



CITY OF MISSISSAUGA

5-YEAR ENERGY CONSERVATION PLAN

2024 - 2028



EXECUTIVE SUMMARY

The the City of Mississauga (the City) has implemented three successful Energy Conservation Plans, aimed at enhancing the performance in City owned and operated facilities. This new 5 Year Energy Conservation Plan (2024-2028) 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 (2019-2023)

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, Ice Plant 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 positive results over the 2019 – 2023 period, as summarized below:

- Electricity consumption has dropped by 6,061,440 kWh, which is equivalent to 7% reduction from 2018
- Natural Gas consumption has dropped by 240,112 m³, which is equivalent to 3% reduction from 2018
- Total consumption has dropped by 8,582,618, which is equivalent to 5% reduction from 2018
- A total utility costs of \$1,304,700 were avoided
- A total incentives of \$691,288 were received 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

- ISO 50001 certification for Energy Management for Frank McKechnie Community Centre (2021 - 2023)
- Energy Efficiency Leadership Award for Mississauga Civic Centre (2020)
- Energy Manager Award (2019 & 2021)
- Don Harrison Energy Champion Award (2019)
- Energy in Action Innovation Award and the Living City Energy Efficiency Gold Award (2019)
- ENERGY STAR® certification for Erin Mills Twin Arena (2019, 2020, 2022)
- ENERGY STAR® Building of the Year Ice and Curling Rink (2023) for Erin Mills Twin Arena



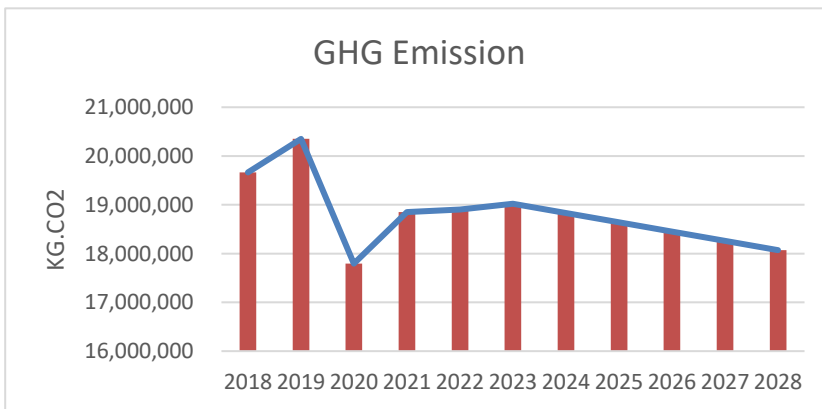
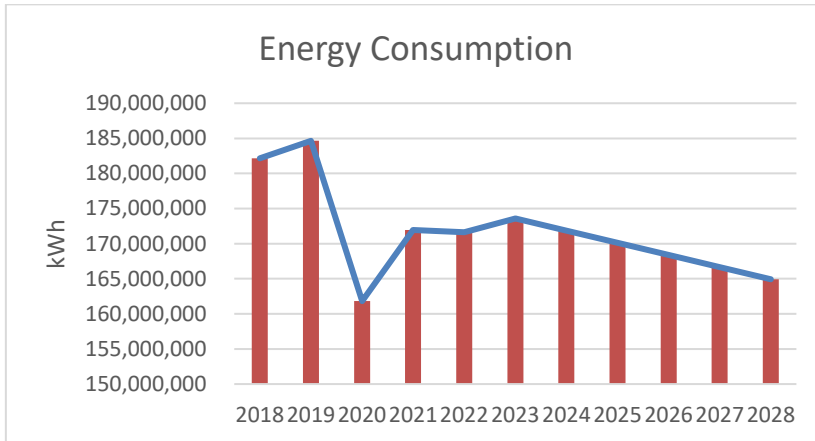
Energy Measure Implementation Plan for City Facilities																				
Energy Measure	2019				2020				2021				2022				2023			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Pool Heat Recovery																				
Community Centres & Multi-Purpose Facilities		<div><div></div><div></div></div>																		
Iceplant Energy Upgrade																				
Indoor Ice Arenas		<div><div></div><div></div></div>																		
Community Centres & Multi-Purpose Facilities		<div><div></div><div></div></div>																		
Building Analytics & Energy Dashboard																				
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Energy Upgrade For Life Cycle Replacement																				
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Metering & Submetering Equipment																				
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Community Centres & Multi-Purpose Facilities		<div><div></div><div></div></div>																		

Energy Measure Implementation Plan for City Facilities																									
Energy Measure		2019				2020				2021				2022				2023							
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Services Yards & Maintenance Dept		<div></div>																							
Operation Optimization																									
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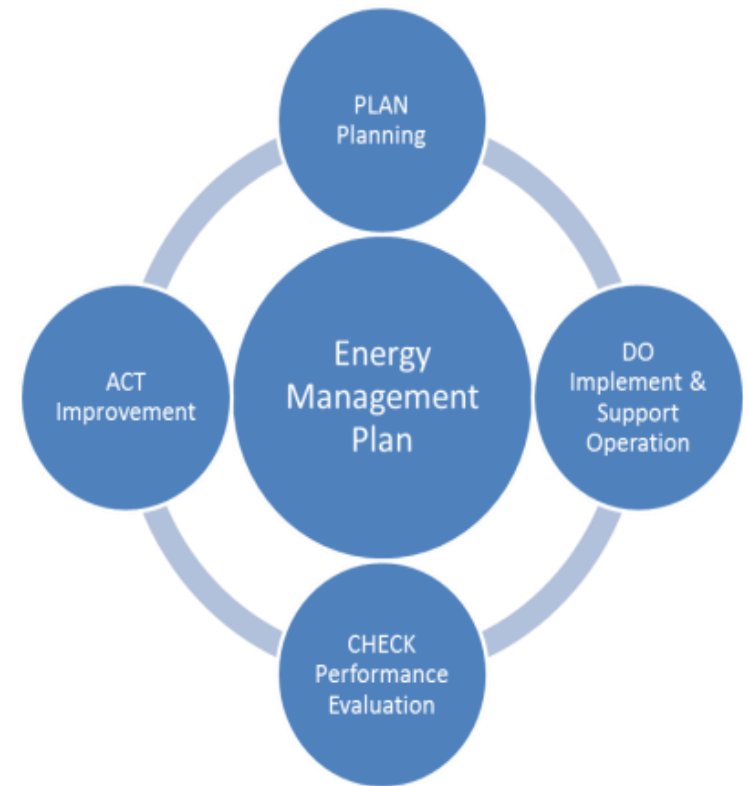
THE NEW 5 YEAR ENERGY CONSERVATION PLAN (2024-2028)

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 (2024-2028). City staff will:

- **PLAN:** Set a target of 1% reduction in energy consumption and greenhouse gas (GHG) emissions each year over the energy consumption of 2023. Planned a list of projects and initiatives in order to achieve and surpass the target.



- **DO:** Request funding each year and execute the planned projects noted below during the five (5) year period.
- **CHECK:** Utilize real-time utility metering and select sub-metering and BAS trend data in the building analytics and energy dashboard software (SkySpark) to track the performance of the projects and diagnose any operation problems.
- **ACT:** Will improve energy performance in the facilities further by using the SkySpark to continually drive energy performance.







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

- Expanding **Pool Heat Recovery** in therapy pools to recover heat from pool drain and transfer to fresh water supply;
- Implementing **Pool Dehumidification heat recovery** to recover heat from the pool dehumidifier to heat the swimming pool water
- Implementing **Ice Plant Energy Upgrades** that includes a robust ice plant controls and cold water ice resurfacing capabilities;
- Implementing **Ice Plant heat recovery**, to recover heat from the compressors to heat different parts of the building
- Conduct **Ongoing Commissioning to the City's main facilities** using data analytics/fault detection tool 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 **HVAC Systems Energy Upgrades** as part of the **Lifecycle Replacements**;

- Implementing **DHW Systems 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 **Lighting Upgrades** to newer and efficient technologies, including efficient controls to match occupancy and natural daylight;
- Analyzing opportunities for **Renewable Energy Generation**, wherever feasibly possible.
- **Electrify Ice Resurfaces** in Ice Rink Arenas

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

Energy Measure Implementation Plan for City Facilities																					
Energy Measure	2024				2025				2026				2027				2028				
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	
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Community Centres & Multi-Purpose Facilities																					
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Community Centres & Multi-Purpose Facilities																					
Libraries																					
Adminstration & Offices																					
Transit & Associated Facilities																					
Culture																					
Energy Upgrade For DHW Systems																					
Adminstration & Offices																					
Indoor Ice Arenas																					
Community Centres & Multi-Purpose Facilities																					
Services Yards & Maintenance Dept																					
Golf Courses																					
Community Halls																					
Energy Upgrade For HVAC Systems																					
Adminstration & Offices																					
Indoor Ice Arenas																					
Community Centres & Multi-Purpose Facilities																					
Firestations																					
Libraries																					
Services Yards & Maintenance Dept																					
Community Halls																					

Energy Measure Implementation Plan for City Facilities																
Energy Measure	2024				2025				2026				2027			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Control Upgrade																
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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 (2024-2028)** is the fourth iteration of the plan, which was first created in 2009 and builds on the successes of three previous plans, created in 2009, 2014 and 2019.

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 GHG emissions 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. This document is the update of the 2019-2023 plan and it be used as the energy conservation plan from 2024-2028

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 2024 PLAN AND COMMITMENT

The new **5 Year Energy Conservation Plan (2024-2028)** is the fourth iteration of the plan and builds on the old **Plan (2019-2023)**. 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.

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 2019 to 2023
- Establishment of the targets and baseline of the new plan, covering 2024 to 2028
- Baseline Energy Use breakdown for city-wide and facility group types
- A summary of the implementation plan to achieve the goals of the new plan, covering 2024 to 2028
- 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 (2024-2028)** 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. The Living Green program was completed in 2023

The City of Mississauga is currently developing a new 2024 – 2028 Strategic Plan.

Information:

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

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

Information: The Living Green Master Plan final report can be seen below,

https://www.mississauga.ca/wp-content/uploads/2020/08/2023-Living-Green-Master-Plan-Final-Report_Accessible.pdf

1.6.3 CLIMATE CHANGE ACTION PLAN

The Climate Change Action Plan is Mississauga’s first action plan on climate change and contains specific actions under five main Action Pathways: Building and Clean Energy, Resiliency, Accelerating Discovery

and Innovation, Low Emissions Mobility, and Engagement and Partnerships. It requires municipal buildings to reduce its GHG emissions by 40% below 1990 levels by 2030 and reduce its GHG emissions by 80% below 1990 levels by 2050

Information:

For more information on the Climate Change Action Plan, see:

<https://www.mississauga.ca/publication/climate-change-action-plan/>

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 (16 facilities/locations)
- Cultural and Performing Arts (8 facilities/locations)
- Fire Stations and Emergency Services (22 facilities/locations)
- Golf Courses and Associated Facilities (6 facilities/locations)
- Heritage Buildings (5 facilities/locations)
- Leased Facilities and Properties (9 facilities/locations)
- Libraries (9 facilities/locations)
- Community Halls, Marinas, and Animal Services (13 facilities/locations)
- Outdoor Pool Buildings (7 facilities/locations)
- Parks and Sports Fields (213 facilities/locations)
- Traffic and Street Lighting (7 facilities/locations)
- Transit and Associated Facilities (15 facilities/locations)
- Service Yards, Central Stores, and Maintenance Facilities (6 facilities/locations)
- Pump Stations (2 facilities/locations)
- Miscellaneous (2 facilities/locations)

City Facilities have a total floor area of approximately 467,750 square meters.

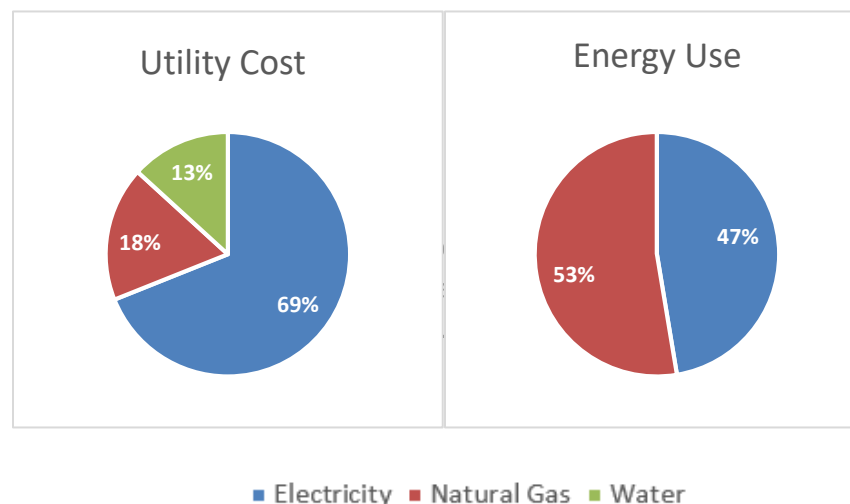
2.2 BASELINE

2.2.1 ENERGY USE

The energy use (combined electricity and natural gas) for **City Wide Facilities** was 181,746,000 equivalent kilowatt hours in 2023. Following are the key takeaways for the energy usage in 2023:

- New facilities added to City's portfolio contributed an additional 12,700 m² and 8,120,000 e-kWh to the 2023 baseline
- 47% of the total energy usage was due to electricity use, with its ratio increasing by 4% due to electrification of city's facilities
- 53% of the total energy usage was due to natural gas use, with its ratio decreased by 4%.
- A total of \$19,946,777 in utility costs was incurred, out of which 69% is attributed to electricity, 18% to natural gas, and 13% to water

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



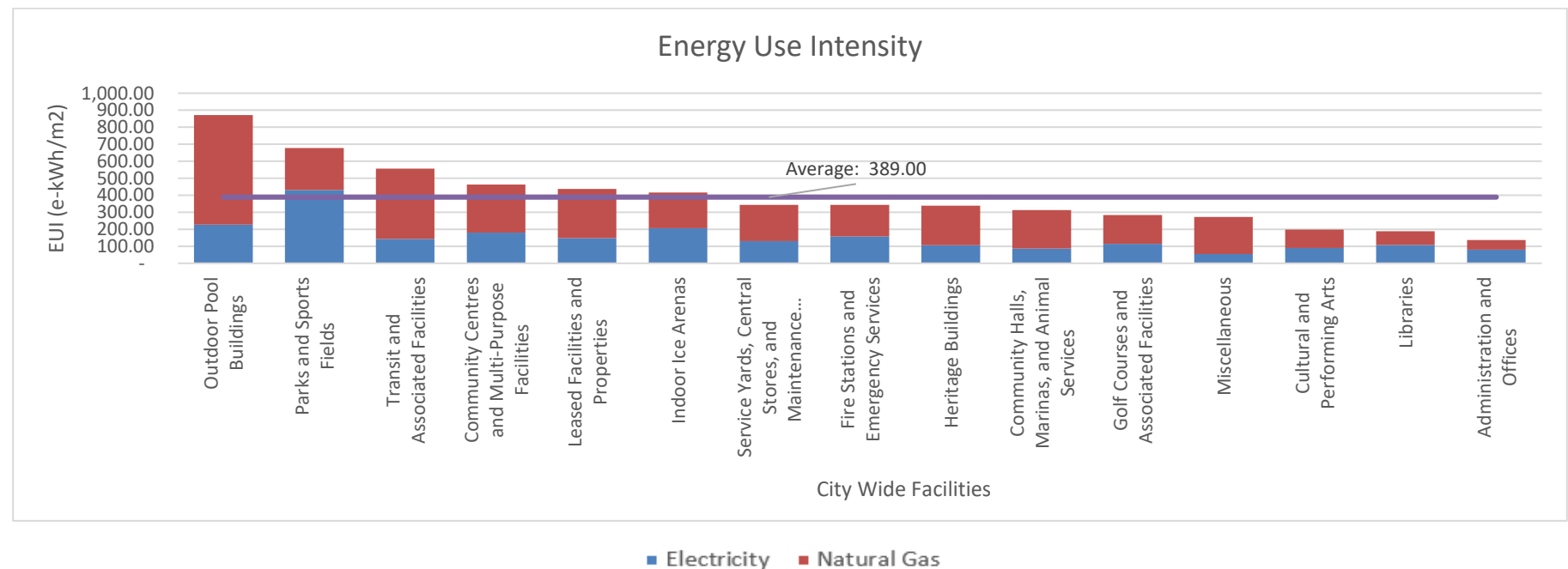
When reviewing EUI, the facility operation type and hours should be taken into account. For example, a facility that operates 24 hours a day will most likely have a higher EUI than a similar one that operates 8 hours a day. Similarly, a facility that has high energy using systems that do not contribute 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 **City Wide Facilities** the average EUI in 2023 was 389 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.

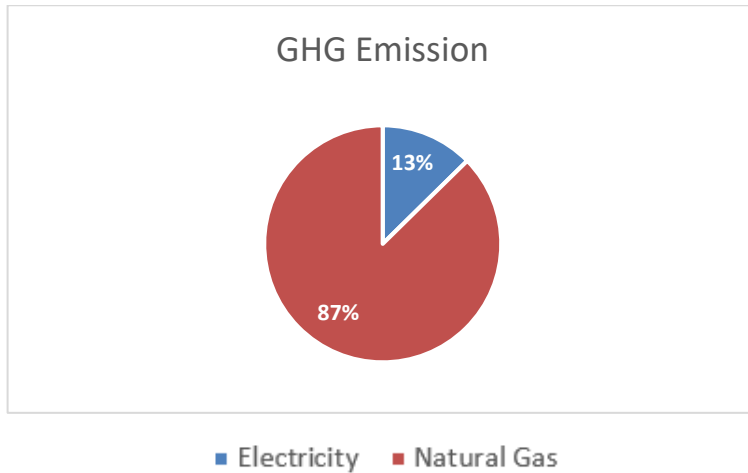
Figure 2-2: Energy Use Intensity for City Wide Facilities



2.2.3 GREENHOUSE GAS (GHG) EMISSIONS

For 2023, **City Wide Facilities** emitted 20,146,811 Kg.CO₂ (or 20,146 tonnes) of CO₂. 13% of these emissions were due to the generation of electricity, while the use of natural gas accounted for the remaining 87%.

Figure 2-3: GHG Emissions Breakdown for City Wide Facilities



2.3 ENERGY AND GHG BREAKDOWN FOR CITY WIDE FACILITIES

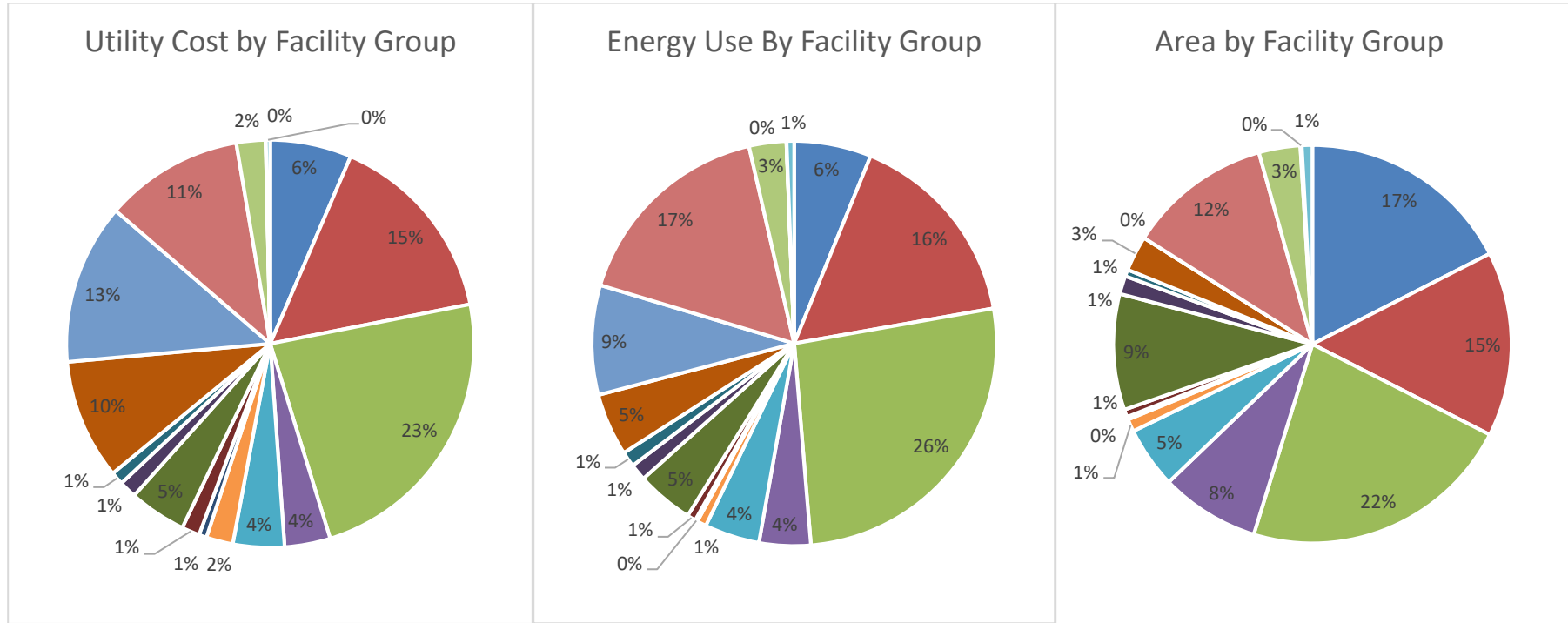
This section provides a brief overview/recap of the Utility and GHG data for all City Facility Groups. The figure below shows the breakdown of utility costs and energy use by Facility Group for 2023. Note: Facility Groups subtalled under 'Other' are further broken down in the smaller charts.

