\$6,578	
Water (m ³)	366	321	323	
Water (\$)	\$791	\$744	\$783	
Total Costs (\$)	\$19,153	\$16,981	\$16,939	
Total e-kWh	273,249	253,587	313,640	
Total e-kWh/m ²	355.3	329.8	407.9	
GHG (kg/Yr)	38,266	34,434	44,379	
GHG (kg/Yr/m ²)	50	45	58	

Energy Measures

Lighting Upgrades

Facility: Garry W Morden Centre

Address 7535 Ninth Line, L5N 7C3

Area (m²): 6,174Area (ft²): 66,273










Year Built: 2012

Hours per Week : 70

Facility Group: Fire Station

Building Components: Offices and Meeting Rooms; Training Rooms; Truck Bay

**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	1,667,820	1,673,764	1,651,085	
Electricity (\$)	\$257,363	\$255,646	\$245,981	
Natural Gas (m ³)	100,928	120,060	106,154	
Natural Gas (\$)	\$25,054	\$31,292	\$26,546	
Water (m ³)	12,359	21,340	7,424	
Water (\$)	\$26,997	\$42,350	\$18,109	
Total Costs (\$)	\$309,414	\$329,287	\$290,636	
Total e-kWh	2,727,561	2,934,392	2,765,699	
Total e-kWh/m ²	441.8	475.3	448.0	
GHG (kg/Yr)	250,896	287,289	260,176	
GHG (kg/Yr/m ²)	41	47	42	

Energy Measures

Facility: Fire Station 119

Address 6375 Airport Rd, L4V 1E4

Area (m²): 1,040Area (ft²): 11,194










Year Built:

Hours per Week :

Facility Group: Fire Station

Building Components:

Historical Energy and GHG Data

Year:	2016	2017	2018	
Electricity (kWh)	112,451	115,624	144,072	
Electricity (\$)	\$17,521	\$15,932	\$16,102	
Natural Gas (m ³)	20,213	19,729	21,778	
Natural Gas (\$)	\$5,206	\$5,826	\$6,472	
Water (m ³)	404	421	446	
Water (\$)	\$911	\$961	\$1,084	
Total Costs (\$)	\$23,638	\$22,720	\$23,659	
Total e-kWh	324,687	322,781	372,735	
Total e-kWh/m ²	312.2	310.4	358.4	
GHG (kg/Yr)	42,271	41,471	46,368	
GHG (kg/Yr/m ²)	41	40	45	

Energy Measures

8.0 GOLF COURSES AND ASSOCIATED FACILITIES

8.1 SCOPE AND BOUNDARY

Golf Courses and Associated Facilities include facilities that consist primarily of the following operations:

- Clubhouse
- Maintenance Shed
- Golf Course

For the purposes of this report, the City of Mississauga has 7 facilities/locations that fall under this category. They include:

- Brae Ben Gen Stn
- BraeBen Academy
- BraeBen Golf Course
- BraeBen Golf Course Maintenance Shed
- Lakeview Golf Course
- Lakeview Golf Course Open Pond
- Lakeview Greenskeeper

The above listed locations have a total floor area of approximately 4,800 square meters. This would account for 1.0% of the total building area for City of Mississauga facilities included in this Plan.

8.2 BASELINE

8.2.1 ENERGY USE

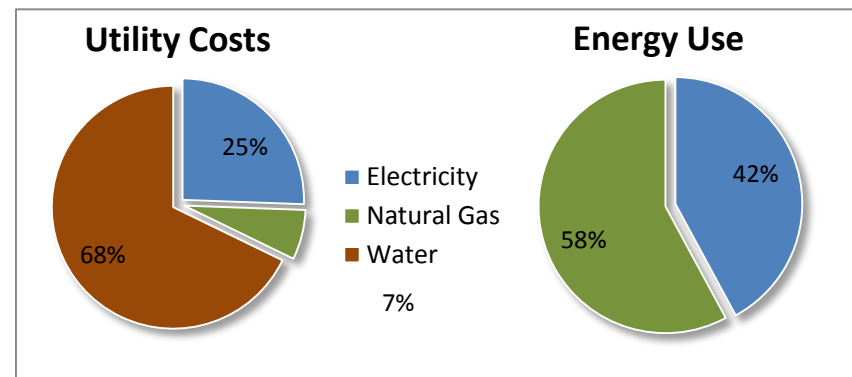
The energy use (combined electricity and natural gas) for **Golf Courses and Associated Facilities** was 1,586,000 equivalent kilowatt hours in 2018. Following are the key takeaways for the energy usage in 2018:

- 42% of the total energy usage was due to electricity use, which has dropped by 13.3% since 2013

- 58% of the total energy usage was due to natural gas use, which has increased by 4.5% since 2013
- A total of \$424,000 in utility costs was incurred, out of which 25% is attributed to electricity, 7% to natural gas, and 68% to water

Golf Courses and Associated Facilities accounted for 2.4% of the City's total utility budget for 2018.

Figure 8-1: Utility Costs and Energy Use Breakdown for Golf Courses and Associated Facilities



8.2.2 ENERGY USE INTENSITY

Energy Use Intensity (EUI) is a measurement that expresses a building's energy use as a function of its size or other characteristic. It is used to give a better picture of the energy efficiency of a facility. The lower the EUI, the more efficient the facility is.

When reviewing EUI, the facility operation type and hours should be taken into account. For example, a facility that operates 24 hours a day will most likely have a higher EUI than a similar one that operates 8

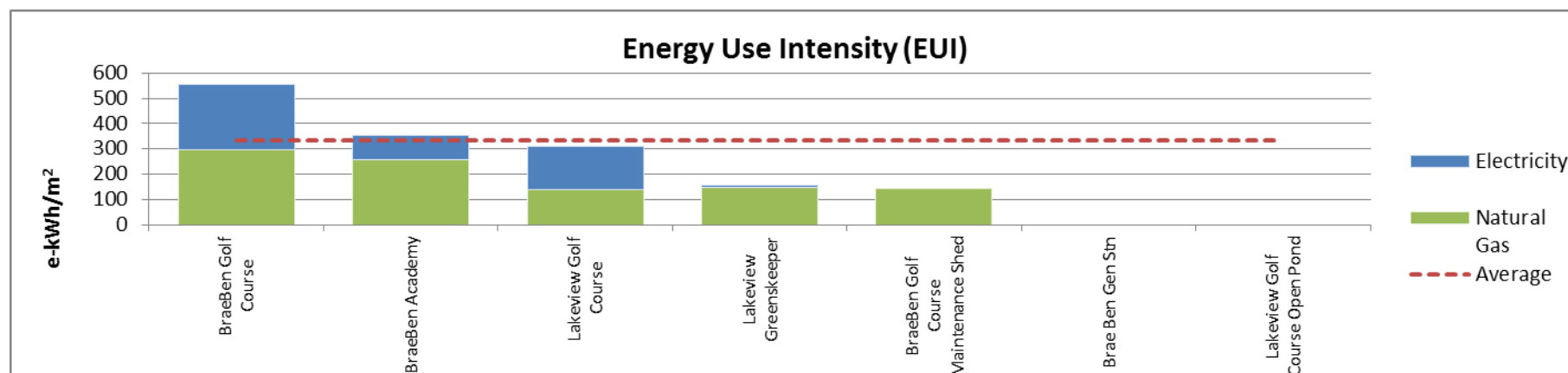
hours a day. Similarly, a facility that has high energy using systems that do not contribute to the building area, such as an outdoor pool or outdoor ice rink, will have a higher EUI than a facility where those systems are located within the facility, as they would add to the facility's area footprint.

For **Golf Courses and Associated Facilities** the average EUI in 2018 was 331.8 e-kWh/m²

The following chart shows the EUI for each facility within **Golf Courses and Associated Facilities**, and compares it to the average for the group.

Note: The Average EUI value is calculated by taking the total energy use of all facilities, and dividing by the total area of the facilities. As such, a larger facility would have a bigger impact on the average than a smaller facility.

Figure 8-2: Energy Use Intensity for Golf Courses and Associated Facilities

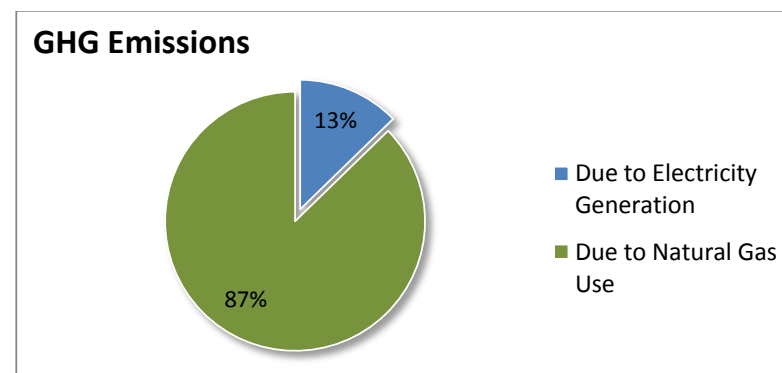


8.2.3 GREENHOUSE GAS (GHG) EMISSIONS

For 2018, **Golf Courses and Associated Facilities** emitted 189,400 kg (or 189 tonnes) of CO₂ in 2018. 12.7% of these emissions were due to the generation of electricity, while the use of natural gas accounted for the remaining 87.3%.

Golf Courses and Associated Facilities accounted for 1.0% of the City's total GHG emissions for facilities included in the plan.

Figure 8-3: GHG Emissions Breakdown for Golf Courses and Associated Facilities

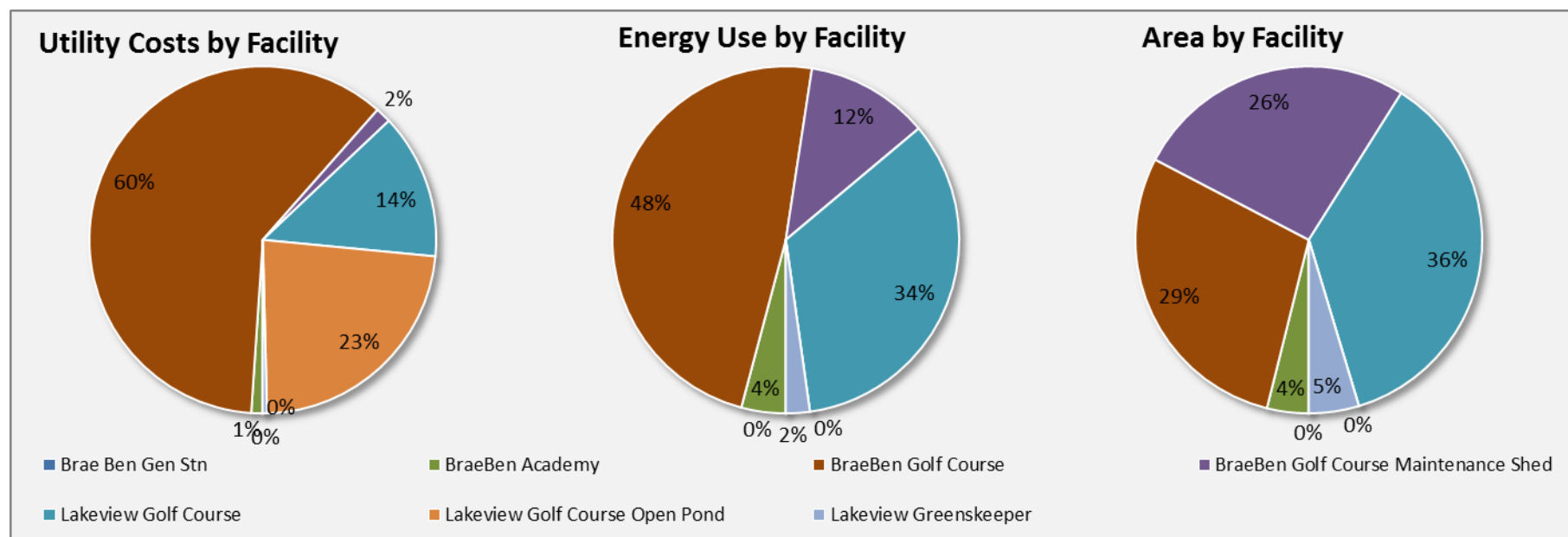


8.3 ENERGY AND GHG BREAKDOWN FOR GOLF COURSES AND ASSOCIATED FACILITIES

This section provides a brief overview/recap of the Utility and GHG data for **Golf Courses and Associated Facilities**. The table below summarizes, by facility, the utility usage and GHG emissions for 2018. Following are the key takeaways:

- The premises at BraeBen Golf Course represent the largest area in the group and contribute towards 64% and 63% of the energy consumption and utility costs respectively in the group
- The premises at Lakeview Golf Course contribute towards 36% and 37% of the energy consumption and utility costs respectively in the group

Figure 8-4: Utility Costs and Energy Use Breakdown by Facility



2018 Annual Report for Golf Courses and Associated Facilities

Facility	Area m ²	Electricity		Natural Gas		Total Energy e-kWh	Water		Total Costs \$	GHG Emissions kg
		kWh	\$	m ³	\$		m ³	\$		
Brae Ben Gen Stn	0	0	\$0	0	\$0	0	0	\$0	\$0	0
BraeBen Academy	186	17,428	\$2,447	4,596	\$2,089	65,685	0	\$0	\$4,536	9,318
BraeBen Golf Course	1,375	355,638	\$57,169	39,047	\$10,895	765,632	127,078	\$188,069	\$256,133	86,641
BraeBen Golf Course Maintenance Shed	1,257	0	\$0	17,351	\$6,146	182,186	0	\$0	\$6,146	32,811
Lakeview Golf Course	1,739	292,236	\$48,256	23,332	\$7,854	537,220	929	\$1,332	\$57,443	54,641
Lakeview Golf Course Open Pond	0	0	\$0	0	\$0	0	67,556	\$97,857	\$97,857	0
Lakeview Greenskeeper	223	2,532	\$496	3,120	\$1,110	35,296	12	\$29	\$1,634	5,992
Totals	4,780	667,834	\$108,368	87,446	\$28,094	1,586,018	195,575	\$287,287	\$423,749	189,403
Usage / Costs per m²:		189.6	\$30.8	18.3	\$5.9	332	38.4	\$56.8	\$68.2	39.6

8.4 ACTION PLAN

An action plan has been identified with the goal to save on electricity, natural gas, oil, and/or other form of energy consumption within a facility or location.





The following figure shows the various projects and initiatives that have been planned for **Golf Courses and Associated Facilities**. The chart shows what projects have been planned, when they are planned to be implemented, and the progress of implementation (if applicable). A brief description of each project has been noted below:

- **Energy Upgrades for Lifecycle Replacements:** Includes energy upgrades for high capital assets that show economic paybacks only at the time of replacement like envelope and HVAC equipment

For the chart below, the **Purple** coloured bars represent the original planned start and completion of a Measure type. The **Green** bar beneath shows the actual start and completion times for a completed measure, while the **Blue** bar shows the actual start time of a Measure that is currently being implemented, but not yet complete. Some Notes:

- A Single Measure timeline may include more than one implementation of that measure (example: In different facilities).
- Due to changing circumstances (change in operations, budget changes, new technology, etc.), a planned measure may be cancelled. These would be indicated by a **Red** plan bar on the chart.

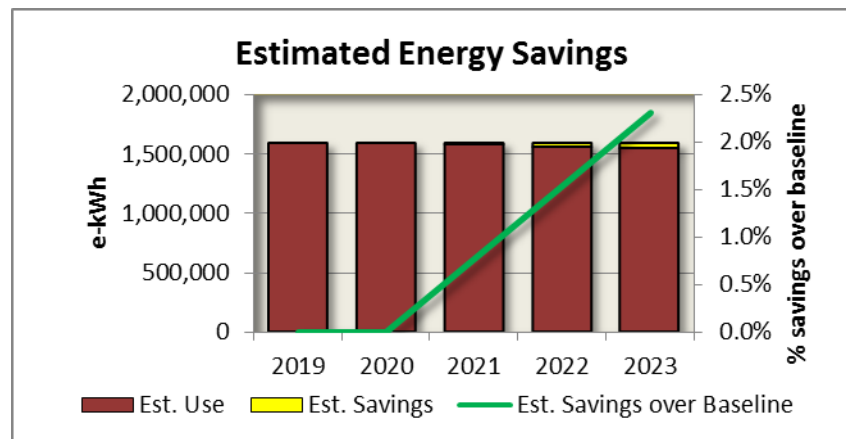
Figure 8-5: Energy Measure Implementation Plan for Golf Courses and Associated Facilities

Energy Measure	2019				2020				2021				2022				2023			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Energy Upgrades for Lifecycle Replacements																				
Planned Implementation  Scheduled Implentation  Cancelled Implementation																Q1 = Jan-Mar				
Actual Implementation  Status = Completed  Status = Underway																Q3 = Jul-Sep				

8.5 ESTIMATED SAVINGS

At the end of the plan, **Golf Courses and Associated Facilities** are expected to save 2.3% over the base year of 2018, which amounts to a total of \$1,540 from all the projects.

Figure 8-6: Energy Measure Annual Savings for Golf Courses and Associated Facilities



8.6 PROGRESS TO TARGETS

The City is targeting a 2.3% reduction in energy use in **Golf Courses and Associated Facilities** by 2023 over the base year, 2018. The reporting of energy consumption data and savings for **Golf Courses and Associated Facilities** will be based on utility meters and assembled annually. Since utility meters monitor energy consumption for the entire facility, the measurement boundary will encompass all parts of the facility. To determine the savings and fairly compare year-to-year energy consumption data, it is important to account for independent variables such as weather and occupancy and apply regression analysis to consumption data. Therefore, actual consumption data for each year starting 2019 will be adjusted to match the weather and occupancy of 2018. The figures below show the updated progress for each year against the set target.

Figure 8-7: Annual Energy Use vs Targeted Energy Use for Golf Courses and Associated Facilities

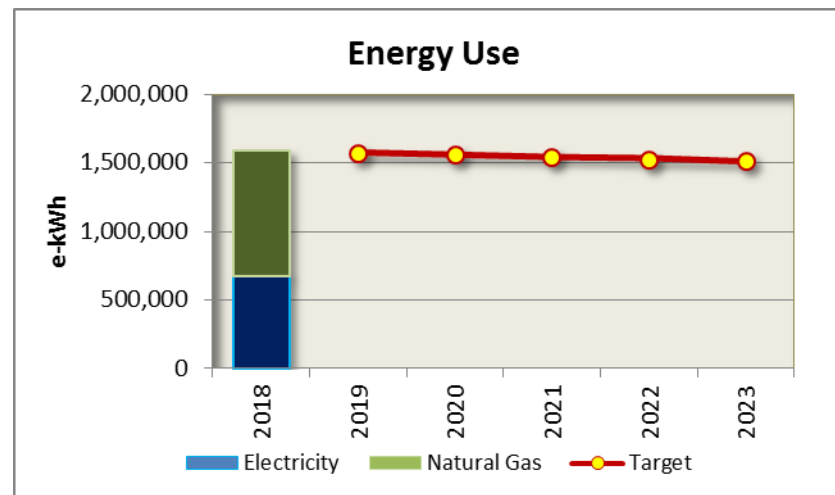
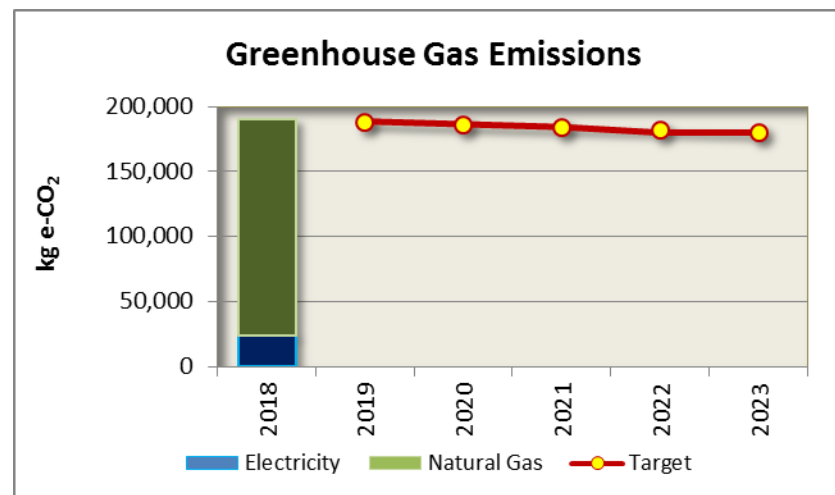


Figure 8-8: Annual GHG Emissions vs Targets for Golf Courses and Associated Facilities



8.7 FACILITY INFORMATION FOR GOLF COURSES AND ASSOCIATED FACILITIES

Facility: BraeBen Academy

Address 5650 Terry Fox Way, L5V 2W2








Area (m²): 186 Area (ft²): 0

Year Built: Hours per Week :

Facility Group: Golf

Building Components:

**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	19,562	24,171	17,428	
Electricity (\$)	\$3,747	\$3,369	\$2,447	
Natural Gas (m ³)	5,263	5,737	4,596	
Natural Gas (\$)	\$2,231	\$2,482	\$2,089	
Water (m ³)	0	0	0	
Water (\$)	\$0	\$0	\$0	
Total Costs (\$)	\$5,979	\$5,851	\$4,536	
Total e-kWh	74,827	84,405	65,685	
Total e-kWh/m ²	402.3	453.8	353.1	
GHG (kg/Yr)	10,657	11,718	9,318	
GHG (kg/Yr/m ²)	57	63	50	

Energy Measures

Facility: BraeBen Golf Course

Address 5700 Terry Fox Way, RR 6, L5V 2W2










Area (m²): 1,375 Area (ft²): 14,800

Year Built: 2005 Hours per Week : 84

Facility Group: Golf

Building Components: Clubhouse; Golf Course

**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	392,172	376,207	355,638	
Electricity (\$)	\$65,629	\$60,998	\$57,169	
Natural Gas (m ³)	32,371	29,798	39,047	
Natural Gas (\$)	\$9,406	\$9,360	\$10,895	
Water (m ³)	164,967	100,654	127,078	
Water (\$)	\$240,594	\$136,739	\$188,069	
Total Costs (\$)	\$315,628	\$207,096	\$256,133	
Total e-kWh	732,072	689,090	765,632	
Total e-kWh/m ²	532.4	501.2	556.8	
GHG (kg/Yr)	75,333	69,892	86,641	
GHG (kg/Yr/m ²)	55	51	63	

Energy Measures

Energy Upgrades for Lifecycle Replacements
Controls Upgrades
Lighting Upgrades

Facility: BraeBen Golf Course Maintenance Shed

Address 5750 Terry Fox Way, L5V 2W2

Area (m²): 1,257Area (ft²): 0






Year Built:

Hours per Week :

Facility Group: Golf

Building Components:

**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	0	0	0	
Electricity (\$)	\$0	\$0	\$0	
Natural Gas (m ³)	14,760	18,979	17,351	
Natural Gas (\$)	\$4,637	\$5,999	\$6,146	
Water (m ³)	0	0	0	
Water (\$)	\$0	\$0	\$0	
Total Costs (\$)	\$4,637	\$5,999	\$6,146	
Total e-kWh	154,982	199,284	182,186	
Total e-kWh/m ²	123.3	158.5	144.9	
GHG (kg/Yr)	27,911	35,890	32,811	
GHG (kg/Yr/m ²)	22	29	26	

Energy Measures

Facility: Lakeview Golf Course

Address 1190 Dixie Rd, L5E 2P4










Area (m²): 1,739 Area (ft²): 18,718

Year Built: 1939 Hours per Week : 84

Facility Group: Golf

Building Components: Clubhouse; Golf Course; Cart Storage/Repair

**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	306,631	299,675	292,236	
Electricity (\$)	\$59,843	\$53,067	\$48,256	
Natural Gas (m ³)	33,600	23,777	23,332	
Natural Gas (\$)	\$10,511	\$8,774	\$7,854	
Water (m ³)	1,228	821	929	
Water (\$)	\$2,095	\$1,551	\$1,332	
Total Costs (\$)	\$72,449	\$63,392	\$57,443	
Total e-kWh	659,430	549,332	537,220	
Total e-kWh/m ²	379.2	315.9	308.9	
GHG (kg/Yr)	74,576	55,750	54,641	
GHG (kg/Yr/m ²)	43	32	31	

Energy Measures

Energy Upgrades for Lifecycle Replacements

Facility: Lakeview Golf Course Open Pond

Address 1190 Dixie Rd, L5E 2P4

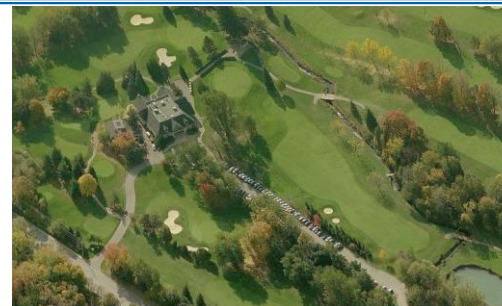
Area (m²):Area (ft²):

Year Built:

Hours per Week :

Facility Group: Golf

Building Components:

**Historical Energy and GHG Data**

Year:	2016	2017	2018
Electricity (kWh)	0	0	0
Electricity (\$)	\$0	\$0	\$0
Natural Gas (m ³)	0	0	0
Natural Gas (\$)	\$0	\$0	\$0
Water (m ³)	82,927	47,375	67,556
Water (\$)	\$104,978	\$63,151	\$97,857
Total Costs (\$)	\$104,978	\$63,151	\$97,857
Total e-kWh	0	0	0
Total e-kWh/m ²	N/A	N/A	N/A
GHG (kg/Yr)	0	0	0
GHG (kg/Yr/m ²)	N/A	N/A	N/A

Energy Measures

Facility: Lakeview Greenskeeper

Address 1392 Dixie Road, L5E 3E1

Area (m²): 223Area (ft²): 2,400










Year Built: 1939

Hours per Week : 70

Facility Group: Golf

Building Components:

**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	3,520	1,452	2,532	
Electricity (\$)	\$780	\$415	\$496	
Natural Gas (m ³)	2,227	721	3,120	
Natural Gas (\$)	\$1,612	\$610	\$1,110	
Water (m ³)	18	7	12	
Water (\$)	\$43	\$16	\$29	
Total Costs (\$)	\$2,436	\$1,040	\$1,634	
Total e-kWh	26,899	9,023	35,296	
Total e-kWh/m ²	120.6	40.5	158.3	
GHG (kg/Yr)	4,337	1,416	5,992	
GHG (kg/Yr/m ²)	19	6	27	

Energy Measures

9.0 HERITAGE BUILDINGS

9.1 SCOPE AND BOUNDARY

For the purposes of this report, the City of Mississauga has 6 facilities/locations that fall under the **Heritage Buildings** category. They include:

- Riverwood - Chappel Estate House
- Riverwood - Chappel Estate Cabin
- Bussell House
- Meadowvale Hall
- Pinchin Property
- Pinchin Property - Leslie Log House

The above listed locations have a total floor area of approximately 1,000 square meters. This would account for 0.2% of the total building area for City of Mississauga facilities included in this Plan.

9.2 BASELINE

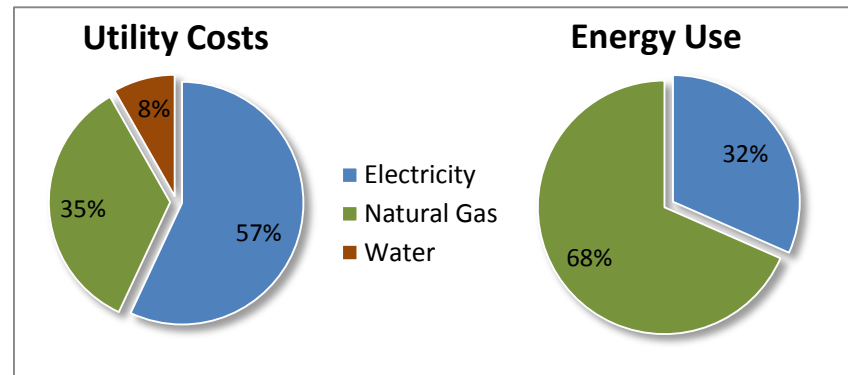
9.2.1 ENERGY USE

The energy use (combined electricity and natural gas) for **Heritage Buildings** was 365,000 equivalent kilowatt hours in 2018. Following are the key takeaways for the energy usage in 2018:

- 32% of the total energy usage was due to electricity use, which has dropped by 15.6% since 2013
- 68% of the total energy usage was due to natural gas use, which has increased by 80.6% since 2013
- A total of \$24,000 in utility costs was incurred, out of which 57% is attributed to electricity, 35% to natural gas, and 8% to water

Heritage Buildings accounted for 0.1% of the City's total utility budget for 2018.

Figure 9-1: Utility Costs and Energy Use Breakdown for Heritage Buildings



9.2.2 ENERGY USE INTENSITY

Energy Use Intensity (EUI) is a measurement that expresses a building's energy use as a function of its size or other characteristic. It is used to give a better picture of the energy efficiency of a facility. The lower the EUI, the more efficient the facility is.

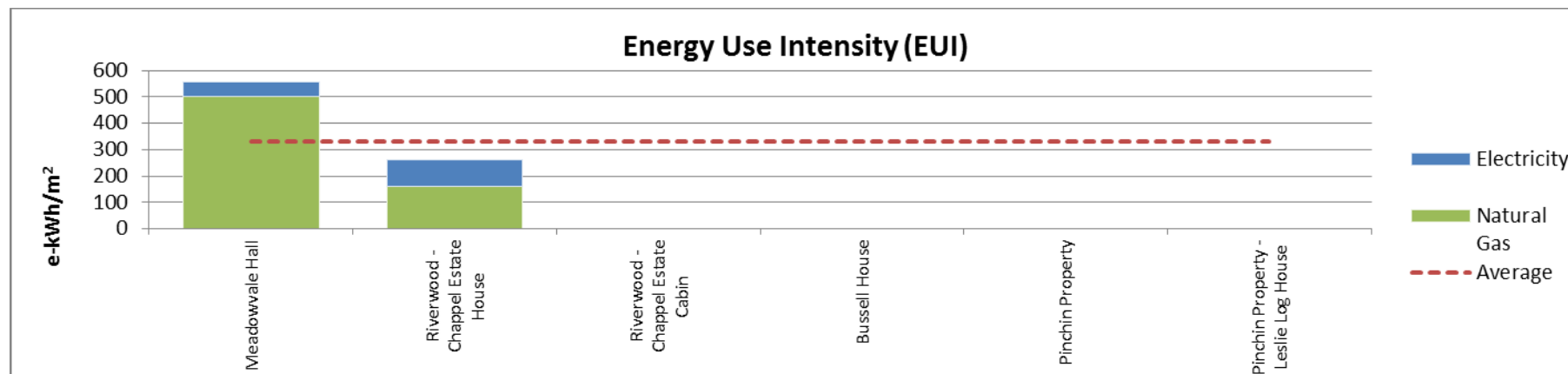
When reviewing EUI, the facility operation type and hours should be taken into account. For example, a facility that operates 24 hours a day will most likely have a higher EUI than a similar one that operates 8 hours a day. Similarly, a facility that has high energy using systems that do not contribute to the building area, such as an outdoor pool or outdoor ice rink, will have a higher EUI than a facility where those systems are located within the facility, as they would add to the facility's area footprint.

For **Heritage Buildings** the average EUI in 2018 was 332.9 e-kWh/m².

The following chart shows the EUI for each facility within **Heritage Buildings**, and compares it to the average for the group.

Note: The Average EUI value is calculated by taking the total energy use of all facilities, and dividing by the total area of the facilities. As such, a larger facility would have a bigger impact on the average than a smaller facility.