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

- Top four facility groups by floor area consume 65.6% of the City's total energy; it includes the following:
 - Community Centres and Multi-Purpose Facilities
 - Transit and Associated Facilities
 - Indoor Ice Arenas
 - Administration and Offices
- The next three facility groups by floor area consume 13.1% of the City's total energy; it includes the following:
 - Libraries
 - Fire Stations and Emergency Services
 - Cultural and Performing Arts
- 13.8% 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
 - Pump Stations
- Remaining 7.5% of the City's energy is consumed by facility groups that add up to 8.1% of the total floor area in the City; it includes the following:
 - Service Yards, Central Stores, and Maintenance Facilities
 - Community Halls, Marinas, and Animal Services
 - Outdoor Pool Buildings
 - Golf Courses and Associated Facilities
 - Leased Facilities and Properties
 - Heritage Buildings
 - Miscellaneous

Figure 2-4: Utility Costs and Energy Use Breakdown by Facility Groups



- Administration and Offices
- Community Centres and Multi-Purpose Facilities
- Fire Stations and Emergency Services
- Heritage Buildings
- Libraries
- Outdoor Pool Buildings
- Traffic and Street Lighting
- Service Yards, Central Stores, and Maintenance Facilities
- Miscellaneous

- Indoor Ice Arenas
- Cultural and Performing Arts
- Golf Courses and Associated Facilities
- Leased Facilities and Properties
- Community Halls, Marinas, and Animal Services
- Parks and Sports Fields
- Transit and Associated Facilities
- Pump Stations

2023 Annual Report for All City Facilities

Facility	# Facilities	Area	Electricity		Natural Gas		Total Energy	Water		Total Costs	GHG Emissions
		m ²	kWh	\$	m ³	\$	e-kWh	m ³	\$	\$	kg
Administration and Offices	2	81,795	6,558,751	\$1,046,777	443,919	\$173,217	11,219,901	27,387	\$68,766	\$1,288,760	1,049,531
Indoor Ice Arenas	7	70,274	14,453,204	\$2,306,731	1,406,622	\$548,864	29,222,735	88,791	222,945	\$3,078,541	3,135,717
Community Centres and Multi-Purpose Facilities	16	104,086	18,794,617	\$2,999,621	2,795,618	\$1,090,850	48,148,606	225,717	\$566,753	\$4,657,224	5,934,221
Cultural and Performing Arts	8	37,718	3,376,407	\$538,875	391,445	\$152,742	7,486,580	12,698	\$31,883	\$723,500	853,258
Fire Stations and Emergency Services	22	23,299	3,661,707	\$584,408	413,424	\$161,318	8,002,659	26,682	\$66,996	\$812,722	904,039
Golf Courses and Associated Facilities	6	4,780	548,426	\$87,529	77,072	\$30,073	1,357,682	121,655	\$305,464	\$423,066	164,508
Heritage Buildings	5	1,036	110,097	\$110,097	22,969	\$8,963	351,272	1,185	\$2,975	\$122,035	47,426
Leased Facilities and Properties	9	2,873	424,426	\$67,738	79,110	\$30,869	1,255,081	73,369	\$184,222	\$282,829	164,703
Libraries	9	44,024	4,739,304	\$756,393	337,868	\$131,836	8,286,918	6,932	\$17,406	\$905,635	791,224
Community Halls, Marinas, and Animal Services	13	6,920	597,370	\$95,340	149,484	\$58,329	2,405,853	48,488	\$121,748	\$275,417	305,080
Outdoor Pool Buildings	7	2,548	578,263	\$92,291	156,331	\$61,000	2,219,739	20,444	\$51,333	\$204,624	317,660
Parks and Sports Fields	213	13,387	5,755,965	\$918,652	316,473	\$123,488	9,078,932	342,577	\$860,177	\$1,902,316	780,624
Traffic and Street Lighting	7	0	15,913,273	\$2,542,941	-	\$0	15,913,273	0	\$0	\$2,542,941	477,398
Transit and Associated Facilities	15	54,717	7,872,872	\$1,256,510	2,154,745	\$840,781	30,497,695	40,050	\$100,562	\$2,197,853	4,375,451
Service Yards, Central Stores, and Maintenance Facilities	6	15,748	2,041,528	325,828	321,675	125,518	5,419,116	4,011	10,071	\$461,417	679,184
Pump Stations	2	557	30,127	\$4,519	0	\$0	30,127		\$0	\$4,519	904
Miscellaneous	2	3,988	217,743	\$32,661	0	\$0	217,743	635	\$0	\$32,661	6,532
Totals	349	467,750	85,674,080	\$13,766,912	9,066,755	\$3,537,848	180,875,008	1,040,621	\$2,611,300	19,916,060	20,146,811
Usage / Costs per m²:			183.2	\$29.43	19.4	\$7.56	387	2.22	\$5.58	\$42.58	43.29

2.4 ACTION PLAN

An action plan has been identified with the main goal to reduce GHG emissions along with saving 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. In addition, includes heat recovery from the pool dehumidification unit to heat the pool water.
- **Ice Plant Heat Recovery:** Installing Desuperheater to recover the heat from the ice plant compressors to heat the building.
- **Ice Resurfacing Electrification** Replace the Ice resurfacers in all the city rinks to electric Ice resurfacers.
- **Ongoing Commissioning:** Conduct regular commissioning to the city's high consuming building using the data analytics/fault detection tools that collects, manages, and analyzes data from various building systems, to identify operation irregularities and ensure optimum operation.
- **HVAC Systems Energy Upgrades for Lifecycle Replacements:** Includes energy upgrades for HVAC equipment that show energy & GHG emission savings
- **DHW Systems Energy Upgrades for Lifecycle Replacements:** Includes energy upgrades for DHW equipment that show energy & GHG emission savings





- **Controls Upgrades:** Includes controller upgrades, optimized sequence of operations, and additional points to better manage and control building systems
- **Operation Optimization:** Add additional sensors such as CO₂ sensors and motion sensors to optimize the operation of HVAC units to satisfy the occupant needs.
- **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 **Orange** 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 2-5: Energy Measure Implementation Plan for City Facilities

Energy Measure Implementation Plan for City Facilities

Energy Measure	2024				2025				2026				2027				2028			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Pool Heat Recovery																				
Iceplant Heat Recovery																				
Electrification Ice Resurfacers																				
Building Ongoing Commissioning																				
Energy Upgrade For DHW Systems																				
Energy Upgrade For HVAC Systems																				
Control Upgrade																				
Metering & Sub-metering Equipment																				
Lighting Upgrades																				
Operation Optimization																				
Renewable Energy Generation																				
 Scheduled Implementation  Cancelled Implementation																	Q1 = Jan - Mar Q2 = Apr - Jun			
 Status = Completed  Status = Underway																	Q3 = Jul - Sep Q4 = Oct - Dec			

2.5 ESTIMATED SAVINGS

At the end of the plan, **City Wide Facilities** are expected to save 5.05% of energy consumption over the base year of 2023 and 8.26% savings on GHG emissions over the base year 2023, because of focusing on electrification measures in the next 5 years

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

Figure 2-6: Energy Measure Annual Savings for City Wide Facilities

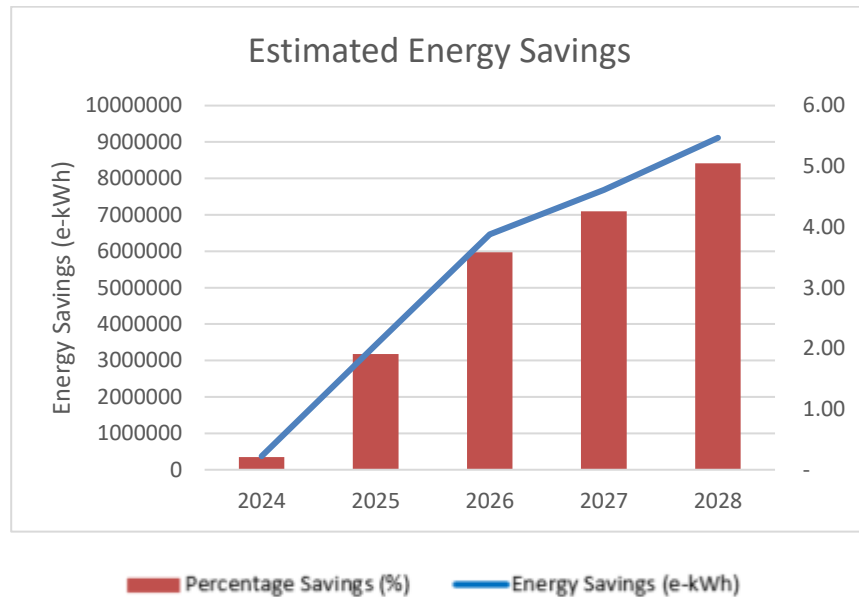
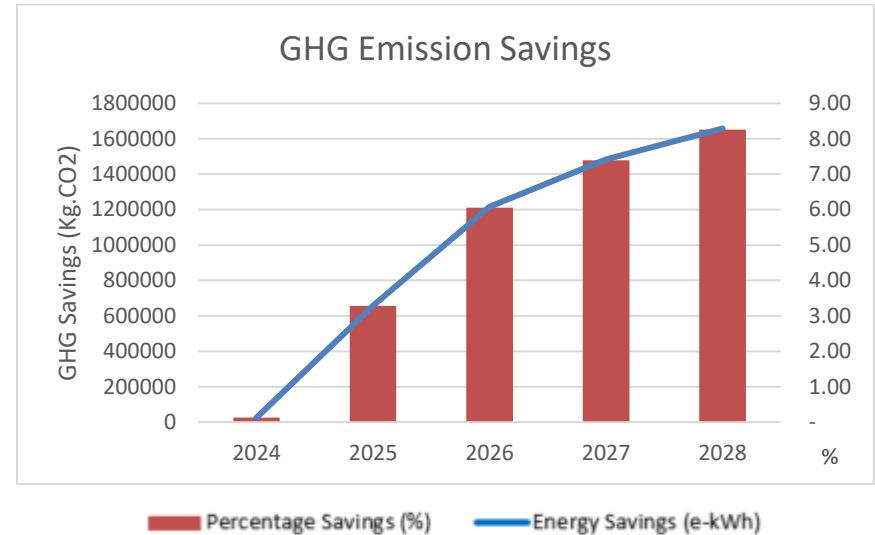


Figure 2-7: Energy Measure Annual GHG Emissions Savings for City Wide Facilities



2.6 REPORTING AND PROGRESS TO TARGET

As per the 5-Year Energy Conservation Plan, the City is targeting a 1.0% reduction in energy use per year in facilities. By 2028, this should result in a 5.0% reduction over the base year, 2023. 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 2024 will be adjusted to match the weather and occupancy of 2023.

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, 2023.

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 17.5% of the total building area for City of Mississauga facilities included in this Plan.

3.2 BASELINE

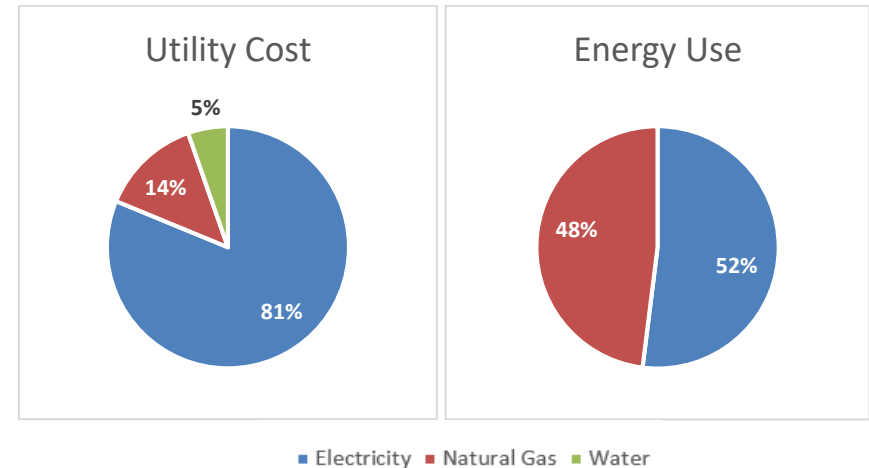
3.2.1 ENERGY USE

The energy use (combined electricity and natural gas) for **Administration and Offices** was 11,219,901 equivalent kilowatt hours in 2023. Following are the key takeaways for the energy usage in 2023:

- 52% of the total energy usage was due to electricity use
- 48% of the total energy usage was due to natural gas use
- A total of \$1,288,760 in utility costs was incurred, out of which 81% is attributed to electricity, 14% to natural gas, and 5% to water

Administration and Offices accounted for 6.5% of the City's total utility budget for 2023.

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.

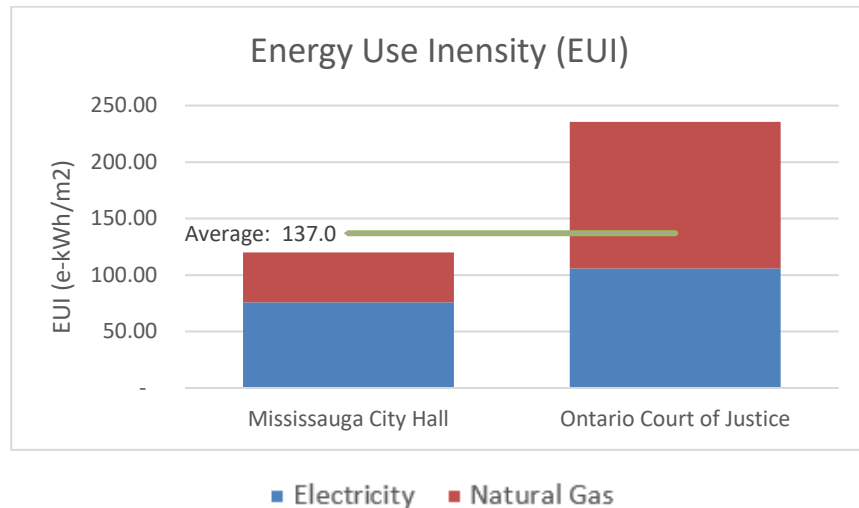
When reviewing EUI, the facility operation type and hours should be taken into account. For example, a facility that operates 24 hours a day will most likely have a higher EUI than a similar one that operates 8 hours a day. Similarly, a facility that has high energy using systems that do not contribute 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 2023 was 137 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

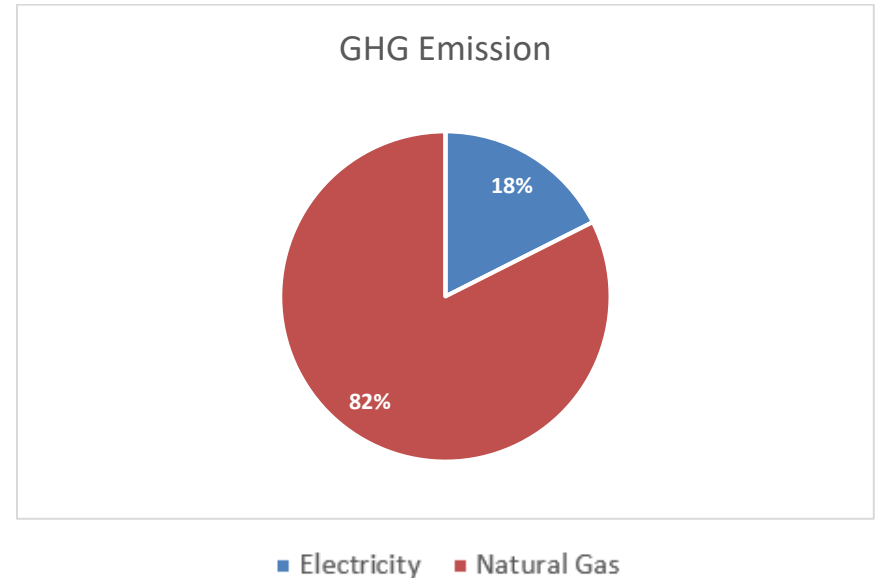


3.2.3 GREENHOUSE GAS (GHG) EMISSIONS

Administration and Offices emitted 1,049,500 kg (or 1,049.5 tonnes) of CO₂ in 2023. 18.0% of these emissions were due to the generation of electricity, while the use of natural gas accounted for the remaining 82.0%.

Administration and Offices accounted for 5.2 % of the City's total GHG emissions for facilities included in the plan.