Figure 9-2: Energy Use Intensity for Heritage Buildings

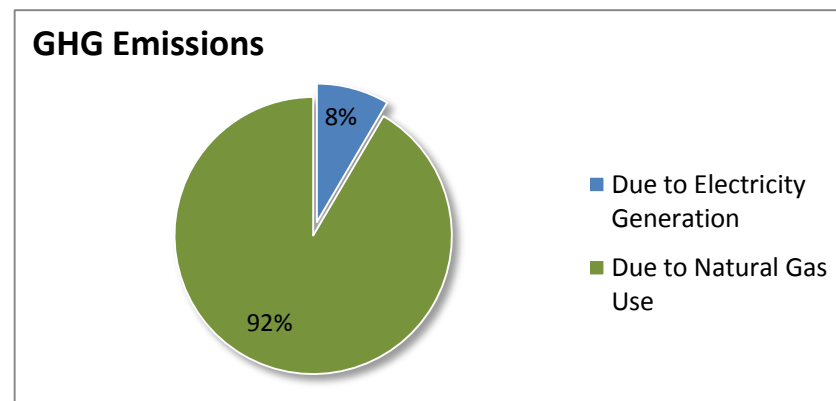


9.2.3 GREENHOUSE GAS (GHG) EMISSIONS

For 2018, **Heritage Buildings** emitted 49,200 kg (or 49 tonnes) of CO₂ in 2018. 8.5% of these emissions were due to the generation of electricity, while the use of natural gas accounted for the remaining 91.5%.

Heritage Buildings accounted for 0.2% of the City's total GHG emissions for facilities included in the plan.

Figure 9-3: GHG Emissions Breakdown for Heritage Buildings

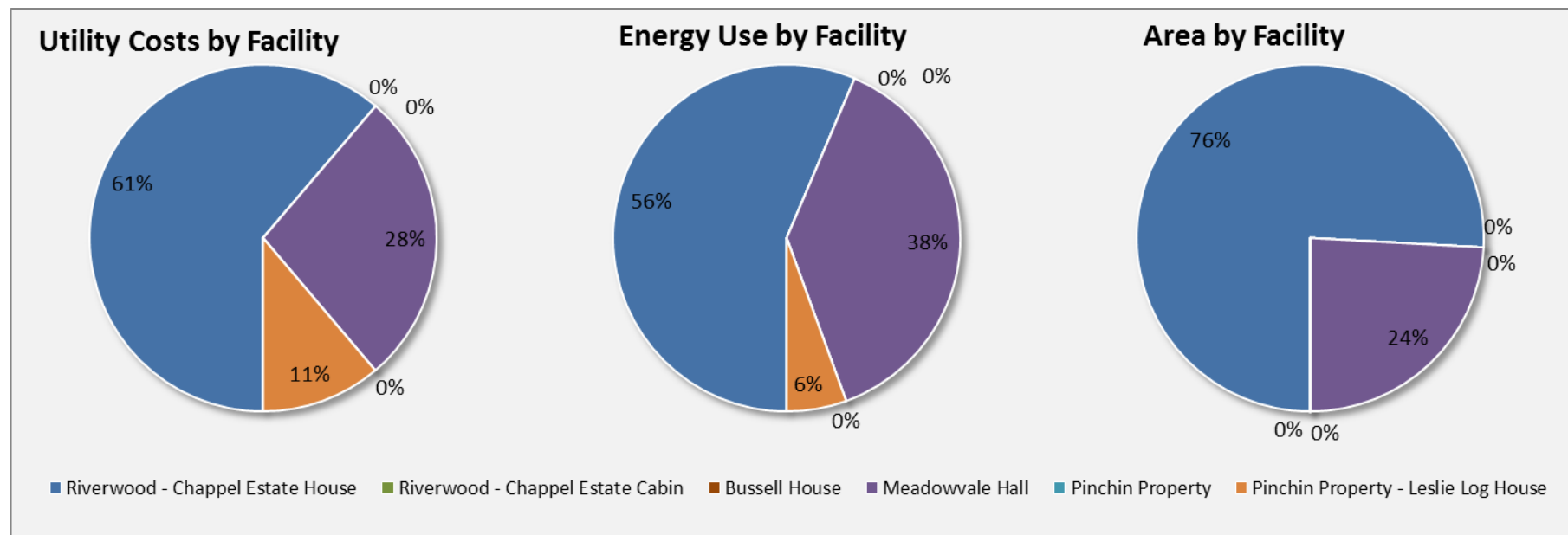


9.3 ENERGY AND GHG BREAKDOWN FOR HERITAGE BUILDINGS

This section provides a brief overview/recap of the Utility and GHG data for **Heritage Buildings**. The table below summarizes, by facility, the utility usage and GHG emissions for 2018. Following are the key takeaways:

- The Riverwood Chappel Estate House represents the largest area in the group and contributes towards 56% and 61% of the energy consumption and utility costs respectively in the group
- The Meadowvale Hall is the second largest area in the group and contributes towards 38% and 28% of the energy consumption and utility costs respectively in the group

Figure 8-4: Utility Costs and Energy Use Breakdown by Facility



2018 Annual Report for Heritage Buildings

Facility	Area	Electricity		Natural Gas		Total Energy	Water		Total Costs	GHG Emissions
	m ²	kWh	\$	m ³	\$	e-kWh	m ³	\$	\$	kg
Riverwood - Chappel Estate House	786	81,185	\$9,217	11,887	\$4,003	206,002	1,217	\$1,756	\$14,976	25,402
Riverwood - Chappel Estate Cabin	0	0	\$0	0	\$0	0	0	\$0	\$0	0
Bussell House	0	0	\$0	0	\$0	0	0	\$0	\$0	0
Meadowvale Hall	250	13,846	\$2,018	11,909	\$4,504	138,885	90	\$219	\$6,741	23,017
Pinchin Property	0	0	\$0	0	\$0	0	0	\$0	\$0	0
Pinchin Property - Leslie Log House	0	20,353	\$2,692	0	\$0	20,353	30	\$43	\$2,735	733
Totals	1,036	115,384	\$13,927	23,796	\$8,507	365,240	1,337	\$2,018	\$24,451	49,152
Usage / Costs per m²:		91.7	\$10.8	23.0	\$8.2	333	1.3	\$1.9	\$21.0	46.7

9.4 ACTION PLAN

No action plan has been identified with the goal to save on electricity, natural gas, oil, and/or other form of energy consumption due to the historic and heritage-designation of the facilities in this group.

9.5 ESTIMATED SAVINGS

Since no action plan exists for this category, no savings are expected.

9.6 PROGRESS TO TARGETS

The City is not targeting any reduction in energy use in **Heritage Buildings** by 2023 over the base year, 2018. However, the energy consumption data will be reported each year for **Heritage Buildings** and will be based on utility meters. Since utility meters monitor energy consumption for the entire facility, the measurement boundary will encompass all parts of the facility. To determine the savings and fairly compare year-to-year energy consumption data, it is important to account for independent variables such as weather and occupancy and apply regression analysis to consumption data. Therefore, actual consumption data for each year starting 2019 will be adjusted to match the weather and occupancy of 2018. The figures below show the updated progress for each year against the set target.

Figure 9-7: Annual Energy Use vs Targeted Energy Use for Heritage Buildings

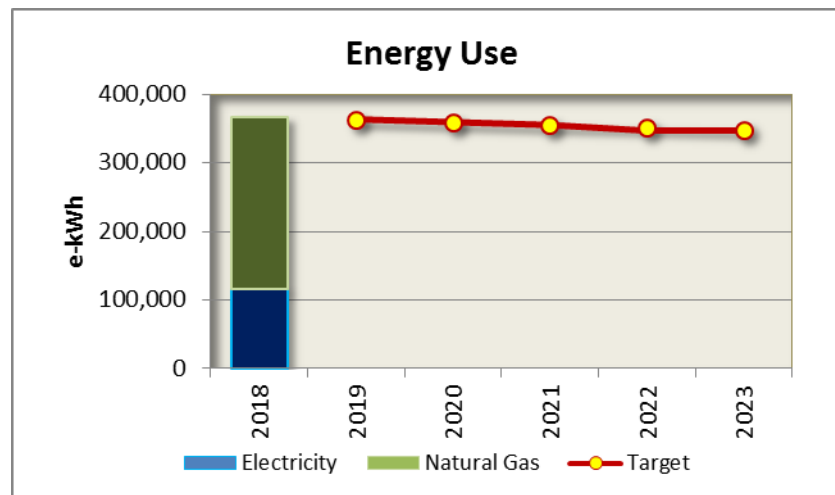
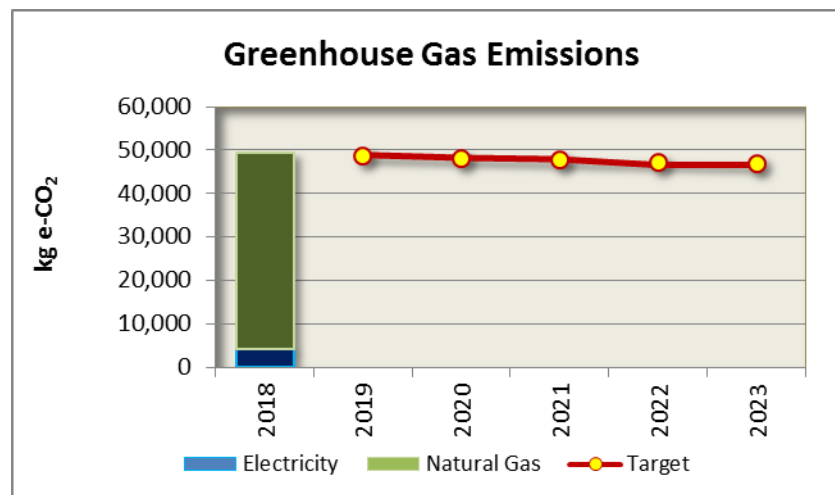


Figure 9-8: Annual GHG Emissions vs Targets for Heritage Buildings



9.7 FACILITY INFORMATION FOR HERITAGE BUILDINGS

Facility: Riverwood - Chappel Estate House

Address 1447 Burnhamthorpe Rd W, L5C 2S7










Area (m²): 786 **Area (ft²):** 13,326

Year Built: 1919 **Hours per Week :** 70

Facility Group: Heritage

Building Components:

Historical Energy and GHG Data

Year:	2016	2017	2018	
Electricity (kWh)	82,651	88,056	81,185	
Electricity (\$)	\$13,111	\$12,204	\$9,217	
Natural Gas (m ³)	0	4,584	11,887	
Natural Gas (\$)	\$0	\$1,745	\$4,003	
Water (m ³)	1,183	1,171	1,217	
Water (\$)	\$1,483	\$1,542	\$1,756	
Total Costs (\$)	\$14,594	\$15,490	\$14,976	
Total e-kWh	82,651	136,186	206,002	
Total e-kWh/m ²	105.2	173.3	262.1	
GHG (kg/Yr)	2,975	11,838	25,402	
GHG (kg/Yr/m ²)	4	15	32	

Energy Measures

Facility: Meadowvale Hall

Address 6970 Second Line W, L5W 1A1










Area (m²): 250 Area (ft²): 2,691

Year Built: 1871 Hours per Week : 72

Facility Group: Heritage

Building Components:

**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	15,588	10,304	13,846	
Electricity (\$)	\$2,879	\$1,886	\$2,018	
Natural Gas (m ³)	10,909	12,955	11,909	
Natural Gas (\$)	\$3,674	\$4,440	\$4,504	
Water (m ³)	73	60	90	
Water (\$)	\$161	\$138	\$219	
Total Costs (\$)	\$6,714	\$6,463	\$6,741	
Total e-kWh	130,138	146,329	138,885	
Total e-kWh/m ²	520.6	585.3	555.5	
GHG (kg/Yr)	21,191	24,868	23,017	
GHG (kg/Yr/m ²)	85	99	92	

Energy Measures

Facility: Pinchin Property - Leslie Log House

Address 4415 Mississauga Road, L5M 7C6







Area (m²): Area (ft²):

Year Built: 1826 Hours per Week : 0

Facility Group: Heritage

Building Components:

**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	15,295	18,014	20,353	
Electricity (\$)	\$3,744	\$3,027	\$2,692	
Natural Gas (m ³)	0	0	0	
Natural Gas (\$)	\$0	\$0	\$0	
Water (m ³)	64	261	30	
Water (\$)	\$80	\$345	\$43	
Total Costs (\$)	\$3,824	\$3,372	\$2,735	
Total e-kWh	15,295	18,014	20,353	
Total e-kWh/m ²	N/A	N/A	N/A	
GHG (kg/Yr)	551	648	733	
GHG (kg/Yr/m ²)	N/A	N/A	N/A	

Energy Measures

10.0 LEASED FACILITIES AND PROPERTIES

10.1 SCOPE AND BOUNDARY

For the purposes of this report, the City of Mississauga has 9 facilities/locations that fall under this category. They include:

- Front Street Pumping Station
- Harding Estate
- Mary Fix House
- Old Fire Hall - Malton (Malton Boy Scouts)
- Riverwood - Art Studio (Visual Arts Mississauga)
- Riverwood - McEwan Estate House
- Riverwood - McEwan Estate Barn
- Russell Langmaid Property
- Sheridan College Parking Lot

The above listed locations have a total floor area of approximately 2,900 square meters. This would account for 0.6% of the total building area for City of Mississauga facilities included in this Plan.

10.2 BASELINE

10.2.1 ENERGY USE

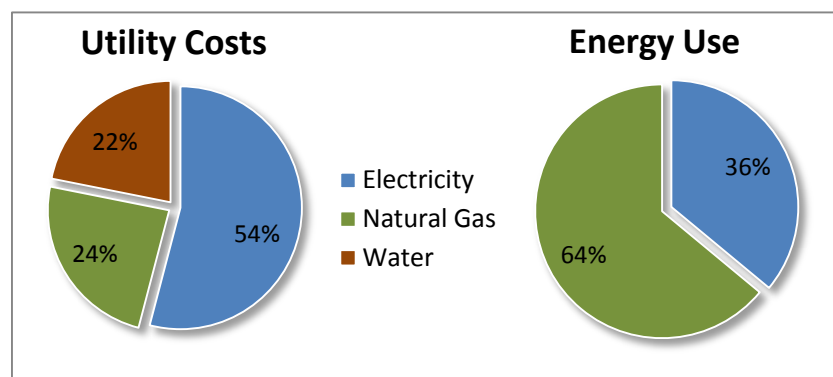
The energy use (combined electricity and natural gas) for **Leased Facilities and Properties** was 1,131,000 equivalent kilowatt hours in 2018. Following are the key takeaways for the energy usage in 2018:

- 36% of the total energy usage was due to electricity use, which has increased by 10.3% since 2013
- 64% of the total energy usage was due to natural gas use, which has increased by 1.1% since 2013

- A total of \$89,000 in utility costs was incurred, out of which 54% is attributed to electricity, 24% to natural gas, and 22% to water

Leased Facilities and Properties accounted for 0.5% of the City's total utility budget for 2018.

Figure 10-1: Utility Costs and Energy Use Breakdown for Leased Facilities and Properties



10.2.2 ENERGY USE INTENSITY

Energy Use Intensity (EUI) is a measurement that expresses a building's energy use as a function of its size or other characteristic. It is used to give a better picture of the energy efficiency of a facility. The lower the EUI, the more efficient the facility is.

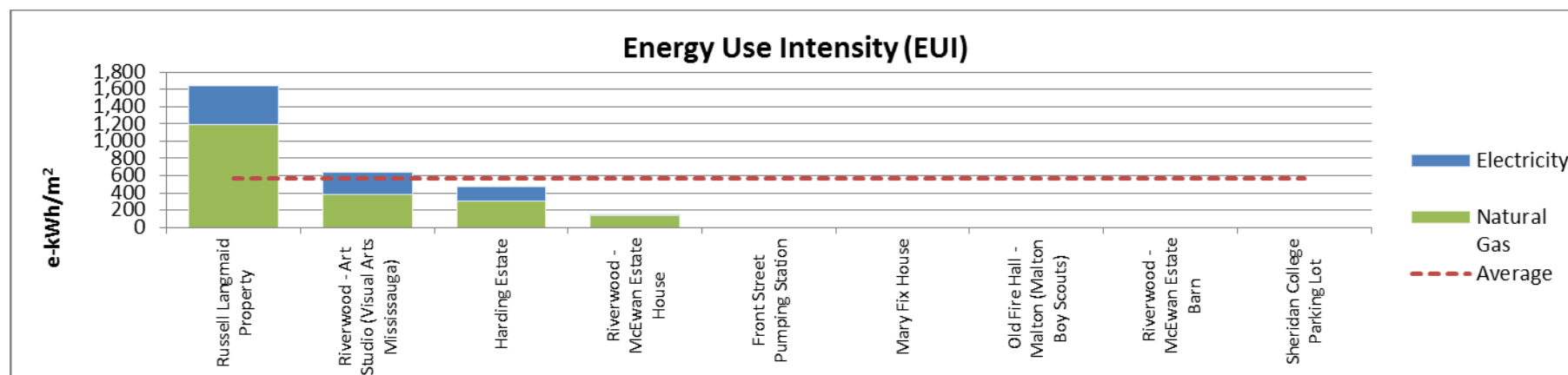
When reviewing EUI, the facility operation type and hours should be taken into account. For example, a facility that operates 24 hours a day will most likely have a higher EUI than a similar one that operates 8 hours a day. Similarly, a facility that has high energy using systems that do not contribute to the building area, such as an outdoor pool or

outdoor ice rink, will have a higher EUI than a facility where those systems are located within the facility, as they would add to the facility's area footprint.

For **Heritage Buildings** the average EUI in 2018 was 570.2 e-kWh/m².

The following chart shows the EUI for each facility within **Leased Facilities and Properties**, and compares it to the average for the group.

Figure 10-2: Energy Use Intensity for Leased Facilities and Properties



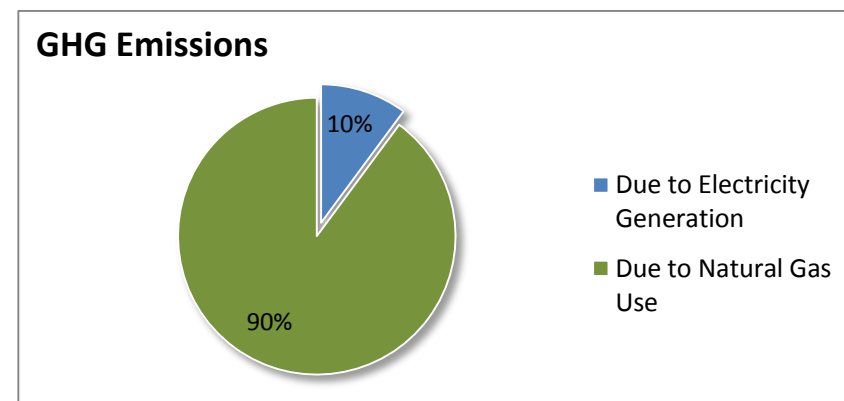
Note: The Average EUI value is calculated by taking the total energy use of all facilities, and dividing by the total area of the facilities. As such, a larger facility would have a bigger impact on the average than a smaller facility.

10.2.3 GREENHOUSE GAS (GHG) EMISSIONS

For 2018, **Leased Facilities and Properties** emitted 145,000 kg (or 145 tonnes) of CO₂ in 2018. 10.1% of these emissions were due to the generation of electricity, while the use of natural gas accounted for the remaining 89.9%.

Leased Facilities and Properties accounted for 0.7% of the City's total GHG emissions for facilities included in the plan.

Figure 10-3: GHG Emissions Breakdown for Leased Facilities and Properties

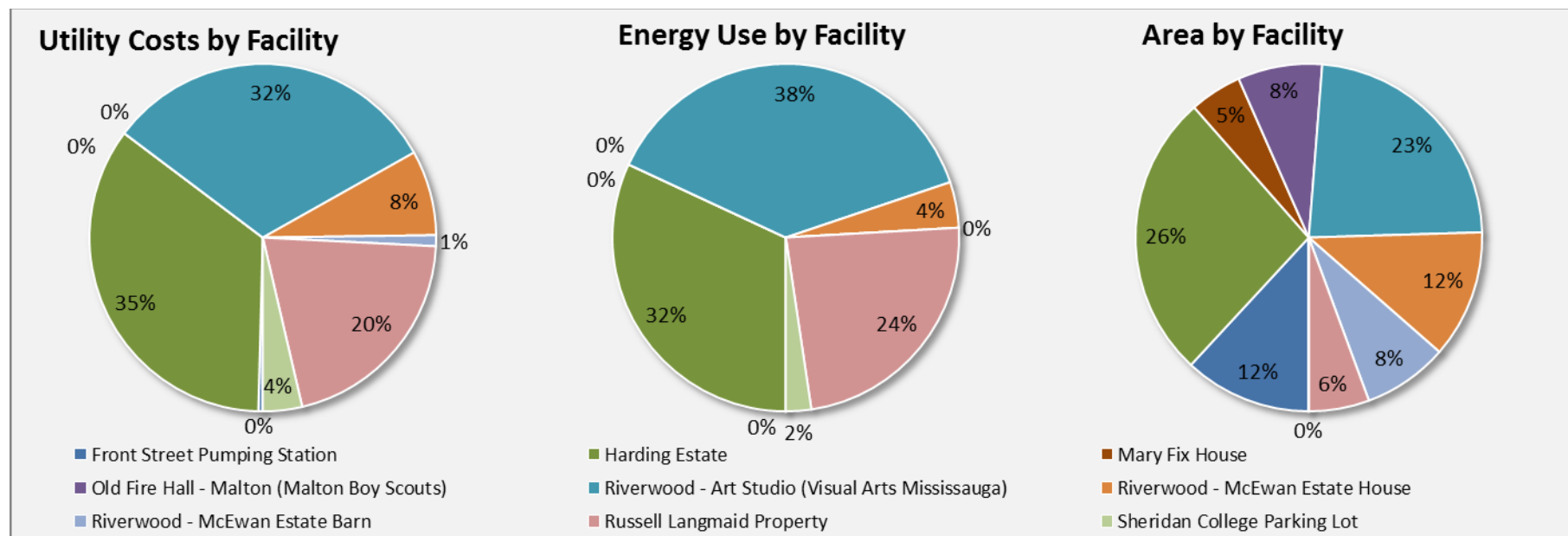


10.3 ENERGY AND GHG BREAKDOWN FOR LEASED FACILITIES AND PROPERTIES

This section provides a brief overview/recap of the Utility and GHG data for **Leased Facilities and Properties**. The table below summarizes, by facility, the utility usage and GHG emissions for 2018.

- The Harding Estate represents the largest area in the group and contributes towards 32% and 35% of the energy consumption and utility costs respectively in the group
- The Riverwood Art Studio is the second largest area in the group and contributes towards 38% and 32% of the energy consumption and utility costs respectively in the group

Figure 8-4: Utility Costs and Energy Use Breakdown by Facility



2018 Annual Report for Leased Facilities and Properties

Facility	Area	Electricity		Natural Gas		Total Energy	Water		Total Costs	GHG Emissions
	m ²	kWh	\$	m ³	\$	e-kWh	m ³	\$	\$	kg
Front Street Pumping Station	342	0	\$0	0	\$0	0	252	\$360	\$360	0
Harding Estate	764	132,476	\$15,610	21,766	\$6,506	361,017	6,094	\$8,745	\$30,861	45,928
Mary Fix House	140	0	\$0	0	\$0	0	0	\$0	\$0	0
Old Fire Hall - Malton (Malton Boy Scouts)	226	0	\$0	0	\$0	0	0	\$0	\$0	0
Riverwood - Art Studio (Visual Arts Mississauga)	669	173,381	\$19,293	24,335	\$7,133	428,897	638	\$1,560	\$27,986	52,259
Riverwood - McEwan Estate House	342	664	\$588	4,525	\$2,084	48,181	1,966	\$4,339	\$7,011	8,581
Riverwood - McEwan Estate Barn	228	0	\$0	0	\$0	0	364	\$900	\$900	0
Russell Langmaid Property	162	74,200	\$9,162	18,301	\$5,580	266,364	1,421	\$3,459	\$18,201	37,279
Sheridan College Parking Lot	0	26,683	\$3,233	0	\$0	26,683	0	\$0	\$3,233	961
Totals	2,873	407,404	\$47,886	68,927	\$21,303	1,131,141	10,736	\$19,363	\$88,551	145,008
Usage / Costs per m²:		196.6	\$23.1	35.6	\$11.0	570	4.3	\$7.7	\$34.0	74.4

10.4 ACTION PLAN

No action plan has been identified with the goal to save on electricity, natural gas, oil, and/or other form of energy consumption since the facilities are operated and occupied by another entity.

10.5 ESTIMATED SAVINGS

Since no action plan exists for this category, no savings are expected.

10.6 PROGRESS TO TARGETS

The City is not targeting any reduction in energy use in **Leased Facilities and Properties** by 2023 over the base year, 2018. However, the energy consumption data will be reported each year for **Leased Facilities and Properties** and will be based on utility meters. Since utility meters monitor energy consumption for the entire facility, the measurement boundary will encompass all parts of the facility. To determine the savings and fairly compare year-to-year energy consumption data, it is important to account for independent variables such as weather and occupancy and apply regression analysis to consumption data. Therefore, actual consumption data for each year starting 2019 will be adjusted to match the weather and occupancy of 2018. The figures below show the updated progress for each year against the set target.

Figure 9-7: Annual Energy Use vs Targeted Energy Use for Leased Facilities and Properties

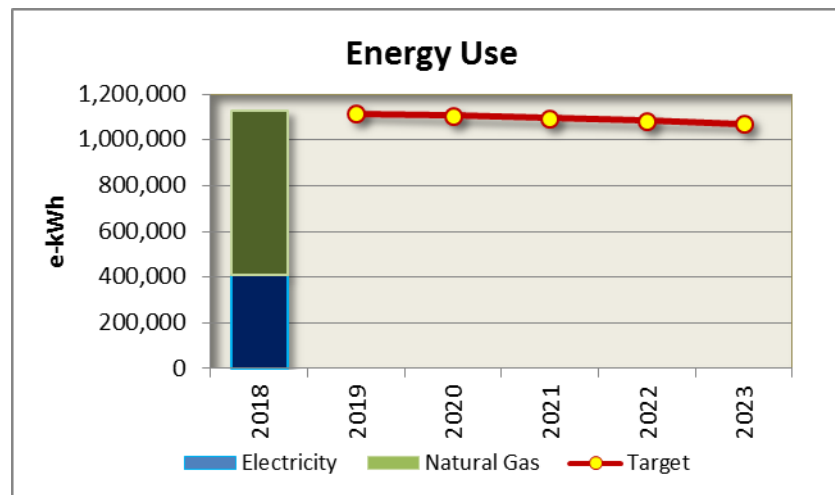
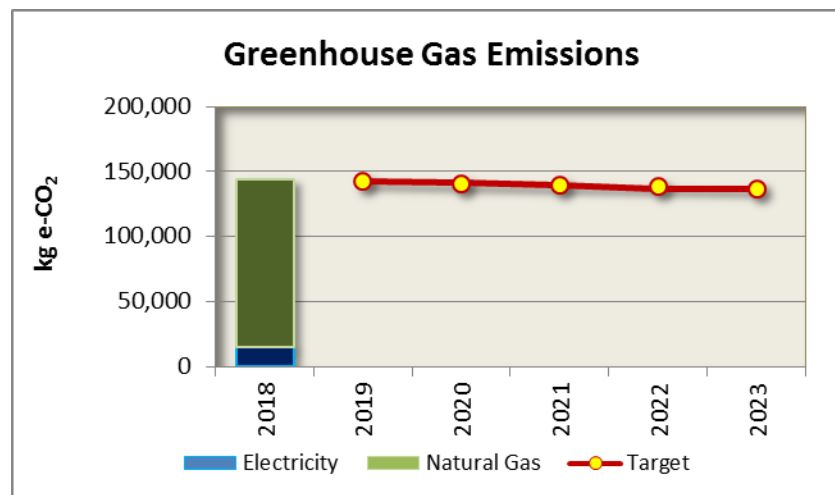


Figure 9-8: Annual GHG Emissions vs Targets for Leased Facilities and Properties



10.7 FACILITY INFORMATION FOR LEASED FACILITIES AND PROPERTIES

Facility: Front Street Pumping Station

Address 105 Lakeshore Rd W, L5H 1E9

Area (m²): 342 Area (ft²): 3,681

Year Built: 1990 Hours per Week : 70

Facility Group: Leased Properties

Building Components:

**Historical Energy and GHG Data**

Year:	2016	2017	2018
Electricity (kWh)	0	0	0
Electricity (\$)	\$0	\$0	\$0
Natural Gas (m ³)	0	0	0
Natural Gas (\$)	\$0	\$0	\$0
Water (m ³)	351	290	252
Water (\$)	\$438	\$381	\$360
Total Costs (\$)	\$438	\$381	\$360
Total e-kWh	0	0	0
Total e-kWh/m ²	0.0	0.0	0.0
GHG (kg/Yr)	0	0	0
GHG (kg/Yr/m ²)	0	0	0

Energy Measures

Facility: Harding Estate

Address 2700 Lakeshore Rd W, L5J 1K3










Area (m²): 764 Area (ft²): 8,224

Year Built: Hours per Week :

Facility Group: Leased Properties

Building Components:

**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	120,034	119,789	132,476	
Electricity (\$)	\$21,156	\$16,436	\$15,610	
Natural Gas (m ³)	18,426	21,404	21,599	
Natural Gas (\$)	\$5,473	\$6,599	\$6,506	
Water (m ³)	4,314	5,746	6,094	
Water (\$)	\$5,411	\$7,586	\$8,745	
Total Costs (\$)	\$32,040	\$30,621	\$30,861	
Total e-kWh	313,507	344,528	359,261	
Total e-kWh/m ²	410.3	451.0	470.2	
GHG (kg/Yr)	39,165	44,787	45,612	
GHG (kg/Yr/m ²)	51	59	60	

Energy Measures

Facility: Riverwood - Art Studio (Visual Arts Mississauga)

Address 4170 Riverwood Park Lane, L5C 2S7










Area (m²): 669 Area (ft²): 7,201

Year Built: Hours per Week :

Facility Group: Leased Properties

Building Components:

**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	167,027	169,040	173,381	
Electricity (\$)	\$26,286	\$22,985	\$19,293	
Natural Gas (m ³)	22,912	23,885	24,151	
Natural Gas (\$)	\$6,655	\$7,381	\$7,133	
Water (m ³)	587	473	638	
Water (\$)	\$1,286	\$1,083	\$1,560	
Total Costs (\$)	\$34,226	\$31,450	\$27,986	
Total e-kWh	407,601	419,834	426,967	
Total e-kWh/m ²	609.3	627.6	638.2	
GHG (kg/Yr)	49,339	51,252	51,911	
GHG (kg/Yr/m ²)	74	77	78	

Energy Measures

Facility: Riverwood - McEwan Estate Barn

Address , L5C 2S7

Area (m²): 228Area (ft²): 4,273

Year Built:

Hours per Week :

Facility Group: Leased Properties

Building Components:

**Historical Energy and GHG Data**

Year:	2016	2017	2018
Electricity (kWh)	0	0	0
Electricity (\$)	\$0	\$0	\$0
Natural Gas (m ³)	0	0	0
Natural Gas (\$)	\$0	\$0	\$0
Water (m ³)	119	342	364
Water (\$)	\$248	\$788	\$900
Total Costs (\$)	\$248	\$788	\$900
Total e-kWh	0	0	0
Total e-kWh/m ²	0.0	0.0	0.0
GHG (kg/Yr)	0	0	0
GHG (kg/Yr/m ²)	0	0	0

Energy Measures

Facility: Russell Langmaid Property

Address 170 Church St, L5M 1M6










Area (m²): 162 Area (ft²): 1,744

Year Built: 0 Hours per Week : 0

Facility Group: Leased Properties

Building Components:

**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	73,589	66,296	71,861	
Electricity (\$)	\$12,287	\$10,572	\$9,162	
Natural Gas (m ³)	19,824	21,159	18,173	
Natural Gas (\$)	\$6,786	\$6,250	\$5,580	
Water (m ³)	791	1,124	1,421	
Water (\$)	\$1,713	\$2,580	\$3,459	
Total Costs (\$)	\$20,787	\$19,403	\$18,201	
Total e-kWh	281,742	288,461	262,681	
Total e-kWh/m ²	1,739.1	1,780.6	1,621.5	
GHG (kg/Yr)	40,137	42,397	36,953	
GHG (kg/Yr/m ²)	248	262	228	

Energy Measures

Facility: Sheridan College Parking Lot

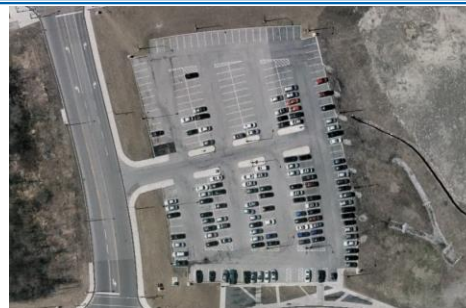
Address 4219 Living Arts Dr,






Area (m²): Area (ft²):

Year Built: Hours per Week :

Facility Group: Leased Properties

Building Components:

**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	21,383	29,899	26,683	
Electricity (\$)	\$4,604	\$4,395	\$3,233	
Natural Gas (m ³)	0	0	0	
Natural Gas (\$)	\$0	\$0	\$0	
Water (m ³)	0	0	0	
Water (\$)	\$0	\$0	\$0	
Total Costs (\$)	\$4,604	\$4,395	\$3,233	
Total e-kWh	21,383	29,899	26,683	
Total e-kWh/m ²	N/A	N/A	N/A	
GHG (kg/Yr)	770	1,076	961	
GHG (kg/Yr/m ²)	N/A	N/A	N/A	

Energy Measures

11.0 LIBRARIES

11.1 SCOPE AND BOUNDARY

The Libraries Group includes all facilities that act as standalone libraries. Libraries located in a community centre are listed under that community centre and would not be included in this section.

For the purposes of this report, the City of Mississauga has 11 facilities/locations that fall under this category. They include:

- Burnhamthorpe Library & Maja Prentice Theatre
- Churchill Meadows Library
- Lakeview Library
- Lorne Park Library
- Meadowvale Library
- Mississauga Central Library
- Port Credit Library
- Sheridan Library
- Streetsville Library
- Woodlands Library
- Woodlands Library (old)

The above listed locations have a total floor area of approximately 46,800 square meters. This would account for 10.1% of the total building area for City of Mississauga facilities included in this Plan.

11.2 BASELINE

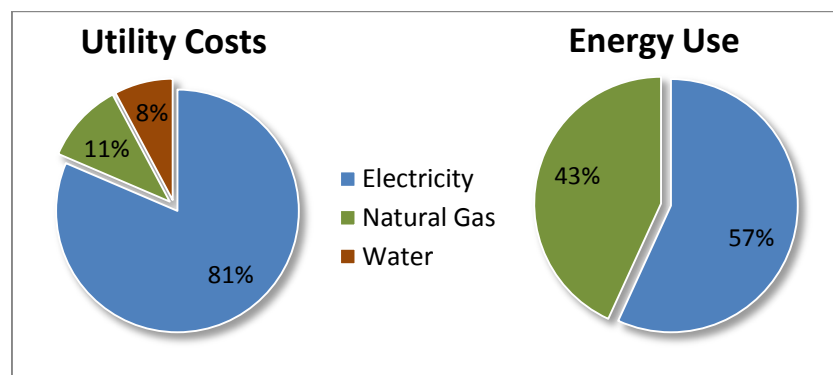
11.2.1 ENERGY USE

The energy use (combined electricity and natural gas) for **Libraries** was 8,390,000 equivalent kilowatt hours in 2018. Following are the key takeaways for the energy usage in 2018:

- 43% of the total energy usage was due to electricity use, which has dropped by 4.0% since 2013
- 57% of the total energy usage was due to natural gas use, which has increased by 2.2% since 2013
- A total of \$850,000 in utility costs was incurred, out of which 81% is attributed to electricity, 11% to natural gas, and 8% to water

Libraries accounted for 4.7% of the City's total utility budget for 2018.

Figure 11-1: Utility Costs and Energy Use Breakdown for Libraries



11.2.2 ENERGY USE INTENSITY

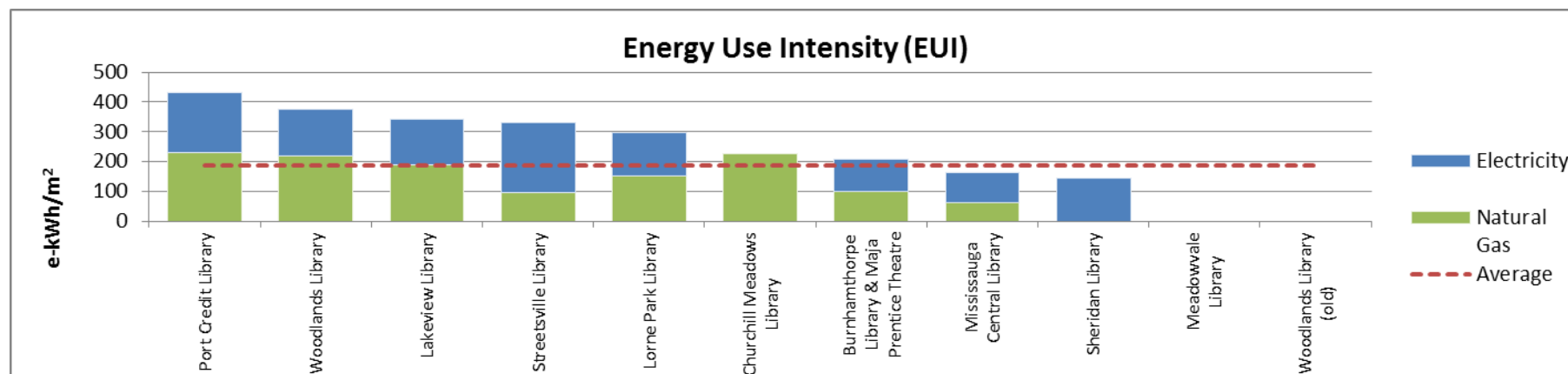
Energy Use Intensity (EUI) is a measurement that expresses a building's energy use as a function of its size or other characteristic. It is used to give a better picture of the energy efficiency of a facility. The lower the EUI, the more efficient the facility is.

When reviewing EUI, the facility operation type and hours should be taken into account. For example, a facility that operates 24 hours a day

will most likely have a higher EUI than a similar one that operates 8 hours a day. Similarly, a facility that has high energy using systems that do not contribute to the building area, such as an outdoor pool or outdoor ice rink, will have a higher EUI than a facility where those systems are located within the facility, as they would add to the facility's area footprint.

For **Libraries** the average EUI in 2018 was 187.4 e-kWh/m².

Figure 11-2: Energy Use Intensity for Libraries



The following chart shows the EUI for each facility within **Libraries**, and compares it to the average for the group.

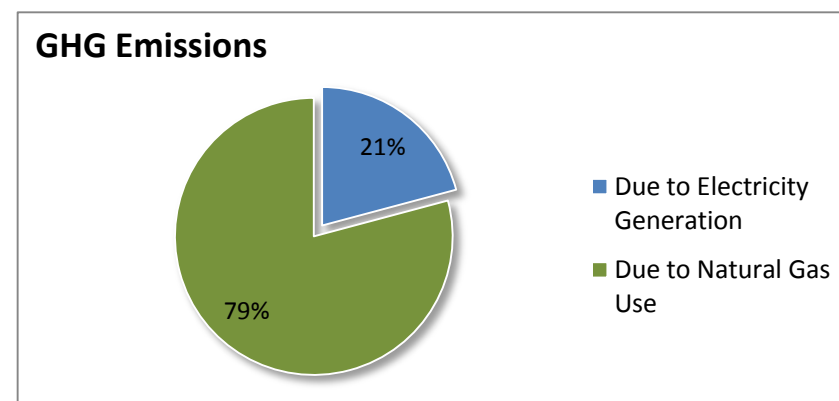
Note: The Average EUI value is calculated by taking the total energy use of all facilities, and dividing by the total area of the facilities. As such, a larger facility would have a bigger impact on the average than a smaller facility.

11.2.3 GREENHOUSE GAS (GHG) EMISSIONS

For 2018, **Libraries** emitted 823,900 kg (or 824 tonnes) of CO₂ in 2018. 20.8% of these emissions were due to the generation of electricity, while the use of natural gas accounted for the remaining 79.2%.

Libraries accounted for 4.2% of the City's total GHG emissions for facilities included in the plan.

Figure 11-3: GHG Emissions Breakdown for Libraries



11.3 ENERGY AND GHG BREAKDOWN FOR LIBRARIES

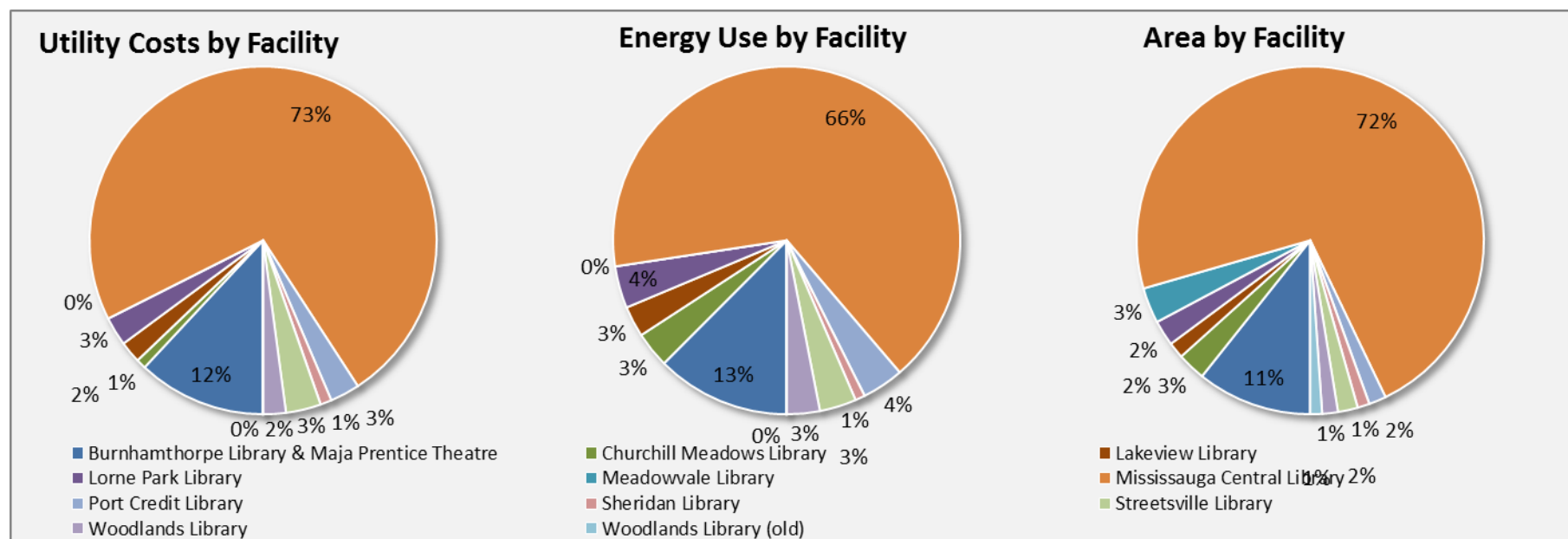
This section provides a brief overview/recap of the Utility and GHG data for **Libraries**. The table below summarizes, by facility, the utility usage and GHG emissions for 2018. Following are the key takeaways:

- Mississauga Central Library is by far the largest facility in this group by area and represents the largest energy consumption (66%) and utility consumption (73%) in this group
- Burnhamthorpe Library & Maja Prentice Theatre represents the second largest facility by area in this group and contributes 13%

and 12% towards the energy consumption and utility consumption in the group

- The remaining nine (9) libraries represent 17% of the facility area in the group and contribute 21% and 15% towards the energy consumption and utility consumption in the group
- Electrical loads such as lighting and fan energy dominate the energy usage in this group
- For this reason, priority was given to the two electricity reduction projects for previous and future planned projects since they greatly reduce utility budget and energy usage

Figure 11-4: Utility Costs and Energy Use Breakdown by Facility



2018 Annual Report for Libraries

Facility	Area	Electricity		Natural Gas		Total Energy	Water		Total Costs	GHG Emissions
	m ²	kWh	\$	m ³	\$	e-kWh	m ³	\$	\$	kg
Burnhamthorpe Library & Maja Prentice Theatre	5,024	542,609	\$85,383	48,169	\$12,999	1,048,383	1,375	\$3,337	\$101,719	110,621
Churchill Meadows Library	1,232	0	\$0	26,625	\$7,731	279,557	0	\$0	\$7,731	50,347
Lakeview Library	705	106,446	\$12,331	12,768	\$4,404	240,513	150	\$363	\$17,098	27,977
Lorne Park Library	1,108	161,378	\$17,672	15,869	\$4,494	328,001	275	\$669	\$22,834	35,818
Meadowvale Library	1,552	0	\$0	0	\$0	0	0	\$0	\$0	0
Mississauga Central Library	33,877	3,419,862	\$514,286	202,537	\$48,731	5,546,501	24,128	\$59,348	\$622,364	506,113
Port Credit Library	754	150,498	\$17,434	16,657	\$5,206	325,396	337	\$820	\$23,460	36,916
Sheridan Library	525	76,565	\$8,982	0	\$0	76,565	0	\$0	\$8,982	2,756
Streetsville Library	867	203,184	\$23,456	8,005	\$3,033	287,240	516	\$1,266	\$27,754	22,453
Woodlands Library	686	107,861	\$12,565	14,284	\$4,777	257,841	228	\$554	\$17,897	30,894
Woodlands Library (old)	511	0	\$0	0	\$0	0	0	\$0	\$0	0
Totals	46,841	4,768,404	\$692,109	344,914	\$91,375	8,389,998	27,009	\$66,356	\$849,840	823,894
Usage / Costs per m²:		109.5	\$15.9	7.8	\$2.1	187	0.6	\$1.5	\$19.0	18.4

11.4 ACTION PLAN

An action plan has been identified with the goal to save on electricity, natural gas, oil, and/or other form of energy consumption within a facility or location.





The following figure shows the various projects and initiatives that have been planned for **Libraries**. The chart shows what projects have been planned, when they are planned to be implemented, and the progress of implementation (if applicable). A brief description of each project has been noted below:

- **Energy Upgrades for Lifecycle Replacements:** Includes energy upgrades for high capital assets that show economic paybacks only at the time of replacement like envelope and HVAC equipment
- **Lighting Upgrades:** Includes replacement of existing lighting technologies to newer technologies like LEDs, and better controls through localized sensors and BAS scheduling

For the chart below, the **Purple** coloured bars represent the original planned start and completion of a Measure type. The **Green** bar beneath shows the actual start and completion times for a completed measure, while the **Blue** bar shows the actual start time of a Measure that is currently being implemented, but not yet complete. Some Notes:

- A Single Measure timeline may include more than one implementation of that measure (example: In different facilities).
- Due to changing circumstances (change in operations, budget changes, new technology, etc.), a planned measure may be cancelled. These would be indicated by a **Red** plan bar on the chart.

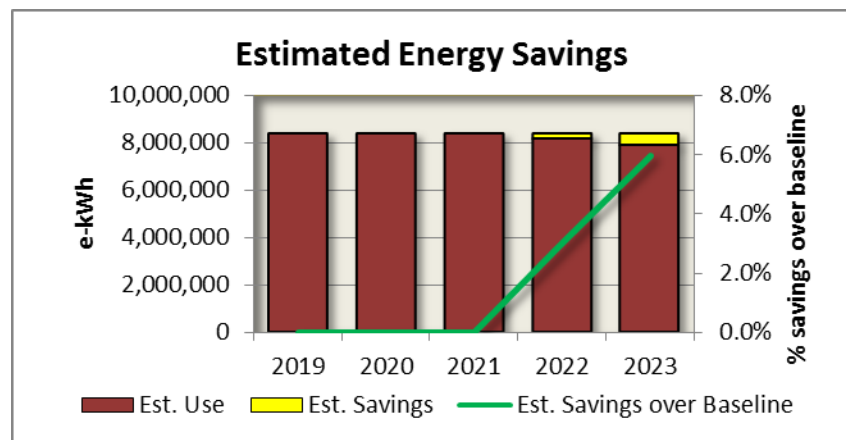
Figure 11-5: Energy Measure Implementation Plan for Libraries

Energy Measure	2019				2020				2021				2022				2023			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Energy Upgrades for Lifecycle Replacements																				
Lighting Upgrades																				
Planned Implementation					Scheduled Implentation								Cancelled Implementation				Q1 = Jan-Mar Q3 = Jul-Sep			
Actual Implementation					Status = Completed								Status = Underway							

11.5 ESTIMATED SAVINGS

At the end of the plan, **Libraries** are expected to save 6.0% over the base year of 2018, which amounts to a total of \$69,000 from all the projects.

Figure 11-6: Energy Measure Annual Savings for Libraries



11.6 PROGRESS TO TARGETS

The City is targeting a 6.0% reduction in energy use in **Libraries** by 2023 over the base year, 2018. The reporting of energy consumption data and savings for **Libraries** will be based on utility meters and assembled annually. Since utility meters monitor energy consumption for the entire facility, the measurement boundary will encompass all parts of the facility. To determine the savings and fairly compare year-to-year energy consumption data, it is important to account for independent variables such as weather and occupancy and apply regression analysis to consumption data. Therefore, actual consumption data for each year starting 2019 will be adjusted to match the weather and occupancy of 2018. The figures below show the updated progress for each year against the set target.

Figure 11-7: Annual Energy Use vs Targeted Energy Use for Libraries

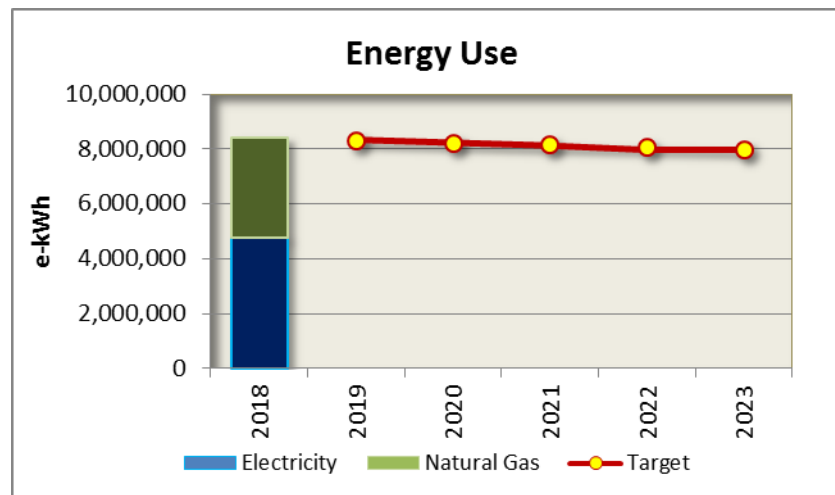
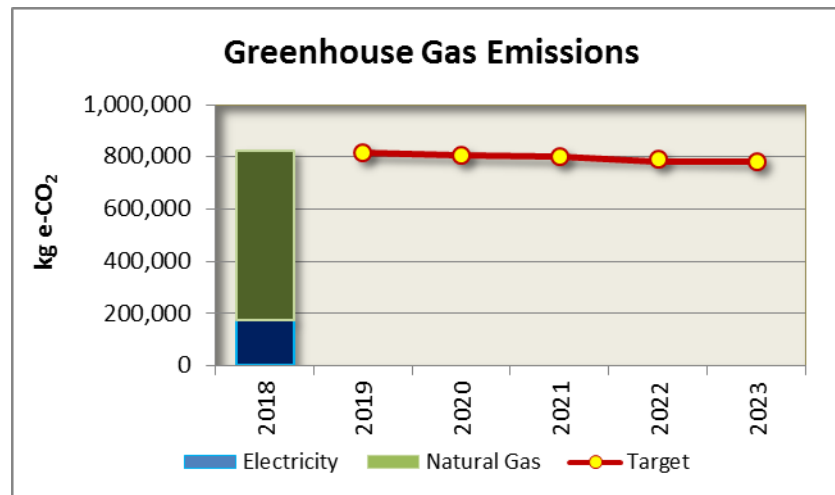


Figure 11-8: Annual GHG Emissions vs Targets for Libraries



11.7 FACILITY INFORMATION FOR LIBRARIES

Facility: Burnhamthorpe Library & Maja Prentice Theatre

Address 3650 Dixie Rd, L4Y 3V9










Area (m²): 5,024 Area (ft²): 54,078

Year Built: 1976 Hours per Week : 72

Facility Group: Library

Building Components: Library; Theatre

**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	535,744	528,336	542,609	
Electricity (\$)	\$87,885	\$85,835	\$85,383	
Natural Gas (m ³)	51,761	53,924	48,169	
Natural Gas (\$)	\$13,149	\$15,568	\$12,999	
Water (m ³)	1,868	2,017	1,375	
Water (\$)	\$4,069	\$4,597	\$3,337	
Total Costs (\$)	\$105,103	\$106,000	\$101,719	
Total e-kWh	1,079,237	1,094,537	1,048,383	
Total e-kWh/m ²	214.8	217.9	208.7	
GHG (kg/Yr)	117,167	120,990	110,621	
GHG (kg/Yr/m ²)	23	24	22	

Energy Measures

Lighting Upgrades

Facility: Churchill Meadows Library

Address 3801 Thomas St., L5M 7G2






Area (m²): 1,232 Area (ft²): 13,261

Year Built: 2008 Hours per Week : 72

Facility Group: Library

Building Components: Library

**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	0	0	0	
Electricity (\$)	\$0	\$0	\$0	
Natural Gas (m ³)	26,155	24,690	26,625	
Natural Gas (\$)	\$7,532	\$7,396	\$7,731	
Water (m ³)	0	0	0	
Water (\$)	\$0	\$0	\$0	
Total Costs (\$)	\$7,532	\$7,396	\$7,731	
Total e-kWh	274,625	259,241	279,557	
Total e-kWh/m ²	222.9	210.4	226.9	
GHG (kg/Yr)	49,459	46,688	50,347	
GHG (kg/Yr/m ²)	40	38	41	

Energy Measures

Lighting Upgrades

Facility: Lakeview Library

Address 1110 Atwater Ave, L5E 1M9










Area (m²): 705 Area (ft²): 7,589

Year Built: 1967 Hours per Week : 49

Facility Group: Library

Building Components: Library

**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	103,993	105,153	106,446	
Electricity (\$)	\$18,055	\$14,943	\$12,331	
Natural Gas (m ³)	12,384	12,063	12,768	
Natural Gas (\$)	\$3,863	\$4,145	\$4,404	
Water (m ³)	155	153	150	
Water (\$)	\$338	\$349	\$363	
Total Costs (\$)	\$22,255	\$19,437	\$17,098	
Total e-kWh	234,023	231,816	240,513	
Total e-kWh/m ²	331.9	328.8	341.2	
GHG (kg/Yr)	27,162	26,597	27,977	
GHG (kg/Yr/m ²)	39	38	40	

Energy Measures

Facility: Lorne Park Library

Address 1474 Truscott Dr, L5J 1Z2










Area (m²): 1,108 Area (ft²): 11,926

Year Built: 1967 Hours per Week : 72

Facility Group: Library

Building Components: Library

**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	139,879	151,828	161,378	
Electricity (\$)	\$24,505	\$22,719	\$17,672	
Natural Gas (m ³)	24,167	28,644	15,869	
Natural Gas (\$)	\$6,771	\$8,320	\$4,494	
Water (m ³)	257	297	275	
Water (\$)	\$581	\$679	\$669	
Total Costs (\$)	\$31,857	\$31,718	\$22,834	
Total e-kWh	393,627	452,591	328,001	
Total e-kWh/m ²	355.3	408.5	296.0	
GHG (kg/Yr)	50,735	59,632	35,818	
GHG (kg/Yr/m ²)	46	54	32	

Energy Measures

Facility: Meadowvale Library

Address 6677 Meadowvale T.Cen., L5N 2R5








Area (m²): 1,552 Area (ft²): 16,706

Year Built: 2002 Hours per Week : 69

Facility Group: Library

Building Components: Library

**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	141,628	0	0	
Electricity (\$)	\$24,310	\$0	\$0	
Natural Gas (m ³)	19,751	9,298	0	
Natural Gas (\$)	\$6,407	\$3,105	\$0	
Water (m ³)	0	0	0	
Water (\$)	\$0	\$0	\$0	
Total Costs (\$)	\$30,717	\$3,105	\$0	
Total e-kWh	349,009	97,631	0	
Total e-kWh/m ²	224.9	62.9	0.0	
GHG (kg/Yr)	42,447	17,583	0	
GHG (kg/Yr/m ²)	27	11	0	

Energy Measures

Facility: Mississauga Central Library

Address 301 Burnhamthorpe, L5B 3Y3

Area (m²): 33,877Area (ft²): 364,649










Year Built: 1990

Hours per Week : 64

Facility Group: Library

Building Components: Auditorium; Library; Underground Parking

**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	3,386,337	3,301,197	3,419,862	
Electricity (\$)	\$538,561	\$498,311	\$514,286	
Natural Gas (m ³)	167,457	168,868	202,537	
Natural Gas (\$)	\$39,683	\$44,412	\$48,731	
Water (m ³)	11,404	10,973	24,128	
Water (\$)	\$24,906	\$25,176	\$59,348	
Total Costs (\$)	\$603,150	\$567,898	\$622,364	
Total e-kWh	5,144,637	5,074,316	5,546,501	
Total e-kWh/m ²	151.9	149.8	163.7	
GHG (kg/Yr)	438,570	438,173	506,113	
GHG (kg/Yr/m ²)	13	13	15	

Energy Measures

Energy Upgrades for Lifecycle Replacements
 Metering & Sub-metering Equipment
 Operation Optimization
 Lighting Upgrades

Facility: Port Credit Library

Address 20 Lakeshore Rd E, L5G 1C8










Area (m²): 754 Area (ft²): 8,116

Year Built: 1962 Hours per Week : 53

Facility Group: Library

Building Components: Library

**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	117,756	117,233	150,498	
Electricity (\$)	\$19,556	\$16,174	\$17,434	
Natural Gas (m ³)	22,811	14,956	16,657	
Natural Gas (\$)	\$6,383	\$4,848	\$5,206	
Water (m ³)	337	330	337	
Water (\$)	\$733	\$756	\$820	
Total Costs (\$)	\$26,672	\$21,778	\$23,460	
Total e-kWh	357,268	274,268	325,396	
Total e-kWh/m ²	473.8	363.8	431.6	
GHG (kg/Yr)	47,374	32,502	36,916	
GHG (kg/Yr/m ²)	63	43	49	

Energy Measures

Facility: Sheridan Library

Address 2225 Erin Mills Parkway #149, L5K 1T9






Area (m²): 525 Area (ft²): 5,651

Year Built: 1970 Hours per Week : 57

Facility Group: Library

Building Components: Library

**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	76,717	78,320	76,565	
Electricity (\$)	\$12,874	\$11,209	\$8,982	
Natural Gas (m ³)	0	0	0	
Natural Gas (\$)	\$0	\$0	\$0	
Water (m ³)	0	0	0	
Water (\$)	\$0	\$0	\$0	
Total Costs (\$)	\$12,874	\$11,209	\$8,982	
Total e-kWh	76,717	78,320	76,565	
Total e-kWh/m ²	146.1	149.2	145.8	
GHG (kg/Yr)	2,762	2,820	2,756	
GHG (kg/Yr/m ²)	5	5	5	

Energy Measures

Facility: Streetsville Library

Address 112 Queen St S, L5M 1K8

Area (m²): 867Area (ft²): 9,332










Year Built: 1967

Hours per Week : 59

Facility Group: Library

Building Components: Library

**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	160,527	184,644	203,184	
Electricity (\$)	\$26,301	\$25,865	\$23,456	
Natural Gas (m ³)	9,892	10,255	8,005	
Natural Gas (\$)	\$3,438	\$3,646	\$3,033	
Water (m ³)	887	504	516	
Water (\$)	\$1,946	\$1,155	\$1,266	
Total Costs (\$)	\$31,686	\$30,665	\$27,754	
Total e-kWh	264,389	292,316	287,240	
Total e-kWh/m ²	304.9	337.2	331.3	
GHG (kg/Yr)	24,484	26,038	22,453	
GHG (kg/Yr/m ²)	28	30	26	

Energy Measures

Lighting Upgrades

Facility: Woodlands Library

Address 3255 Erindale Station Rd, L5C 1L6










Area (m²): 686 Area (ft²): 7,384

Year Built: 2014 Hours per Week : 57

Facility Group: Library

Building Components: Library

**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	102,496	103,207	107,861	
Electricity (\$)	\$17,827	\$14,741	\$12,565	
Natural Gas (m ³)	10,801	15,699	14,284	
Natural Gas (\$)	\$3,517	\$4,969	\$4,777	
Water (m ³)	240	259	228	
Water (\$)	\$522	\$593	\$554	
Total Costs (\$)	\$21,866	\$20,303	\$17,897	
Total e-kWh	215,908	268,044	257,841	
Total e-kWh/m ²	314.7	390.7	375.9	
GHG (kg/Yr)	24,115	33,402	30,894	
GHG (kg/Yr/m ²)	35	49	45	

Energy Measures

12.0 COMMUNITY HALLS, MARINAS, AND ANIMAL SERVICES

12.1 SCOPE AND BOUNDARY

For the purposes of this report, the City of Mississauga has 16 facilities/locations that fall under this category. They include:

- 69 Church St
- Adamson Estate - Barn
- Adamson Estate - Derry House
- Adamson Estate - Main House
- Animal Services Centre
- Brookmeade Centre
- Cawthra Elliot Estate - House
- Clarke Memorial Hall
- Credit Village Marina
- Erindale Community Hall
- Lakefront Promenade Marina
- Lorne Park Hall
- Malton Hall (Victory)
- Mississauga Canoe Club
- Streetsville Village Hall
- Streetsville Kinsmen Hall

The above listed locations have a total floor area of approximately 7,900 square meters. This would account for 1.7% of the total building area for City of Mississauga facilities included in this Plan.

12.2 BASELINE

12.2.1 ENERGY USE

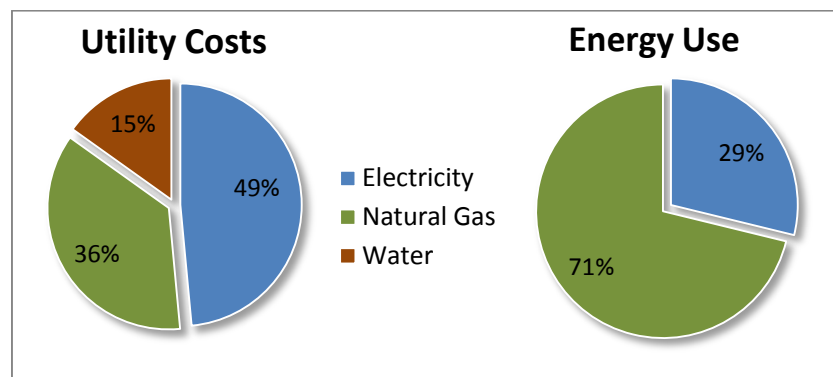
The energy use (combined electricity and natural gas) for **Community Halls, Marinas, and Animal Services** was 2,406,000 equivalent kilowatt

hours in 2018. Following are the key takeaways for the energy usage in 2018:

- 29% of the total energy usage was due to electricity use, which has increased by 37.6% since 2013
- 71% of the total energy usage was due to natural gas use, which has dropped by 6.4% since 2013
- A total of \$166,000 in utility costs was incurred, out of which 49% is attributed to electricity, 36% to natural gas, and 15% to water

Community Halls, Marinas, and Animal Services accounted for 0.9% of the City's total utility budget for 2018.