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

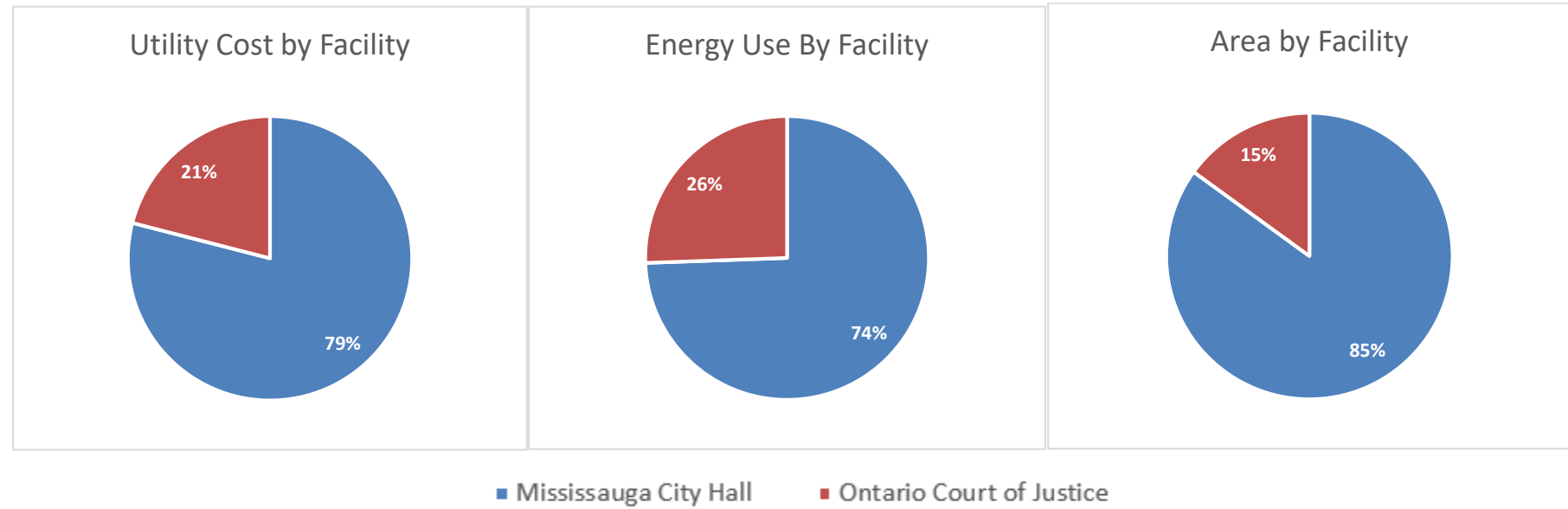


3.3 ENERGY AND GHG BREAKDOWN FOR ADMINISTRATION AND OFFICES

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 2023. Following are the key takeaways:

- Ontario Court of Justice is the smallest facility by area in this group, representing 15% of the total area
- Ontario Court of Justice emits 31% of the group GHG emission, while only taking 15% of the group area
- For this reason, priority was given to projects reducing GHG emission for previous and future planned projects

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



2023 Annual Utility Report for Administration and Offices

Facility	Area	Electricity		Natural Gas		Total Energy	Water		Total Costs	GHG Emissions
	m ²	kWh	\$	m ³	\$	e-kWh	m ³	\$	\$	kg
Mississauga City Hall	69,621	5,270,654	\$841,196	293,477	\$114,515	8,352,163	24,873	\$62,454	\$1,018,165	721,889
Ontario Court of Justice	12,174	1,288,097	\$205,580	150,442	\$58,702	2,867,738	2,514	\$6,312	\$270,595	327,642
Totals	81,795	6,558,751	\$1,046,777	443,919	\$173,217	11,219,901	27,387	\$68,766	1,288,760	1,049,531
Usage / Costs per m²:		80.2	\$12.80	5.4	\$2.12	137.2	0.33	\$0.84	\$15.76	12.8

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:

- **Ongoing Commissioning:** Conduct regular commissioning to the city's high consuming building using the data analytics/fault detection tools that collects, manages, and analyzes data from various building systems, to identify operation irregularities and ensure optimum operation.
- **HVAC Systems Energy Upgrades for Lifecycle Replacements:** Includes energy upgrades for HVAC equipment that show energy & GHG emission savings.
- **DHW Systems Energy Upgrades for Lifecycle Replacements:** Includes energy upgrades for DHW equipment that show energy & GHG emission savings.
- **Controls Upgrades:** Includes controller upgrades, optimized sequence of operations, and additional points to better manage and control building systems






- **Operation Optimization:** Add additional sensors such as CO₂ sensors and motion sensors to optimize the operation of HVAC units to satisfy the occupant needs.
- **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

For the chart below, the **Orange** 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

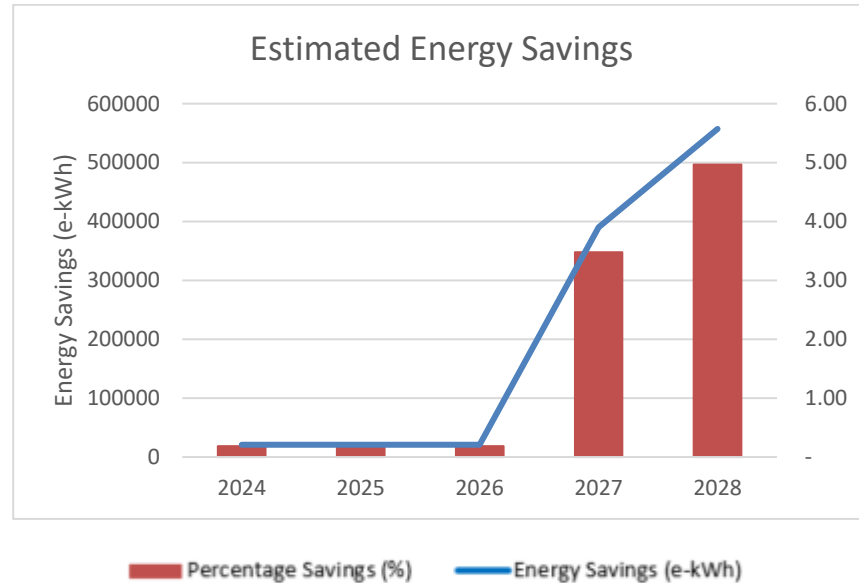
Energy Measure Implementation Plan for Administration and Offices

Energy Measure	2024				2025				2026				2027				2028			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Building Ongoing Commissioning																				
Energy Upgrade For DHW Systems																				
Energy Upgrade For HVAC Systems																				
Control Upgrade																				
Operation Optimization																				
Planned Implementation  Scheduled Implementation  Cancelled Implementation 																	Q1 = Jan - Mar Q2 = Apr - Jun			
Community Cent  Status = Completed  Status = Underway																	Q3 = Jul - Sep Q4 = Oct - Dec			

3.5 ESTIMATED SAVINGS

At the end of the plan, **Administration and Offices** are expected to save 4.97% over the base year of 2023

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



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 2024 will be adjusted to match the weather and occupancy of 2023. The figures below show the updated progress for each year against the set target.

3.6 PROGRESS TO TARGETS

The City is targeting a 4.97% reduction in energy use in **Administration and Offices** by 2028 over the base year, 2023. 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

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 15.0% of the total building area for City of Mississauga facilities included in this Plan.

4.2 BASELINE

4.2.1 ENERGY USE

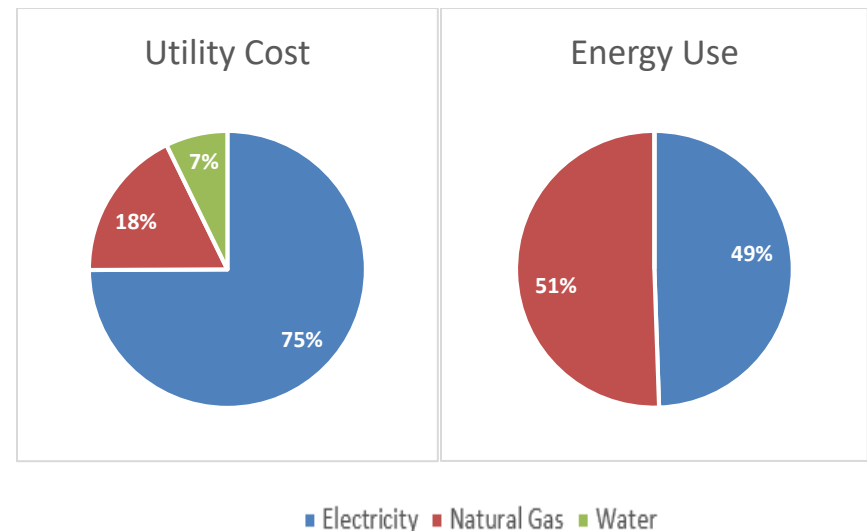
The energy use (combined electricity and natural gas) for **Indoor Ice Arenas** was 29,223,000 equivalent kilowatt hours in 2023. Following are the key takeaways for the energy usage in 2023:

- 51% of the total energy usage was due to electricity use

- 49% of the total energy usage was due to natural gas use,
- A total of \$3,078,000 in utility costs was incurred, out of which 75% is attributed to electricity, 18% to natural gas, and 7% to water

Indoor Ice Arenas accounted for 15.5% of the City's total utility budget for 2023.

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

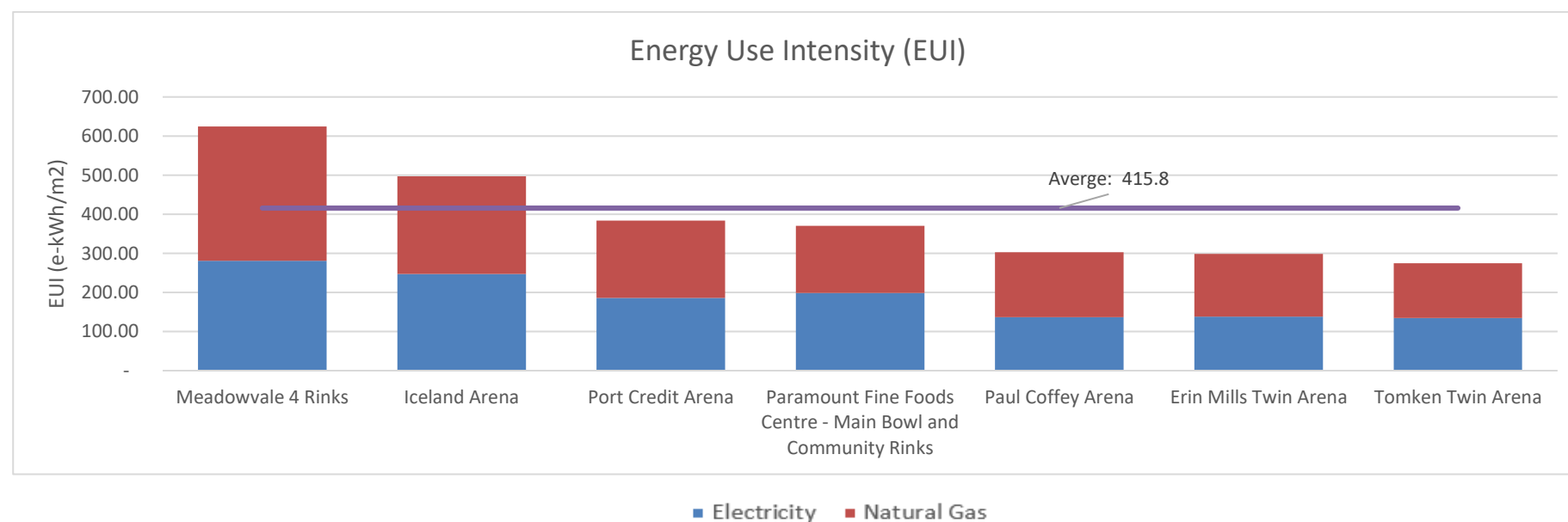
will most likely have a higher EUI than a similar one that operates 8 hours a day. Similarly, a facility that has high energy using systems that do not contribute to the building area, such as an outdoor pool or outdoor ice rink, will have a higher EUI than a facility where those systems are located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

For **Indoor Ice Arenas** the average EUI in 2023 was 416 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.

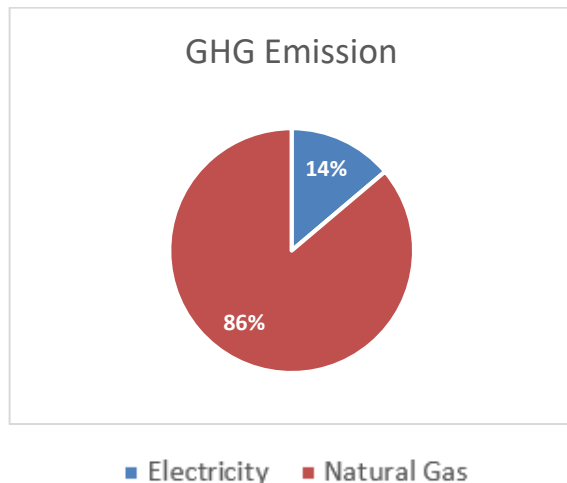
Figure 4-2: Energy Use Intensity for Indoor Ice Arenas



4.2.3 GREENHOUSE GAS (GHG) EMISSIONS

For 2023, **Indoor Ice Arenas** emitted 3,135,700 kg (or 3,136 tonnes) of CO₂ in 2023. 14% of these emissions were due to the generation of electricity, while the use of natural gas accounted for the remaining 86%.

Indoor Ice Arenas accounted for 15.6% of the City's total GHG emissions for facilities included in the plan.

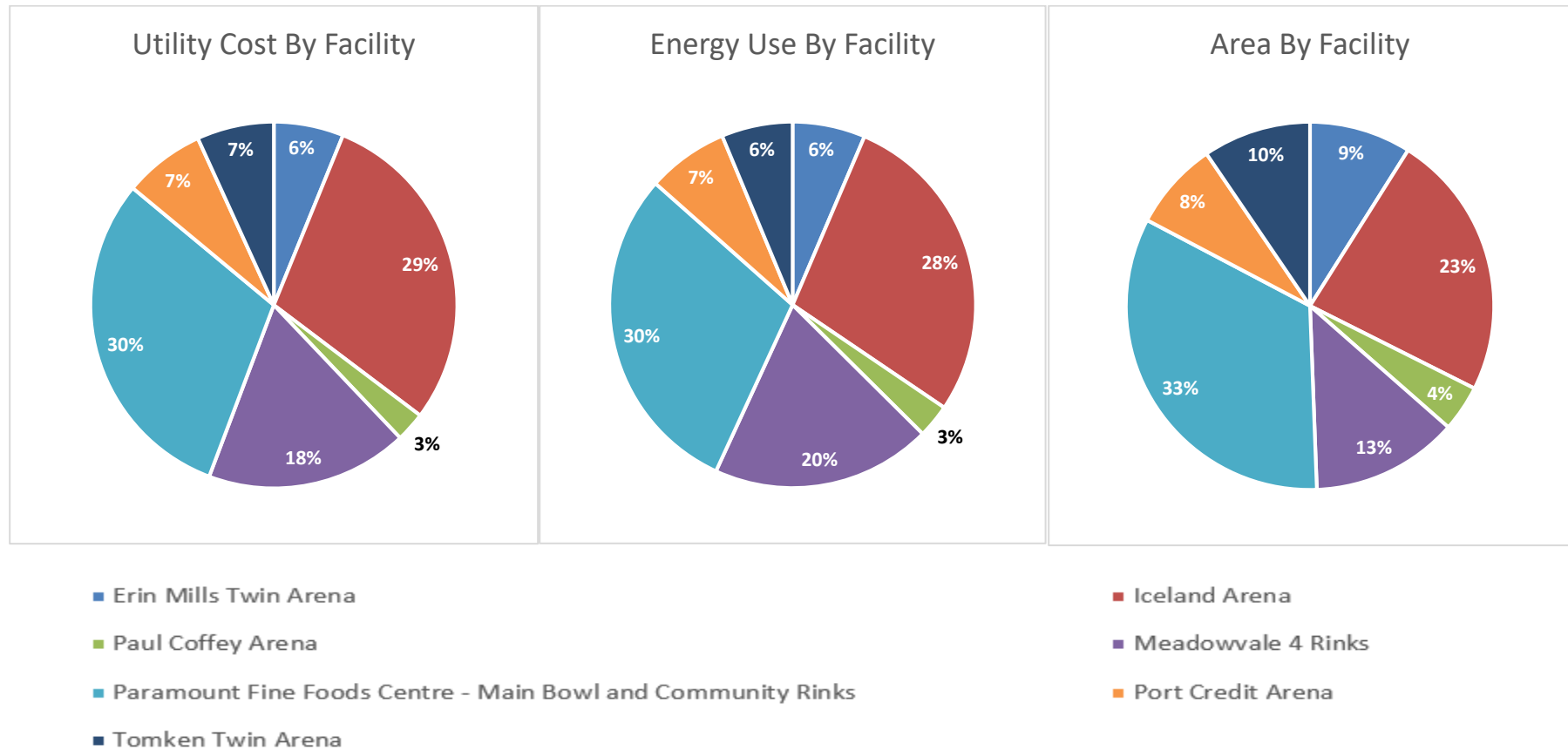
Figure 4-3: GHG Emissions Breakdown for Administration and Offices

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 2023. 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 77% of the total energy consumption 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 12% of the total energy consumption
- 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
- 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). In addition the process to generate ice, rejects a significant amount of heat
- For this reason, priority was given to projects to recover the heat rejected from the making of ice through the ice plant refrigeration system.

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



2023 Annual Utility Report for Indoor Ice Arenas

Facility	Area	Electricity		Natural Gas		Total Energy	Water		Total Costs	GHG Emissions
	m ²	kWh	\$	m ³	\$	e-kWh	m ³	\$	\$	kg
Erin Mills Twin Arena	6,287	867,636	138,475	95,982	37,452	1,875,447	5,425	13,622	189,549	210,411
Iceland Arena	16,490	4,079,642	651,111	392,540	153,169	8,201,312	36,925	92,715	896,995	876,459
Paul Coffey Arena	2,851	389,550	62,172	45,127	17,609	863,384	269	675	80,456	98,375
Meadowvale 4 Rinks	9,092	2,556,348	407,993	297,445	116,063	5,679,521	9,912	24,888	548,944	648,082
Paramount Fine Foods Centre - Main Bowl and Community Rinks	23,407	4,644,893	741,325	383,303	149,565	8,669,575	16,493	41,412	932,302	875,672
Port Credit Arena	5,466	1,015,868	162,133	102,956	40,173	2,096,906	7,370	18,505	220,811	228,255
Tomken Twin Arena	6,681	899,267	143,523	89,269	34,833	1,836,592	12,397	31,128	209,483	198,464
Totals	70,274	14,453,204	2,306,731	1,406,622	548,864	29,222,735	88,791	222,945	3,078,541	3,135,717
Usage / Costs per m²:		205.67	32.82	20.02	7.81	415.84	1.26	3.17	43.81	44.62

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 Heat Recovery:** Installing Desuperheater to recover the heat from the ice plant compressors to heat the building.
- **Ice Resurfaces Electrification** Replace the Ice resurfaces in all the city rinks to electric Ice resurfaces.
- **Ongoing Commissioning:** Conduct regular commissioning to the city's high consuming building using the data analytics/fault detection tools that collects, manages, and analyzes data from various building systems, to identify operation irregularities and ensure optimum operation.
- **HVAC Systems energy Upgrades for Lifecycle Replacements:** Includes energy upgrades for HVAC equipment that show energy & GHG emission savings.
- **DHW Systems Energy Upgrades for Lifecycle Replacements:** Includes energy upgrades for DHW equipment that show energy & GHG emission savings.
- **Controls Upgrades:** Includes controller upgrades, optimized sequence of operations, and additional points to better manage and control building systems






- **Operation Optimization:** Add additional sensors such as CO₂ sensors and motion sensors to optimize the operation of HVAC units to satisfy the occupant needs.
- **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 **Orange** 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

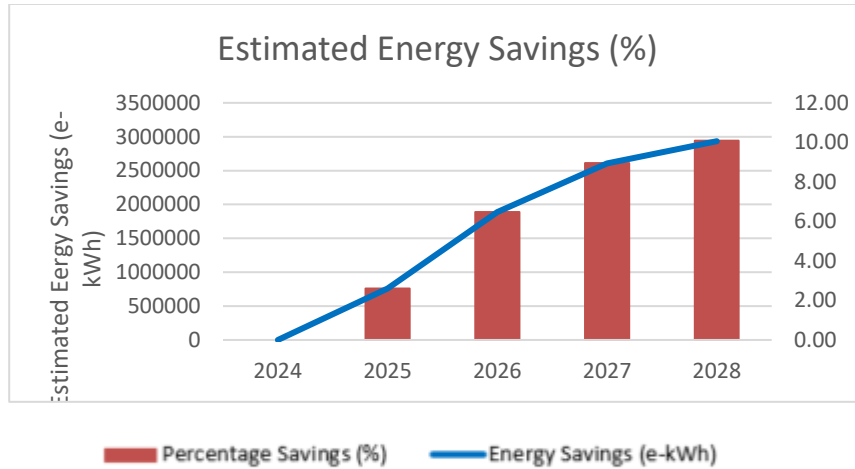
Energy Measure Implementation Plan for Indoor Ice Arenas

Energy Measure	2024				2025				2026				2027				2028			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Iceplant Heat Recovery																				
Electrification Ice Resurfacing																				
Building Ongoing Commissioning																				
Energy Upgrade For DHW Systems																				
Energy Upgrade For HVAC Systems																				
Control Upgrade																				
Metering & Submetering Equipment																				
Lighting Upgrades																				
Operation Optimization																				
Renewable Energy Generation																				
Planned Implementation  Scheduled Implementation  Cancelled Implementation 																	Q1 = Jan - Mar Q2 = Apr - Jun			
Community Cent  Status = Completed  Status = Underway																	Q3 = Jul - Sep Q4 = Oct - Dec			

4.5 ESTIMATED SAVINGS

At the end of the plan, **Indoor Ice Arenas** are expected to save 10.0% over the base year of 2023

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



4.6 PROGRESS TO TARGETS

The City is targeting a 10.0% reduction in energy use in **Indoor Ice Arenas** by 2028 over the base year, 2023. 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 2024 will be adjusted to match the weather and occupancy of 2023. The figures below show the updated progress for each year against the set target

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 16 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
- Churchill Meadows Community Centre

The above listed locations have a total floor area of approximately 104,086 square meters. This would account for 22.3% of the total building area for City of Mississauga facilities included in this Plan.

5.2 BASELINE

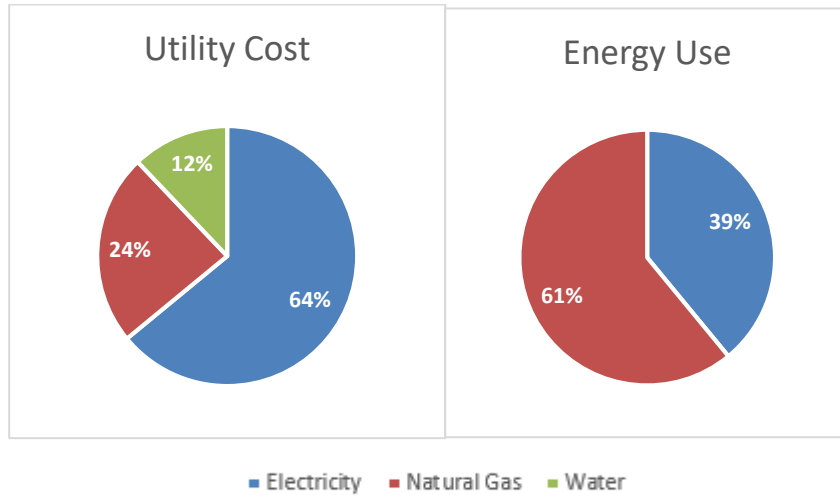
5.2.1 ENERGY USE

The energy use (combined electricity and natural gas) for **Community Centres and Multi-Purpose Facilities** was 48,148,606 equivalent kilowatt hours in 2023. Following are the key takeaways for the energy usage in 2023:

- 39% of the total energy usage was due to electricity use.
- 61% of the total energy usage was due to natural gas use.
- A total of \$4,657,224 in utility costs was incurred, out of which 64% is attributed to electricity, 24% to natural gas, and 12% to water

Community Centres and Multi-Purpose Facilities accounted for 23.4% of the City's total utility budget for 2023.

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



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.

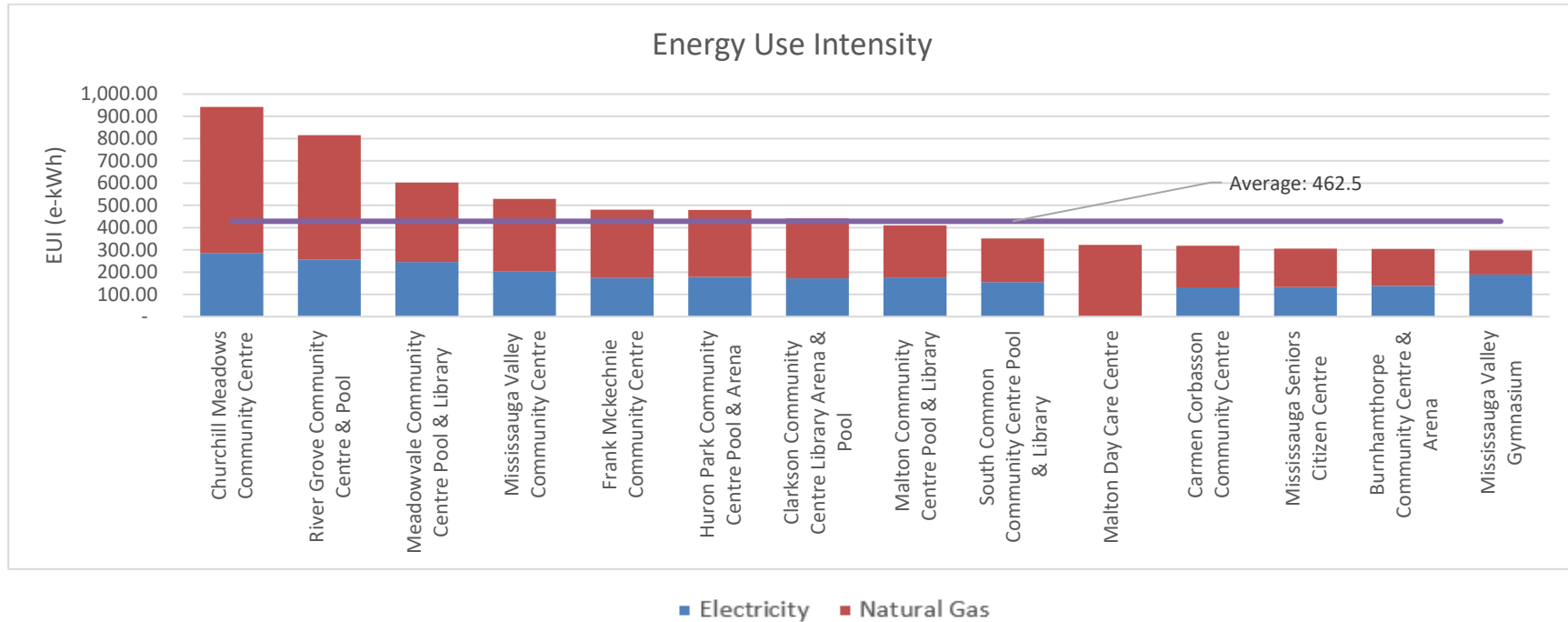
When reviewing EUI, the facility operation type and hours should be taken into account. For example, a facility that operates 24 hours a day will most likely have a higher EUI than a similar one that operates 8 hours a day. Similarly, a facility that has high energy using systems that do not contribute 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 total EUI in 2023 was 463 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.

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

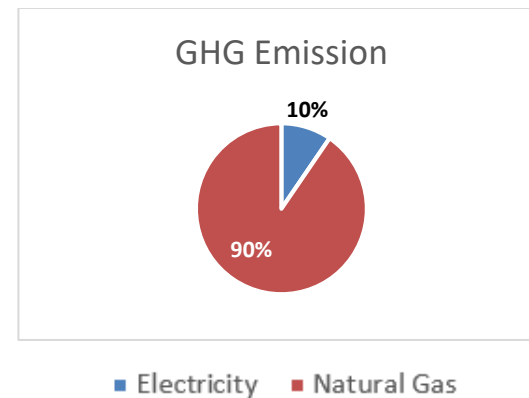


5.2.3 GREENHOUSE GAS (GHG) EMISSIONS

For 2023, **Community Centres and Multi-Purpose Facilities** emitted 5,934,221 kg (or 5,934 tonnes) of CO₂ in 2023. 10% of these emissions were due to the generation of electricity, while the use of natural gas accounted for the remaining 90%.

Community Centres and Multi-Purpose Facilities accounted for 29.5% 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

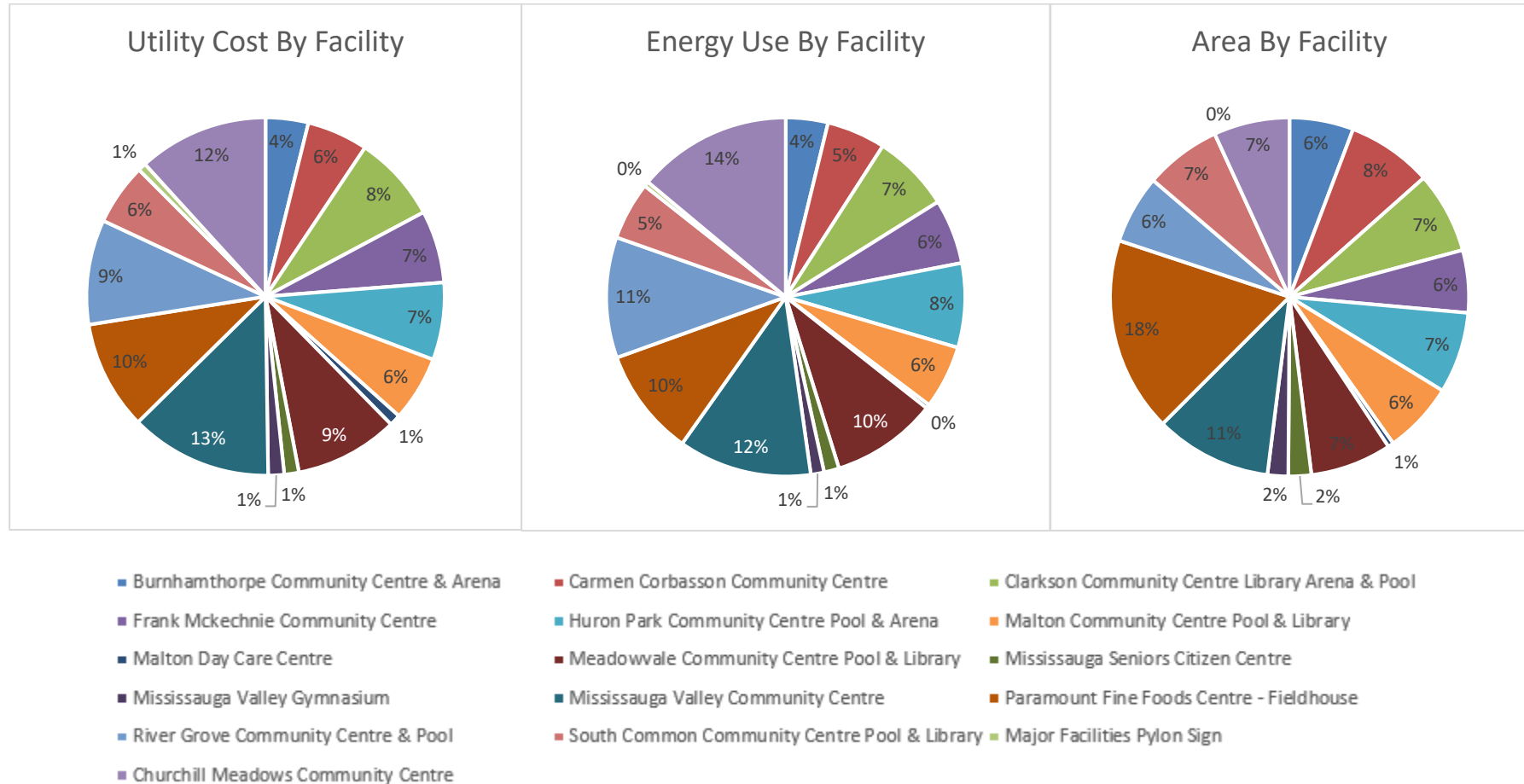


5.3 ENERGY AND GHG BREAKDOWN FOR COMMUNITY CENTRES AND MULTI-PURPOSE FACILITIES

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 2023. Following are the key takeaways:

- The top two facilities: Paramount Fine Foods Centre Fieldhouse and Mississauga Valley Community Centre in this group by area (29%) contribute towards 22% and 23% of the group's total energy consumption and utility costs respectively
- ten (10) facilities with approximately similar areas in this group together contribute towards 76% and 74% 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 5-4: Utility Costs and Energy Use Breakdown by Facility



2023 Annual Report for Community Centres and Multi-Purpose Facilities

Facility	Area	Electricity		Natural Gas		Total Energy	Water		Total Costs	GHG Emissions
	m ²	kWh	\$	m ³	\$	e-kWh	m ³	\$	\$	kg
Burnhamthorpe Community Centre & Arena	6,008	830,494	\$132,547	95,222	\$37,156	1,830,325	3,966	\$9,958	\$179,661	207,836
Carmen Corbasson Community Centre	7,993	1,056,586	\$168,631	142,206	\$55,489	2,549,749	12,979	\$32,589	\$256,709	304,875
Clarkson Community Centre Library Arena & Pool	7,639	1,317,767	\$210,316	196,025	\$76,489	3,376,030	31,028	\$77,908	\$364,713	416,097
Frank Mckechnie Community Centre	5,863	1,017,472	\$162,389	171,347	\$66,860	2,816,616	30,080	\$75,528	\$304,776	359,682
Huron Park Community Centre Pool & Arena	7,626	1,366,113	\$218,032	218,539	\$85,274	3,660,773	8,821	\$22,149	\$325,454	460,797
Malton Community Centre Pool & Library	6,708	1,180,990	\$188,486	149,714	\$58,418	2,752,987	10,999	\$27,617	\$274,522	323,030
Malton Day Care Centre	535	0	\$0	16,450	\$6,419	172,725	16,465	\$41,342	\$47,761	31,600
Meadowvale Community Centre Pool & Library	7,636	1,872,602	\$298,867	260,188	\$101,525	4,604,576	14,115	\$35,441	\$435,834	555,999
Mississauga Seniors Citizen Centre	2,149	284,448	\$45,398	35,438	\$13,828	656,547	844	\$2,119	\$61,345	76,610
Mississauga Valley Gymnasium	1,939	366,969	\$58,568	19,950	\$7,784	576,444	265	\$665	\$67,018	49,333
Mississauga Valley Community Centre	10,955	2,220,792	\$354,438	340,028	\$132,679	5,791,086	44,353	\$111,366	\$598,483	719,818
Paramount Fine Foods Centre - Fieldhouse	18,311	2,266,353	\$361,710	229,973	\$89,735	4,681,070	3,165	\$7,947	\$459,392	509,769

Facility	Area	Electricity		Natural Gas		Total Energy	Water		Total Costs	GHG Emissions
	m ²	kWh	\$	m ³	\$	e-kWh	m ³	\$	\$	kg
River Grove Community Centre & Pool	6,428	1,647,821	\$262,992	342,106	\$133,490	5,239,934	17,818	\$44,739	\$441,221	706,620
South Common Community Centre Pool & Library	7,174	1,113,769	\$177,758	133,744	\$52,187	2,518,081	11,482	\$28,830	\$258,775	290,335
Major Facilities Pylon Sign	0	213,750	\$34,115	0	\$0	213,750	0	\$0	\$34,115	6,413
Churchill Meadows Community Centre	7,122	2,038,691	\$325,375	444,688	\$173,517	6,707,915	19,337	\$48,553	\$547,446	915,406
Totals	104,086	18,794,617	\$2,999,621	2,795,618	\$1,090,850	48,148,606	225,717	\$566,753	4,657,224	5,934,221
Usage / Costs per m²:		180.57	28.82	26.86	10.48	462.58	2.17	5.45	44.74	57.01

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. In addition, includes heat recovery from the pool dehumidification unit to heat the pool water.
- **Ice Plant Heat Recovery:** Installing Desuperheater to recover the heat from the ice plant compressors to heat the building.
- **Ice Resurfaces Electrification** Replace the Ice resurfaces in all the city rinks to electric Ice resurfaces.
- **Ongoing Commissioning:** Conduct regular commissioning to the city's high consuming building using the data analytics/fault detection tools that collects, manages, and analyzes data from various building systems, to identify operation irregularities and ensure optimum operation.
- **HVAC Systems Energy Upgrades for Lifecycle Replacements:** Includes energy upgrades for HVAC equipment that show energy & GHG emission savings.
- **DHW Systems Energy Upgrades for Lifecycle Replacements:** Includes energy upgrades for DHW equipment that show energy & GHG emission savings.





- **Controls Upgrades:** Includes controller upgrades, optimized sequence of operations, and additional points to better manage and control building systems
- **Operation Optimization:** Add additional sensors such as CO₂ sensors and motion sensors to optimize the operation of HVAC units to satisfy the occupant needs.
- **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 **Orange** 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

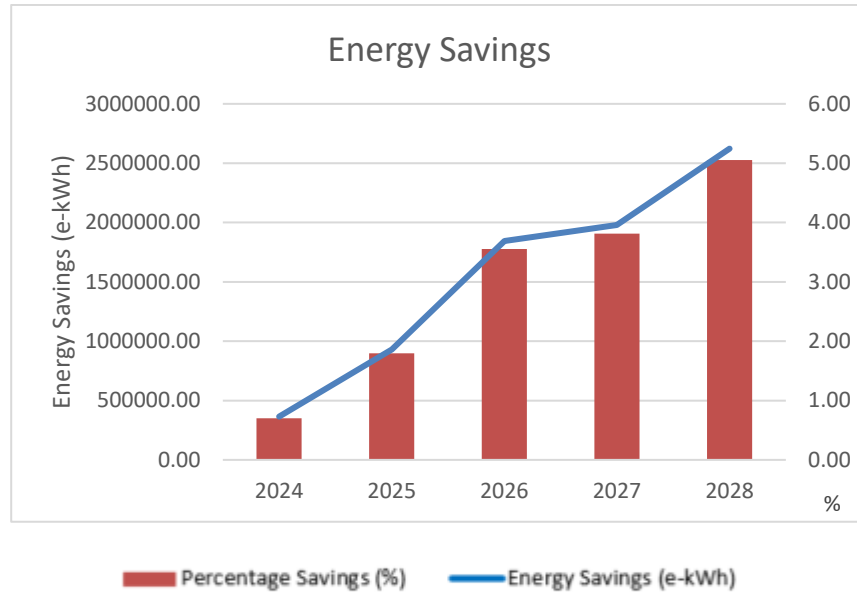
Energy Measure Implementation Plan for Community Centres

Energy Measure	2024				2025				2026				2027				2028			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Pool Heat Recovery																				
Iceplant Heat Recovery																				
Electrification Ice Resurfacers																				
Building Ongoing Commissioning																				
Energy Upgrade For DHW Systems																				
Energy Upgrade For HVAC Systems																				
Control Upgrade																				
Metering & Submetering Equipment																				
Lighting Upgrades																				
Operation Optimization																				
Renewable Energy Generation																				
 Scheduled Implementation  Cancelled Implementation																	Q1 = Jan - Mar Q2 = Apr - Jun			
 Status = Completed  Status = Underway																	Q3 = Jul - Sep Q4 = Oct - Dec			

5.5 ESTIMATED SAVINGS

At the end of the plan, **Community Centres and Multi-Purpose Facilities** are expected to save 5.25% over the base year of 2023.

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



5.6 PROGRESS TO TARGETS

The City is targeting a 5.25% reduction in energy use in **Community Centres and Multi-Purpose Facilities** by 2028 over the base year, 2023. 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 2024 will be adjusted to match the weather and occupancy of 2023. The figures below show the updated progress for each year against the set target.

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 8.4% of the total building area for City of Mississauga facilities included in this Plan.

6.2 BASELINE

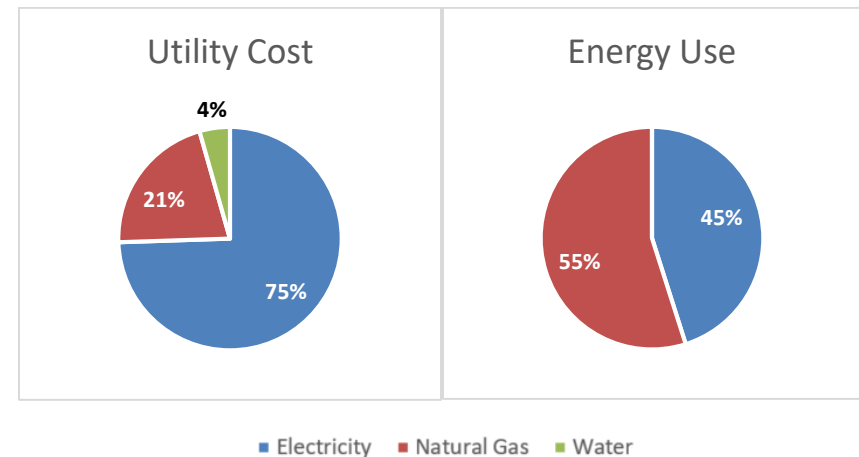
6.2.1 ENERGY USE

The energy use (combined electricity and natural gas) for **Cultural and Performing Arts** was 7,486,580 equivalent kilowatt hours in 2023. Following are the key takeaways for the energy usage in 2023:

- 45% of the total energy usage was due to electricity use.
- 55% of the total energy usage was due to natural gas use.
- A total of \$724,00, in utility costs was incurred, out of which 75% is attributed to electricity, 21% to natural gas, and 4% to water

Cultural and Performing Arts accounted for 3.6% of the City's total utility budget for 2023.

Figure 6-1: Utility Costs and Energy Use Breakdown for Cultural And Performing Arts



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.