Figure 12-1: Utility Costs and Energy Use Breakdown for Community Halls, Marinas, and Animal Services



12.2.2 ENERGY USE INTENSITY

Energy Use Intensity (EUI) is a measurement that expresses a building's energy use as a function of its size or other characteristic. It is used to

give a better picture of the energy efficiency of a facility. The lower the EUI, the more efficient the facility is.

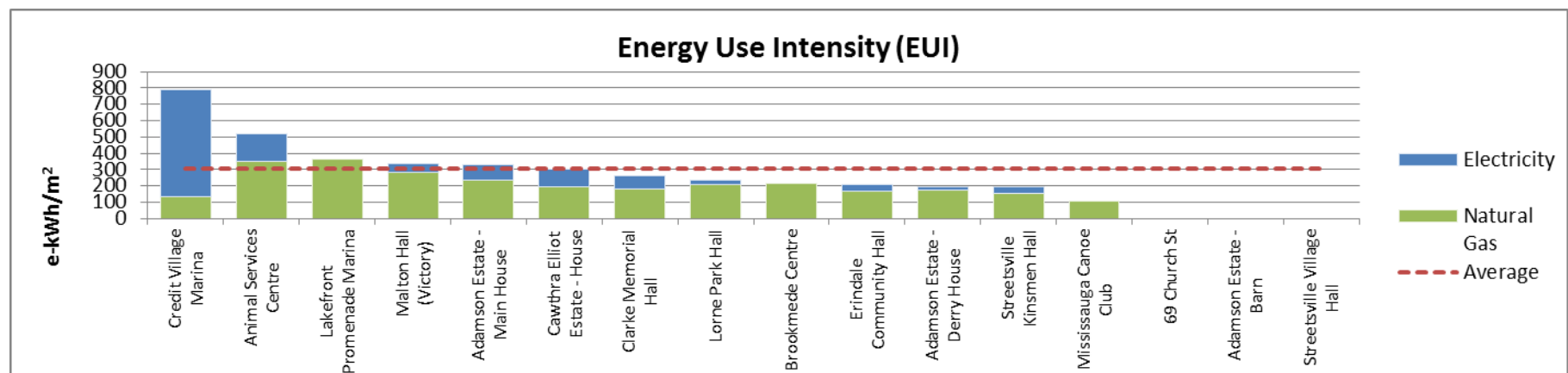
When reviewing EUI, the facility operation type and hours should be taken into account. For example, a facility that operates 24 hours a day will most likely have a higher EUI than a similar one that operates 8 hours a day. Similarly, a facility that has high energy using systems that do not contribute to the building area, such as an outdoor pool or outdoor ice rink, will have a higher EUI than a facility where those systems are located within the facility, as they would add to the facility's area footprint.

For **Community Halls, Marinas, and Animal Services** the average EUI in 2018 was 307.8 e-kWh/m².

The following chart shows the EUI for each facility within **Community Halls, Marinas, and Animal Services**, and compares it to the average for the group.

Note: The Average EUI value is calculated by taking the total energy use of all facilities, and dividing by the total area of the facilities. As such, a larger facility would have a bigger impact on the average than a smaller facility.

Figure 12-2: Energy Use Intensity for Community Halls, Marinas, and Animal Services

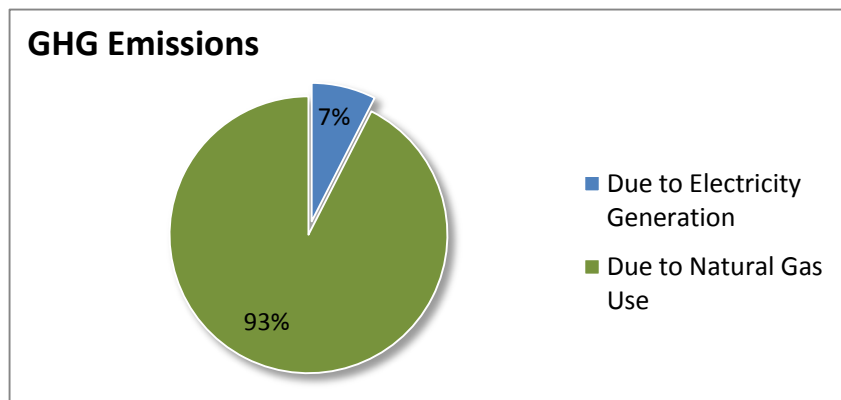


12.2.3 GREENHOUSE GAS (GHG) EMISSIONS

For 2018, **Community Halls, Marinas, and Animal Services** emitted 333,400 kg (or 333 tonnes) of CO₂ in 2018. 7.5% of these emissions were due to the generation of electricity, while the use of natural gas accounted for the remaining 92.5%.

Community Halls, Marinas, and Animal Services accounted for 1.7% of the City's total GHG emissions for facilities included in the plan.

Figure 12-3: GHG Emissions Breakdown for Community Halls, Marinas, and Animal Services



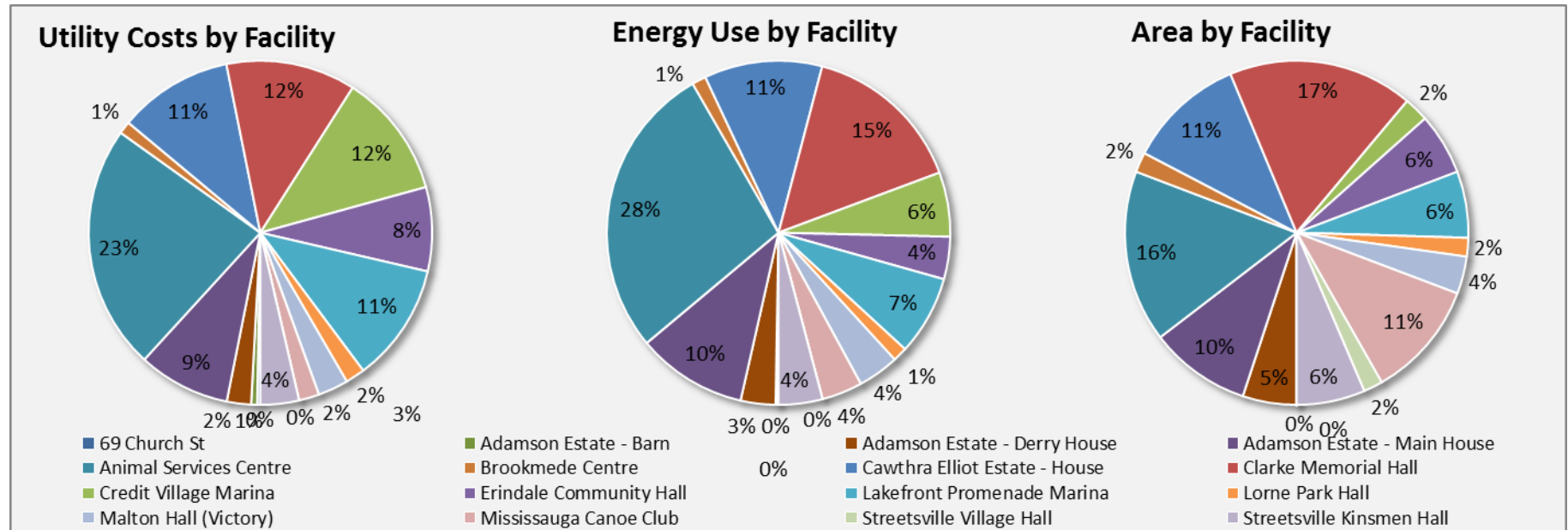
12.3 ENERGY AND GHG BREAKDOWN FOR COMMUNITY HALLS, MARINAS, AND ANIMAL SERVICES

This section provides a brief overview/recap of the Utility and GHG data for **Community Halls, Marinas, and Animal Services**. The table below

summarizes, by facility, the utility usage and GHG emissions for 2018. Following are the key takeaways:

- Clarke Memorial Hall, Erindale Community Hall, Streetsville Kinsmen Hall, Malton Hall, Lorne Park Hall, Streetsville Village Hall, represent 37% of the floor area in the group and contribute 28% and 29% towards the energy consumption and utility consumption in the group
- The two estates: Adamson Estate and Cawthra Elliot Estate, represent 26% of the floor area in the group and contribute 24% and 22% towards the energy consumption and utility consumption in the group
- Animal Services Centre represents the second largest facility by area in this group and contributes 28% and 23% towards the energy consumption and utility consumption in the group

Figure 12-4: Utility Costs and Energy Use Breakdown by Facility



2018 Annual Report for Community Halls, Marinas, and Animal Services

Facility	Area	Electricity		Natural Gas		Total Energy	Water		Total Costs	GHG Emissions
	m ²	kWh	\$	m ³	\$	e-kWh	m ³	\$	\$	kg
69 Church St	0	2,631	\$504	0	\$0	2,631	0	\$0	\$504	95
Adamson Estate - Barn	0	3,888	\$926	0	\$0	3,888	0	\$0	\$926	140
Adamson Estate - Derry House	403	9,074	\$1,136	6,657	\$2,657	78,968	0	\$0	\$3,793	12,914
Adamson Estate - Main House	757	69,866	\$8,067	17,128	\$5,368	249,708	385	\$941	\$14,376	34,904
Animal Services Centre	1,283	214,567	\$23,966	43,096	\$11,814	667,077	1,021	\$2,482	\$38,262	89,219
Brookmeade Centre	149	0	\$0	3,047	\$1,598	31,994	144	\$351	\$1,949	5,762
Cawthra Elliot Estate - House	877	97,613	\$11,258	16,156	\$5,083	267,252	627	\$1,539	\$17,879	34,065
Clarke Memorial Hall	1,383	114,632	\$13,021	23,964	\$7,085	366,249	64	\$156	\$20,262	49,442
Credit Village Marina	184	120,776	\$13,035	2,359	\$1,508	145,540	1,967	\$4,854	\$19,397	8,808
Erindale Community Hall	460	19,585	\$2,607	7,266	\$10,239	95,880	101	\$244	\$13,090	14,445
Lakefront Promenade Marina	495	0	\$0	17,114	\$5,453	179,692	5,324	\$13,072	\$18,525	32,362
Lorne Park Hall	139	3,881	\$932	2,736	\$1,614	32,605	198	\$490	\$3,036	5,313
Malton Hall (Victory)	279	14,210	\$2,055	7,511	\$2,330	93,073	144	\$351	\$4,735	14,714
Mississauga Canoe Club	875	0	\$0	8,757	\$2,855	91,945	133	\$327	\$3,182	16,559
Streetsville Village Hall	143	0	\$0	0	\$0	0	0	\$0	\$0	0

Streetsville Kinsmen Hall	511	22,573	\$2,990	7,312	\$2,716	99,352	108	\$298	\$6,004	14,640
Totals	7,938	693,295	\$80,496	163,101	\$60,319	2,405,853	10,214	\$25,104	\$165,919	333,382
Usage / Costs per m²:		109.4	\$12.6	20.9	\$7.7	308	1.4	\$3.4	\$21.1	42.7

12.4 ACTION PLAN

An action plan has not been identified to save on electricity, natural gas, oil, and/or other form of energy consumption within this group since the group represent less than 1.0% of the City's utility budget.

12.5 ESTIMATED SAVINGS

At the end of the plan, **Community Halls, Marinas, and Animal Services** are not expected to save since no action plan has been identified for the group.

12.6 PROGRESS TO TARGETS

The City is not targeting reduction in energy use in **Community Halls, Marinas, and Animal Services** by 2023 over the base year, 2018. The reporting of energy consumption data and savings for **Community Halls, Marinas, and Animal Services** will be based on utility meters and assembled annually. Since utility meters monitor energy consumption for the entire facility, the measurement boundary will encompass all parts of the facility. To determine the savings and fairly compare year-to-year energy consumption data, it is important to account for independent variables such as weather and occupancy and apply regression analysis to consumption data. Therefore, actual consumption data for each year starting 2019 will be adjusted to match the weather and occupancy of 2018. The figures below show the updated progress for each year against the set target.

Figure 12-7: Annual Energy Use vs Targeted Energy Use for Community Halls, Marinas, and Animal Services

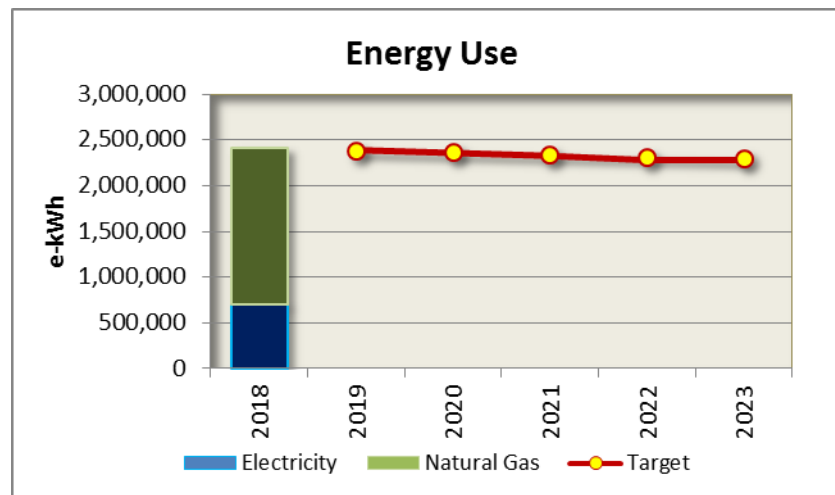
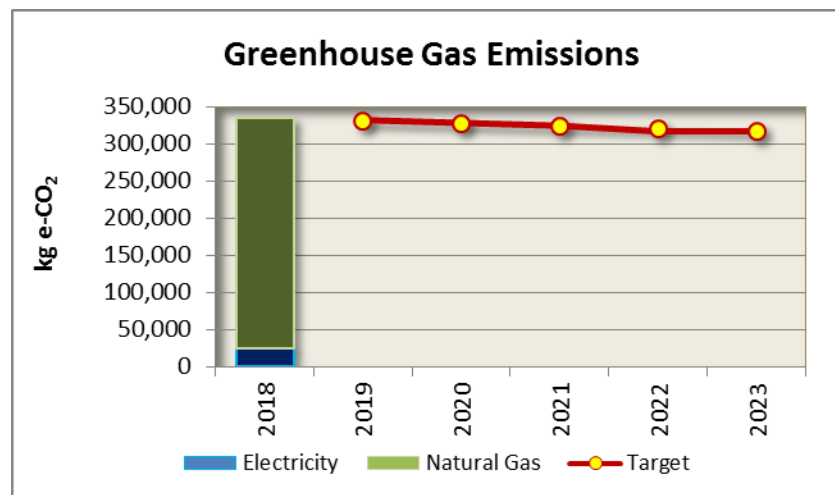


Figure 12-8: Annual GHG Emissions vs Targets for Community Halls, Marinas, and Animal Services



12.7 FACILITY INFORMATION FOR COMMUNITY HALLS, MARINAS, AND ANIMAL SERVICES

Facility: 69 Church St

Address 69 Church St.,

Area (m²):Area (ft²):

Year Built:

Hours per Week :

Facility Group: Minor Centres/Halls

Building Components:

**Historical Energy and GHG Data**

Year:	2016	2017	2018
Electricity (kWh)	0	0	2,631
Electricity (\$)	\$0	\$0	\$504
Natural Gas (m ³)	0	0	0
Natural Gas (\$)	\$0	\$0	\$0
Water (m ³)	0	0	0
Water (\$)	\$0	\$0	\$0
Total Costs (\$)	\$0	\$0	\$504
Total e-kWh	0	0	2,631
Total e-kWh/m ²	N/A	N/A	N/A
GHG (kg/Yr)	0	0	95
GHG (kg/Yr/m ²)	N/A	N/A	N/A

Energy Measures

Facility: Adamson Estate - Barn

Address 850 Enola Avenue, L5G 4B2






Area (m²): Area (ft²):

Year Built: 1920 Hours per Week : 0

Facility Group: Minor Centres/Halls

Building Components:

**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	3,866	4,092	3,888	
Electricity (\$)	\$1,186	\$1,095	\$926	
Natural Gas (m ³)	0	0	0	
Natural Gas (\$)	\$0	\$0	\$0	
Water (m ³)	0	0	0	
Water (\$)	\$0	\$0	\$0	
Total Costs (\$)	\$1,186	\$1,095	\$926	
Total e-kWh	3,866	4,092	3,888	
Total e-kWh/m ²	N/A	N/A	N/A	
GHG (kg/Yr)	139	147	140	
GHG (kg/Yr/m ²)	N/A	N/A	N/A	

Energy Measures

Facility: Adamson Estate - Derry House

Address 875 Enola Avenue, L5G 4R1










Area (m²): 403 Area (ft²): 4,435

Year Built: 1932 Hours per Week : 50

Facility Group: Minor Centres/Halls

Building Components:

**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	4,951	8,312	9,074	
Electricity (\$)	\$1,142	\$1,258	\$1,136	
Natural Gas (m ³)	7,025	6,425	6,657	
Natural Gas (\$)	\$2,641	\$2,639	\$2,657	
Water (m ³)	498	262	0	
Water (\$)	\$1,030	\$562	\$0	
Total Costs (\$)	\$4,813	\$4,458	\$3,793	
Total e-kWh	78,717	75,775	78,968	
Total e-kWh/m ²	195.3	188.0	195.9	
GHG (kg/Yr)	13,463	12,449	12,914	
GHG (kg/Yr/m ²)	33	31	32	

Energy Measures

Facility: Adamson Estate - Main House

Address 850 Enola Ave, L5B 3C1










Area (m²): 757 Area (ft²): 8,816

Year Built: 1920 Hours per Week : 50

Facility Group: Minor Centres/Halls

Building Components:

**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	74,231	71,056	69,866	
Electricity (\$)	\$12,382	\$10,586	\$8,067	
Natural Gas (m ³)	16,432	17,030	17,128	
Natural Gas (\$)	\$4,586	\$5,399	\$5,368	
Water (m ³)	1,049	906	385	
Water (\$)	\$2,306	\$2,085	\$941	
Total Costs (\$)	\$19,275	\$18,070	\$14,376	
Total e-kWh	246,769	249,874	249,708	
Total e-kWh/m ²	326.0	330.1	329.9	
GHG (kg/Yr)	33,746	34,762	34,904	
GHG (kg/Yr/m ²)	45	46	46	

Energy Measures

Facility: Animal Services Centre

Address 735 Central Parkway W, L5C 4H4










Area (m²): 1,283 Area (ft²): 13,810

Year Built: 1987 Hours per Week : 50

Facility Group: Minor Centres/Halls

Building Components:

**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	199,619	232,364	214,567	
Electricity (\$)	\$32,710	\$32,237	\$23,966	
Natural Gas (m ³)	44,534	33,088	43,096	
Natural Gas (\$)	\$12,144	\$9,970	\$11,814	
Water (m ³)	1,357	1,193	1,021	
Water (\$)	\$2,962	\$2,722	\$2,482	
Total Costs (\$)	\$47,815	\$44,929	\$38,262	
Total e-kWh	667,229	579,793	667,077	
Total e-kWh/m ²	520.1	451.9	519.9	
GHG (kg/Yr)	91,401	70,935	89,219	
GHG (kg/Yr/m ²)	71	55	70	

Energy Measures

Facility: Brookmede Centre

Address 2250 Council Ring Road, L5L 1B7

Area (m²): 149 Area (ft²): 1,604

Year Built: 1973 Hours per Week : 84

Facility Group: Minor Centres/Halls

Building Components:

**Historical Energy and GHG Data**

Year:	2016	2017	2018
Electricity (kWh)	0	0	0
Electricity (\$)	\$0	\$0	\$0
Natural Gas (m ³)	2,481	2,513	3,047
Natural Gas (\$)	\$1,520	\$1,584	\$1,598
Water (m ³)	27	95	144
Water (\$)	\$137	\$217	\$351
Total Costs (\$)	\$1,657	\$1,801	\$1,949
Total e-kWh	26,045	26,386	31,994
Total e-kWh/m ²	174.8	177.1	214.7
GHG (kg/Yr)	4,691	4,752	5,762
GHG (kg/Yr/m ²)	31	32	39

Energy Measures

Facility: Cawthra Elliot Estate - House

Address 1507 Cawthra Rd, L5G 4L1










Area (m²): 877 Area (ft²): 9,655

Year Built: 1926 Hours per Week : 70

Facility Group: Minor Centres/Halls

Building Components:

**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	96,730	100,633	97,613	
Electricity (\$)	\$15,962	\$14,279	\$11,258	
Natural Gas (m ³)	14,935	15,542	16,156	
Natural Gas (\$)	\$4,691	\$5,011	\$5,083	
Water (m ³)	1,335	948	627	
Water (\$)	\$2,983	\$2,182	\$1,539	
Total Costs (\$)	\$23,636	\$21,471	\$17,879	
Total e-kWh	253,547	263,825	267,252	
Total e-kWh/m ²	289.1	300.8	304.7	
GHG (kg/Yr)	31,724	33,013	34,065	
GHG (kg/Yr/m ²)	36	38	39	

Energy Measures

Facility: Clarke Memorial Hall

Address 161 Lakeshore Rd W, L5H 1G3










Area (m²): 1,383 Area (ft²): 14,886

Year Built: 1921 Hours per Week : 72

Facility Group: Minor Centres/Halls

Building Components:

**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	142,509	119,068	114,632	
Electricity (\$)	\$23,475	\$17,026	\$13,021	
Natural Gas (m ³)	16,622	21,520	23,964	
Natural Gas (\$)	\$5,061	\$6,684	\$7,085	
Water (m ³)	193	1,044	64	
Water (\$)	\$408	\$2,383	\$156	
Total Costs (\$)	\$28,943	\$26,093	\$20,262	
Total e-kWh	317,039	345,025	366,249	
Total e-kWh/m ²	229.2	249.5	264.8	
GHG (kg/Yr)	36,562	44,980	49,442	
GHG (kg/Yr/m ²)	26	33	36	

Energy Measures

Facility: Credit Village Marina

Address 12 Stavebank Rd S, L5G 2T1










Area (m²): 184 Area (ft²): 1,981

Year Built: 1998 Hours per Week : 70

Facility Group: Minor Centres/Halls

Building Components:

**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	117,380	135,397	120,776	
Electricity (\$)	\$17,775	\$16,500	\$13,035	
Natural Gas (m ³)	3,572	3,463	2,359	
Natural Gas (\$)	\$1,561	\$1,924	\$1,508	
Water (m ³)	2,299	1,929	1,967	
Water (\$)	\$5,054	\$4,453	\$4,854	
Total Costs (\$)	\$24,390	\$22,876	\$19,397	
Total e-kWh	154,884	171,760	145,540	
Total e-kWh/m ²	841.8	933.5	791.0	
GHG (kg/Yr)	10,980	11,423	8,808	
GHG (kg/Yr/m ²)	60	62	48	

Energy Measures

Facility: Erindale Community Hall

Address 1620 Dundas St. W, L5C 1E6










Area (m²): 460 Area (ft²): 4,951

Year Built: 0 Hours per Week: 72

Facility Group: Minor Centres/Halls

Building Components:

**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	18,155	18,805	19,585	
Electricity (\$)	\$3,408	\$2,836	\$2,607	
Natural Gas (m ³)	7,536	7,036	7,266	
Natural Gas (\$)	\$2,791	\$2,796	\$10,239	
Water (m ³)	76	143	101	
Water (\$)	\$165	\$328	\$244	
Total Costs (\$)	\$6,364	\$5,960	\$13,090	
Total e-kWh	97,284	92,683	95,880	
Total e-kWh/m ²	211.5	201.5	208.4	
GHG (kg/Yr)	14,904	13,982	14,445	
GHG (kg/Yr/m ²)	32	30	31	

Energy Measures

Facility: Lakefront Promenade Marina

Address 135 Lakefront Promenade, L5E 3G6

Area (m²): 495 Area (ft²): 5,328

Year Built: 1991 Hours per Week : 70

Facility Group: Minor Centres/Halls

Building Components:

**Historical Energy and GHG Data**

Year:	2016	2017	2018
Electricity (kWh)	0	0	0
Electricity (\$)	\$0	\$0	\$0
Natural Gas (m ³)	14,712	15,935	17,114
Natural Gas (\$)	\$8,358	\$7,904	\$5,453
Water (m ³)	2,432	3,386	5,324
Water (\$)	\$5,369	\$7,794	\$13,072
Total Costs (\$)	\$13,727	\$15,698	\$18,525
Total e-kWh	154,477	167,322	179,692
Total e-kWh/m ²	312.1	338.0	363.0
GHG (kg/Yr)	27,821	30,134	32,362
GHG (kg/Yr/m ²)	56	61	65

Energy Measures

Facility: Lorne Park Hall

Address 1288 Lorne Park Road, L5H 3B1

Area (m²): 139 Area (ft²): 1,496

Year Built: 1940 Hours per Week : 72

Facility Group: Minor Centres/Halls

Building Components:

**Historical Energy and GHG Data**

Year:	2016	2017	2018
Electricity (kWh)	1,279	2,370	3,881
Electricity (\$)	\$736	\$851	\$932
Natural Gas (m ³)	2,763	2,815	2,736
Natural Gas (\$)	\$1,594	\$1,678	\$1,614
Water (m ³)	225	180	198
Water (\$)	\$498	\$415	\$490
Total Costs (\$)	\$2,828	\$2,944	\$3,036
Total e-kWh	30,290	31,925	32,605
Total e-kWh/m ²	217.9	229.7	234.6
GHG (kg/Yr)	5,271	5,408	5,313
GHG (kg/Yr/m ²)	38	39	38

Energy Measures

Facility: Malton Hall (Victory)

Address 3091 Victory Cres, L4T 1L5










Area (m²): 279 Area (ft²): 3,003

Year Built: 1940 Hours per Week : 72

Facility Group: Minor Centres/Halls

Building Components:

**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	13,363	12,145	14,210	
Electricity (\$)	\$2,643	\$1,980	\$2,055	
Natural Gas (m ³)	7,181	7,748	7,511	
Natural Gas (\$)	\$2,131	\$2,332	\$2,330	
Water (m ³)	137	85	144	
Water (\$)	\$294	\$194	\$351	
Total Costs (\$)	\$5,067	\$4,505	\$4,735	
Total e-kWh	88,766	93,502	93,073	
Total e-kWh/m ²	318.2	335.1	333.6	
GHG (kg/Yr)	14,061	15,089	14,714	
GHG (kg/Yr/m ²)	50	54	53	

Energy Measures

Facility: Mississauga Canoe Club

Address 33 Front St N, L5H 2E1








Area (m²): 875 Area (ft²): 9,418

Year Built: 1950 Hours per Week : 70

Facility Group: Minor Centres/Halls

Building Components:

**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	0	0	0	
Electricity (\$)	\$0	\$0	\$0	
Natural Gas (m ³)	11,314	12,459	8,757	
Natural Gas (\$)	\$3,866	\$4,238	\$2,855	
Water (m ³)	10	150	133	
Water (\$)	\$21	\$344	\$327	
Total Costs (\$)	\$3,887	\$4,582	\$3,182	
Total e-kWh	118,800	130,818	91,945	
Total e-kWh/m ²	135.8	149.5	105.1	
GHG (kg/Yr)	21,395	23,560	16,559	
GHG (kg/Yr/m ²)	24	27	19	

Energy Measures

Facility: Streetsville Village Hall

Address 280 Queen St S, L5M 1M1

Area (m²): 143 Area (ft²): 1,539

Year Built: 1860 Hours per Week : 72

Facility Group: Minor Centres/Halls

Building Components:

**Historical Energy and GHG Data**

Year:	2016	2017	2018
Electricity (kWh)	0	0	0
Electricity (\$)	\$0	\$0	\$0
Natural Gas (m ³)	0	0	0
Natural Gas (\$)	\$0	\$0	\$0
Water (m ³)	0	0	0
Water (\$)	\$0	\$0	\$0
Total Costs (\$)	\$0	\$0	\$0
Total e-kWh	0	0	0
Total e-kWh/m ²	0.0	0.0	0.0
GHG (kg/Yr)	0	0	0
GHG (kg/Yr/m ²)	0	0	0

Energy Measures

Facility: Streetsville Kinsmen Hall

Address 327 Queen St S, L5M 1M3

 Area (m²): 511 Area (ft²): 5,500

Year Built: Hours per Week :

Facility Group: Minor Centres/Halls

Building Components:

Historical Energy and GHG Data				Energy Measures
Year:	2016	2017	2018	
Electricity (kWh)	0	0	22,573	
Electricity (\$)	\$0	\$0	\$2,990	
Natural Gas (m ³)	0	0	7,312	
Natural Gas (\$)	\$0	\$0	\$2,716	
Water (m ³)	0	0	108	
Water (\$)	\$0	\$0	\$298	
Total Costs (\$)	\$0	\$0	\$6,004	
Total e-kWh	0	0	99,352	
Total e-kWh/m ²	0.0	0.0	194.4	
GHG (kg/Yr)	0	0	14,640	
GHG (kg/Yr/m ²)	0	0	29	

13.0 OUTDOOR POOL BUILDINGS

13.1 SCOPE AND BOUNDARY

For the purposes of this report, the City of Mississauga has 7 facilities/locations that fall under this category. They include:

- Applewood Heights - Outdoor Pool
- David Ramsey - Outdoor Pool
- Don McLean Westacres - Outdoor Pool
- Ron Lenyk Springfield Park - Erindale Outdoor Pool
- Lewis Bradley Park - Outdoor Pool
- Lions Club of Credit Valley Pool Building
- Streetsville - Outdoor Pool

The above listed locations have a total floor area of approximately 2,500 square meters. This would account for 0.5% of the total building area for City of Mississauga facilities included in this Plan.

13.2 BASELINE

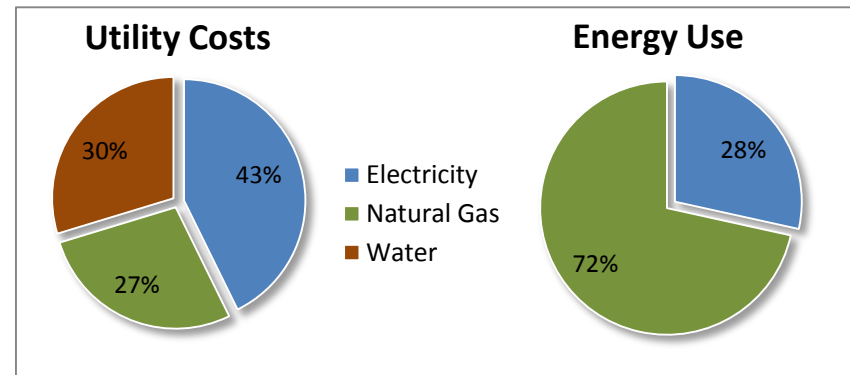
13.2.1 ENERGY USE

The energy use (combined electricity and natural gas) for **Outdoor Pool Buildings** was 1,896,000 equivalent kilowatt hours in 2018. Following are the key takeaways for the energy usage in 2018:

- 28% of the total energy usage was due to electricity use, which has increased by 17.6% since 2013
- 72% of the total energy usage was due to natural gas use, which has dropped by 3.5% since 2013
- A total of \$143,000 in utility costs was incurred, out of which 43% is attributed to electricity, 27% to natural gas, and 30% to water

Outdoor Pool Buildings accounted for 0.8% of the City's total utility budget for 2018.