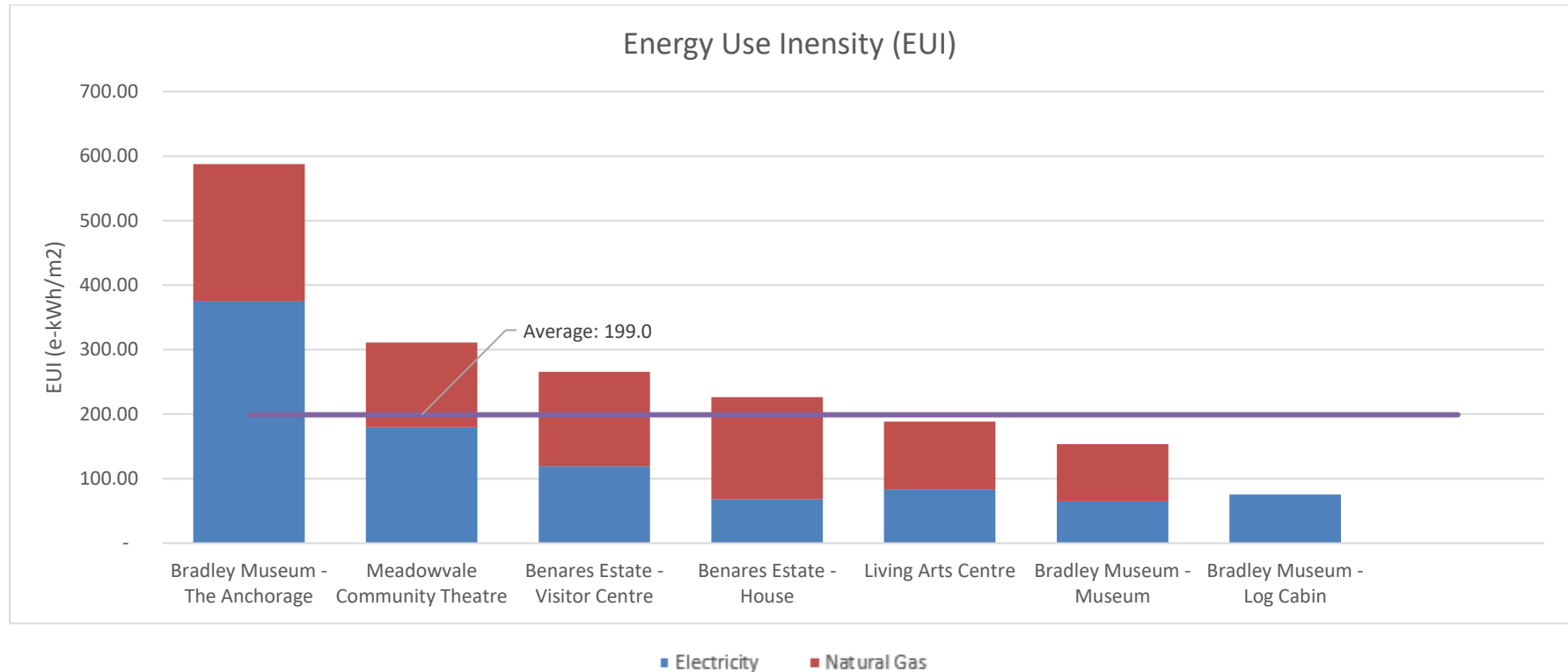
When reviewing EUI, the facility operation type and hours should be taken into account. For example, a facility that operates 24 hours a day will most likely have a higher EUI than a similar one that operates 8 hours a day. Similarly, a facility that has high energy using systems that do not contribute 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 2023 was 199 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.

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

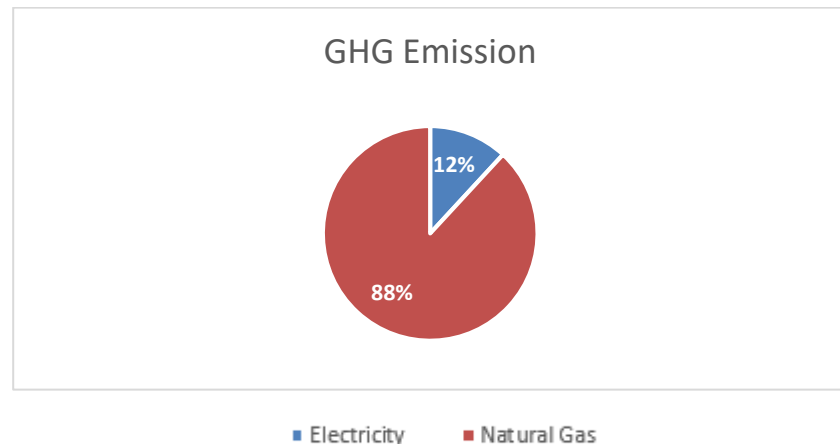


6.2.3 GREENHOUSE GAS (GHG) EMISSIONS

For 2023, **Cultural and Performing Arts** emitted 853,258 kg (or 853 tonnes) of CO₂ in 2023. 12% of these emissions were due to the generation of electricity, while the use of natural gas accounted for the remaining 88%.

Cultural and Performing Arts accounted for 4.2% of the City's total GHG emissions for facilities included in the plan.

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

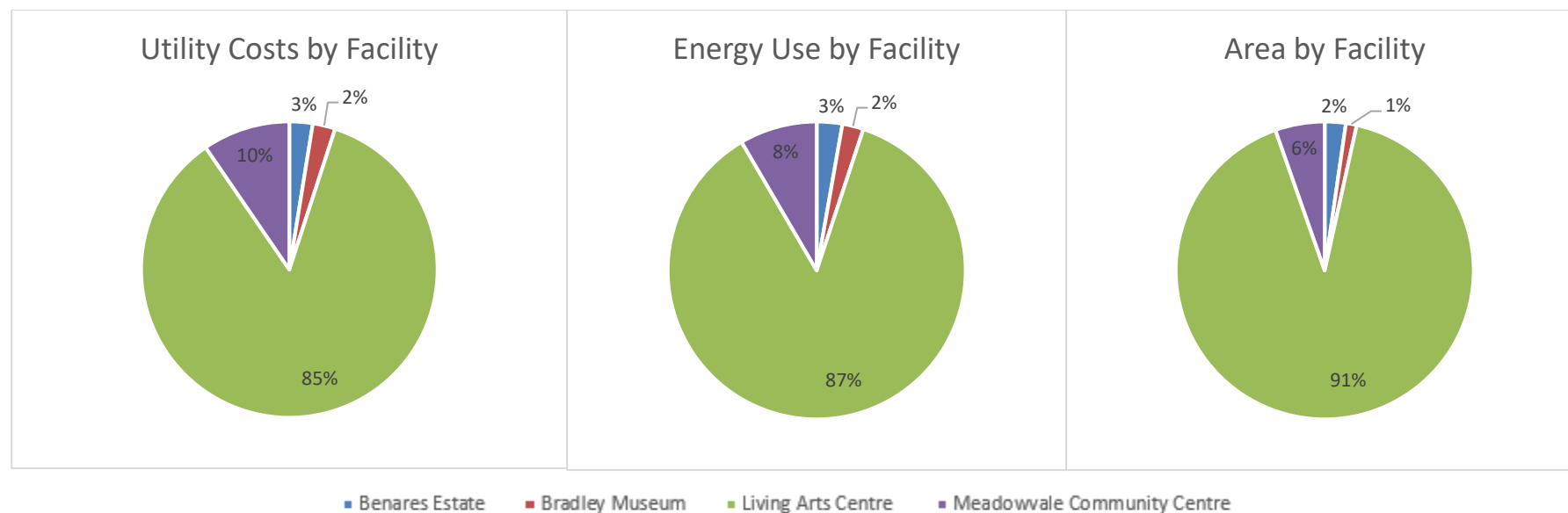


6.3 ENERGY AND GHG BREAKDOWN FOR CULTURAL AND PERFORMING ARTS

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 2023. 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 electrify DHW systems and conduct ongoing commissioning at Living Arts Centre.

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



2023 Annual Report for Cultural and Performing Arts

Facility	Area	Electricity		Natural Gas		Total Energy	Water		Total Costs	GHG Emissions
	m ²	kWh	\$	m ³	\$	e-kWh	m ³	\$	\$	kg
Benares Estate - House	535	36,241	\$5,784	8,078	\$3,152	121,060	462	\$1,160	\$10,096	16,605
Benares Estate - Visitor Centre	327	38,913	\$6,211	4,569	\$1,783	86,888	123	\$309	\$8,302	9,944
Bradley Museum - Barn	0	3,925	\$626	3,701	\$1,444	42,786	0	\$0	\$2,071	7,227
Bradley Museum - Log Cabin	126	9,483	\$1,513	0	\$0	9,483	0	\$0	\$1,513	284
Bradley Museum - Museum	151	9,789	\$1,562	1,274	\$497	23,166	419	\$1,052	\$3,112	2,741
Bradley Museum - The Anchorage	164	61,629	\$9,836	3,312	\$1,292	96,405	0	\$0	\$11,128	8,211
Living Arts Centre	34,387	2,851,744	\$455,138	345,212	\$134,702	6,476,470	11,253	\$28,255	\$618,095	748,705
Meadowvale Community Theatre	2,028	364,683	\$58,203	25,299	\$9,872	630,323	441	\$1,107	\$69,182	59,540
Totals	37,718	3,376,407	\$538,875	391,445	\$152,742	7,486,580	12,698	\$31,883	\$723,500	853,258
Usage / Costs per m²:		89.52	14.29	10.38	4.05	198.49	0.34	0.85	19.18	22.62

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:

- **Ongoing Commissioning:** Conduct regular commissioning to the city's high consuming building using the data analytics/fault detection tools that collects, manages, and analyzes data from various building systems, to identify operation irregularities.

For the chart below, the **Orange** 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

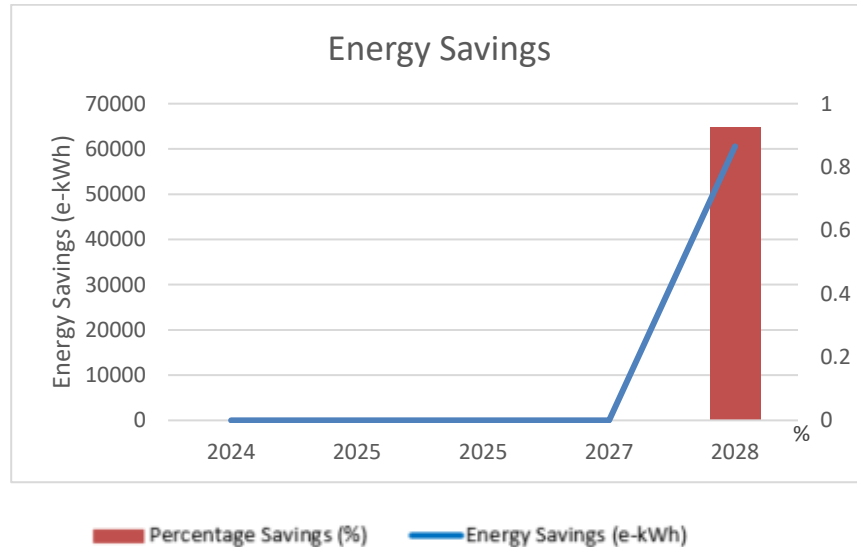
Figure 6-5: Energy Measure Implementation Plan for Cultural and Performing Arts

Energy Measure Implementation Plan for Culture																				
Energy Measure	2024				2025				2026				2027				2028			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Building Ongoing Commissioning																				
<div><div></div> Scheduled Implementation</div> <div><div></div> Cancelled Implementation</div>														<div>Q1 = Jan - Mar</div> <div>Q2 = Apr - Jun</div>						
<div><div></div> Status = Completed</div> <div><div></div> Status = Underway</div>														<div>Q3 = Jul - Sep</div> <div>Q4 = Oct - Dec</div>						

6.5 ESTIMATED SAVINGS

At the end of the plan, **Cultural and Performing Arts** are expected to save 0.87% over the base year of 2023

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



starting 2024 will be adjusted to match the weather and occupancy of 2023. The figures below show the updated progress for each year against the set target.

6.6 PROGRESS TO TARGETS

The City is targeting a 0.87% reduction in energy use in **Cultural and Performing Arts** by 2028 over the base year, 2023. 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

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 22 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 117 (North Dixie)
- Fire Station 118 (East Credit)
- Fire Station 119
- Fire Station 120
- Fire Station 121 (Meadowvale Village)
- Fire Station 122 (Churchill Meadows)
- Garry W Morden Centre

The above listed locations have a total floor area of approximately 23,299 square meters. This would account for 5.2% of the total building area for City of Mississauga facilities included in this Plan.

7.2 BASELINE

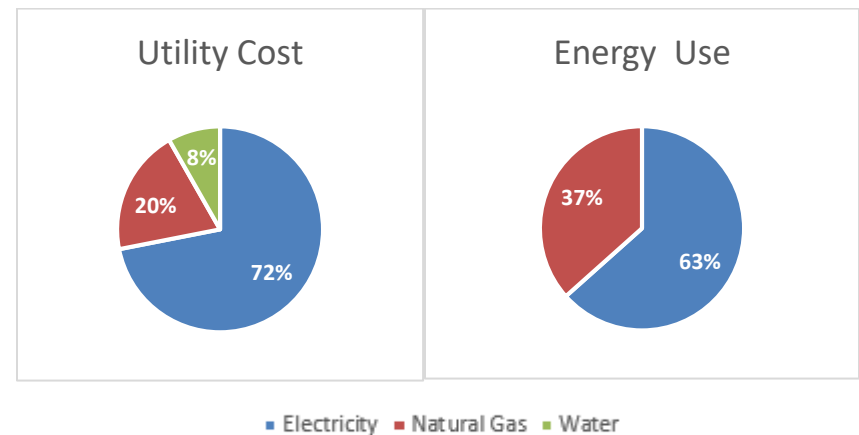
7.2.1 ENERGY USE

The energy use (combined electricity and natural gas) for **Fire Stations and Emergency Services** was 8,002,659 equivalent kilowatt hours in 2023. Following are the key takeaways for the energy usage in 2023:

- 37% of the total energy usage was due to electricity use
- 63% of the total energy usage was due to natural gas use
- A total of \$813,000 in utility costs was incurred, out of which 72% is attributed to electricity, 20% to natural gas, and 8% to water

Fire Stations and Emergency Services accounted for 4.1% of the City's total utility budget for 2023.

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



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.

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

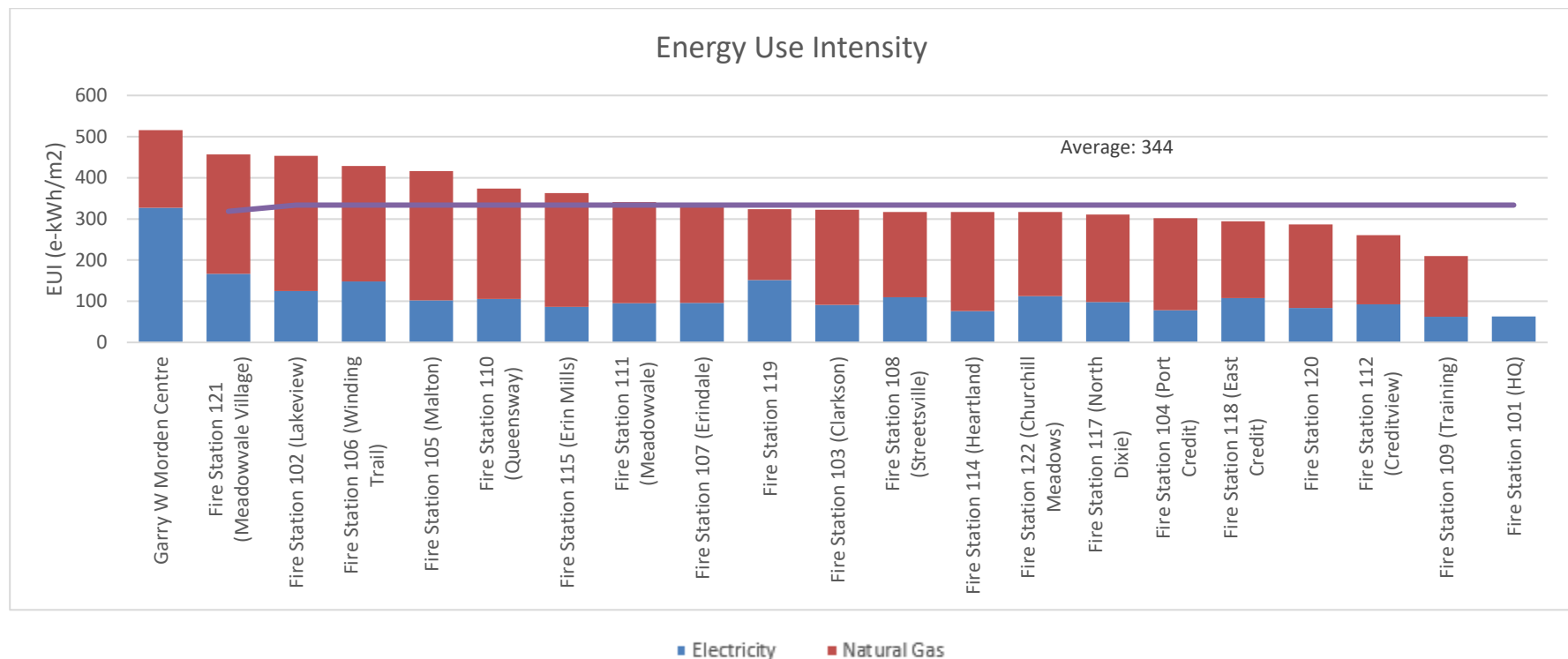
Figure 7-2: Energy Use Intensity for Fire Stations and Emergency Services

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

For **Fire Stations and Emergency Services** the average EUI in 2023 was 344 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.

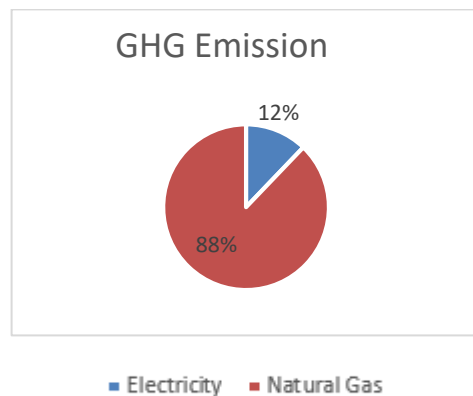


7.2.3 GREENHOUSE GAS (GHG) EMISSIONS

For 2023, **Fire Stations and Emergency Services** emitted 904,000 kg (or 904 tonnes) of CO₂ in 2023. 12% of these emissions were due to the generation of electricity, while the use of natural gas accounted for the remaining 88%.

Fire Stations and Emergency Services accounted for 4.5% 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

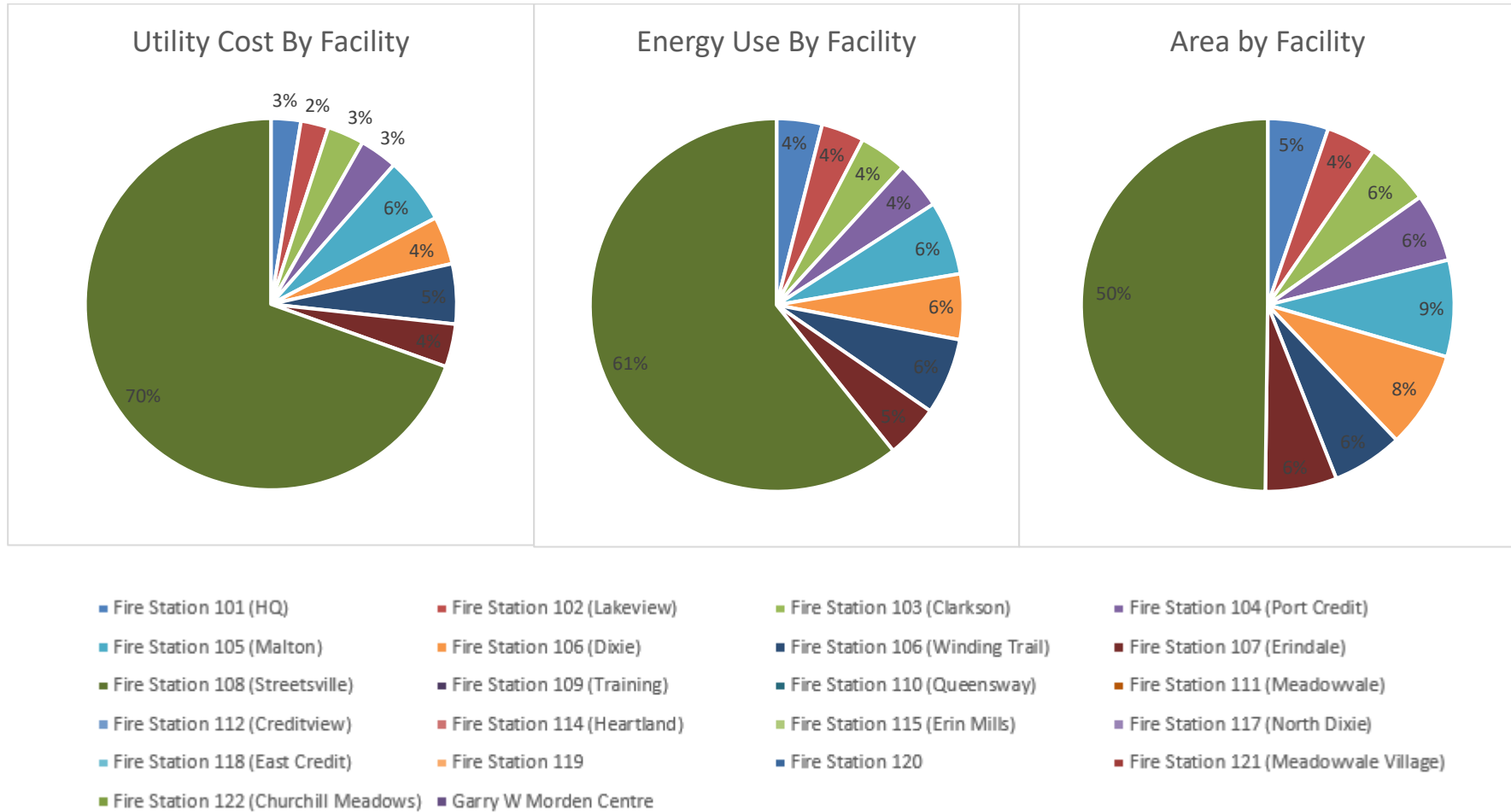


7.3 ENERGY AND GHG BREAKDOWN FOR FIRE STATIONS AND EMERGENCY SERVICES

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 2023. Following are the key takeaways:

- Gary W. Morden Centre is the largest facility by area in the group and contributes towards 26% and 40% of the energy consumption and utility costs respectively in the group
- Fire Station 101 (HQ) is the second largest facility and contributes towards 2% and 4% 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
- The city will be targeting major mechanical, electrical renovation to a number of the fire stations

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



2023 Annual Report for Fire Stations and Emergency Services – Part 1 of 2

Facility	Area	Electricity		Natural Gas		Total Energy	Water		Total Costs	GHG Emissions
	m ²	kWh	\$	m ³	\$	e-kWh	m ³	\$	\$	kg
Fire Station 101 (HQ)	2,646	167,600	\$26,749	-	\$0	167,600	1,314	\$3,299	\$30,048	5,028
Fire Station 102 (Lakeview)	452	56,385	\$8,999	14,142	\$5,518	204,876	305	\$766	\$15,283	28,858
Fire Station 103 (Clarkson)	568	51,862	\$8,277	12,497	\$4,876	183,081	465	\$1,168	\$14,321	25,563
Fire Station 104 (Port Credit)	513	40,225	\$6,420	10,907	\$4,256	154,749	919	\$2,308	\$12,983	22,159
Fire Station 105 (Malton)	782	79,789	\$12,734	23,393	\$9,128	325,416	918	\$2,305	\$24,167	47,332
Fire Station 106 (Dixie)	518	-	\$0	-	\$0	0	-	\$0	\$0	0
Fire Station 106 (Winding Trail)	1,164	172,513	\$27,533	31,084	\$12,129	498,895	774	\$1,943	\$41,605	64,888
Fire Station 107 (Erindale)	537	51,506	\$8,220	12,231	\$4,773	179,932	383	\$962	\$13,955	25,041
Fire Station 108 (Streetsville)	524	57,611	\$9,195	10,332	\$4,032	166,097	692	\$1,738	\$14,964	21,576
Fire Station 109 (Training)	1,362	84,825	\$13,538	19,180	\$7,484	286,215	4,711	\$11,829	\$32,851	39,390
Fire Station 110 (Queensway)	596	62,999	\$10,055	15,214	\$5,937	222,746	587	\$1,474	\$17,465	31,116
Fire Station 111 (Meadowvale)	588	55,928	\$8,926	13,763	\$5,370	200,440	437	\$1,097	\$15,394	28,117
Fire Station 112 (Creditview)	649	60,239	\$9,614	10,366	\$4,045	169,082	340	\$854	\$14,513	21,720

2023 Annual Report for Fire Stations and Emergency Services – Part 2 of 2

Facility	Area	Electricity		Natural Gas		Total Energy	Water		Total Costs	GHG Emissions
	m ²	kWh	\$	m ³	\$	e-kWh	m ³	\$	\$	kg
Fire Station 114 (Heartland)	653	49,775	\$7,944	14,970	\$5,841	206,960	353	\$886	\$14,672	30,251
Fire Station 115 (Erin Mills)	534	45,998	\$7,341	14,083	\$5,495	193,870	324	\$814	\$13,650	28,433
Fire Station 117 (North Dixie)	697	68,167	\$10,879	14,153	\$5,523	216,774	656	\$1,647	\$18,049	29,233
Fire Station 118 (East Credit)	733	79,166	\$12,635	13,007	\$5,075	215,740	371	\$932	\$18,642	27,361
Fire Station 119	1,040	157,411	\$25,123	17,048	\$6,652	336,415	433	\$1,087	\$32,862	37,472
Fire Station 120	1040	86,880	\$13,866	20,103	\$7,844	297,962	760	\$1,908	\$23,619	41,224
Fire Station 121 (Meadowvale Village)	760	126,604	\$20,206	21,005	\$8,196	347,157	451	\$1,132	\$29,535	44,149
Fire Station 122 (Churchill Meadows)	769	86,725	\$13,841	14,944	\$5,831	243,637	581	\$1,459	\$21,131	31,309
Garry W Morden Centre	6,174	2,019,499	\$322,312	111,002	\$43,313	3,185,020	10,908	\$27,389	\$393,014	273,820
Totals	23,299	3,661,707	\$584,408	413,424	\$ 161,318	8,002,659	26,682	\$66,996	\$812,722	904,039
Usage / Costs per m²:		157.2	25.1	17.7	6.9	343.5	1.1	2.9	34.9	38.8

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:





- **Ongoing Commissioning:** Conduct regular commissioning to the city's high consuming building using the data analytics/fault detection tools that collects, manages, and analyzes data from various building systems, to identify operation irregularities and ensure optimum operation.
- **DHW Systems Energy Upgrades for Lifecycle Replacements:** Includes energy upgrades for DHW equipment that show energy & GHG emission savings.
- **HVAC Systems Energy Upgrades for Lifecycle Replacements:** Includes energy upgrades for HVAC equipment that show energy & GHG emission savings.
- **Controls Upgrades:** Includes controller upgrades, optimized sequence of operations, and additional points to better manage and control building systems

- **Lighting Upgrades:** Includes replacement of existing lighting technologies to newer technologies like LEDs, and better controls through localized sensors and BAS scheduling
- **Data Centre Heat recovery:** includes the installation of a heat recovery system to recover heat rejected from the data centre in the winter
- **Operation Optimization:** Add additional sensors such as CO₂ sensors and motion sensors to optimize the operation of HVAC units to satisfy the occupant needs
- **Renewable Energy Generation:** Includes energy generation from renewable sources like solar photovoltaics, solar hot water heating, solar lighting

For the chart below, the **Orange** 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.

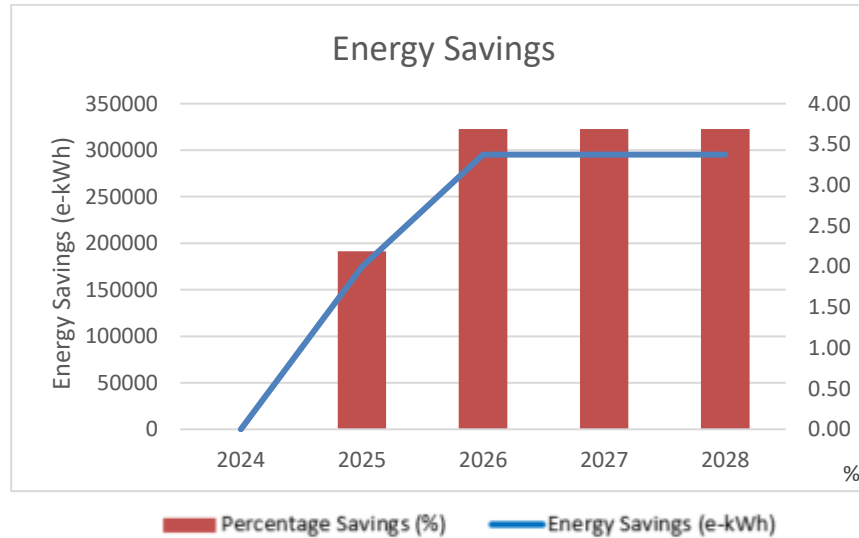
Figure 7-5: Energy Measure Implementation Plan for Fire Stations and Emergency Services

Energy Measure Implementation Plan for Firestations																				
Energy Measure	2024				2025				2026				2027				2028			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Energy Upgrade For DHW Systems																				
Energy Upgrade For HVAC Systems																				
Control Upgrade																				
Lighting Upgrades																				
Operation Optimization																				
 Scheduled Implementation  Cancelled Implementation																	Q1 = Jan-Mar Q2 = April - June			
 Status = Completed  Status = Underway																	Q3 = Jul-Sep Q4 = Oct - Dec			

7.5 ESTIMATED SAVINGS

At the end of the plan, **Fire Stations and Emergency Services** are expected to save 3.69% over the base year of 2023

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



starting 2024 will be adjusted to match the weather and occupancy of 2023. The figures below show the updated progress for each year against the set target.

7.6 PROGRESS TO TARGETS

The City is targeting a 3.69% reduction in energy use in **Fire Stations and Emergency Services** by 2028 over the base year, 2023. 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

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 6 facilities/locations that fall under this category. They include:

- 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

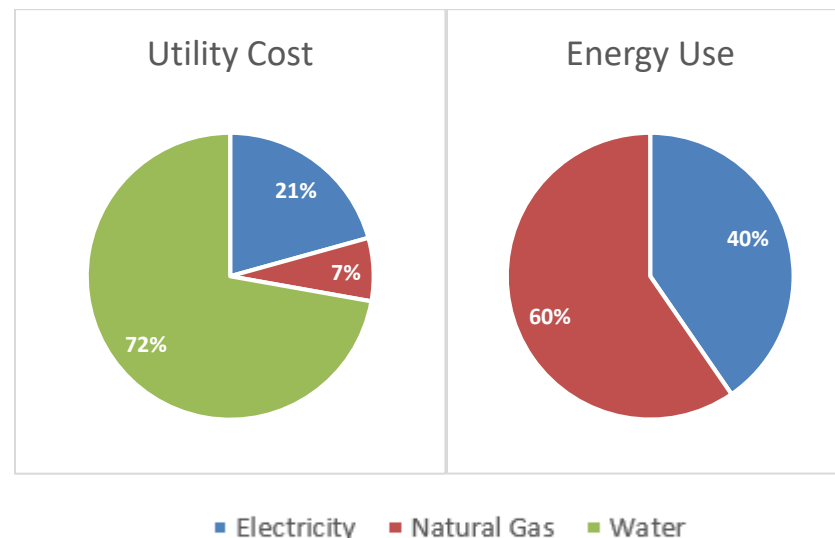
8.2.1 ENERGY USE

The energy use (combined electricity and natural gas) for **Golf Courses and Associated Facilities** was 1,357,682 equivalent kilowatt hours in 2023. Following are the key takeaways for the energy usage in 2023:

- 40% of the total energy usage was due to electricity use
- 60% of the total energy usage was due to natural gas use
- A total of \$423,000 in utility costs was incurred, out of which 21% is attributed to electricity, 7% to natural gas, and 72% to water

Golf Courses and Associated Facilities accounted for 2.1% of the City's total utility budget for 2023.

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.

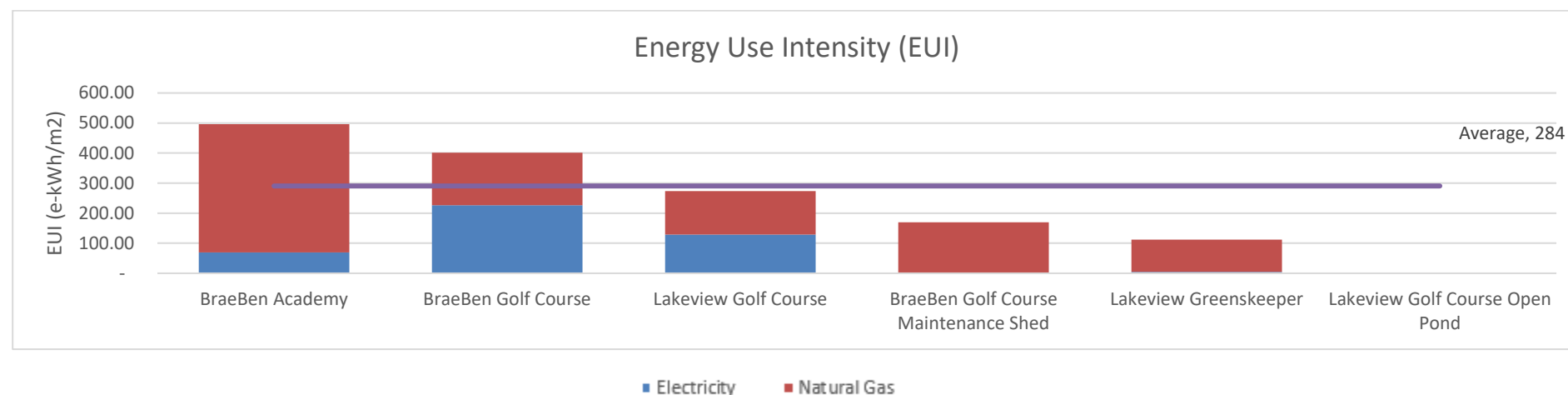
When reviewing EUI, the facility operation type and hours should be taken into account. For example, a facility that operates 24 hours a day will most likely have a higher EUI than a similar one that operates 8 hours a day. Similarly, a facility that has high energy using systems that do not contribute 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 2023 was 284 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.

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

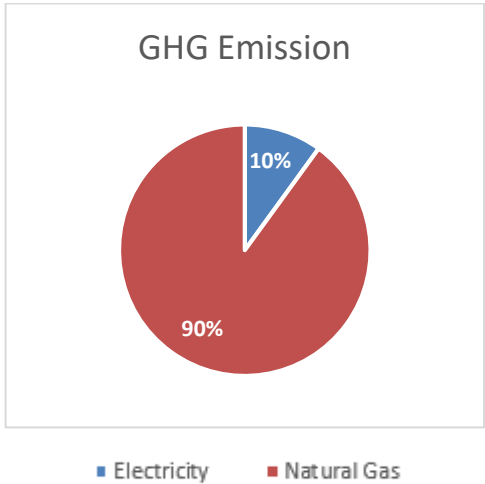


8.2.3 GREENHOUSE GAS (GHG) EMISSIONS

For 2023 **Golf Courses and Associated Facilities** emitted 164,500 kg (or 164.5 tonnes) of CO₂ in 2023. 10.0% of these emissions were due to the generation of electricity, while the use of natural gas accounted for the remaining 90.0%.

Golf Courses and Associated Facilities accounted for 0.8% 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

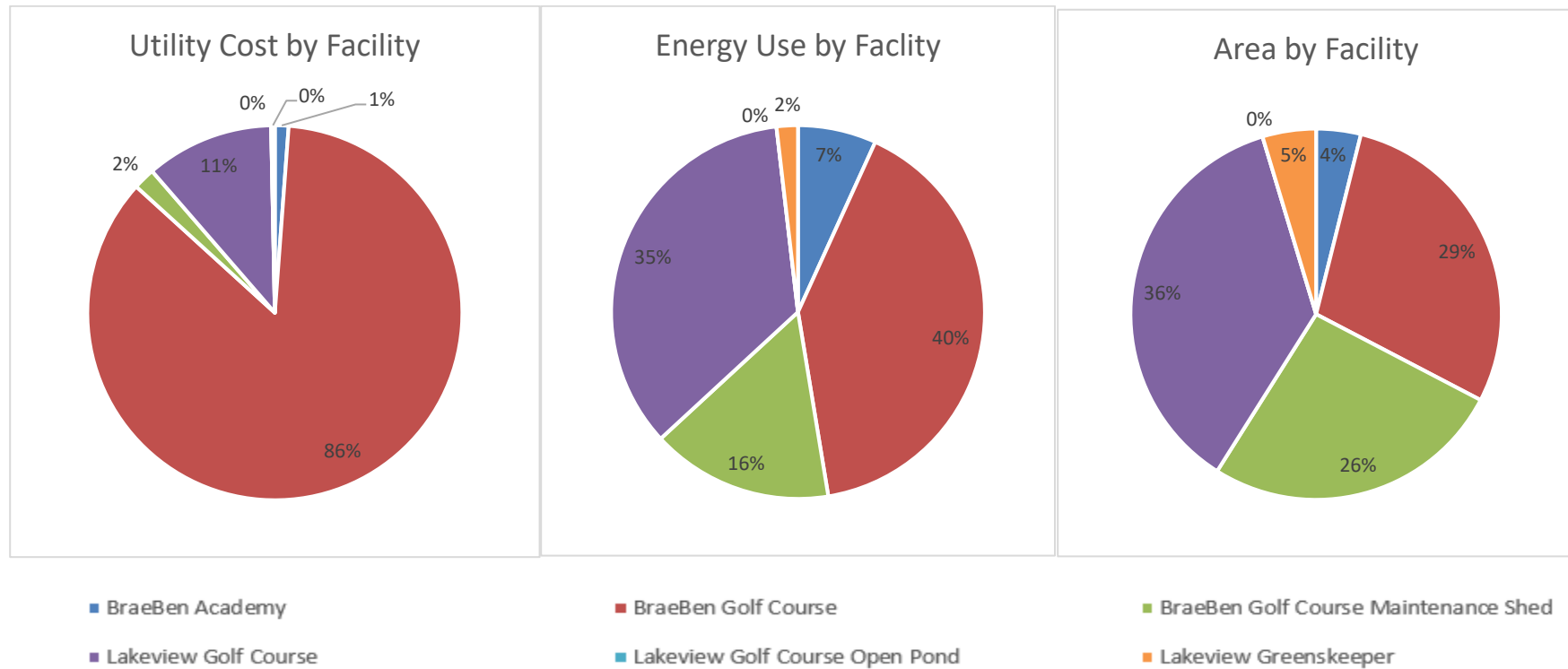


8.3 ENERGY AND GHG BREAKDOWN FOR GOLF COURSES AND ASSOCIATED FACILITIES

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 2023. Following are the key takeaways:

- The premises at BreaBen Golf Course represent the largest area in the group and contribute towards 63% and 89% of the energy consumption and utility costs respectively in the group
- The premises at Lakeview Golf Course contribute towards 37% and 11% of the energy consumption and utility costs respectively in the group

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



2023 Annual Report for Golf Courses 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
BraeBen Academy	186	12,827	2,047	7,563	2,951	92,239	-	-	4,998	14,913
BraeBen Golf Course	1,375	311,257	49,677	22,863	8,921	551,319	120,850	303,442	362,040	53,258
BraeBen Golf Course Maintenance Shed	1,257	-	-	20,353	7,942	213,707	-	-	7,942	39,098
Lakeview Golf Course	1,739	223,306	35,640	24,008	9,368	475,390	694	1,743	46,750	52,819
Lakeview Golf Course Open Pond	-	-	-	-	-	-	-	-	-	-
Lakeview Greenskeeper	223	1,036	165	2,285	892	25,029	111	279	1,336	4,421
Totals	4,780	548,426	87,529	77,072	\$30,073	1,357,682	121,655	305,464	\$423,066	164,508
Usage / Costs per m²:		114.73	18.31	16.12	6.29	284.03	25.45	63.90	88.51	34.42

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:

- **DHW Systems Energy Upgrades for Lifecycle Replacements:** Includes energy upgrades for DHW equipment that show energy & GHG emission savings.

For the chart below, the **Orange** 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.