Figure 13-1: Utility Costs and Energy Use Breakdown for Outdoor Pool Buildings



13.2.2 ENERGY USE INTENSITY

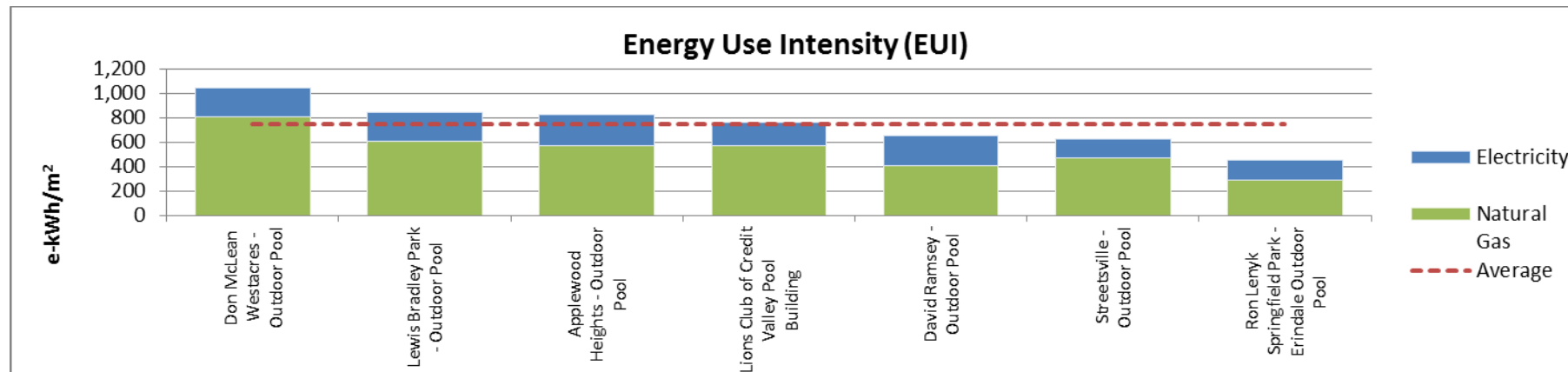
Energy Use Intensity (EUI) is a measurement that expresses a building's energy use as a function of its size or other characteristic. It is used to give a better picture of the energy efficiency of a facility. The lower the EUI, the more efficient the facility is.

When reviewing EUI, the facility operation type and hours should be taken into account. For example, a facility that operates 24 hours a day will most likely have a higher EUI than a similar one that operates 8 hours a day. Similarly, a facility that has high energy using systems that do not contribute to the building area, such as an outdoor pool or outdoor ice rink, will have a higher EUI than a facility where those systems are located within the facility, as they would add to the facility's area footprint.

For **Outdoor Pool Buildings** the average EUI in 2018 was 744.1 e-kWh/m².

The following chart shows the EUI for each facility within **Outdoor Pool Buildings**, and compares it to the average for the group.

Figure 13-2: Energy Use Intensity for Outdoor Pool Buildings



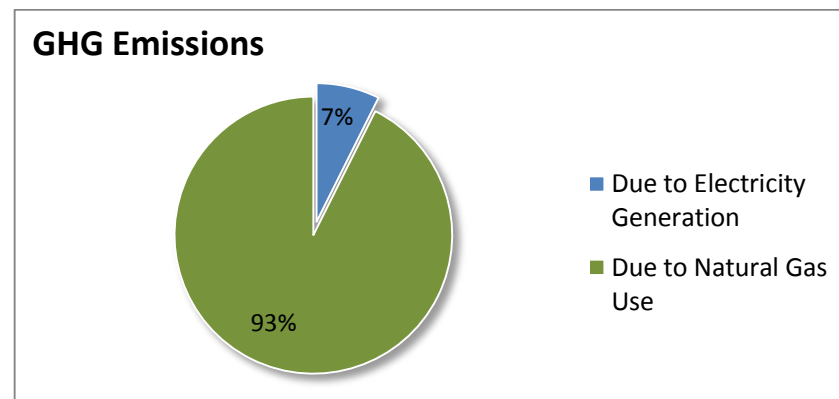
Note: The Average EUI value is calculated by taking the total energy use of all facilities, and dividing by the total area of the facilities. As such, a larger facility would have a bigger impact on the average than a smaller facility.

13.2.3 GREENHOUSE GAS (GHG) EMISSIONS

For 2018, **Outdoor Pool Buildings** emitted 263,700 kg (or 264 tonnes) of CO₂ in 2018. 7.4% of these emissions were due to the generation of electricity, while the use of natural gas accounted for the remaining 92.6%.

Outdoor Pool Buildings accounted for 1.3% of the City's total GHG emissions for facilities included in the plan.

Figure 13-3: GHG Emissions Breakdown for Outdoor Pool Buildings

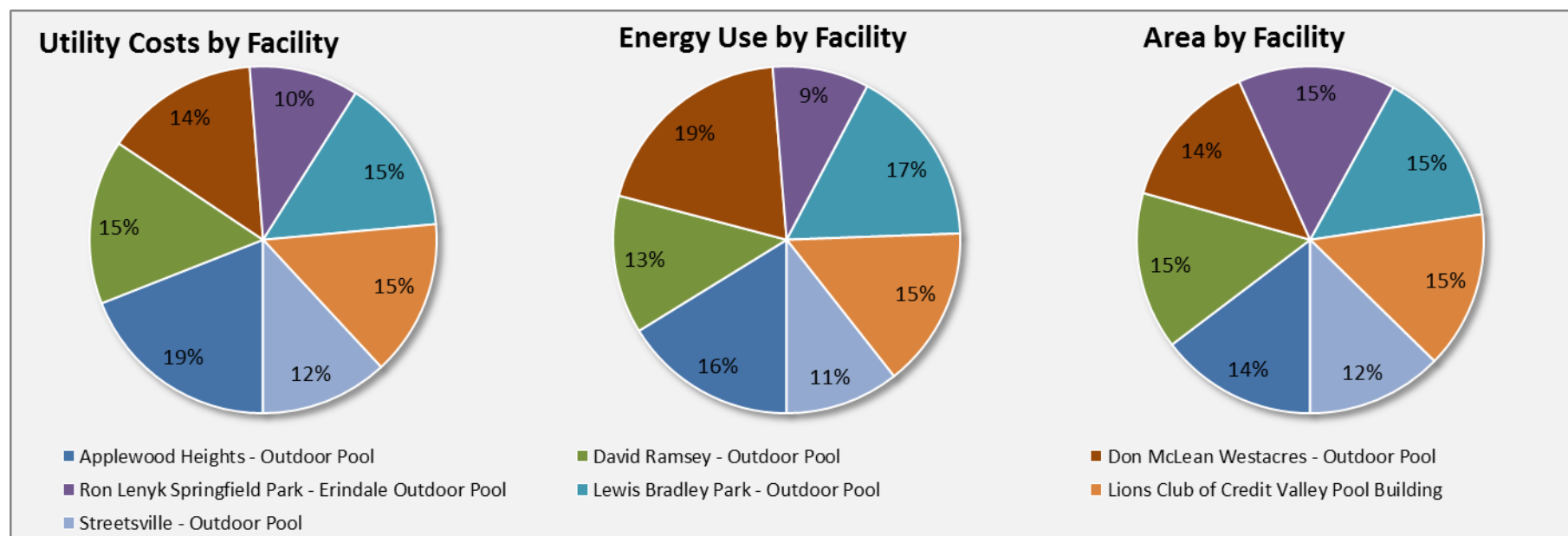


13.3 ENERGY AND GHG BREAKDOWN FOR OUTDOOR POOL BUILDINGS

This section provides a brief overview/recap of the Utility and GHG data for **Outdoor Pool Buildings**. The table below summarizes, by facility, the utility usage and GHG emissions for 2018. Following are the key takeaways:

- The seven (7) outdoor pool buildings represent the same floor area in the group, with Don McLean Westacres Outdoor Pool consuming the most energy due to the higher number of bathers experienced at the facility

Figure 12-4: Utility Costs and Energy Use Breakdown by Facility



2018 Annual Report for Outdoor Pool Buildings

Facility	Area	Electricity		Natural Gas		Total Energy	Water		Total Costs	GHG Emissions
	m ²	kWh	\$	m ³	\$	e-kWh	m ³	\$	\$	kg
Applewood Heights - Outdoor Pool	374	92,778	\$10,307	20,434	\$5,615	307,332	4,549	\$11,235	\$27,157	41,980
David Ramsey - Outdoor Pool	374	92,123	\$10,381	14,508	\$4,492	244,452	2,895	\$7,016	\$21,889	30,750
Don McLean Westacres - Outdoor Pool	355	84,826	\$9,574	27,314	\$7,976	371,627	1,209	\$2,984	\$20,533	54,705
Ron Lenyk Springfield Park - Erindale Outdoor Pool	374	60,992	\$7,004	10,418	\$3,696	170,376	1,560	\$3,853	\$14,553	21,895
Lewis Bradley Park - Outdoor Pool	374	89,685	\$10,011	21,664	\$6,492	317,155	1,750	\$4,323	\$20,825	44,195
Lions Club of Credit Valley Pool Building	374	71,095	\$8,073	20,263	\$6,338	283,857	2,565	\$6,336	\$20,746	40,877
Streetsville - Outdoor Pool	323	47,975	\$5,619	14,582	\$4,729	201,087	2,685	\$6,631	\$16,979	29,302
Totals	2,548	539,474	\$60,967	129,182	\$39,336	1,895,886	17,214	\$42,378	\$142,681	263,704
Usage / Costs per m²:		211.7	\$23.9	50.7	\$15.4	744	6.8	\$16.6	\$56.0	103.5

13.4 ACTION PLAN

An action plan has not been identified to save on electricity, natural gas, oil, and/or other form of energy consumption within this group since the group represent less than 1.0% of the City's utility budget.

13.5 ESTIMATED SAVINGS

At the end of the plan, **Outdoor Pool Buildings** are not expected to save since no action plan has been identified for the group.

13.6 PROGRESS TO TARGETS

The City is not targeting reduction in energy use in **Outdoor Pool Buildings** by 2023 over the base year, 2018. The reporting of energy consumption data and savings for **Outdoor Pool Buildings** will be based on utility meters and assembled annually. Since utility meters monitor energy consumption for the entire facility, the measurement boundary will encompass all parts of the facility. To determine the savings and fairly compare year-to-year energy consumption data, it is important to account for independent variables such as weather and occupancy and apply regression analysis to consumption data. Therefore, actual consumption data for each year starting 2019 will be adjusted to match the weather and occupancy of 2018. The figures below show the updated progress for each year against the set target.

Figure 12-7: Annual Energy Use vs Targeted Energy Use for Outdoor Pool Buildings

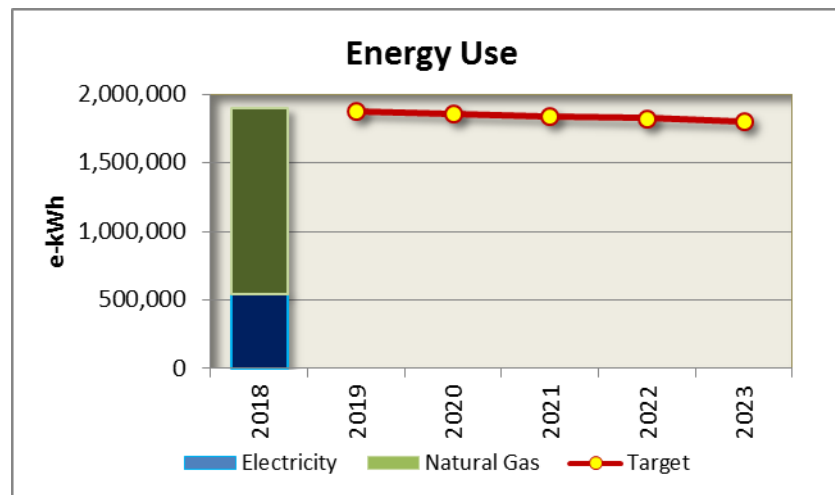
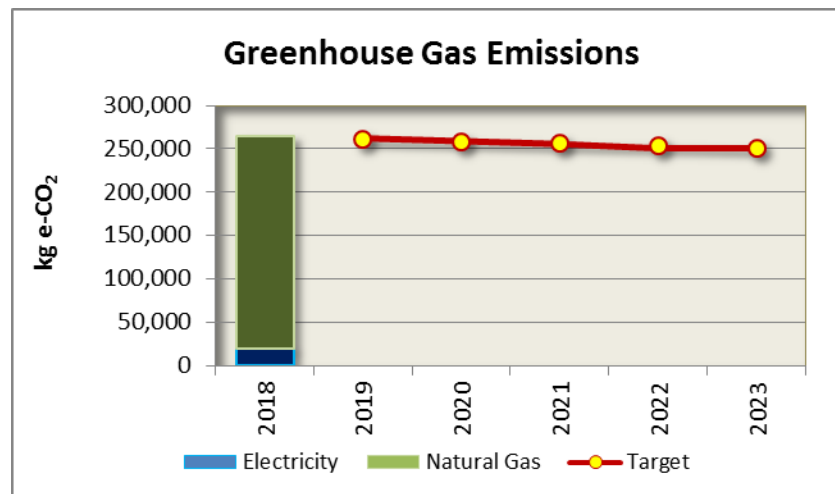


Figure 12-8: Annual GHG Emissions vs Targets for Outdoor Pool Buildings



Facility: Applewood Heights - Outdoor Pool

Address 3119 Constitution Blvd, L4Y 2Z1










Area (m²): 374 Area (ft²): 4,026

Year Built: 1976 Hours per Week : 70

Facility Group: Outdoor Pool Building

Building Components: Pool (Outdoor)

**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	78,672	115,034	92,778	
Electricity (\$)	\$12,969	\$11,951	\$10,307	
Natural Gas (m ³)	19,235	19,358	20,434	
Natural Gas (\$)	\$5,654	\$6,429	\$5,615	
Water (m ³)	5,858	3,985	4,549	
Water (\$)	\$12,943	\$9,198	\$11,235	
Total Costs (\$)	\$31,566	\$27,577	\$27,157	
Total e-kWh	280,635	318,290	307,332	
Total e-kWh/m ²	750.4	851.0	821.7	
GHG (kg/Yr)	39,205	40,747	41,980	
GHG (kg/Yr/m ²)	105	109	112	

Energy Measures

Facility: David Ramsey - Outdoor Pool

Address 2470 Thorn Lodge Dr, L5K 1K5










Area (m²): 374 Area (ft²): 4,026

Year Built: 1976 Hours per Week : 100

Facility Group: Outdoor Pool Building

Building Components: Pool (Outdoor)

**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	68,287	97,285	92,123	
Electricity (\$)	\$11,489	\$10,116	\$10,381	
Natural Gas (m ³)	21,795	28,187	14,508	
Natural Gas (\$)	\$5,883	\$9,002	\$4,492	
Water (m ³)	4,174	2,319	2,895	
Water (\$)	\$9,122	\$5,299	\$7,016	
Total Costs (\$)	\$26,493	\$24,417	\$21,889	
Total e-kWh	297,130	393,245	244,452	
Total e-kWh/m ²	794.5	1,051.5	653.6	
GHG (kg/Yr)	43,672	56,803	30,750	
GHG (kg/Yr/m ²)	117	152	82	

Energy Measures

Facility: Don McLean Westacres - Outdoor Pool

Address 2166 Westfield Dr, L4Y 1P7










Area (m²): 355 Area (ft²): 3,821

Year Built: 1962 Hours per Week : 100

Facility Group: Outdoor Pool Building

Building Components: Pool (Outdoor)

**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	78,591	103,797	84,826	
Electricity (\$)	\$13,179	\$11,106	\$9,574	
Natural Gas (m ³)	13,546	6,425	27,314	
Natural Gas (\$)	\$4,537	\$2,835	\$7,976	
Water (m ³)	1,295	1,436	1,209	
Water (\$)	\$2,865	\$3,310	\$2,984	
Total Costs (\$)	\$20,581	\$17,251	\$20,533	
Total e-kWh	220,822	171,263	371,627	
Total e-kWh/m ²	622.0	482.4	1,046.8	
GHG (kg/Yr)	28,444	15,887	54,705	
GHG (kg/Yr/m ²)	80	45	154	

Energy Measures

Facility: Ron Lenyk Springfield Park - Erindale Outdoor Pool

Address 1244 Shamir Cres., L5C 1L1










Area (m²): 374 Area (ft²): 4,026

Year Built: 1962 Hours per Week : 100

Facility Group: Outdoor Pool Building

Building Components: Pool (Outdoor)

**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	53,372	81,112	60,992	
Electricity (\$)	\$9,358	\$7,855	\$7,004	
Natural Gas (m ³)	13,955	19,522	10,418	
Natural Gas (\$)	\$4,877	\$6,412	\$3,696	
Water (m ³)	2,430	1,970	1,560	
Water (\$)	\$5,375	\$4,523	\$3,853	
Total Costs (\$)	\$19,610	\$18,789	\$14,553	
Total e-kWh	199,897	286,093	170,376	
Total e-kWh/m ²	534.5	765.0	455.5	
GHG (kg/Yr)	28,310	39,836	21,895	
GHG (kg/Yr/m ²)	76	107	59	

Energy Measures

Facility: Lewis Bradley Park - Outdoor Pool

Address 745 Inverhouse Road, L5J 4N9










Area (m²): 374 Area (ft²): 4,026

Year Built: 1976 Hours per Week : 100

Facility Group: Outdoor Pool Building

Building Components: Pool (Outdoor)

**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	78,924	106,099	89,685	
Electricity (\$)	\$13,051	\$11,180	\$10,011	
Natural Gas (m ³)	18,551	17,185	21,664	
Natural Gas (\$)	\$5,789	\$5,425	\$6,492	
Water (m ³)	3,710	2,360	1,750	
Water (\$)	\$8,652	\$5,448	\$4,323	
Total Costs (\$)	\$27,492	\$22,053	\$20,825	
Total e-kWh	273,706	286,546	317,155	
Total e-kWh/m ²	731.8	766.2	848.0	
GHG (kg/Yr)	37,921	36,317	44,195	
GHG (kg/Yr/m ²)	101	97	118	

Energy Measures

Facility: Lions Club of Credit Valley Pool Building

Address 20 Rosewood Ave, L5G 3H9










Area (m²): 374 Area (ft²): 4,026

Year Built: 1953 Hours per Week : 100

Facility Group: Outdoor Pool Building

Building Components: Pool (Outdoor)

**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	74,500	103,808	71,095	
Electricity (\$)	\$12,599	\$10,302	\$8,073	
Natural Gas (m ³)	22,527	25,069	20,263	
Natural Gas (\$)	\$7,402	\$8,186	\$6,338	
Water (m ³)	3,477	2,520	2,565	
Water (\$)	\$7,691	\$5,818	\$6,336	
Total Costs (\$)	\$27,693	\$24,305	\$20,746	
Total e-kWh	311,031	367,033	283,857	
Total e-kWh/m ²	831.6	981.4	759.0	
GHG (kg/Yr)	45,280	51,143	40,877	
GHG (kg/Yr/m ²)	121	137	109	

Energy Measures

Facility: Streetsville - Outdoor Pool

Address 335 Church St, L5M 2C2










Area (m²): 323 Area (ft²): 3,477

Year Built: 1966 Hours per Week : 100

Facility Group: Outdoor Pool Building

Building Components: Pool (Outdoor)

**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	52,360	65,148	47,975	
Electricity (\$)	\$9,821	\$7,145	\$5,619	
Natural Gas (m ³)	15,943	22,168	14,582	
Natural Gas (\$)	\$5,549	\$6,730	\$4,729	
Water (m ³)	2,384	2,240	2,685	
Water (\$)	\$5,118	\$5,244	\$6,631	
Total Costs (\$)	\$20,488	\$19,119	\$16,979	
Total e-kWh	219,757	297,915	201,087	
Total e-kWh/m ²	680.4	922.3	622.6	
GHG (kg/Yr)	32,032	44,266	29,302	
GHG (kg/Yr/m ²)	99	137	91	

Energy Measures

14.0 PARKS AND SPORTS FIELDS

14.1 SCOPE AND BOUNDARY

For the purposes of this report, the City of Mississauga has 242 facilities/locations that fall under this category. The group has a total floor area of approximately 13,500 square meters. This would account for 2.9% of the total building area for City of Mississauga facilities included in this Plan.

14.2 BASELINE

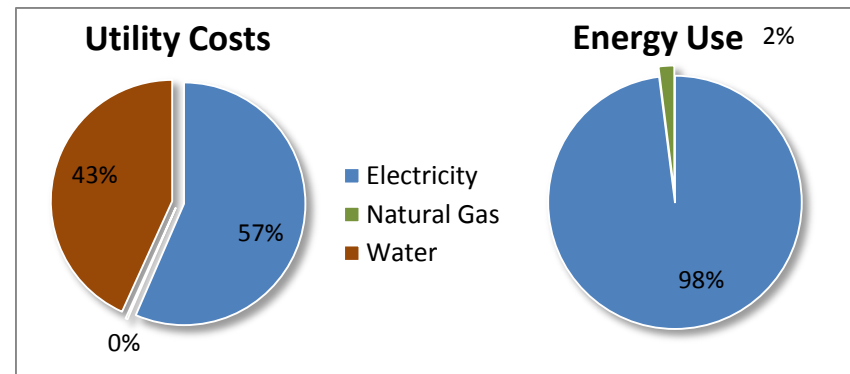
14.2.1 ENERGY USE

The energy use (combined electricity and natural gas) for **Parks and Sports Fields** was 5,959,000 equivalent kilowatt hours in 2018. Following are the key takeaways for the energy usage in 2018:

- 98% of the total energy usage was due to electricity use
- 2% of the total energy usage was due to natural gas use
- A total of \$1,593,000 in utility costs was incurred, out of which 57% is attributed to electricity and 43% to water

Parks and Sports Fields accounted for 8.9% of the City's total utility budget for 2018.

Figure 14-1: Utility Costs and Energy Use Breakdown for Parks and Sports Fields



14.2.2 ENERGY USE INTENSITY

Energy Use Intensity (EUI) is a measurement that expresses a building's energy use as a function of its size or other characteristic. It is used to give a better picture of the energy efficiency of a facility. The lower the EUI, the more efficient the facility is.

When reviewing EUI, the facility operation type and hours should be taken into account. For example, a facility that operates 24 hours a day will most likely have a higher EUI than a similar one that operates 8 hours a day. Similarly, a facility that has high energy using systems that do not contribute to the building area, such as an outdoor pool or outdoor ice rink, will have a higher EUI than a facility where those systems are located within the facility, as they would add to the facility's area footprint.

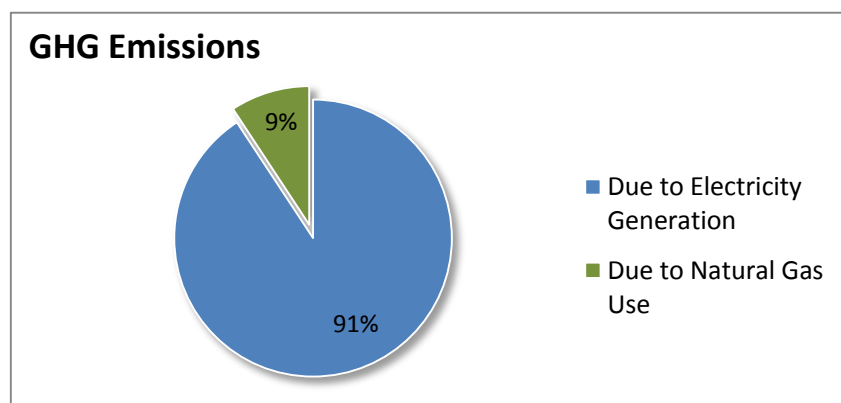
For **Parks and Sports Fields** the average EUI in 2018 was 37.5 e-kWh/m².

14.2.3 GREENHOUSE GAS (GHG) EMISSIONS

For 2018, **Parks and Sports Fields** emitted 231,700 kg (or 232 tonnes) of CO₂ in 2018. 90.7% of these emissions were due to the generation of electricity, while the use of natural gas accounted for the remaining 9.3%.

Parks and Sports Fields accounted for 1.2% of the City's total GHG emissions for facilities included in the plan.

Figure 14-2: GHG Emissions Breakdown for Parks and Sports Fields

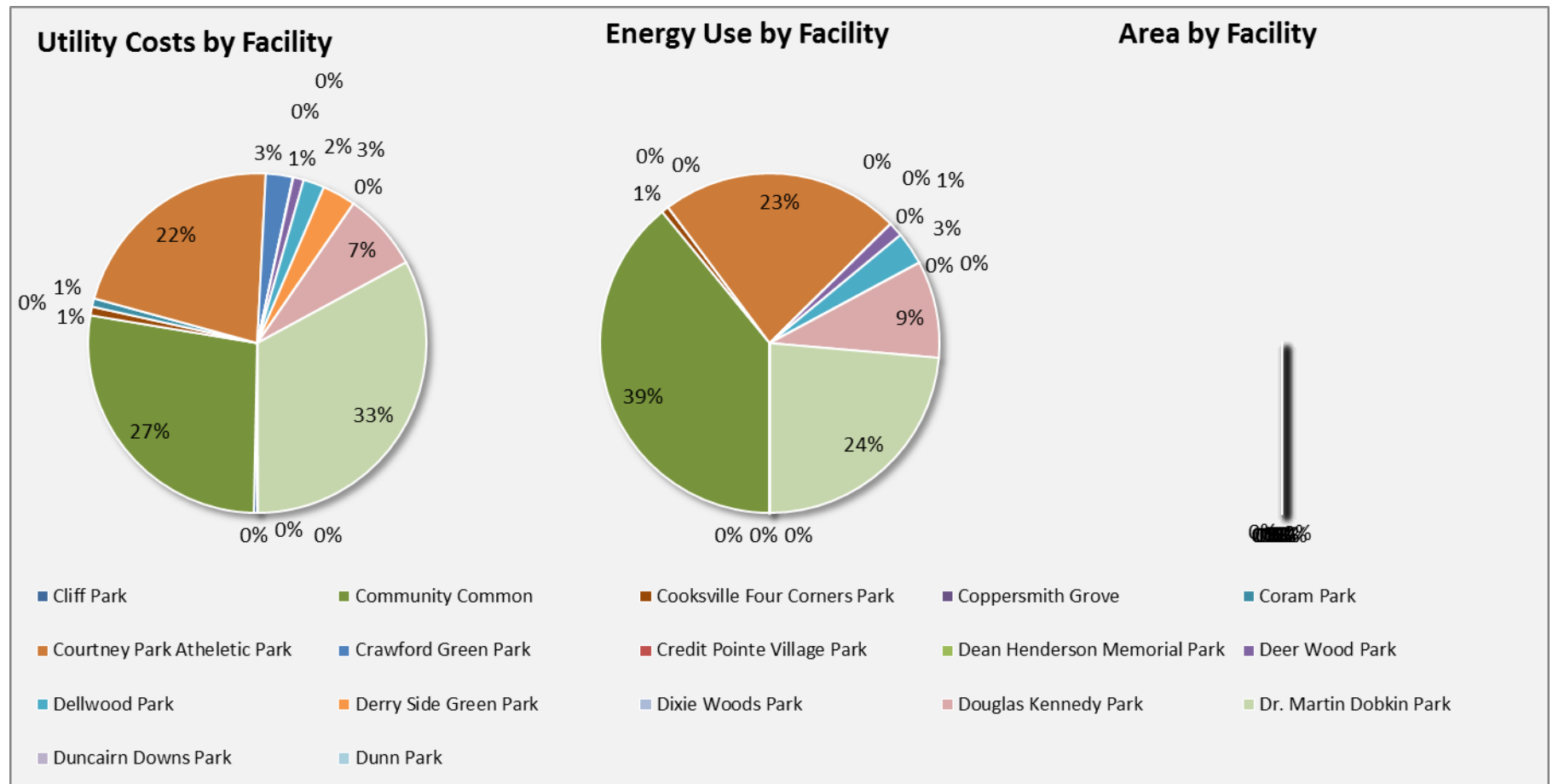


14.3 ENERGY AND GHG BREAKDOWN FOR PARKS AND SPORTS FIELDS

This section provides a brief overview/recap of the Utility and GHG data for **Parks and Sports Fields**. The table below summarizes, by facility, the utility usage and GHG emissions for 2018. Following are the key takeaways:

- Community Common, Dr. Martin Dobkin Park, Courtney Park Athletic Park, and Douglas Kennedy Park are the largest energy and utility consumers in the group due to the presence of both sports field lighting and change room enclosures

Figure 12-4: Utility Costs and Energy Use Breakdown by Facility



2018 Annual Report for Parks and Sports Fields

Facility	Area m ²	Electricity		Natural Gas		Total Energy e-kWh	Water		Total Costs \$	GHG Emissions kg
		kWh	\$	m ³	\$		m ³	\$		
Cliff Park	0	0	\$0	0	\$0	0	0	\$352	\$352	0
Community Common	0	98,247	\$11,439	6,869	\$2,310	170,375	6,462	\$15,915	\$29,664	16,527
Cooksville Four Corners Park	0	3,067	\$816	0	\$0	3,067	64	\$89	\$905	110
Coppersmith Grove	0	0	\$0	0	\$0	0	0	\$0	\$0	0
Coram Park	0	0	\$512	0	\$0	0	0	\$352	\$864	0
Courtney Park Athletic Park	0	99,645	\$15,501	0	\$0	99,645	5,466	\$7,915	\$23,416	3,587
Crawford Green Park	0	0	\$0	0	\$0	0	1,926	\$2,791	\$2,791	0
Credit Pointe Village Park	0	0	\$0	0	\$0	0	21	\$50	\$50	0
Dean Henderson Memorial Park	0	0	\$0	0	\$0	0	0	\$0	\$0	0
Deer Wood Park	0	6,029	\$1,074	0	\$0	6,029	5	\$7	\$1,081	217
Dellwood Park	0	13,709	\$1,834	0	\$0	13,709	0	\$352	\$2,186	494
Derry Side Green Park	0	0	\$0	0	\$0	0	2,398	\$3,474	\$3,474	0
Dixie Woods Park	0	0	\$0	0	\$0	0	0	\$0	\$0	0
Douglas Kennedy Park	0	40,271	\$8,107	0	\$0	40,271	0	\$0	\$8,107	1,450
Dr. Martin Dobkin Park	0	103,006	\$25,844	0	\$0	103,006	6,867	\$9,903	\$35,747	3,708
Duncairn Downs Park	0	0	\$0	0	\$0	0	0	\$0	\$0	0
Dunn Park	0	0	\$0	0	\$0	0	10	\$15	\$15	0

15.0 TRAFFIC AND STREET LIGHTING

15.1 SCOPE AND BOUNDARY

For the purposes of this report, the City of Mississauga has 7 facilities/locations that fall under this category. They include:

- Bus Shelters
- Decorative Bridge Lighting
- Gateway Lighting Feature
- Street Lighting
- Street Lighting - LED
- Traffic Bollards
- Traffic Signals

The above listed locations have a total floor area of approximately 0 square meters. This would account for 0.0% of the total building area for City of Mississauga facilities included in this Plan.