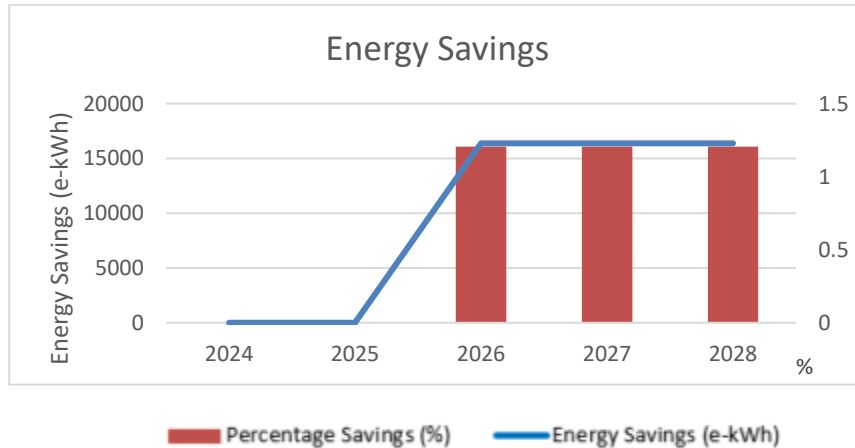
Energy Measure Implementation Plan for Golf Courses & Associated Facilities

Energy Measure	2024				2025				2026				2027				2028			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Energy Upgrade For DHW Systems																				
<div><div></div>Scheduled Implementation</div> <div><div></div>Cancelled Implementation</div>																<div>Q1 = Jan - Mar</div> <div>Q2 = Apr - Jun</div> <div>Q3 = Jul - Sep</div> <div>Q4 = Oct - Dec</div>				
<div><div></div>Status = Completed</div> <div><div></div>Status = Underway</div>																				

8.5 ESTIMATED SAVINGS

At the end of the plan, **Golf Courses and Associated Facilities** are expected to save 1.21% over the base year of 2023

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



8.6 PROGRESS TO TARGETS

The City is targeting a 1.21% reduction in energy use in **Golf Courses and Associated Facilities** by 2028 over the base year, 2023. 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 2024 will be adjusted to match the weather and occupancy of 2023. The figures below show the updated progress for each year against the set target.

9.0 HERITAGE BUILDINGS

9.1 SCOPE AND BOUNDARY

For the purposes of this report, the City of Mississauga has 5 facilities/locations that fall under the **Heritage Buildings** category. They include:

- Riverwood - Chappel Estate House
- 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

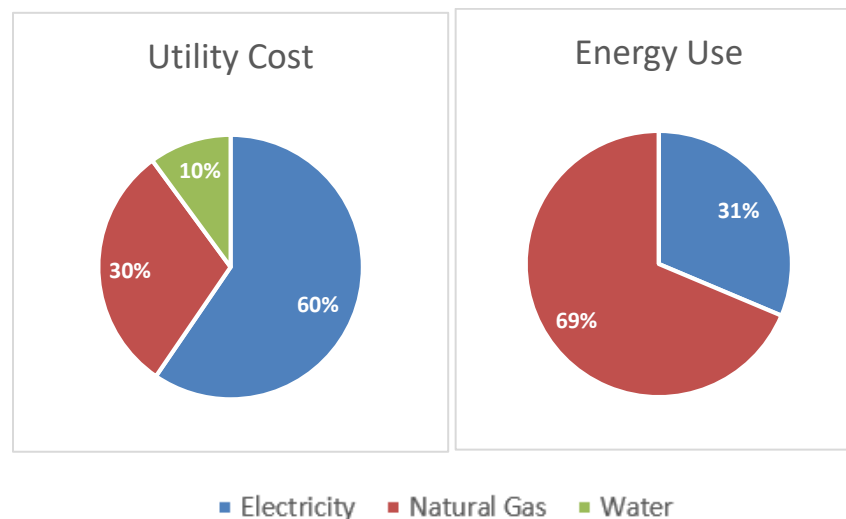
9.2.1 ENERGY USE

The energy use (combined electricity and natural gas) for **Heritage Buildings** was 351,000 equivalent kilowatt hours in 2023. Following are the key takeaways for the energy usage in 2023.

- 31% of the total energy usage was due to electricity use
- 69% of the total energy usage was due to natural gas use
- A total of \$47,400 in utility costs was incurred, out of which 60% is attributed to electricity, 30% to natural gas, and 10% to water

Heritage Buildings accounted for 0.1% of the City's total utility budget for 2023.

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.

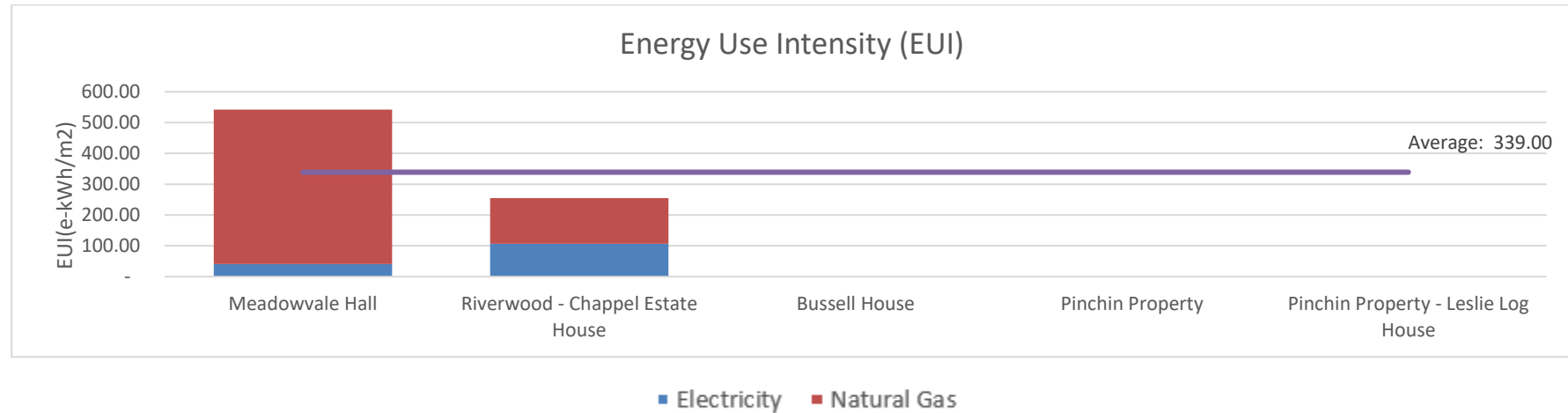
When reviewing EUI, the facility operation type and hours should be taken into account. For example, a facility that operates 24 hours a day will most likely have a higher EUI than a similar one that operates 8 hours a day. Similarly, a facility that has high energy using systems that do not contribute 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 2023 was 339 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

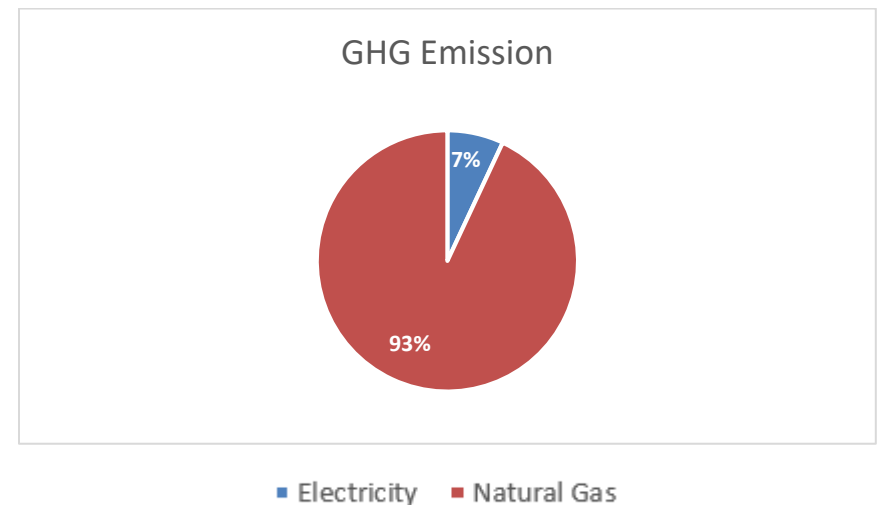


9.2.3 GREENHOUSE GAS (GHG) EMISSIONS

For 2023, **Heritage Buildings** emitted 47,400 kg (or 47 tonnes) of CO₂ in 2023. 7% of these emissions were due to the generation of electricity, while the use of natural gas accounted for the remaining 93%.

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

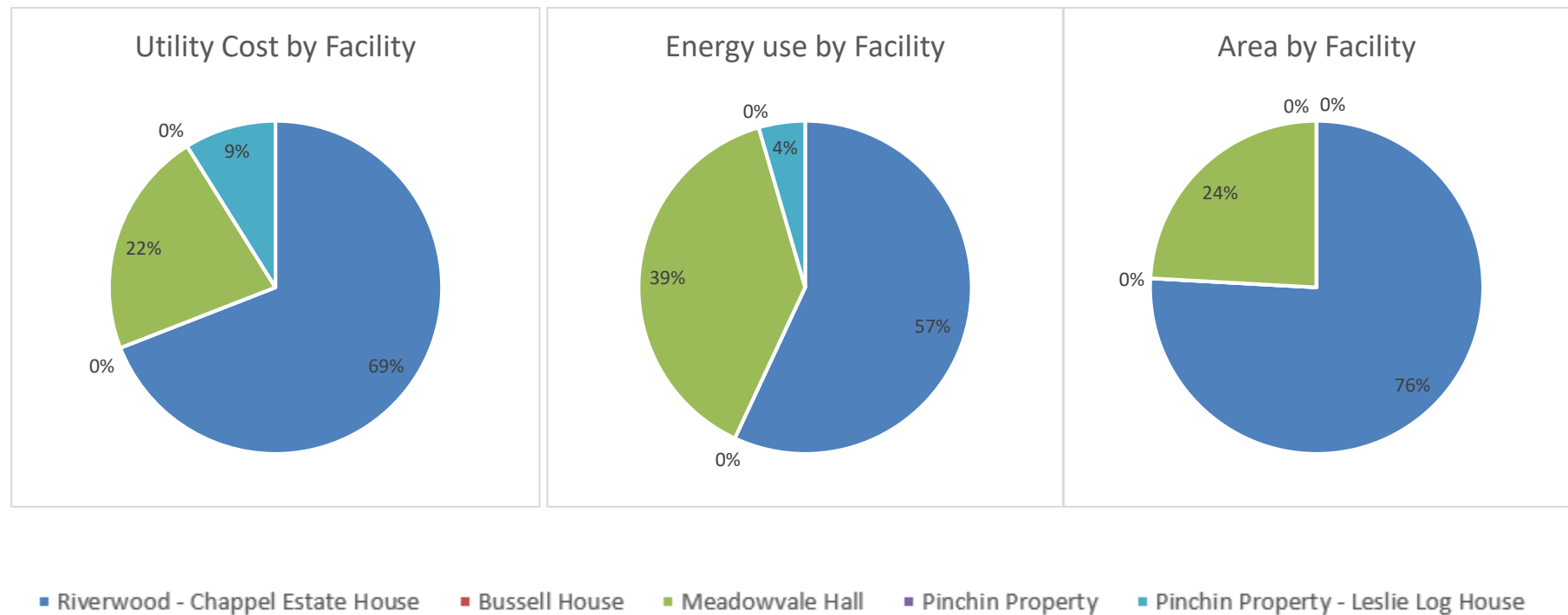


9.3 ENERGY AND GHG BREAKDOWN FOR HERITAGE BUILDINGS

This section provides a brief overview/recap of the Utility and GHG data for **Heritage Buildings**. The table below summarizes, by facility, the energy usage and utility usage for 2023. Following are the key takeaways:

- The Riverwood Chappel Estate House represents the largest area in the group and contributes towards 57% and 69% 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 39% and 22% of the energy consumption and utility costs respectively in the group

Figure 9-4: Utility Costs and Energy Use Breakdown by Facility



2023 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	84,019	\$13,409	11,049	\$4,311	200,034	1,061	\$2,664	\$20,385	23,746
Bussell House	0	0	\$0	0	\$0	0	0	\$0	\$0	0
Meadowvale Hall	250	10,266	\$1,638	11,920	\$4,651	135,426	83	\$208	\$6,498	23,206
Pinchin Property	0	0	\$0	0	\$0	0	0	\$0	\$0	0
Pinchin Property - Leslie Log House	0	15,812	\$2,524	0	\$0	15,812	41	\$103	\$2,627	474
Totals	1,036	110,097	\$17,571	22,969	\$8,963	351,272	1,185	\$2,975	\$29,509	47,426
Usage / Costs per m²:		106.3	17.0	22.2	8.7	339.1	1.1	2.9	28.5	45.8

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.

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

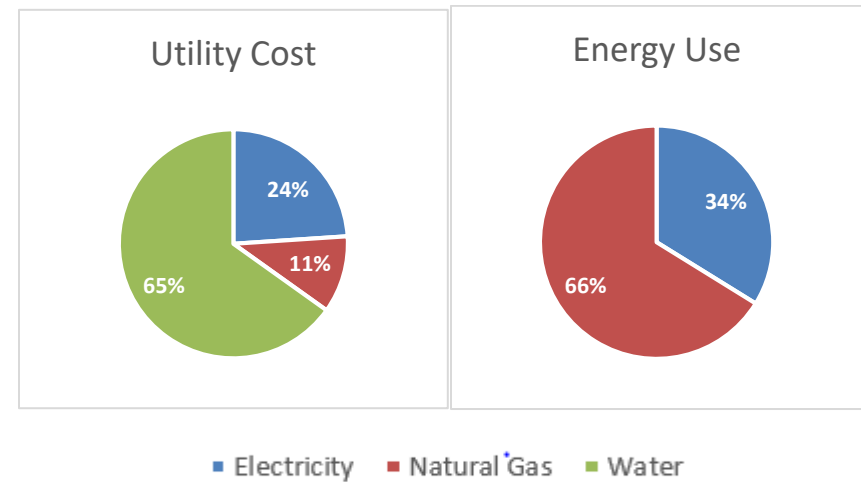
10.2.1 ENERGY USE

The energy use (combined electricity and natural gas) for **Leased Facilities and Properties** was 1,255,000 equivalent kilowatt hours in 2023. Following are the key takeaways for the energy usage in 2023:

- 34% of the total energy usage was due to electricity use
- 66% of the total energy usage was due to natural gas use
- A total of \$283,000 in utility costs was incurred, out of which 24% is attributed to electricity, 11% to natural gas, and 65% to water

Leased Facilities and Properties accounted for 1.4% of the City's total utility budget for 2023.

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.

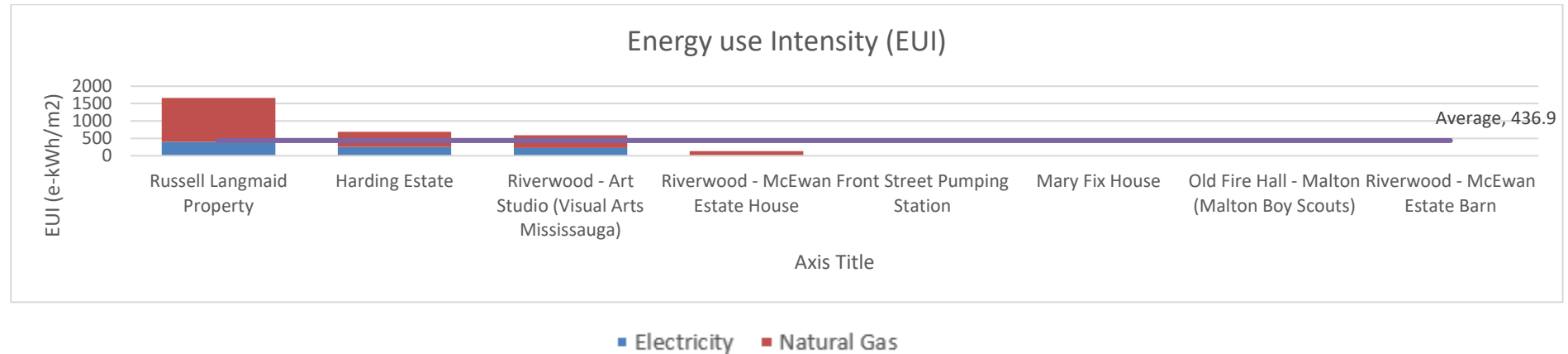
When reviewing EUI, the facility operation type and hours should be taken into account. For example, a facility that operates 24 hours a day will most likely have a higher EUI than a similar one that operates 8 hours a day. Similarly, a facility that has high energy using systems that do not contribute 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 2023 was 437 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.

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

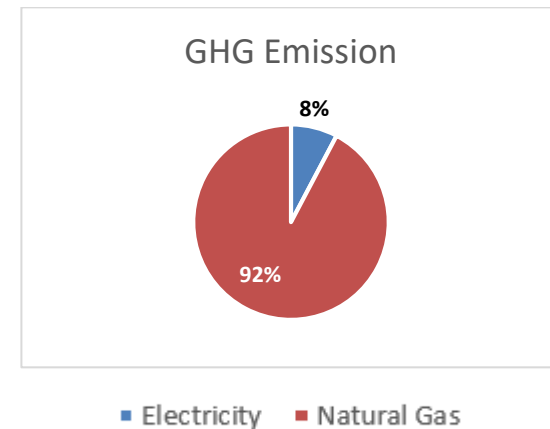


10.2.3 GREENHOUSE GAS (GHG) EMISSIONS

For 2023, **Leased Facilities and Properties** emitted 164,000 kg (or 164tonnes) of CO₂ in 2023. 8% of these emissions were due to the generation of electricity, while the use of natural gas accounted for the remaining 92%.

Leased Facilities and Properties accounted for 0.2% of the City's total GHG emissions for facilities included in the plan.

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

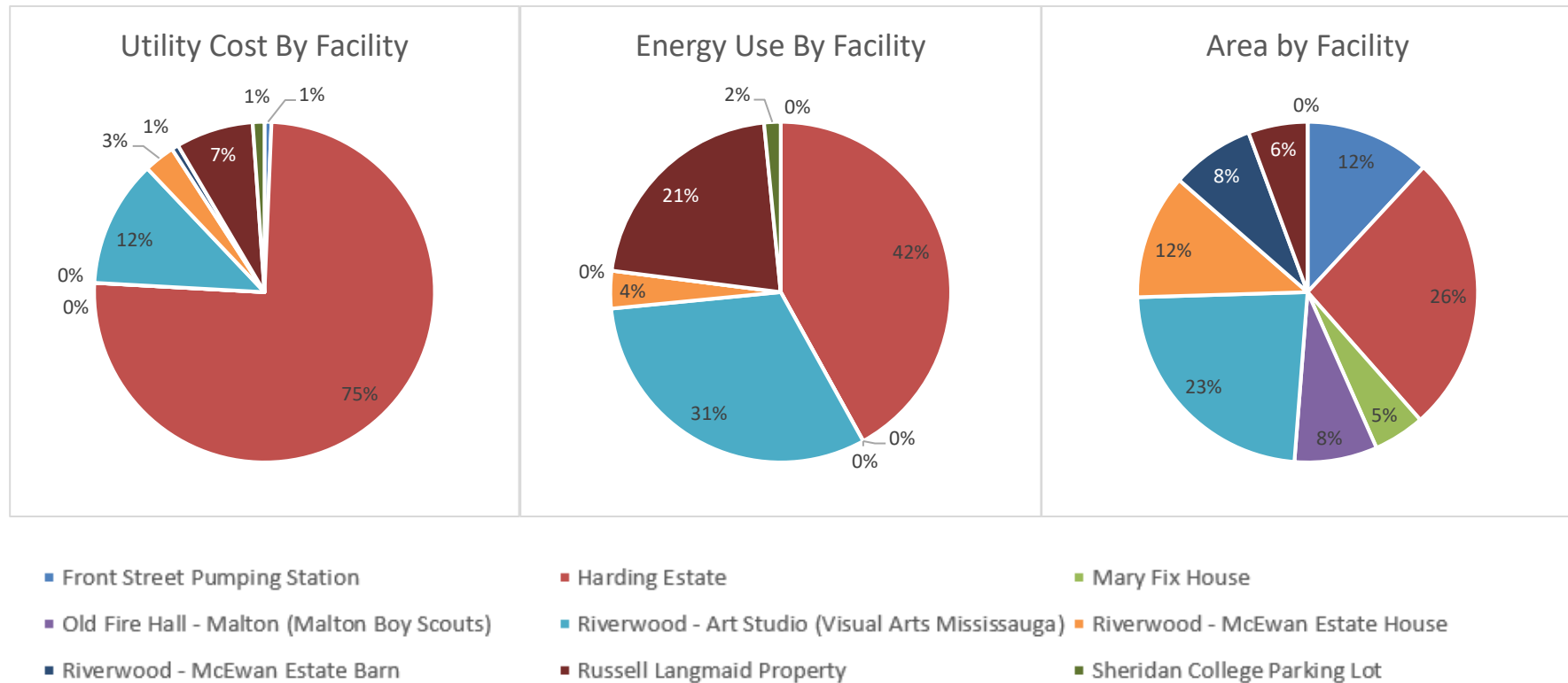


10.3 ENERGY AND GHG BREAKDOWN FOR LEASED FACILITIES AND PROPERTIES

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 2023.