15.2 BASELINE

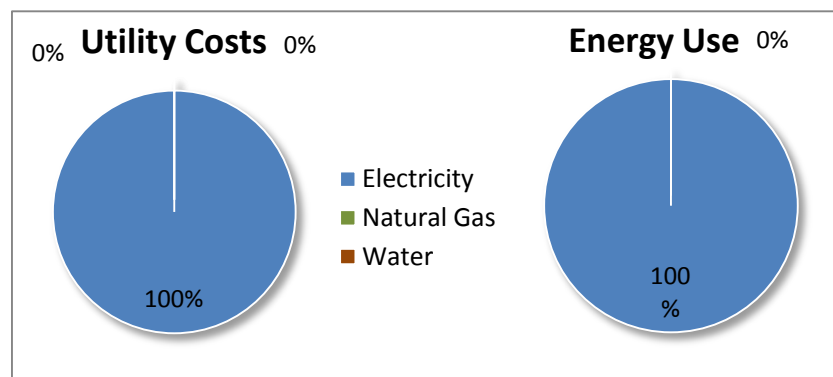
15.2.1 ENERGY USE

The energy use (combined electricity and natural gas) for **Traffic and Street Lighting** was 17,388,000 equivalent kilowatt hours in 2018. Following are the key takeaways for the energy usage in 2018:

- 100% of the total energy usage was due to electricity use
- A total of \$2,855,000 in utility costs was incurred, out of which 100% is attributed to electricity

Traffic and Street Lighting accounted for 15.9% of the City's total utility budget for 2018.

Figure 15-1: Utility Costs and Energy Use Breakdown for Traffic and Street Lighting

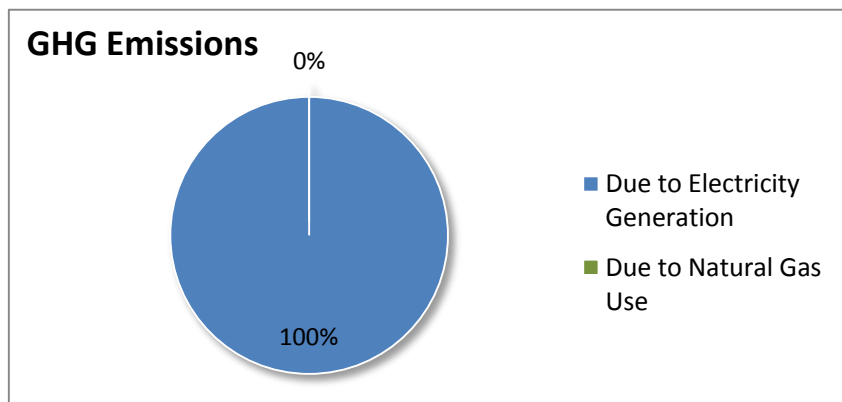


15.2.2 GREENHOUSE GAS (GHG) EMISSIONS

For 2018, **Traffic and Street Lighting** emitted 626,000 kg (or 626 tonnes) of CO₂ in 2018. 100.0% of these emissions were due to the generation of electricity, while the use of natural gas accounted for the remaining 0.0%.

Traffic and Street Lighting accounted for 3.2% of the City's total GHG emissions for facilities included in the plan.

Figure 15-2: GHG Emissions Breakdown for Traffic and Street Lighting

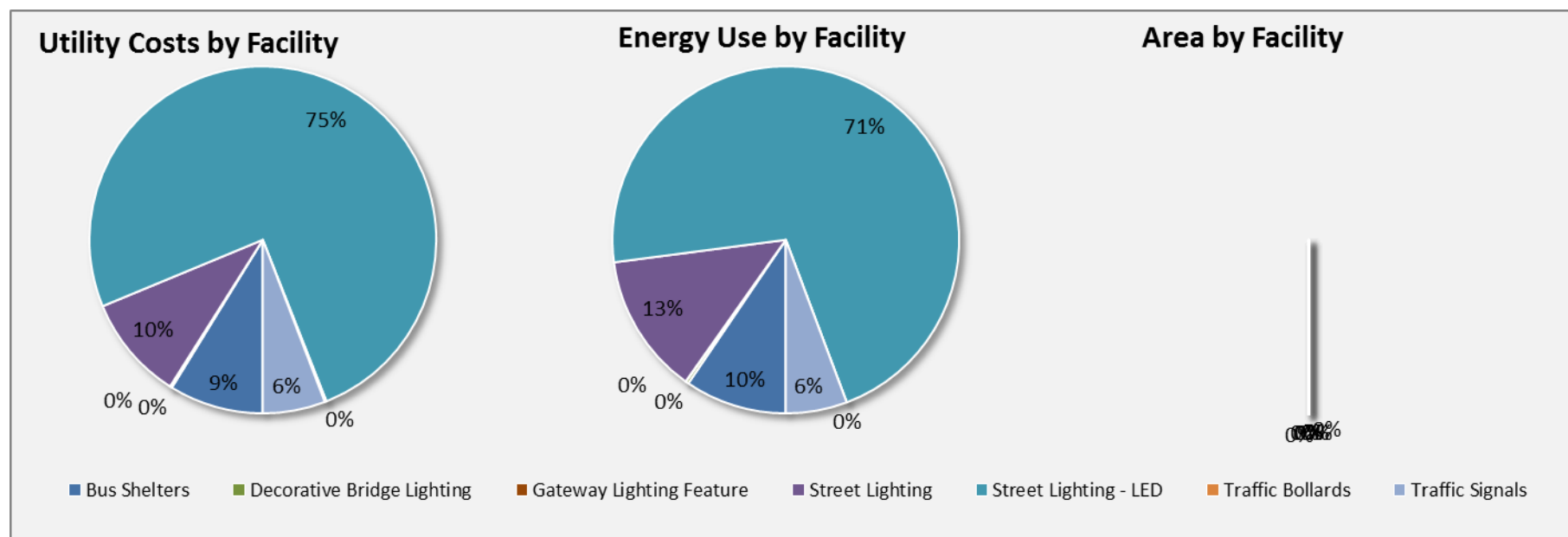


15.3 ENERGY AND GHG BREAKDOWN FOR TRAFFIC AND STREET LIGHTING

This section provides a brief overview/recap of the Utility and GHG data for **Traffic and Street Lighting**. The table below summarizes, by facility, the utility usage and GHG emissions for 2018. Following are the key takeaways:

- Street Lighting is the largest energy and utility consumer in the group, with the bus shelters and traffic signals as the next largest energy and utility consumers in the group

Figure 12-4: Utility Costs and Energy Use Breakdown by Facility



2018 Annual Report for Traffic and Street Lighting

Facility	Area m ²	Electricity		Natural Gas		Total Energy e-kWh	Water		Total Costs \$	GHG Emissions kg
		kWh	\$	m ³	\$		m ³	\$		
Bus Shelters	0	1,653,815	\$251,072	0	\$0	1,653,815	0	\$0	\$251,072	59,537
Decorative Bridge Lighting	0	47,739	\$5,024	0	\$0	47,739	0	\$0	\$5,024	1,719
Gateway Lighting Feature	0	3,679	\$496	0	\$0	3,679	0	\$0	\$496	132
Street Lighting	0	2,282,474	\$279,016	0	\$0	2,282,474	0	\$0	\$279,016	82,169
Street Lighting - LED	0	12,406,722	\$2,148,774	0	\$0	12,406,722	0	\$0	\$2,148,774	446,642
Traffic Bollards	0	1,117	\$4,763	0	\$0	1,117	0	\$0	\$4,763	40
Traffic Signals	0	992,903	\$165,990	0	\$0	992,903	0	\$0	\$165,990	35,745
Totals	0	17,388,450	\$2,855,134	0	\$0	17,388,450	0	\$0	\$2,855,134	625,984
Usage / Costs per m²:		-	-	-	-	-	-	-	-	-

15.4 FACILITY INFORMATION FOR TRAFFIC AND STREET LIGHTING

Facility: Bus Shelters

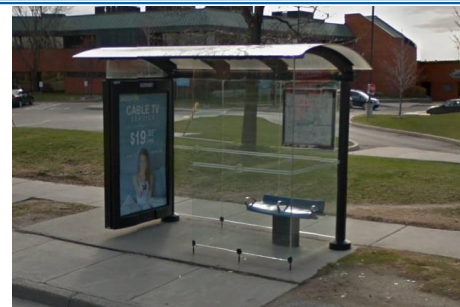
Address Various Locations, L5B 3C1






Area (m²): Area (ft²):

Year Built: Hours per Week :

Facility Group: Traffic/Street Lighting

Building Components:

**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	1,615,588	1,653,815	1,653,815	
Electricity (\$)	\$315,201	\$294,875	\$251,072	
Natural Gas (m ³)	0	0	0	
Natural Gas (\$)	\$0	\$0	\$0	
Water (m ³)	0	0	0	
Water (\$)	\$0	\$0	\$0	
Total Costs (\$)	\$315,201	\$294,875	\$251,072	
Total e-kWh	1,615,588	1,653,815	1,653,815	
Total e-kWh/m ²	N/A	N/A	N/A	
GHG (kg/Yr)	58,161	59,537	59,537	
GHG (kg/Yr/m ²)	N/A	N/A	N/A	






Energy Measures

Facility: Decorative Bridge LightingAddress: **Nw Cnr Confederation Pkwy & Rathburn Rd, L5B 3C1**Area (m²): Area (ft²):

Year Built: Hours per Week :

Facility Group: **Traffic/Street Lighting**

Building Components:

Historical Energy and GHG Data				Energy Measures
Year:	2016	2017	2018	
Electricity (kWh)	38,007	62,137	47,739	
Electricity (\$)	\$6,607	\$8,814	\$5,024	
Natural Gas (m ³)	0	0	0	
Natural Gas (\$)	\$0	\$0	\$0	
Water (m ³)	0	0	0	
Water (\$)	\$0	\$0	\$0	
Total Costs (\$)	\$6,607	\$8,814	\$5,024	
Total e-kWh	38,007	62,137	47,739	
Total e-kWh/m ²	N/A	N/A	N/A	
GHG (kg/Yr)	1,368	2,237	1,719	
GHG (kg/Yr/m ²)	N/A	N/A	N/A	

Facility: Gateway Lighting Feature






Address 500 Eglinton Ave W - West Entrance, L4Z 1Y8

 Area (m²): Area (ft²):

Year Built: Hours per Week :

Facility Group: Traffic/Street Lighting

Building Components:

Historical Energy and GHG Data				Energy Measures
Year:	2016	2017	2018	
Electricity (kWh)	3,689	3,679	3,679	
Electricity (\$)	\$654	\$592	\$496	
Natural Gas (m ³)	0	0	0	
Natural Gas (\$)	\$0	\$0	\$0	
Water (m ³)	0	0	0	
Water (\$)	\$0	\$0	\$0	
Total Costs (\$)	\$654	\$592	\$496	
Total e-kWh	3,689	3,679	3,679	
Total e-kWh/m ²	N/A	N/A	N/A	
GHG (kg/Yr)	133	132	132	
GHG (kg/Yr/m ²)	N/A	N/A	N/A	

Facility: Street Lighting

Address Various Locations, L5B 3C1

Area (m²):Area (ft²):






Year Built:

Hours per Week :

Facility Group: Traffic/Street Lighting

Building Components:

**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	4,754,379	2,772,244	2,282,474	
Electricity (\$)	\$902,204	\$521,012	\$279,016	
Natural Gas (m ³)	0	0	0	
Natural Gas (\$)	\$0	\$0	\$0	
Water (m ³)	0	0	0	
Water (\$)	\$0	\$0	\$0	
Total Costs (\$)	\$902,204	\$521,012	\$279,016	
Total e-kWh	4,754,379	2,772,244	2,282,474	
Total e-kWh/m ²	N/A	N/A	N/A	
GHG (kg/Yr)	171,158	99,801	82,169	
GHG (kg/Yr/m ²)	N/A	N/A	N/A	

Energy Measures

LED Street Lighting

Facility: Street Lighting - LED

Address Various,

Area (m²):Area (ft²):






Year Built:

Hours per Week :

Facility Group: Traffic/Street Lighting

Building Components:

**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	11,614,118	12,140,331	12,406,722	
Electricity (\$)	\$2,760,609	\$2,903,925	\$2,148,774	
Natural Gas (m ³)	0	0	0	
Natural Gas (\$)	\$0	\$0	\$0	
Water (m ³)	0	0	0	
Water (\$)	\$0	\$0	\$0	
Total Costs (\$)	\$2,760,609	\$2,903,925	\$2,148,774	
Total e-kWh	11,614,118	12,140,331	12,406,722	
Total e-kWh/m ²	N/A	N/A	N/A	
GHG (kg/Yr)	418,108	437,052	446,642	
GHG (kg/Yr/m ²)	N/A	N/A	N/A	

Energy Measures

Facility: Traffic Bollards

Address Various Locations, L5B 3C1

Area (m²):Area (ft²):






Year Built:

Hours per Week :

Facility Group: Traffic/Street Lighting

Building Components:

Historical Energy and GHG Data**Energy Measures**

Year:	2016	2017	2018	
Electricity (kWh)	1,249	1,204	1,117	
Electricity (\$)	\$4,581	\$4,800	\$4,763	
Natural Gas (m ³)	0	0	0	
Natural Gas (\$)	\$0	\$0	\$0	
Water (m ³)	0	0	0	
Water (\$)	\$0	\$0	\$0	
Total Costs (\$)	\$4,581	\$4,800	\$4,763	
Total e-kWh	1,249	1,204	1,117	
Total e-kWh/m ²	N/A	N/A	N/A	
GHG (kg/Yr)	45	43	40	
GHG (kg/Yr/m ²)	N/A	N/A	N/A	

Facility: Traffic Signals

Address Various Locations, L5B 3C1






Area (m²): Area (ft²):

Year Built: Hours per Week :

Facility Group: Traffic/Street Lighting

Building Components:

**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	974,397	980,038	992,903	
Electricity (\$)	\$202,770	\$190,634	\$165,990	
Natural Gas (m ³)	0	0	0	
Natural Gas (\$)	\$0	\$0	\$0	
Water (m ³)	0	0	0	
Water (\$)	\$0	\$0	\$0	
Total Costs (\$)	\$202,770	\$190,634	\$165,990	
Total e-kWh	974,397	980,038	992,903	
Total e-kWh/m ²	N/A	N/A	N/A	
GHG (kg/Yr)	35,078	35,281	35,745	
GHG (kg/Yr/m ²)	N/A	N/A	N/A	

Energy Measures

16.0 TRANSIT AND ASSOCIATED FACILITIES

16.1 SCOPE AND BOUNDARY

For the purposes of this report, the City of Mississauga has 17 facilities/locations that fall under this category. They include:

- Cawthra Road Station
- CCTT Transitway Terminal
- Central Parkway Station
- City Centre Transit Terminal
- Dixie Rd Station
- Etobicoke Creek Station
- Go Bus Stop
- Malton Satellite Terminal
- Orbitor Drive Station
- Semenyk Crt - T&W Administration-TEP
- Spectrum Way Station
- Tahoe Blvd Station
- Tomken Rd Station
- Edward J. Dowling Transit Facility (Bldg ABCD)
- Transit Central - New Bus Storage Building (Bldg E)
- Transit Central - Body Shop (Bldg F)
- Transit Drivers Lounge & WC

The above listed locations have a total floor area of approximately 55,400 square meters. This would account for 11.9% of the total building area for City of Mississauga facilities included in this Plan.

16.2 BASELINE

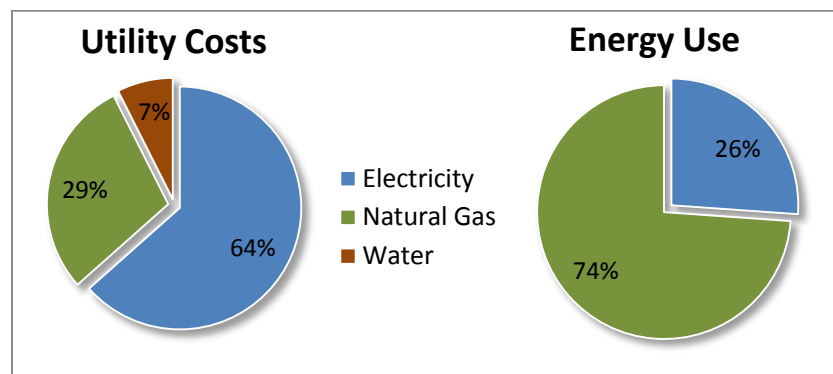
16.2.1 ENERGY USE

The energy use (combined electricity and natural gas) for **Transit and Associated Facilities** was 31,705,000 equivalent kilowatt hours in 2018. Following are the key takeaways for the energy usage in 2018:

- 26% of the total energy usage was due to electricity use, which has dropped by 18.6% since 2013
- 74% of the total energy usage was due to natural gas use, which has increased by 11.6% since 2013
- A total of \$1,877,000 in utility costs was incurred, out of which 64% is attributed to electricity, 29% to natural gas, and 7% to water

Transit and Associated Facilities accounted for 10.4% of the City's total utility budget for 2018.

Figure 16-1: Utility Costs and Energy Use Breakdown for Transit and Associated Facilities

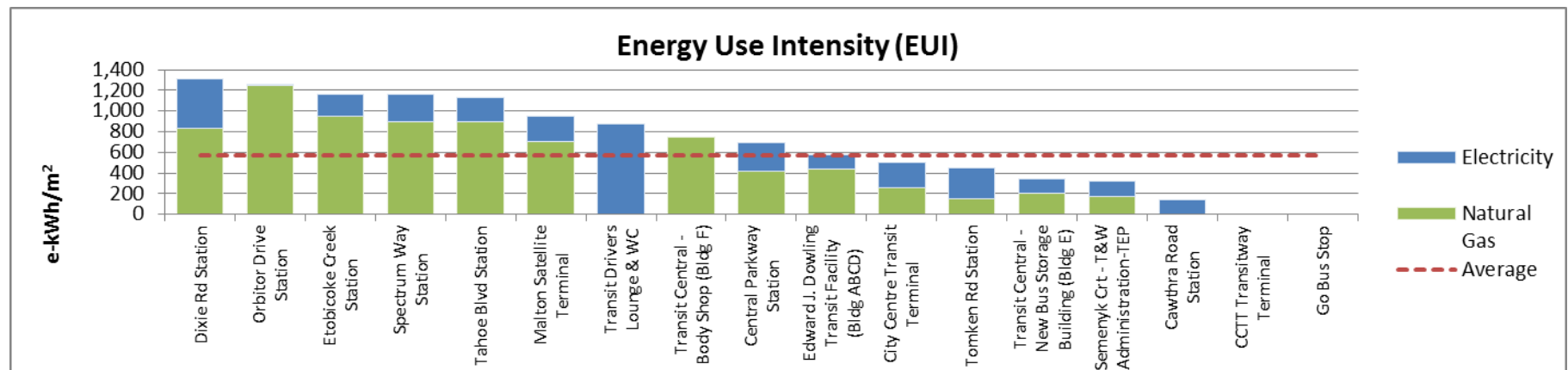


16.2.2 ENERGY USE INTENSITY

Energy Use Intensity (EUI) is a measurement that expresses a building's energy use as a function of its size or other characteristic. It is used to give a better picture of the energy efficiency of a facility. The lower the EUI, the more efficient the facility is.

When reviewing EUI, the facility operation type and hours should be taken into account. For example, a facility that operates 24 hours a day will most likely have a higher EUI than a similar one that operates 8 hours a day. Similarly, a facility that has high energy using systems that do not contribute to the building area, such as an outdoor pool or outdoor ice rink, will have a higher EUI than a facility where those

Figure 16-2: Energy Use Intensity for Transit and Associated Facilities



systems are located within the facility, as they would add to the facility's area footprint.

For **Transit and Associated Facilities** the average EUI in 2018 was 572.2 e-kWh/m².

The following chart shows the EUI for each facility within **Transit and Associated Facilities**, and compares it to the average for the group.

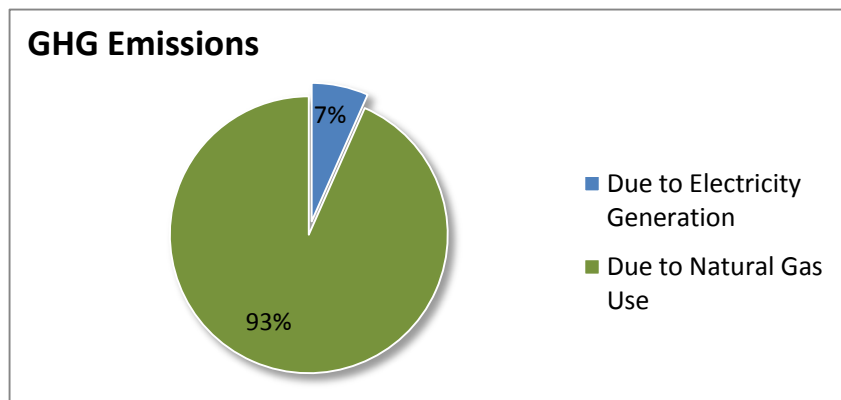
Note: The Average EUI value is calculated by taking the total energy use of all facilities, and dividing by the total area of the facilities. As such, a larger facility would have a bigger impact on the average than a smaller facility.

16.2.3 GREENHOUSE GAS (GHG) EMISSIONS

For 2018, **Transit and Associated Facilities** emitted 4,516,400 kg (or 4,516 tonnes) of CO₂ in 2018. 6.6% of these emissions were due to the generation of electricity, while the use of natural gas accounted for the remaining 93.4%.

Transit and Associated Facilities accounted for 22.9% of the City's total GHG emissions for facilities included in the plan.

Figure 16-3: GHG Emissions Breakdown for Transit and Associated Facilities

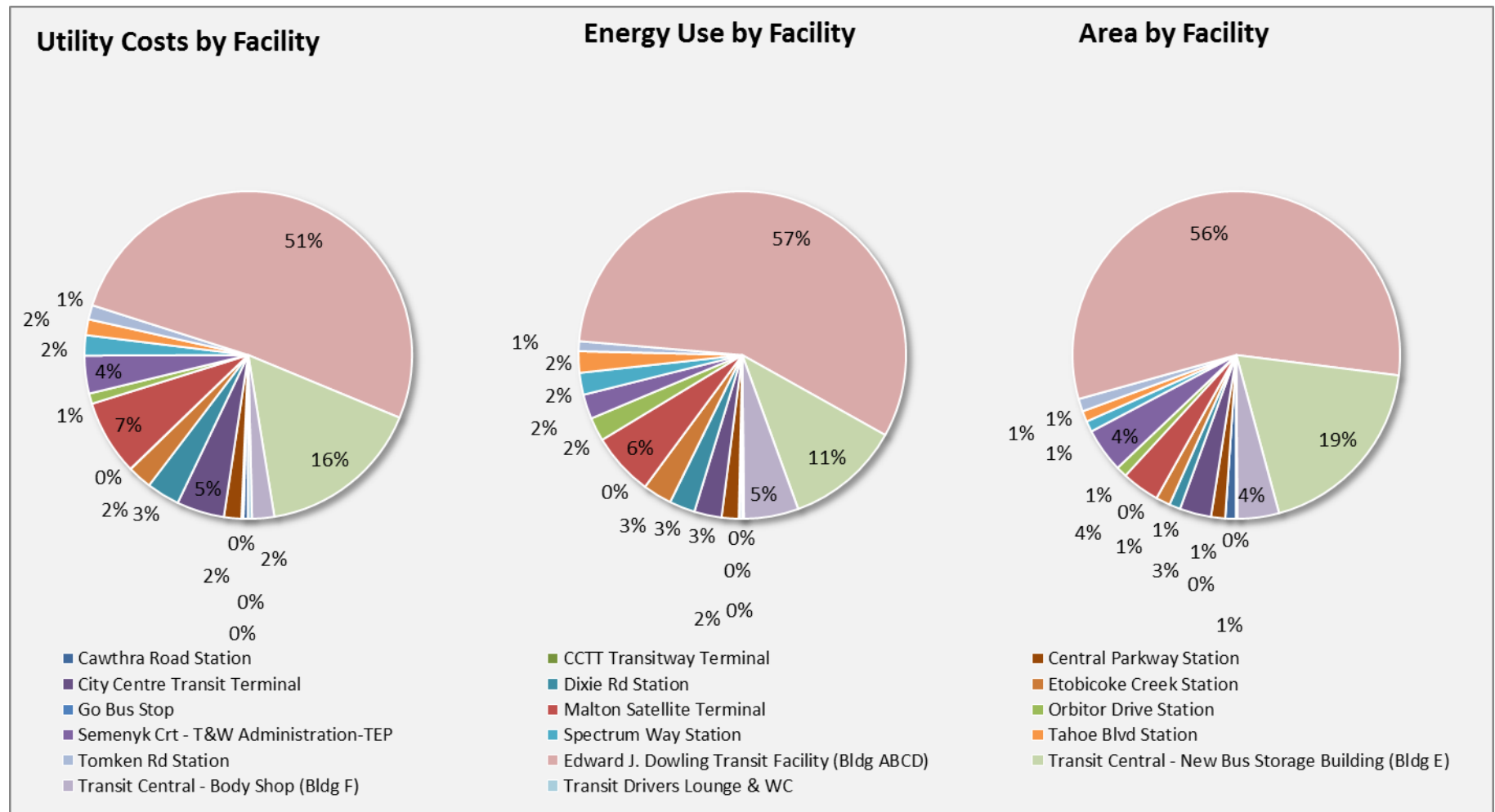


16.3 ENERGY AND GHG BREAKDOWN FOR TRANSIT AND ASSOCIATED FACILITIES

This section provides a brief overview/recap of the Utility and GHG data for **Transit and Associated Facilities**. The table below summarizes, by facility, the utility usage and GHG emissions for 2018. Following are the key takeaways:

- The Transit Central campus consisting of Edward J Dowling Transit Facility (Bldg ABCD), New Bus Storage Building (Bldg E) and Body Shop (Bldg F) is by far the largest facility in this group by area and represents the largest energy consumption (69%) and utility consumption (73%) in this group
- The T&W Administration Building and Malton Satellite Terminal represent the second and third largest facility by area in this group and contribute 8% and 11% towards the energy consumption and utility consumption in the group
- City Centre Transit Terminal and the BRT Stations represent 13% of the facility area in the group and contribute 23% and 16% towards the energy consumption and utility consumption in the group
- Natural gas-fired space heating loads dominate the energy usage in this group, while compressed air equipment, lighting, and fan energy dominate the electrical loads
- For this reason, priority was given to space heating, lighting, and fan energy reduction projects for future planned projects since they greatly reduce utility budget and energy usage

Figure 16-4: Utility Costs and Energy Use Breakdown by Facility



2018 Annual Report for Transit and Associated Facilities

Facility	Area	Electricity		Natural Gas		Total Energy	Water		Total Costs	GHG Emissions
	m ²	kWh	\$	m ³	\$	e-kWh	m ³	\$	\$	kg
Cawthra Road Station	600	81,264	\$8,942	0	\$0	81,264	0	\$0	\$8,942	2,926
CCTT Transitway Terminal	0	27,023	\$3,469	0	\$0	27,023	0	\$0	\$3,469	973
Central Parkway Station	773	212,691	\$23,532	30,809	\$8,745	536,186	61	\$146	\$32,423	65,917
City Centre Transit Terminal	1,718	413,874	\$65,978	42,112	\$11,541	856,053	4,379	\$10,719	\$88,238	94,534
Dixie Rd Station	614	294,434	\$43,401	48,363	\$13,093	802,240	2,010	\$4,888	\$61,382	102,053
Etobicoke Creek Station	781	169,723	\$26,664	70,411	\$18,126	909,035	50	\$118	\$44,908	139,257
Go Bus Stop	0	259	\$536	0	\$0	259	0	\$0	\$536	9
Malton Satellite Terminal	2,070	522,537	\$76,650	137,858	\$34,379	1,970,042	11,558	\$27,989	\$139,018	279,500
Orbitor Drive Station	591	683	\$1,088	70,327	\$18,082	739,116	24	\$60	\$19,229	133,013
Semenyk Crt - T&W Administration-TEP	2,422	351,976	\$57,026	39,691	\$10,963	768,734	834	\$2,028	\$70,018	87,727
Spectrum Way Station	591	154,836	\$24,073	50,606	\$13,566	686,196	17	\$40	\$37,679	101,270
Tahoe Blvd Station	591	143,155	\$15,926	50,177	\$13,304	670,009	9	\$21	\$29,251	100,038
Tomken Rd Station	693	207,694	\$23,119	9,821	\$3,225	310,809	80	\$114	\$26,458	26,048
Edward J. Dowling Transit Facility (Bldg ABCD)	31,178	4,238,831	\$600,194	1,310,278	\$311,086	17,996,753	21,397	\$51,741	\$963,020	2,630,334

Transit Central - New Bus Storage Building (Bldg E)	10,412	1,415,188	\$214,195	207,384	\$49,813	3,592,722	16,549	\$40,146	\$304,154	443,110
Transit Central - Body Shop (Bldg F)	2,274	0	\$0	162,842	\$40,570	1,709,841	153	\$373	\$40,943	307,934
Transit Drivers Lounge & WC	56	48,981	\$5,745	0	\$0	48,981	471	\$1,147	\$6,892	1,763
Totals	55,364	8,283,148	\$1,190,537	2,230,678	\$546,494	31,705,263	57,593	\$139,528	\$1,876,559	4,516,405
Usage / Costs per m²:		155.5	\$22.3	40.8	\$10.0	572	1.1	\$2.5	\$33.8	81.6

16.4 ACTION PLAN

An action plan has been identified with the goal to save on electricity, natural gas, oil, and/or other form of energy consumption within a facility or location.

The following figure shows the various projects and initiatives that have been planned for **Transit and Associated Facilities**. The chart shows what projects have been planned, when they are planned to be implemented, and the progress of implementation (if applicable). A brief description of each project has been noted below:

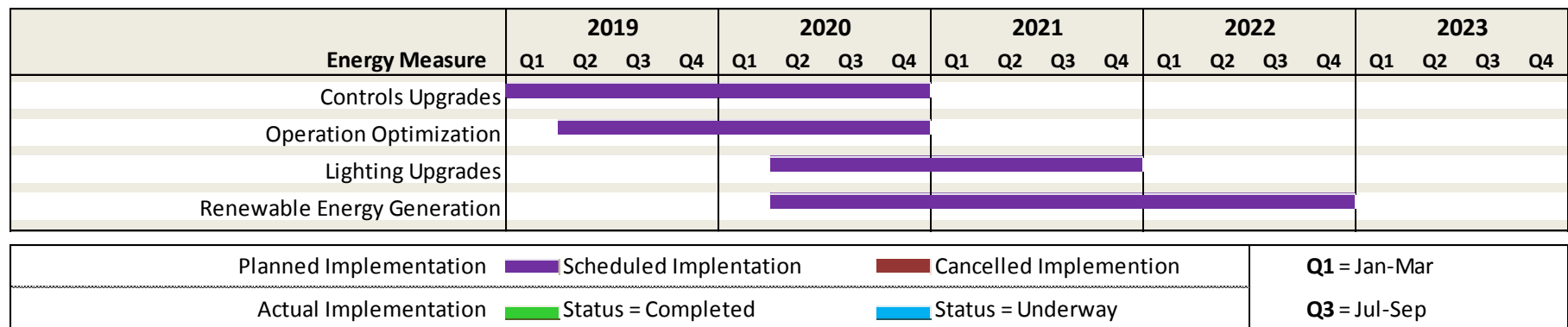
- **Controls Upgrades:** Includes controller upgrades, optimized sequence of operations, and additional points to better manage and control building systems
- **Operation Optimization:** Includes optimizing energy-consuming equipment operation and promoting energy awareness to drive energy efficiency
- **Lighting Upgrades:** Includes replacement of existing lighting technologies to newer technologies like LEDs, and better controls through localized sensors and BAS scheduling

- **Renewable Energy Generation:** Includes energy generation from renewable sources like solar photovoltaics, solar hot water heating, solar lighting

For the chart below, the **Purple** coloured bars represent the original planned start and completion of a Measure type. The **Green** bar beneath shows the actual start and completion times for a completed measure, while the **Blue** bar shows the actual start time of a Measure that is currently being implemented, but not yet complete. Some Notes:

- A Single Measure timeline may include more than one implementation of that measure (example: In different facilities).
- Due to changing circumstances (change in operations, budget changes, new technology, etc.), a planned measure may be cancelled. These would be indicated by a **Red** plan bar on the chart.

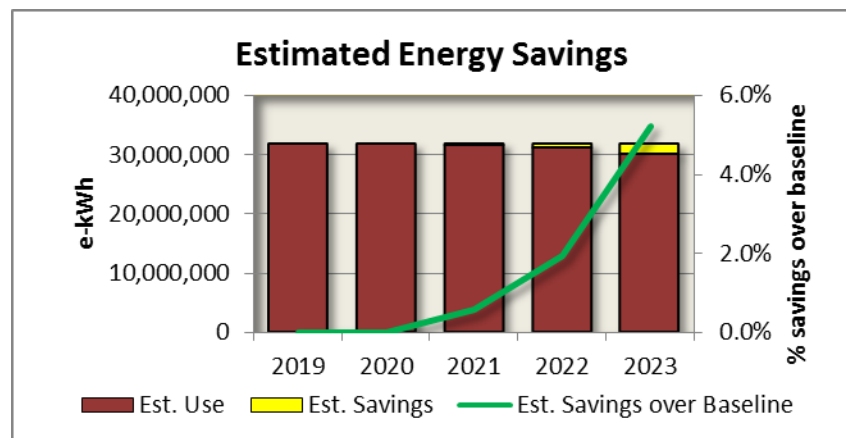
Figure 16-5: Energy Measure Implementation Plan for Transit and Associated Facilities



16.5 ESTIMATED SAVINGS

At the end of the plan, **Transit and Associated Facilities** are expected to save 5.2% over the base year of 2018, which amounts to a total of \$207,400 from all the projects.

Figure 16-6: Energy Measure Annual Savings for Transit and Associated Facilities



16.6 PROGRESS TO TARGETS

The City is targeting a 5.2% reduction in energy use in **Transit and Associated Facilities** by 2023 over the base year, 2018. The reporting of energy consumption data and savings for **Transit and Associated Facilities** will be based on utility meters and assembled annually. Since utility meters monitor energy consumption for the entire facility, the measurement boundary will encompass all parts of the facility. To determine the savings and fairly compare year-to-year energy consumption data, it is important to account for independent variables such as weather and occupancy and apply regression analysis to consumption data. Therefore, actual consumption data for each year starting 2019 will be adjusted to match the weather and occupancy of

2018. The figures below show the updated progress for each year against the set target.

Figure 11-7: Annual Energy Use vs Targeted Energy Use for Transit and Associated Facilities

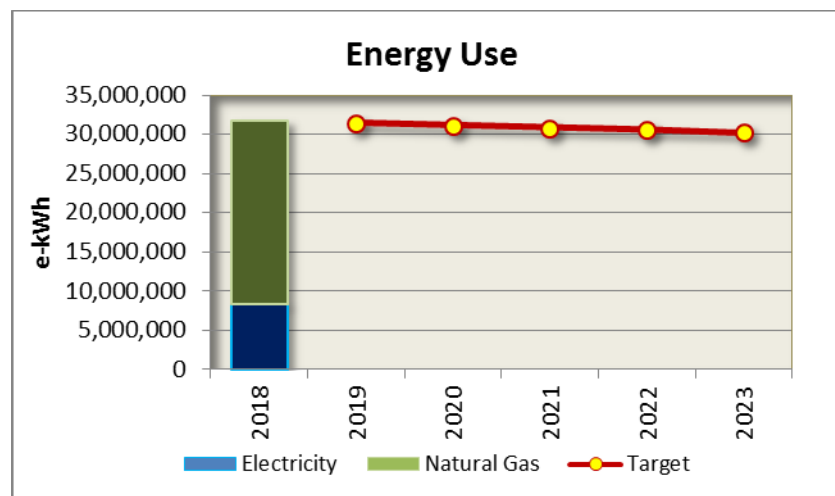
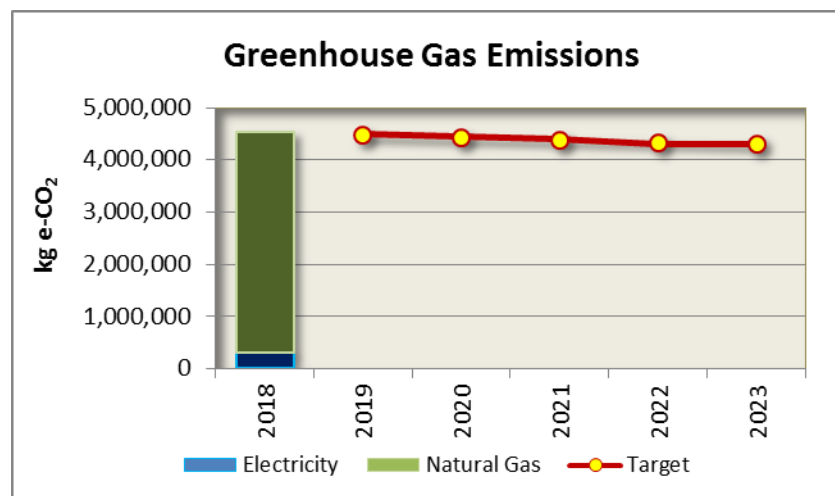


Figure 11-8: Annual GHG Emissions vs Targets for Transit and Associated Facilities



16.7 FACILITY INFORMATION FOR TRANSIT AND ASSOCIATED FACILITIES

Facility: Cawthra Road Station

Address 775 Eastgate Parkway,

Area (m²): 600Area (ft²): 0






Year Built:

Hours per Week :

Facility Group: Transit

Building Components:

**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	79,332	81,177	81,264	
Electricity (\$)	\$13,894	\$11,178	\$8,942	
Natural Gas (m ³)	0	0	0	
Natural Gas (\$)	\$0	\$0	\$0	
Water (m ³)	0	0	0	
Water (\$)	\$0	\$0	\$0	
Total Costs (\$)	\$13,894	\$11,178	\$8,942	
Total e-kWh	79,332	81,177	81,264	
Total e-kWh/m ²	132.2	135.3	135.4	
GHG (kg/Yr)	2,856	2,922	2,926	
GHG (kg/Yr/m ²)	5	5	5	

Energy Measures

Facility: CCTT Transitway Terminal






Address 209 Rathburn Rd W, L5B 4C1

Area (m²): Area (ft²):

Year Built: Hours per Week :

Facility Group: Transit

Building Components:

Historical Energy and GHG Data				Energy Measures
Year:	2016	2017	2018	
Electricity (kWh)	27,447	29,680	27,023	
Electricity (\$)	\$4,820	\$4,696	\$3,469	
Natural Gas (m ³)	0	0	0	
Natural Gas (\$)	\$0	\$0	\$0	
Water (m ³)	0	0	0	
Water (\$)	\$0	\$0	\$0	
Total Costs (\$)	\$4,820	\$4,696	\$3,469	
Total e-kWh	27,447	29,680	27,023	
Total e-kWh/m ²	N/A	N/A	N/A	
GHG (kg/Yr)	988	1,068	973	
GHG (kg/Yr/m ²)	N/A	N/A	N/A	

Facility: Central Parkway Station

Address 4325/4327 Central Parkway East,










Area (m²): 773 Area (ft²): 8,310

Year Built: Hours per Week :

Facility Group: Transit

Building Components:

**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	179,125	212,461	212,691	
Electricity (\$)	\$27,640	\$28,605	\$23,532	
Natural Gas (m ³)	19,746	17,771	30,809	
Natural Gas (\$)	\$5,640	\$5,672	\$8,745	
Water (m ³)	175	253	61	
Water (\$)	\$386	\$583	\$146	
Total Costs (\$)	\$33,666	\$34,860	\$32,423	
Total e-kWh	386,460	399,053	536,186	
Total e-kWh/m ²	499.9	516.2	693.6	
GHG (kg/Yr)	43,789	41,253	65,917	
GHG (kg/Yr/m ²)	57	53	85	

Energy Measures

Facility: City Centre Transit Terminal

Address 200 Rathburn Rd W, L5B 4E5










Area (m²): 1,718 Area (ft²): 8,267

Year Built: 1997 Hours per Week : 168

Facility Group: Transit

Building Components:

**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	482,761	466,684	413,874	
Electricity (\$)	\$77,051	\$75,239	\$65,978	
Natural Gas (m ³)	47,513	41,447	42,112	
Natural Gas (\$)	\$6,102	\$12,436	\$11,541	
Water (m ³)	5,965	3,175	4,379	
Water (\$)	\$13,064	\$7,236	\$10,719	
Total Costs (\$)	\$96,217	\$94,912	\$88,238	
Total e-kWh	981,646	901,881	856,053	
Total e-kWh/m ²	571.4	525.0	498.3	
GHG (kg/Yr)	107,226	95,178	94,534	
GHG (kg/Yr/m ²)	62	55	55	

Energy Measures

Energy Upgrades for Lifecycle Replacements
Lighting Upgrades

Facility: Dixie Rd Station

Address 4440/4442 Dixie Rd,

Area (m²): 614Area (ft²): 6,609










Year Built:

Hours per Week :

Facility Group: Transit

Building Components:

**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	288,899	233,455	294,434	
Electricity (\$)	\$45,148	\$36,961	\$43,401	
Natural Gas (m ³)	36,329	38,494	48,363	
Natural Gas (\$)	\$9,811	\$9,949	\$13,093	
Water (m ³)	2,245	2,124	2,010	
Water (\$)	\$4,897	\$4,857	\$4,888	
Total Costs (\$)	\$59,857	\$51,767	\$61,382	
Total e-kWh	670,357	637,644	802,240	
Total e-kWh/m ²	1,091.8	1,038.5	1,306.6	
GHG (kg/Yr)	79,099	81,197	102,053	
GHG (kg/Yr/m ²)	129	132	166	

Energy Measures

Facility: Etobicoke Creek Station

Address 1915 Eglinton Ave E,










Area (m²): 781 Area (ft²): 0

Year Built: Hours per Week :

Facility Group: Transit

Building Components:

Historical Energy and GHG Data

Year:	2016	2017	2018	
Electricity (kWh)	139,163	190,053	169,723	
Electricity (\$)	\$22,865	\$30,273	\$26,664	
Natural Gas (m ³)	60,565	61,791	70,411	
Natural Gas (\$)	\$8,843	\$14,737	\$18,126	
Water (m ³)	30	63	50	
Water (\$)	\$150	\$145	\$118	
Total Costs (\$)	\$31,858	\$45,154	\$44,908	
Total e-kWh	775,097	838,855	909,035	
Total e-kWh/m ²	992.4	1,074.1	1,163.9	
GHG (kg/Yr)	119,538	123,688	139,257	
GHG (kg/Yr/m ²)	153	158	178	

Energy Measures

Facility: Go Bus Stop

Address Centre View/Station Gate Rd, L5B 3C1






Area (m²): Area (ft²):

Year Built: Hours per Week :

Facility Group: Transit

Building Components:

**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	892	564	259	
Electricity (\$)	\$658	\$616	\$536	
Natural Gas (m ³)	0	0	0	
Natural Gas (\$)	\$0	\$0	\$0	
Water (m ³)	0	0	0	
Water (\$)	\$0	\$0	\$0	
Total Costs (\$)	\$658	\$616	\$536	
Total e-kWh	892	564	259	
Total e-kWh/m ²	N/A	N/A	N/A	
GHG (kg/Yr)	32	20	9	
GHG (kg/Yr/m ²)	N/A	N/A	N/A	

Energy Measures

Facility: Malton Satellite Terminal

Address 6780 Professional Court, L4V 1X6










Area (m²): 2,070 Area (ft²): 22,281

Year Built: 1991 Hours per Week : 168

Facility Group: Transit

Building Components: Maintenance Bay; Offices and Meeting Rooms; Outdoor Bus Storage; Wash Bay

**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	593,132	642,778	522,537	
Electricity (\$)	\$92,157	\$97,930	\$76,650	
Natural Gas (m ³)	201,618	153,544	137,858	
Natural Gas (\$)	\$47,108	\$39,413	\$34,379	
Water (m ³)	12,159	11,930	11,558	
Water (\$)	\$27,873	\$27,264	\$27,989	
Total Costs (\$)	\$167,139	\$164,606	\$139,018	
Total e-kWh	2,710,120	2,254,990	1,970,042	
Total e-kWh/m ²	1,309.2	1,089.4	951.7	
GHG (kg/Yr)	402,612	313,492	279,500	
GHG (kg/Yr/m ²)	194	151	135	

Energy Measures

Lighting Upgrades

Facility: Orbitor Drive Station










Address 5015/5017 Orbitor Drive,

Area (m²): 591 Area (ft²): 0

Year Built: Hours per Week :

Facility Group: Transit

Building Components:

Historical Energy and GHG Data				Energy Measures	
Year:	2016	2017	2018		
Electricity (kWh)	0	91	683		
Electricity (\$)	\$0	\$131	\$1,088		
Natural Gas (m ³)	0	28,821	70,327		
Natural Gas (\$)	\$0	\$7,995	\$18,082		
Water (m ³)	0	46	24		
Water (\$)	\$0	\$185	\$60		
Total Costs (\$)	\$0	\$8,311	\$19,229		
Total e-kWh	0	302,708	739,116		
Total e-kWh/m ²	0.0	512.2	1,250.6		
GHG (kg/Yr)	0	54,503	133,013		
GHG (kg/Yr/m ²)	0	92	225		

Facility: Semenyk Crt - T&W Administration-TEP

Address 3484 Semenyk Court, L5C 4R1










Area (m²): 2,422 Area (ft²): 26,070

Year Built: 1989 Hours per Week : 50

Facility Group: Transit

Building Components: Offices and Meeting Rooms

**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	304,550	316,402	351,976	
Electricity (\$)	\$52,663	\$52,900	\$57,026	
Natural Gas (m ³)	30,242	32,620	39,691	
Natural Gas (\$)	\$8,229	\$9,600	\$10,963	
Water (m ³)	984	946	834	
Water (\$)	\$2,150	\$2,160	\$2,028	
Total Costs (\$)	\$63,042	\$64,660	\$70,018	
Total e-kWh	622,087	658,916	768,734	
Total e-kWh/m ²	256.8	272.1	317.4	
GHG (kg/Yr)	68,151	73,076	87,727	
GHG (kg/Yr/m ²)	28	30	36	

Energy Measures

Lighting Upgrades

Facility: Spectrum Way Station










Address 5005/5007 Spectrum Way,

Area (m²): 591 Area (ft²): 0

Year Built: Hours per Week :

Facility Group: Transit

Building Components:

Historical Energy and GHG Data				Energy Measures
Year:	2016	2017	2018	
Electricity (kWh)	0	6,654	154,836	
Electricity (\$)	\$0	\$1,091	\$24,073	
Natural Gas (m ³)	0	50,147	50,606	
Natural Gas (\$)	\$0	\$13,664	\$13,566	
Water (m ³)	0	22	17	
Water (\$)	\$0	\$131	\$40	
Total Costs (\$)	\$0	\$14,886	\$37,679	
Total e-kWh	0	533,194	686,196	
Total e-kWh/m ²	0.0	902.2	1,161.1	
GHG (kg/Yr)	0	95,067	101,270	
GHG (kg/Yr/m ²)	0	161	171	

Facility: Tahoe Blvd Station

Address 4651/4653 Tahoe Blvd,










Area (m²): 591 Area (ft²): 0

Year Built: Hours per Week :

Facility Group: Transit

Building Components:

Historical Energy and GHG Data

Year:	2016	2017	2018	
Electricity (kWh)	120,400	144,777	143,155	
Electricity (\$)	\$19,402	\$20,294	\$15,926	
Natural Gas (m ³)	49,987	53,548	50,177	
Natural Gas (\$)	\$8,141	\$13,850	\$13,304	
Water (m ³)	7	13	9	
Water (\$)	\$96	\$29	\$21	
Total Costs (\$)	\$27,639	\$34,173	\$29,251	
Total e-kWh	645,263	707,031	670,009	
Total e-kWh/m ²	1,091.8	1,196.3	1,133.7	
GHG (kg/Yr)	98,860	106,471	100,038	
GHG (kg/Yr/m ²)	167	180	169	

Energy Measures

Facility: Tomken Rd Station

Address 4450/4452 Tomken Rd,

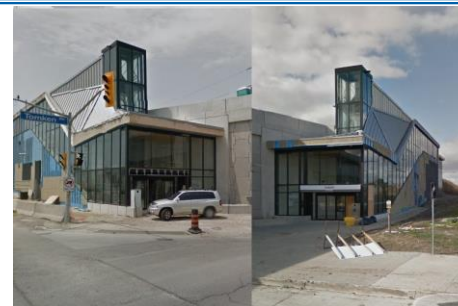
Area (m²): 693Area (ft²): 6,598










Year Built:

Hours per Week :

Facility Group: Transit

Building Components:

**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	185,732	222,553	207,694	
Electricity (\$)	\$29,859	\$29,972	\$23,119	
Natural Gas (m ³)	19,975	18,574	9,821	
Natural Gas (\$)	\$5,485	\$6,147	\$3,225	
Water (m ³)	196	382	80	
Water (\$)	\$242	\$503	\$114	
Total Costs (\$)	\$35,585	\$36,623	\$26,458	
Total e-kWh	395,469	417,579	310,809	
Total e-kWh/m ²	570.7	602.6	448.5	
GHG (kg/Yr)	44,459	43,135	26,048	
GHG (kg/Yr/m ²)	64	62	38	

Energy Measures

Facility: Edward J. Dowling Transit Facility (Bldg ABCD)

Address 975 Central Parkway W, L5C 3B1

Area (m²): 31,178Area (ft²): 335,565










Year Built: 1975

Hours per Week : 168

Facility Group: Transit

Building Components: Indoor Bus Storage; Maintenance Bay; Offices and Meeting Rooms; Wash Bay

**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	4,530,854	4,692,156	4,238,831	
Electricity (\$)	\$675,401	\$683,984	\$600,194	
Natural Gas (m ³)	1,276,533	1,233,036	1,310,278	
Natural Gas (\$)	\$300,802	\$309,820	\$311,086	
Water (m ³)	18,106	18,947	21,397	
Water (\$)	\$39,129	\$43,221	\$51,741	
Total Costs (\$)	\$1,015,333	\$1,037,025	\$963,020	
Total e-kWh	17,934,450	17,639,029	17,996,753	
Total e-kWh/m ²	575.2	565.8	577.2	
GHG (kg/Yr)	2,577,035	2,500,588	2,630,334	
GHG (kg/Yr/m ²)	83	80	84	

Energy Measures

Controls Upgrades
 Operation Optimization
 Renewable Energy Generation

Facility: Transit Central - New Bus Storage Building (Bldg E)

Address 3567 Erindale Station Rd, L5C 2S9

Area (m²): 10,412Area (ft²): 112,074










Year Built: 2009

Hours per Week : 168

Facility Group: Transit

Building Components: Indoor Bus Storage

**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	1,433,680	1,572,800	1,415,188	
Electricity (\$)	\$229,864	\$246,021	\$214,195	
Natural Gas (m ³)	168,383	172,010	207,384	
Natural Gas (\$)	\$41,668	\$45,488	\$49,813	
Water (m ³)	11,978	14,490	16,549	
Water (\$)	\$29,738	\$33,077	\$40,146	
Total Costs (\$)	\$301,270	\$324,586	\$304,154	
Total e-kWh	3,201,700	3,378,909	3,592,722	
Total e-kWh/m ²	307.5	324.5	345.1	
GHG (kg/Yr)	370,025	381,892	443,110	
GHG (kg/Yr/m ²)	36	37	43	

Energy Measures

Controls Upgrades
Operation Optimization

Facility: Transit Central - Body Shop (Bldg F)

Address 3585 Erindale Station Rd, L5C 2S9








Area (m²): 2,274 Area (ft²): 24,477

Year Built: 2008 Hours per Week : 56

Facility Group: Transit

Building Components: Maintenance Bay

**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	0	0	0	
Electricity (\$)	\$0	\$0	\$0	
Natural Gas (m ³)	148,590	123,796	162,842	
Natural Gas (\$)	\$36,799	\$33,386	\$40,570	
Water (m ³)	185	167	153	
Water (\$)	\$402	\$383	\$373	
Total Costs (\$)	\$37,201	\$33,768	\$40,943	
Total e-kWh	1,560,193	1,299,861	1,709,841	
Total e-kWh/m ²	686.1	571.6	751.9	
GHG (kg/Yr)	280,983	234,099	307,934	
GHG (kg/Yr/m ²)	124	103	135	

Energy Measures

Controls Upgrades
Operation Optimization

Facility: Transit Drivers Lounge & WC

Address 7205 Goreway Dr, L5B 3C1

Area (m²): 56Area (ft²): 603








Year Built:

Hours per Week :

Facility Group: Transit

Building Components:

**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	36,353	50,174	48,981	
Electricity (\$)	\$8,843	\$7,329	\$5,745	
Natural Gas (m ³)	0	0	0	
Natural Gas (\$)	\$0	\$0	\$0	
Water (m ³)	420	401	471	
Water (\$)	\$908	\$916	\$1,147	
Total Costs (\$)	\$9,750	\$8,244	\$6,892	
Total e-kWh	36,353	50,174	48,981	
Total e-kWh/m ²	649.2	896.0	874.7	
GHG (kg/Yr)	1,309	1,806	1,763	
GHG (kg/Yr/m ²)	23	32	31	

Energy Measures

17.0 SERVICE YARDS, CENTRAL STORES, AND MAINTENANCE FACILITIES

17.1 SCOPE AND BOUNDARY

For the purposes of this report, the City of Mississauga has 7 facilities/locations that fall under this category. They include:

- Clarkson Yard
- Lakefront Promenade Maintenance Depot
- Malton Yard
- Mavis Maintenance Hut
- Mavis North
- Mavis South
- Meadowvale Depot

The above listed locations have a total floor area of approximately 15,700 square meters. This would account for 3.4% of the total building area for City of Mississauga facilities included in this Plan.

17.2 BASELINE

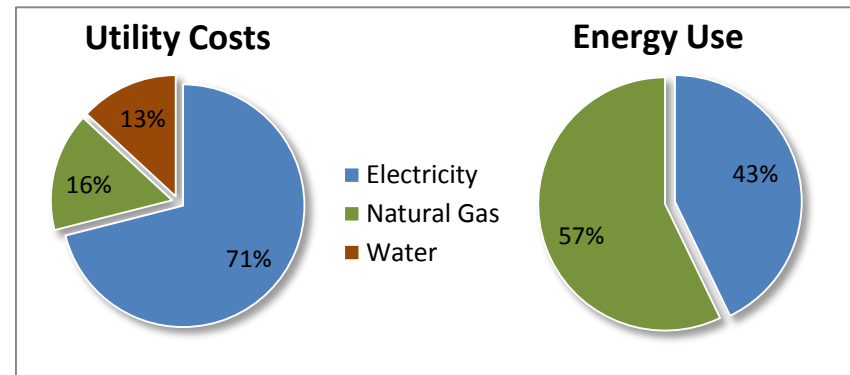
17.2.1 ENERGY USE

The energy use (combined electricity and natural gas) for **Service Yards, Central Stores, and Maintenance Facilities** was 5,495,000 equivalent kilowatt hours in 2018. Following are the key takeaways for the energy usage in 2018:

- 43% of the total energy usage was due to electricity use, which has remained consistent since 2013
- 57% of the total energy usage was due to natural gas use, which has dropped by 2.7% since 2013
- A total of \$507,000 in utility costs was incurred, out of which 71% is attributed to electricity, 16% to natural gas, and 13% to water

Service Yards, Central Stores, and Maintenance Facilities accounted for 2.8% of the City's total utility budget for 2018.

Figure 17-1: Utility Costs and Energy Use Breakdown for Service Yards, Central Stores, and Maintenance Facilities



17.2.2 ENERGY USE INTENSITY

Energy Use Intensity (EUI) is a measurement that expresses a building's energy use as a function of its size or other characteristic. It is used to give a better picture of the energy efficiency of a facility. The lower the EUI, the more efficient the facility is.

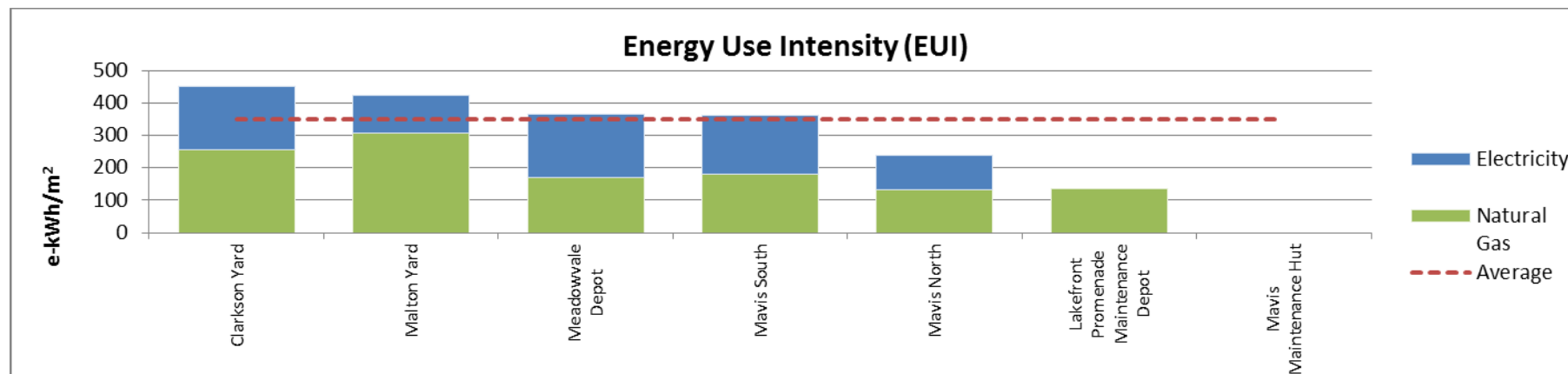
When reviewing EUI, the facility operation type and hours should be taken into account. For example, a facility that operates 24 hours a day will most likely have a higher EUI than a similar one that operates 8 hours a day. Similarly, a facility that has high energy using systems that do not contribute to the building area, such as an outdoor pool or outdoor ice rink, will have a higher EUI than a facility where those systems are located within the facility, as they would add to the facility's area footprint.

For **Service Yards, Central Stores, and Maintenance Facilities** the average EUI in 2018 was 348.9 e-kWh/m².

The following chart shows the EUI for each facility within **Service Yards, Central Stores, and Maintenance Facilities**, and compares it to the average for the group.

Note: The Average EUI value is calculated by taking the total energy use of all facilities, and dividing by the total area of the facilities. As such, a larger facility would have a bigger impact on the average than a smaller facility.

Figure 17-2: Energy Use Intensity for Service Yards, Central Stores, and Maintenance Facilities

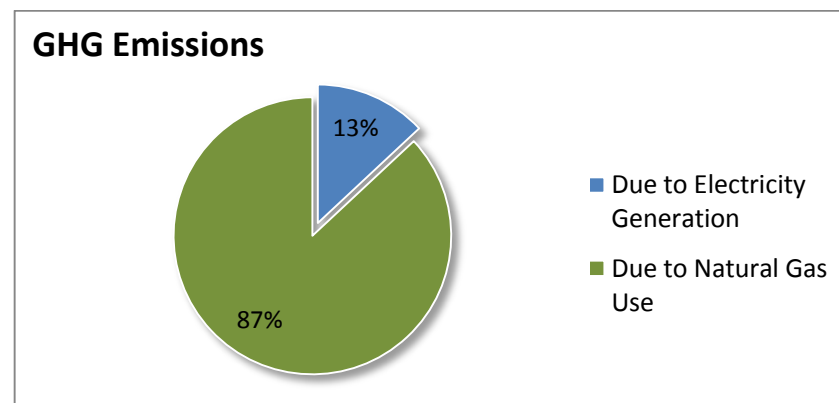


17.2.3 GREENHOUSE GAS (GHG) EMISSIONS

For 2018, **Service Yards, Central Stores, and Maintenance Facilities** emitted 650,400 kg (or 650 tonnes) of CO₂ in 2018. 13.0% of these emissions were due to the generation of electricity, while the use of natural gas accounted for the remaining 87.0%.

Service Yards, Central Stores, and Maintenance Facilities accounted for 3.3% of the City's total GHG emissions for facilities included in the plan.

Figure 17-3: GHG Emissions Breakdown for Service Yards, Central Stores, and Maintenance Facilities



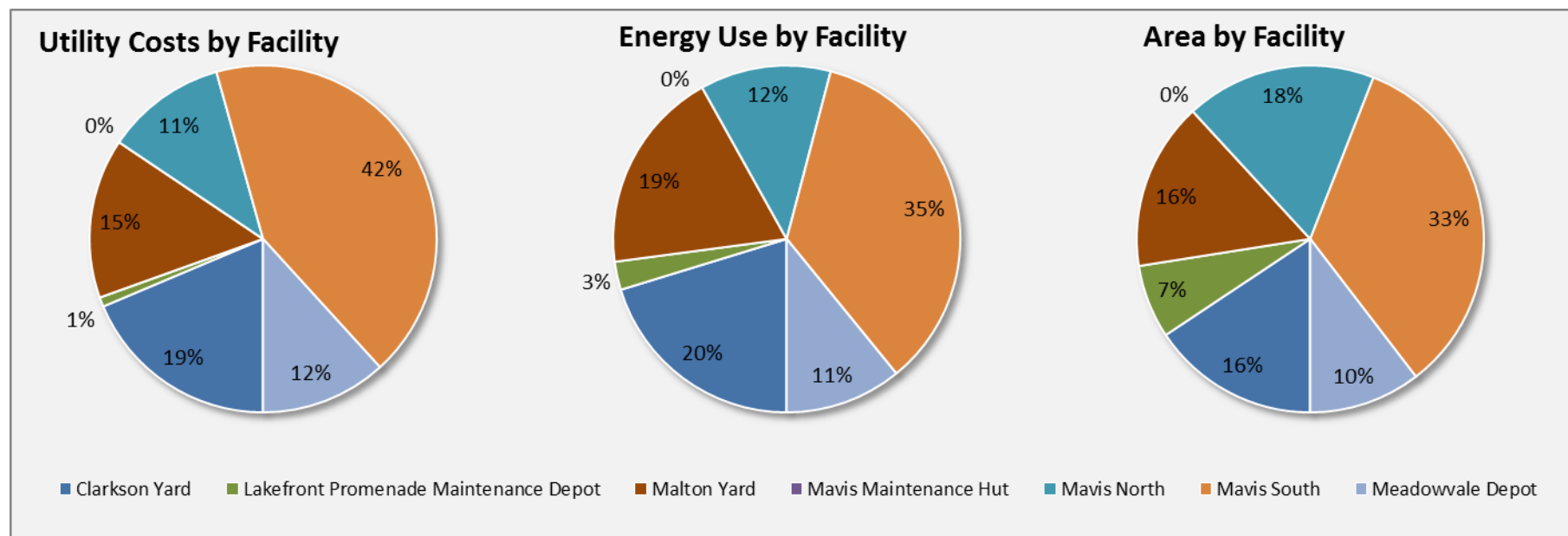
17.3 ENERGY AND GHG BREAKDOWN FOR SERVICE YARDS, CENTRAL STORES, AND MAINTENANCE FACILITIES

This section provides a brief overview/recap of the Utility and GHG data for **Service Yards, Central Stores, and Maintenance Facilities**. The table below summarizes, by facility, the utility usage and GHG emissions for 2018. Following are the key takeaways:

- The Mavis Yards are the largest facility in this group by area and contribute 47% and 53% towards energy consumption and utility consumption in this group

- The Clarkson Yard is the second largest facility in this group by area and contribute 20% and 19% towards energy consumption and utility consumption in this group
- The Malton Yard is the third largest facility in this group by area and contribute 19% and 15% towards energy consumption and utility consumption in this group
- Meadowvale Depot and Lakefront Promenade Maintenance Depot represent the remaining facility area in the group and contribute 14% and 13% towards the energy consumption and utility consumption in the group

Figure 16-4: Utility Costs and Energy Use Breakdown by Facility



2018 Annual Report for Service Yards, Central Stores, and Maintenance Facilities

Facility	Area	Electricity		Natural Gas		Total Energy	Water		Total Costs	GHG Emissions
	m ²	kWh	\$	m ³	\$	e-kWh	m ³	\$	\$	kg
Clarkson Yard	2,466	479,785	\$73,542	60,368	\$15,716	1,113,645	2,152	\$5,235	\$94,493	131,427
Lakefront Promenade Maintenance Depot	1,078	0	\$0	13,762	\$4,418	144,501	19	\$47	\$4,465	26,024
Malton Yard	2,466	287,055	\$46,172	72,111	\$18,513	1,044,223	4,398	\$10,836	\$75,521	146,696
Mavis Maintenance Hut	0	0	\$0	0	\$0	0	0	\$0	\$0	0
Mavis North	2,799	303,495	\$45,686	34,870	\$9,788	669,629	635	\$1,543	\$57,017	76,865
Mavis South	5,299	963,772	\$145,408	91,515	\$24,230	1,924,683	18,925	\$46,229	\$215,866	207,751
Meadowvale Depot	1,640	319,761	\$49,363	26,489	\$7,662	597,893	1,065	\$2,596	\$59,621	61,602
Totals	15,748	2,353,868	\$360,171	299,115	\$80,326	5,494,574	27,195	\$66,485	\$506,983	650,365
Usage / Costs per m²:		160.5	\$24.6	19.0	\$5.1	349	1.7	\$4.2	\$32.2	41.3

17.4 ACTION PLAN

An action plan has been identified with the goal to save on electricity, natural gas, oil, and/or other form of energy consumption within a facility or location.

The following figure shows the various projects and initiatives that have been planned for **Service Yards, Central Stores, and Maintenance Facilities**. The chart shows what projects have been planned, when they are planned to be implemented, and the progress of implementation (if applicable). A brief description of each project has been noted below:






- **Energy Upgrades for Lifecycle Replacements:** Includes energy upgrades for high capital assets that show economic paybacks only at the time of replacement like envelope and HVAC equipment

- **Lighting Upgrades:** Includes replacement of existing lighting technologies to newer technologies like LEDs, and better controls through localized sensors and BAS scheduling

For the chart below, the **Purple** coloured bars represent the original planned start and completion of a Measure type. The **Green** bar beneath shows the actual start and completion times for a completed measure, while the **Blue** bar shows the actual start time of a Measure that is currently being implemented, but not yet complete. Some Notes:

- A Single Measure timeline may include more than one implementation of that measure (example: In different facilities).
- Due to changing circumstances (change in operations, budget changes, new technology, etc.), a planned measure may be cancelled. These would be indicated by a **Red** plan bar on the chart.

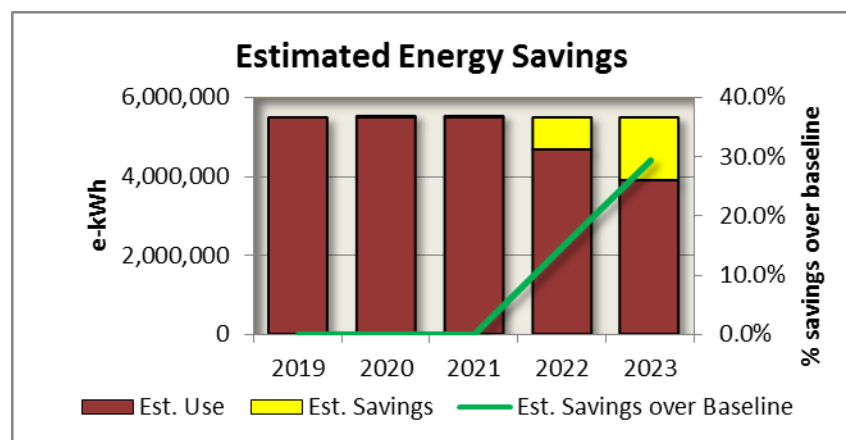
Figure 16-5: Energy Measure Implementation Plan for Service Yards, Central Stores, and Maintenance Facilities

Energy Measure	2019				2020				2021				2022				2023			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Energy Upgrades for Lifecycle Replacements																				
Lighting Upgrades																				
Planned Implementation  Scheduled Implentation  Cancelled Implementation 																	Q1 = Jan-Mar			
Actual Implementation  Status = Completed  Status = Underway																	Q3 = Jul-Sep			

17.5 ESTIMATED SAVINGS

At the end of the plan, **Service Yards, Central Stores, and Maintenance Facilities** are expected to save 29.4% over the base year of 2018, which amounts to a total of \$220,725 from all the projects.

Figure 16-6: Energy Measure Annual Savings for Service Yards, Central Stores, and Maintenance Facilities



17.6 PROGRESS TO TARGETS

The City is targeting a 29.4% reduction in energy use in **Service Yards, Central Stores, and Maintenance Facilities** by 2023 over the base year, 2018. The reporting of energy consumption data and savings for **Service Yards, Central Stores, and Maintenance Facilities** will be based on utility meters and assembled annually. Since utility meters monitor energy consumption for the entire facility, the measurement boundary will encompass all parts of the facility. To determine the savings and fairly compare year-to-year energy consumption data, it is important to account for independent variables such as weather and occupancy and apply regression analysis to consumption data. Therefore, actual consumption data for each year starting 2019 will be adjusted to match

the weather and occupancy of 2018. The figures below show the updated progress for each year against the set target.

Figure 11-7: Annual Energy Use vs Targeted Energy Use for Service Yards, Central Stores, and Maintenance Facilities

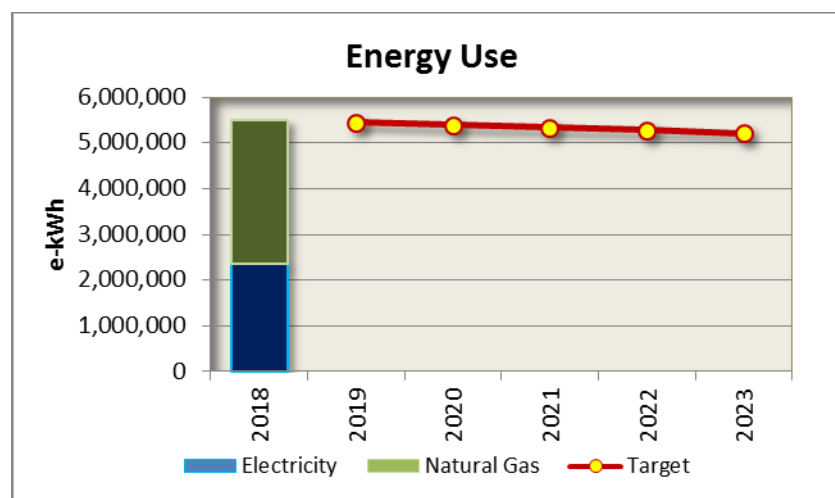
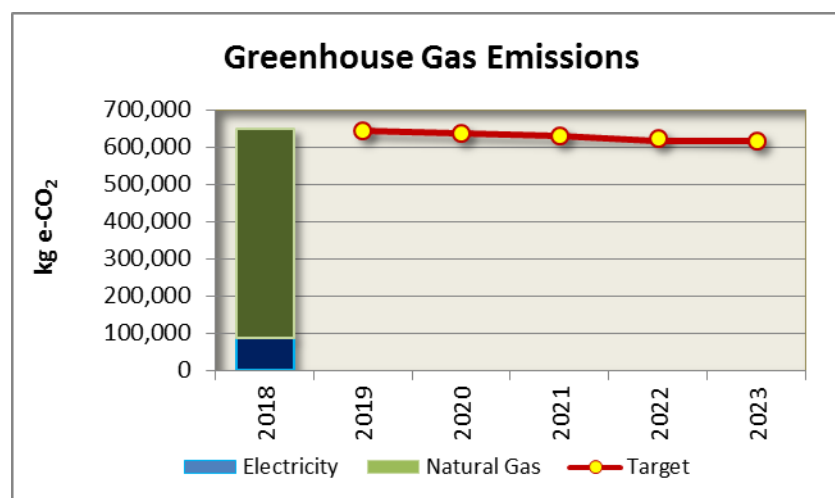


Figure 11-8: Annual GHG Emissions vs Targets for Service Yards, Central Stores, and Maintenance Facilities



17.7 FACILITY INFORMATION FOR SERVICE YARDS, CENTRAL STORES, AND MAINTENANCE FACILITIES

Facility: Clarkson Yard

Address 2167 Royal Windsor Dr, L5J 1K5










Area (m²): 2,466 Area (ft²): 26,544

Year Built: 1977 Hours per Week : 94.5

Facility Group: Yard/Maintenance Depot

Building Components: Maintenance Bay; Offices and Meeting Rooms

**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	460,140	495,236	479,785	
Electricity (\$)	\$74,344	\$79,454	\$73,542	
Natural Gas (m ³)	68,800	74,257	60,368	
Natural Gas (\$)	\$17,695	\$20,554	\$15,716	
Water (m ³)	2,791	2,129	2,152	
Water (\$)	\$7,253	\$4,867	\$5,235	
Total Costs (\$)	\$99,292	\$104,876	\$94,493	
Total e-kWh	1,182,536	1,274,936	1,113,645	
Total e-kWh/m ²	479.5	517.0	451.6	
GHG (kg/Yr)	146,665	158,249	131,427	
GHG (kg/Yr/m ²)	59	64	53	

Energy Measures

Energy Upgrades for Lifecycle Replacements
Lighting Upgrades

Facility: Lakefront Promenade Maintenance Depot

Address 725 Lakefront Promenade, L5E 3G9

Area (m²): 1,078 Area (ft²): 11,603

Year Built: 1988 Hours per Week : 63

Facility Group: Yard/Maintenance Depot

Building Components:

**Historical Energy and GHG Data**

Year:	2016	2017	2018
Electricity (kWh)	0	0	0
Electricity (\$)	\$0	\$0	\$0
Natural Gas (m ³)	14,571	11,611	13,762
Natural Gas (\$)	\$4,522	\$4,039	\$4,418
Water (m ³)	10	0	19
Water (\$)	\$22	-\$111	\$47
Total Costs (\$)	\$4,544	\$3,928	\$4,465
Total e-kWh	152,991	121,917	144,501
Total e-kWh/m ²	141.9	113.1	134.0
GHG (kg/Yr)	27,553	21,957	26,024
GHG (kg/Yr/m ²)	26	20	24

Energy Measures

Facility: Malton Yard

Address 7100 Fir Tree Dr, L5S 1G5










Area (m²): 2,466 Area (ft²): 26,544

Year Built: 1977 Hours per Week : 94.5

Facility Group: Yard/Maintenance Depot

Building Components: Maintenance Bay; Offices and Meeting Rooms

**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	299,357	294,302	287,055	
Electricity (\$)	\$50,429	\$49,310	\$46,172	
Natural Gas (m ³)	67,599	71,338	72,111	
Natural Gas (\$)	\$17,496	\$19,704	\$18,513	
Water (m ³)	3,367	3,202	4,398	
Water (\$)	\$8,190	\$7,325	\$10,836	
Total Costs (\$)	\$76,116	\$76,339	\$75,521	
Total e-kWh	1,009,148	1,043,351	1,044,223	
Total e-kWh/m ²	409.2	423.1	423.4	
GHG (kg/Yr)	138,607	145,495	146,696	
GHG (kg/Yr/m ²)	56	59	59	

Energy Measures

Lighting Upgrades

Facility: Mavis Maintenance Hut

Address 3235 Mavis Rd, L5C 1T7

Area (m²): Area (ft²):

Year Built: 1964 Hours per Week : 70

Facility Group: Yard/Maintenance Depot

Building Components:

**Historical Energy and GHG Data**

Year:	2016	2017	2018
Electricity (kWh)	0	0	0
Electricity (\$)	\$0	\$0	\$0
Natural Gas (m ³)	0	0	0
Natural Gas (\$)	\$0	\$0	\$0
Water (m ³)	0	0	0
Water (\$)	\$0	\$0	\$0
Total Costs (\$)	\$0	\$0	\$0
Total e-kWh	0	0	0
Total e-kWh/m ²	N/A	N/A	N/A
GHG (kg/Yr)	0	0	0
GHG (kg/Yr/m ²)	N/A	N/A	N/A

Energy Measures

Facility: Mavis North

Address 3235 Mavis Rd, L5C 1T7










Area (m²): 2,799 Area (ft²): 30,128

Year Built: 1982 Hours per Week : 50

Facility Group: Yard/Maintenance Depot

Building Components:

**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	330,078	303,329	303,495	
Electricity (\$)	\$52,923	\$48,329	\$45,686	
Natural Gas (m ³)	31,706	32,037	34,870	
Natural Gas (\$)	\$8,102	\$9,531	\$9,788	
Water (m ³)	759	640	635	
Water (\$)	\$1,643	\$1,461	\$1,543	
Total Costs (\$)	\$62,667	\$59,321	\$57,017	
Total e-kWh	662,992	639,720	669,629	
Total e-kWh/m ²	236.9	228.6	239.2	
GHG (kg/Yr)	71,839	71,502	76,865	
GHG (kg/Yr/m ²)	26	26	27	

Energy Measures

Lighting Upgrades

Facility: Mavis South

Address 3185 Mavis Rd, L5C 1T7

Area (m²): 5,299Area (ft²): 57,038










Year Built: 1956

Hours per Week : 94.5

Facility Group: Yard/Maintenance Depot

Building Components: Machine Shop; Maintenance Bay; Offices and Meeting Rooms

**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	908,264	990,919	963,772	
Electricity (\$)	\$150,723	\$156,648	\$145,408	
Natural Gas (m ³)	75,460	90,775	91,515	
Natural Gas (\$)	\$19,501	\$25,197	\$24,230	
Water (m ³)	7,627	10,861	18,925	
Water (\$)	\$16,818	\$24,860	\$46,229	
Total Costs (\$)	\$187,042	\$206,705	\$215,866	
Total e-kWh	1,700,593	1,944,060	1,924,683	
Total e-kWh/m ²	320.9	366.9	363.2	
GHG (kg/Yr)	175,392	207,329	207,751	
GHG (kg/Yr/m ²)	33	39	39	

Energy Measures

Lighting Upgrades

Facility: Meadowvale Depot

Address 6300 Millcreek Dr, L5N 7K1










Area (m²): 1,640 Area (ft²): 17,653

Year Built: 1980 Hours per Week : 94.5

Facility Group: Yard/Maintenance Depot

Building Components: Maintenance Bay; Offices and Meeting Rooms

**Historical Energy and GHG Data**

Year:	2016	2017	2018	
Electricity (kWh)	376,113	327,005	319,761	
Electricity (\$)	\$60,857	\$52,180	\$49,363	
Natural Gas (m ³)	21,871	23,268	26,489	
Natural Gas (\$)	\$6,387	\$7,136	\$7,662	
Water (m ³)	566	1,584	1,065	
Water (\$)	\$2,371	\$3,623	\$2,596	
Total Costs (\$)	\$69,615	\$62,939	\$59,621	
Total e-kWh	605,760	571,324	597,893	
Total e-kWh/m ²	369.4	348.4	364.6	
GHG (kg/Yr)	54,898	55,773	61,602	
GHG (kg/Yr/m ²)	33	34	38	

Energy Measures

Energy Upgrades for Lifecycle Replacements
Lighting Upgrades

APPENDIX 1.0: MEASURE TYPE INFORMATION

A1.1 PROJECTS

Project = Technological – operational & technological actions.

Examples: Lighting retrofit, new controls, efficient boiler, etc.

A1.1.1 BUILDING ENVELOPE

Building Envelope Sealing Minimizing heat loss by installing weather stripping on windows and doors, improving the building envelope. Saves natural gas for heating.

Window Coating Installing a film on building windows to: a) reduce heat loss in winter, cutting heating load; and b) reduce heat gain in summer, cutting air conditioning load. Saves both natural gas and electricity.

A1.1.2 CONTROLS

BAS Installation Installation of a Building Automation System (BAS). Can also be known as a Building Management System. A BAS is a network of controllers designed to monitor and control the mechanical (HVAC, ventilation, and dehumidification) and lighting systems of a building.

The BAS can be used to operate the equipment on a schedule, i.e. setting back, or turning off, during unoccupied periods.

BAS Upgrade An upgrade or modification to an existing Building Automation System. Usually entails new equipment, or improvements to the controls and/or control strategy.

CO2 Controls Controls used to monitor CO2 levels in a space and adjust fresh air ventilation according to needs. That reduces outside air brought into the building during unoccupied periods, reducing the need to heat/cool the air.

Ice Controls Controls used to monitor ice temperature and control the ice plant in an arena. Allows for adjustments to ice temperature depending on use type, and save energy during unoccupied periods by setting back temperatures.

Lighting Controls Installation of new controls to better operate lighting. Could include:

- Occupancy sensors to turn off lighting when a room is unoccupied.
- Scheduling control (through a BAS or other control system), enabling the lighting to be on or off as required.

Programmable Thermostats	Designed to adjust the temperature according to a series of programmed settings that take effect at different times. Programmable thermostats may also be called setback thermostats or clock thermostats.
Unit Heater Disconnect	Controls that sense when a large garage or bay door is left open and turns off the unit heaters in the immediate area.
Vending Miser	Special controls that turn off a vending machine, and turn it on when someone approaches by means of a sensor. The controls also cycle the compressors in the unit to ensure the contents stay cold.

A1.1.3 ENERGY DASHBOARD

Energy Dashboard	Computerized display showing a facility's energy (electricity and natural gas) and water usage, both current, and over a period of time. The Energy Dashboard helps increase the energy awareness of facility operations staff and the public.
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A1.1.4 EQUIPMENT UPGRADE

AHU Replacement	Replacing an Air Handling Unit (or rooftop, furnace or other general HVAC piece of equipment) with a higher efficiency unit.
Boiler Replacement	Replacing an existing boiler with a higher efficiency boiler. Normally performed when the existing equipment is at or near the end of its useful life.
Chiller Replacement	Replacing a chiller (used in air conditioning and ice plants) with a more efficient unit. Normally performed when the existing equipment is at or near the end of its useful life.
Desiccant Dehumidifier	Installation of a gas fired dehumidifier to replace an electric unit.
Free Cooling	Using outside air to provide cool a facility rather than an air conditioning unit. Generally done during shoulder seasons (i.e. spring and fall) when the temperatures are cool.
Heater Replacement	Replacing a heater with a more efficient unit.
Infrared Unit Heater	Replacing an electric or forced air unit heater with a more efficient infrared unit heater. An infrared unit heater heats the objects in the space, rather than the air, avoiding the loss of heat when doors are opened. Usually installed in areas with large garage doors (fire stations, truck bays, etc.).
Insulation	Adding/fixing insulation on piping carrying hot fluids, on ductwork or equipment. The insulation helps reduce heat

loss and saves on energy required for heating.

A1.1.5 HEAT RECOVERY

Waste Heat Recovery A process that takes advantage of waste heat, i.e. the heat from exhaust air, the ice-making process in an arena or water drained from a pool. This waste heat can be used for preheating incoming air, space heating or pre-heating the hot water in the facility.

A1.1.6 IMPLEMENT NEW MEASURES

Energy Audit Measures Implementation of measures determined by the Energy Audit

Re-commissioning Measures Implementation of measures determined by Re-commissioning

A1.1.7 LIGHTING

LED Arena/Pool Lighting Replacing the lighting, usually metal halide or mercury vapour, in an arena and/or pool with LED fixtures. The LED fixture would provide higher efficiency (lower energy use), better life (lower maintenance costs), and better control (dimming, on/off control).

LED Lighting Retrofit Replacing the standard lighting with LED fixtures. The LED fixture would provide higher efficiency (lower energy use), better life (lower maintenance costs), and better control (dimming, on/off control).

LED Parking Lot Replacing the standard lighting in a parking lot with LED fixtures. The LED fixture would provide higher efficiency (lower energy use), better life (lower maintenance costs), and better control (dimming, on/off control).

LED Street Lighting Replacing the standard street lighting with LED fixtures. The LED fixture would provide higher efficiency (lower energy use), better life (lower maintenance costs), and better control (dimming during shoulder hours).

Lighting Retrofit Modification to the lighting of a facility to save energy. Can involve:

- Replacing existing lighting with more efficient type lamps and fixture.
- Reducing lighting where areas are over lit.
- Installation of occupancy sensors and other controls to turn off lights when spaces are unoccupied.

A1.1.8 MAINTENANCE

Equipment Repairing existing equipment for energy efficiency. This does not include all maintenance performed on equipment.

Maintenance

Equipment Optimization Adjustments of the operation or controls of equipment to make it operate more efficiently in general and energy efficiently.

A1.1.9 NEW TECHNOLOGY

New Technology Installation of a new or recent technology or equipment meant to improve energy efficiency. Generally, unproven technology is installed at a single location for testing. Once proven, it is then installed in more facilities/locations.

A1.1.10 RENEWABLE ENERGY

Solar Photovoltaic Installation of solar panels to generate electricity from the energy of the sun.

Solar Water Heating A system that uses heat from the sun to pre-heat the domestic hot water of a building.

A1.1.11 VARIABLE SPEED DRIVE

Pool VSD A Variable Speed Drive (VSD) that installed to control the speed of a pools filtration pump.

The filtration system, the system that removes contaminants from the pool water, is generally designed to operate at speeds based on full occupancy of the pool.

The VSD controls allows the pump motor to operate at lower speeds during periods of low to no occupancy (periods where the contaminant levels are low), savings large amounts of energy.

Variable Speed Drive Installation of controls on electric motors which allows the motor speed to be reduced when the requirements on the motor or equipment are lower.

A slight reduction in the speed of an electric motor can have huge savings in electricity.

A1.1.12 WATER

Water Retrofit A water retrofit generally involves installing more efficient washroom fixtures, including:

- low flow toilets;
- faucet aerators and low flow shower heads;
- faucet/tap sensors; and
- toilet/urinal flush sensors.

Reducing hot water use saves the natural gas (or electricity) required for heating the water.

A1.2 PROCESSES

Process = Organizational – building an energy managing culture.

Examples: Turning off equipment at night, implementing start up and shut down schedules, etc.

A1.2.1 CONTROLS

Control Optimization Optimizing the controls for equipment to provide more efficient operation. Includes:

- Improving equipment schedules to better match usage patterns and setback during periods of non-occupancy or non-use.
- Adjusting set points such as temperatures and outside air volumes, to save energy while maintaining building comfort.
- Adjusting the way equipment runs to improve its efficiency.

A1.3 PROGRAMS

Program = People – Awareness, habits, procedures & feedback.

Examples: Training staff in energy awareness, Employee Participation Program-Identification of Improvements.

A1.3.1 ENERGY AWARENESS

Energenius A strategy to help staff understand and accept the importance of energy conservation at all City facilities, and the initiatives of the Energy Management Team.

Includes a program that recognizes City employees for providing energy efficiency ideas.

EBEAR Stands for Energy Benchmarking, Energy Awareness and Retro-commissioning (EBEAR). The City launched the program in January 2012 to improve energy performance in City-owned and operated facilities. The three elements:

1. Energy Benchmarking compares a facility's EUI to other facilities of the same type, ranks a facility relative to the best in the portfolio of facilities, and sets targets for energy cost reduction.
2. Energy Awareness efforts help train and educate facility staff and users on how energy resources are being used in a facility, and how their actions can help bring down operating costs, reduce greenhouse gas emissions,

and create a better environment.

3. Retro-commissioning identifies less-than-optimal performance in a facility's existing equipment and control systems, and makes necessary upgrades or enhancements to save energy and cost.

Energy Champion

An Energy Champion is the “voice of energy efficiency” committed to improve the energy performance of City facilities by:

- Promoting energy conservation and building an energy-saving culture in our workplace.
- Being a point of contact for energy-related issues within a facility.
- Advocating for energy efficiency and conservation in regular staff or departmental meetings.
- Motivating staff to help maintain efficient operations within a facility.

Green Leaders

An ongoing program to provide information and incentives to staff to take sustainable actions and monitor environmental sustainability in the workplace. The ultimate goal is to create a green culture throughout the corporation.

Training

Providing training to City staff to help improve their energy awareness in key areas, such as BAS operation.

APPENDIX 2.0: DEFINITIONS

Below are definitions of some terms that may appear in this document.

AHU	Air Handling Unit. A device used to condition (heat or cool) and circulate air as part of a heating, ventilating, and air-conditioning (HVAC) system.
BAS	Building Automation System. Sometimes also referred to as a Building Management System (BMS). A BAS is a computer network of electronic devices designed to monitor and control a building's mechanical, security, fire and flood safety, lighting, HVAC and humidity control and ventilation systems.
CO₂	Carbon dioxide. A greenhouse gas that contributes to the greenhouse effect (See Greenhouse Gas)
Cubic Meter	Measurement of volume commonly used for natural gas. Can also be denoted as m³ 1 cubic meter of natural gas contains approximately 10.5 equivalent kilowatt hours of energy ($1 \text{ m}^3 = 10.5 \text{ e-kWh}$)
Conservation and Demand Management	The reduction or conservation of electricity and natural gas consumption and peak electricity demand.
Domestic Hot Water	Water used in washrooms, kitchens and showers. Does not include water used in pools or building heating.
Electricity Consumption	The electrical energy actually used. Measured in kilowatt hours. Example: ten 100-watt light bulbs used for 2 hours would consume 2,000 watt-hours, or 2 kilowatt-hours ($10 \times 100 \text{ watt} \times 2 \text{ hours} = 2,000 \text{ watt-hours} = 2 \text{ kWh}$)
Electricity Demand	The rate of using electricity. Measures in kilowatts. Example: ten 100-watt light bulbs consume electricity at a rate of 1,000 watts, or 1 kilowatt. The peak demand is the highest rate of electricity use during a given period of time.

Emission Factor	<p>Representative value that attempts to relate the quantity of a pollutant released to the atmosphere with an activity associated with the release of that pollutant.</p> <p>Usually expressed as the weight of pollutant divided by a unit weight, volume, distance, or duration of the activity emitting the pollutant (e.g., kilograms of CO₂ emitted per cubic meter of natural gas burned)</p>
Energy Efficiency Measure	<p>An action or work done to save on electricity, natural gas, oil, or other form of energy consumption, within City of Mississauga facilities.</p> <p>Each measure can be classified as a Project, a Process, or a Program (see definition for each).</p>
Energy Use Intensity	<p>Also referred to as EUI, a measurement that essentially expresses a building's energy use as a function of its size or other characteristics.</p> <p>The measurement used in this plan for EUI is e-kWh/m²</p>
Equivalent kilowatt hour	<p>An equivalent kilowatt hour (e-kWh) is the conversion of an unit of energy to a common unit to better compare different types of energy sources.</p> <p>Example: Converting a cubic meter (see Cubic Meter) of natural gas to an equivalent kilowatt hour measure to compare to electricity usage in kilowatt hours.</p> <p>1 e-kWh is comparable to 1 kWh in energy terms</p>
EUI	See Energy Use Intensity
Facilities and Property Development	A section of the City's Facility and Property Management division. The section is responsible for carrying out and implementing capital projects such as building construction, redevelopments, and life cycle replacement of equipment.
FIT	<p>Feed-In Tariff Program. Developed by the Province of Ontario to encourage and promote greater use of renewable energy sources including on-shore wind, waterpower, renewable biomass, biogas, landfill gas and solar photovoltaic (PV) for electricity generating projects in Ontario.</p> <p>See http://fit.powerauthority.on.ca/fit-program for more information.</p>
Fossil Fuel	A fuel (as coal, oil, or natural gas) formed in the earth from plant or animal remains.
GHG	See Greenhouse Gas

GHG Intensity	A measurement that essentially expresses a building's GHG emissions as a function of its size or other characteristics.
Green Energy Act	Formally Bill 150 , the Green Energy and Green Economy Act, 2009 , introduced in the Ontario legislature on February 23, 2009. It aims to expand renewable energy production, encourage energy conservation and create green jobs.
Green Power	Energy produced from renewable and non-hazardous technologies. Common sources of green power include solar, wind, geothermal, biogas, and low-impact hydroelectric.
Greenhouse Gas	Any of the atmospheric gases that contribute to the greenhouse effect by absorbing infrared radiation produced by solar warming of the Earth's surface. They include carbon dioxide (CO ₂), methane (CH ₄), nitrous oxide (NO ₂), and water vapour.
HVAC	H eating V entilation and A ir C onditioning.
Kilowatt	<p>Unit on measurement for the rate of power use (the power at any instance in time). Commonly used on electricity bills to show the electrical demand.</p> <p>1 kilowatt = 1,000 watts</p> <p>1 megawatt = 1,000 kilowatt</p> <p>Can also be denoted as kW</p>
Kilowatt Hour	<p>A measurement of power used (commonly electricity) over a period of time.</p> <p>1 kilowatt hour = 1,000 watt hours</p> <p>1 megawatt hour = 1,000 kilowatt hours</p> <p>1 kilowatt hour = 1 watt x 1,000 hour OR 500 watts x 2 hour² OR 2,000 watt x ½ hour</p> <p>Can also be denoted as kWh</p>
kW	See Kilowatt .
kWh	See Kilowatt Hour .

LED	Light Emitting Diode. An electronic device that emits light when an electrical current is passed through it. Modern LED lights are highly efficient (more light for less power) and have a long lifespan.
LEED	Leadership in Energy and Environmental Design. An ecology-oriented building certification program. Concentrates its efforts on improving performance across five key areas of environmental and human health: energy efficiency, indoor environmental quality, materials selection, sustainable site development and water savings.
m³	See Cubic Meter .
Megawatt	1 Megawatt is equal to 1,000 kilowatts (see Kilowatt).
Megawatt Hour	1 Megawatt hour is equal to 1,000 kilowatt hours (see Kilowatt Hour).
MW	See Megawatt .
MWh	See Megawatt Hour .
Net-zero Carbon	Also called carbon neutral, refers to achieving net zero carbon emissions by balancing a measured amount of carbon released with an equivalent amount sequestered or offset.
Process	Organizational Energy Efficiency Measure, involving building an energy conservation culture. Examples: Turning off equipment at night, implementing start up and shut down schedules, etc.
Program	People Energy Efficiency Measure, involving awareness, habits, procedures and feedback. Examples: Training staff in energy awareness, Employee Participation Program-Identification of Improvements.
Project	Technological type Energy Efficiency Measure, involving operational and technological actions. Examples: Lighting retrofit, new controls, efficient boiler, etc.
Renewable Energy	Energy that comes from resources that are naturally replenished on a human timescale. Includes sunlight, wind, rain, tides, waves, and geothermal heat.