- The Harding Estate represents the largest area in the group and contributes towards 42% and 75% 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 31% and 12% of the energy consumption and utility costs respectively in the group

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



2023 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	742	1,863	\$1,863	0
Harding Estate	764	192,080	\$30,656	31,859	\$12,431	526,600	67,561	169,639	\$212,726	66,964
Mary Fix House	140	-	\$0	-	-	-	-	-	-	-
Old Fire Hall - Malton (Malton Boy Scouts)	226	-	\$0	-	-	-	-	-	-	-
Riverwood - Art Studio (Visual Arts Mississauga)	669	147,870	\$23,600	23,564	\$9,195	395,292	520	1,306	\$34,100	49,703
Riverwood - McEwan Estate House	342	408	\$65	4,220	\$1,647	44,718	2,632	6,609	\$8,320	8,119
Riverwood - McEwan Estate Barn	228	-	\$0	-	-	-	735	1,846	\$1,846	-
Russell Langmaid Property	162	64,394	\$10,277	19,467	\$7,596	268,798	1,179	2,960	\$20,834	39,328
Sheridan College Parking Lot	0	19,674	\$3,140	-	-	19,674	-	-	\$3,140	590
Totals	2,873	424,426	\$67,738	79,110	\$30,869	1,255,081	73,369	184,222	\$282,829	164,703
Usage / Costs per m²:		147.7	23.6	27.5	10.7	436.9	25.5	64.1	98.4	57.3

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.

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 9 facilities/locations that fall under this category. They include:

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

The above listed locations have a total floor area of approximately 44,000 square meters. This would account for 9.4 % of the total building area for City of Mississauga facilities included in this Plan.

11.2 BASELINE

11.2.1 ENERGY USE

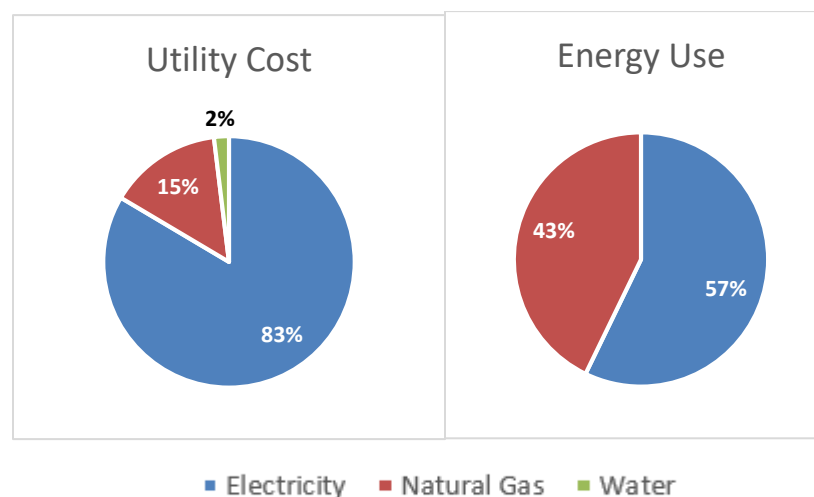
The energy use (combined electricity and natural gas) for **Libraries** was 8,286,900 equivalent kilowatt hours in 2023. Following are the key takeaways for the energy usage in 2023:

- 43% of the total energy usage was due to electricity use
- 57% of the total energy usage was due to natural gas use,

- A total of \$905,000 in utility costs was incurred, out of which 83% is attributed to electricity, 15% to natural gas, and 2% to water

Libraries accounted for 4.5% of the City's total utility budget for 2023.

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.

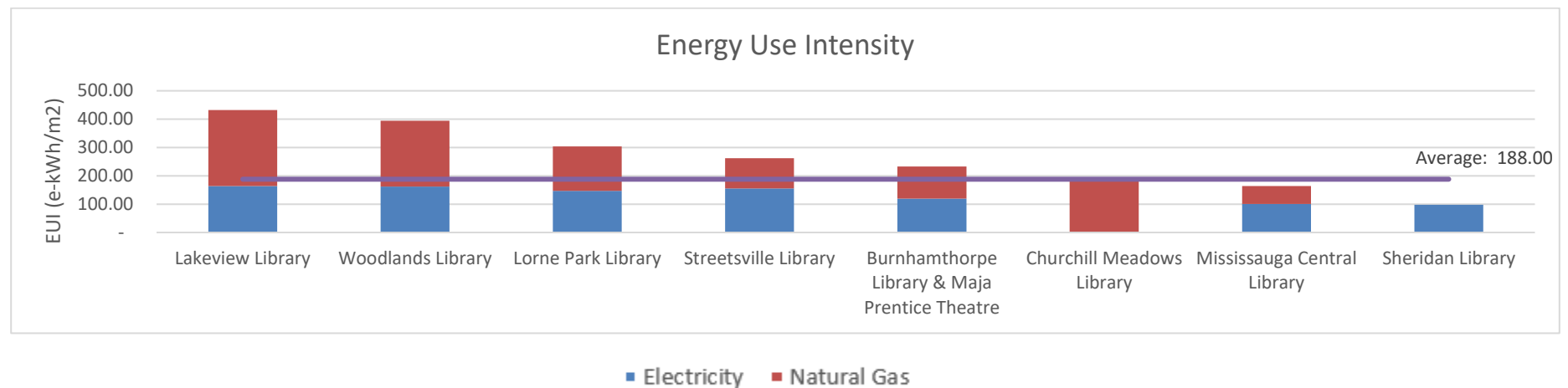
When reviewing EUI, the facility operation type and hours should be taken into account. For example, a facility that operates 24 hours a day will most likely have a higher EUI than a similar one that operates 8 hours a day. Similarly, a facility that has high energy using systems that do not contribute 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 2023 was 188 e-kWh/m².

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

Figure 11-2: Energy Use Intensity for Libraries

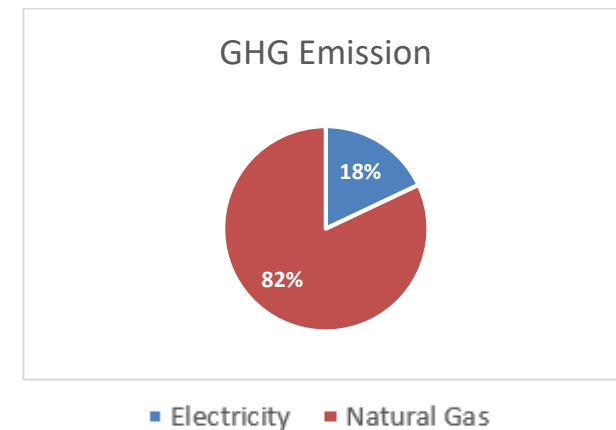


11.2.3 GREENHOUSE GAS (GHG) EMISSIONS

For 2023, **Libraries** emitted 791,224 kg (or 791 tonnes) of CO₂ in 2023. 18% of these emissions were due to the generation of electricity, while the use of natural gas accounted for the remaining 82%.

Libraries accounted for 3.9% 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

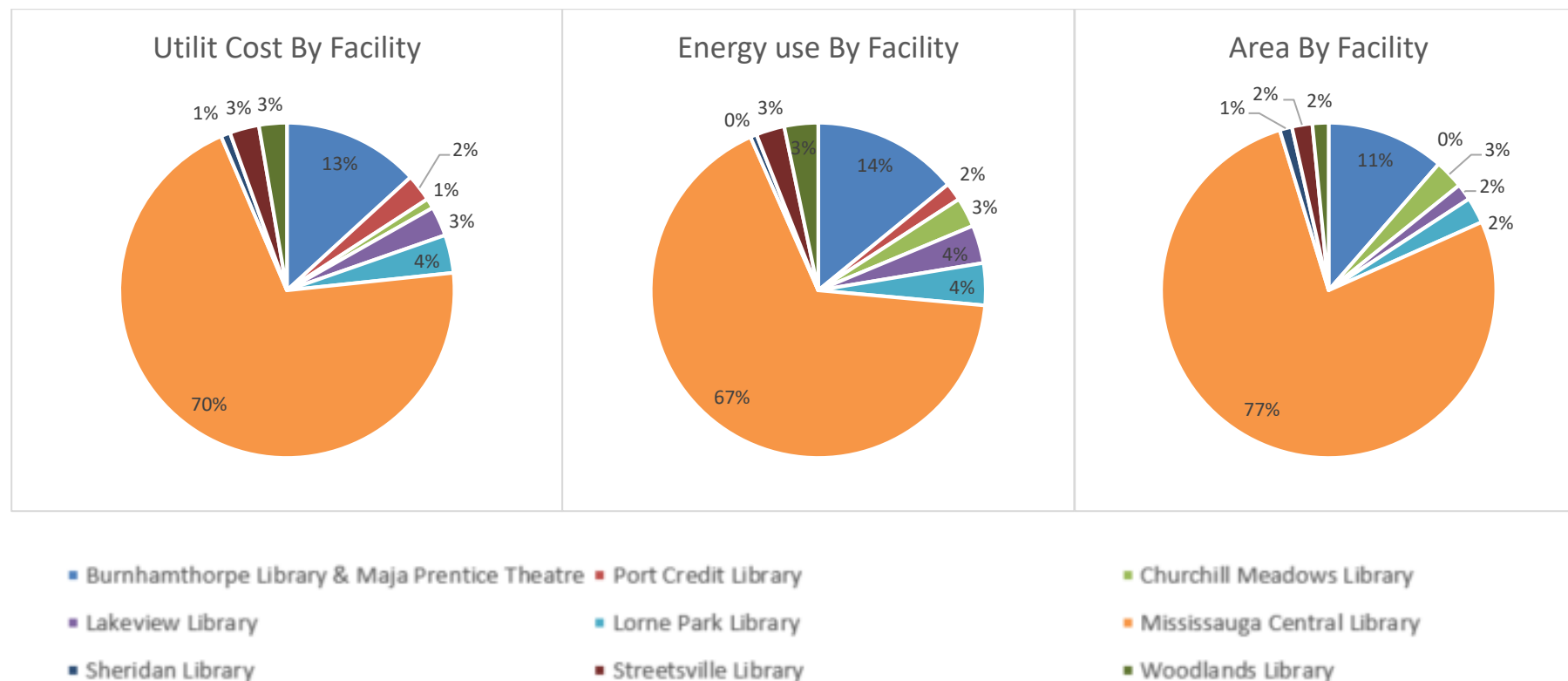
This section provides a brief overview/recap of the Utility and GHG data for **Libraries**. The table below summarizes, by facility, the utility usage and GHG emissions for 2023. Following are the key takeaways:

- Mississauga Central Library is by far the largest facility in this group by area and represents the largest energy consumption (67%) and utility consumption (70%) in this group
- Burnhamthorpe Library & Maja Prentice Theatre represents the second largest facility by area in this group and contributes 14%

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 19% and 18% 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
- Central library and Burnhamthorpe had major renovation done b 2023

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



2023 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	598,175	\$95,469	54,298	\$21,187	1,168,304	1,185	\$2,975	\$119,631	122,252
Port Credit Library		145,550	\$23,230	-	-	145,550	206	\$517	\$23,747	4,367
Churchill Meadows Library	1,232	-	-	22,534	\$8,793	236,607	-	-	\$8,793	43,288
Lakeview Library	705	115,450	\$18,426	18,005	\$7,026	304,503	175	\$439	\$25,891	38,051
Lorne Park Library	1,108	162,955	\$26,008	16,485	\$6,432	336,048	298	\$748	\$33,188	36,556
Mississauga Central Library	33,877	3,419,857	\$545,809	202,536	\$79,030	5,546,485	4,507	\$11,317	\$636,155	491,667
Sheridan Library	525	51,278	\$8,184	-	-	51,278	-	-	\$8,184	1,538
Streetsville Library	867	135,137	\$21,568	8,808	\$3,437	227,621	280	\$703	\$25,708	20,974
Woodlands Library	686	110,902	\$17,700	15,202	\$5,932	270,523	281	\$706	\$24,337	32,530
Totals	44,024	4,739,304	\$756,393	337,868	\$131,836	8,286,918	6,932	\$17,406	\$905,635	791,224
Usage / Costs per m²:		107.7	17.2	7.7	3.0	188.2	0.2	0.4	20.6	18.0

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:

- **Ongoing Commissioning:** Conduct regular commissioning to the city's high consuming building using the data analytics/fault detection tools that collects, manages, and analyzes data from various building systems, to identify operation irregularities and ensure optimum operation.
- **HVAC Systems Energy Upgrades for Lifecycle Replacements:** Includes energy upgrades for HVAC equipment that show energy & GHG emission savings.
- **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 **Orange** 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

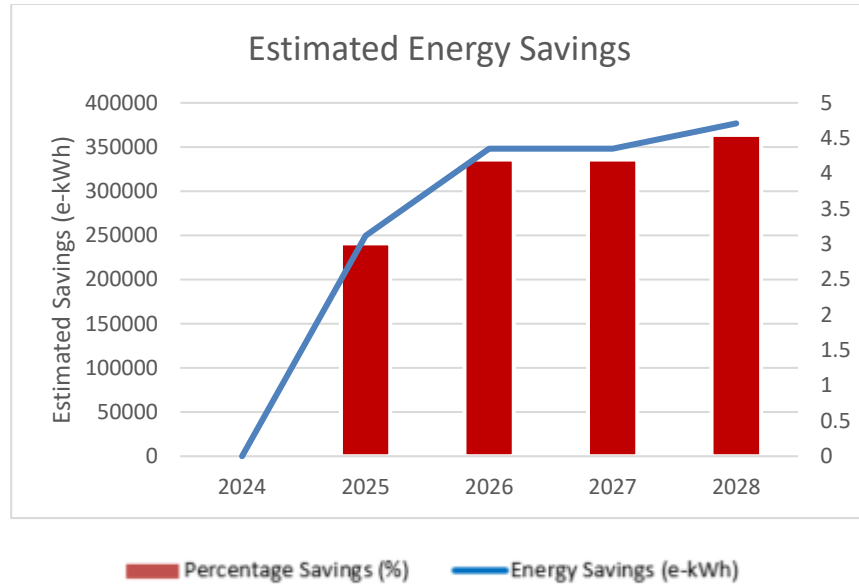
Energy Measure Implementation Plan for Libraries

Energy Measure	2024				2025				2026				2027				2028			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Building Ongoing Commissioning																				
Energy Upgrade For HVAC Systems																				
Control Upgrade																				
Metering & Submetering Equipment																				
Lighting Upgrades																				
Planned Implementation  Scheduled Implementation  Cancelled Implementation 																Q1 = Jan - Mar Q2 = Apr - Jun Q3 = Jul - Sep Q4 = Oct - Dec				
Community Cent  Status = Completed  Status = Underway																				

11.5 ESTIMATED SAVINGS

At the end of the plan, **Libraries** are expected to save 4.55% over the base year of 2023.

Figure 11-6: Energy Measure Annual Savings for Libraries



11.6 PROGRESS TO TARGETS

The City is targeting a 4.55% reduction in energy use in **Libraries** by 2028 over the base year, 2023. 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 2024 will be adjusted to match the weather and occupancy of 2023. The figures below show the updated progress for each year against the set target.

12.0 COMMUNITY HALLS, MARINAS, AND ANIMAL SERVICES

12.1 SCOPE AND BOUNDARY

For the purposes of this report, the City of Mississauga has 13 facilities/locations that fall under this category. They include:

- 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)
- Streetsville Kinsmen Hall

The above listed locations have a total floor area of approximately 6,920 square meters. This would account for 1.5% of the total building area for City of Mississauga facilities included in this Plan.

12.2 BASELINE

12.2.1 ENERGY USE

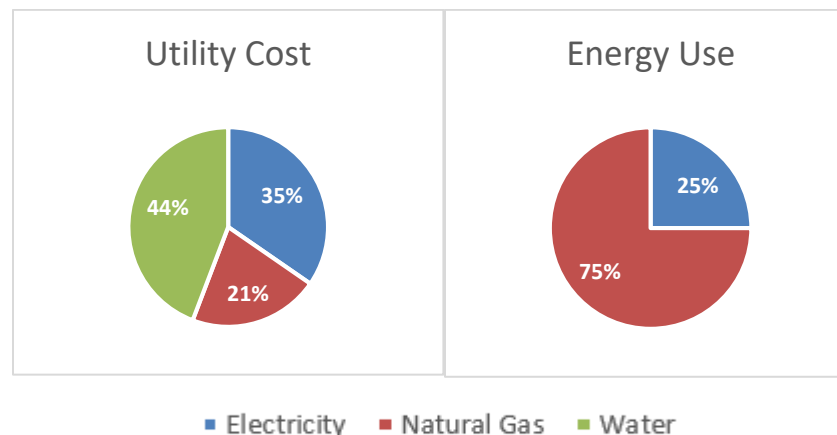
The energy use (combined electricity and natural gas) for **Community Halls, Marinas, and Animal Services** was 2,406,000 equivalent kilowatt hours in 2023. Following are the key takeaways for the energy usage in 2023:

- 25% of the total energy usage was due to electricity use.

- 75% of the total energy usage was due to natural gas use.
- A total of \$275,000 in utility costs was incurred, out of which 35% is attributed to electricity, 21% to natural gas, and 44% to water

Community Halls, Marinas, and Animal Services accounted for 1.4% of the City's total utility budget for 2023.

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

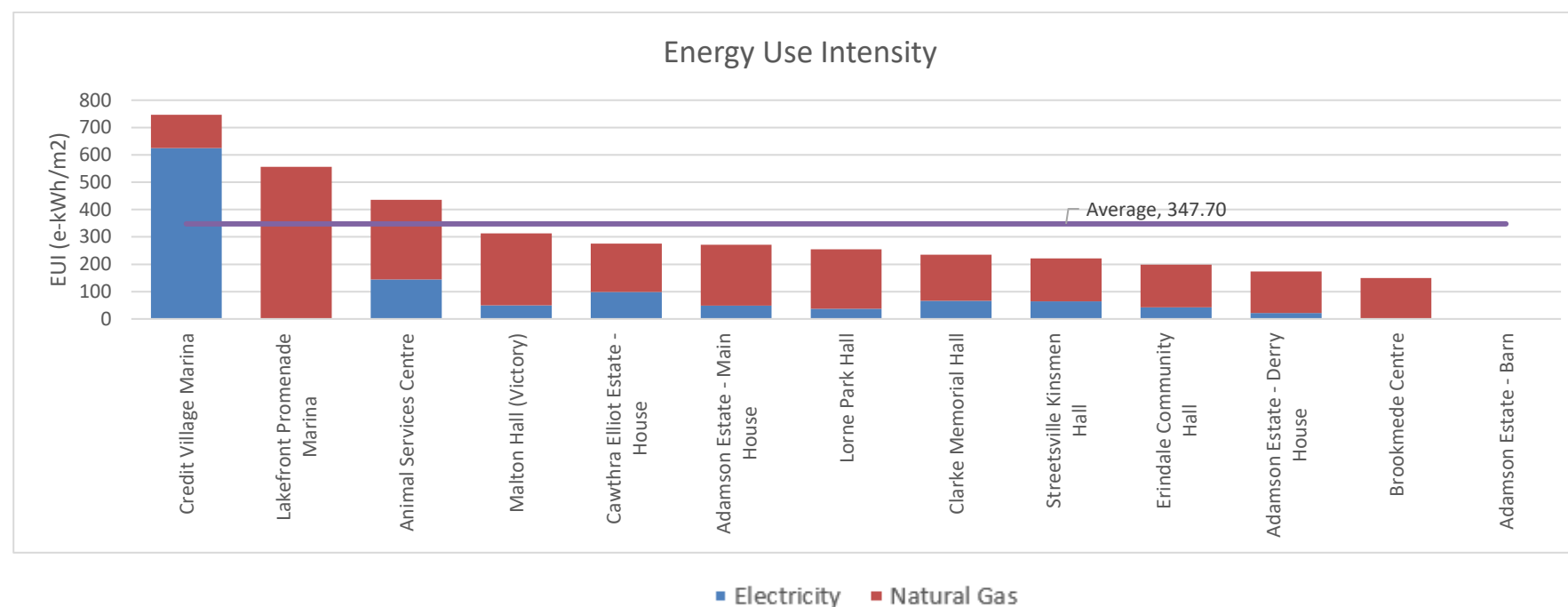
rink, will have a higher EUI than a facility where those systems are located within the facility, as they would add to the facility's area footprint.

For **Community Halls, Marinas, and Animal Services** the average EUI in 2023 was 347.7 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

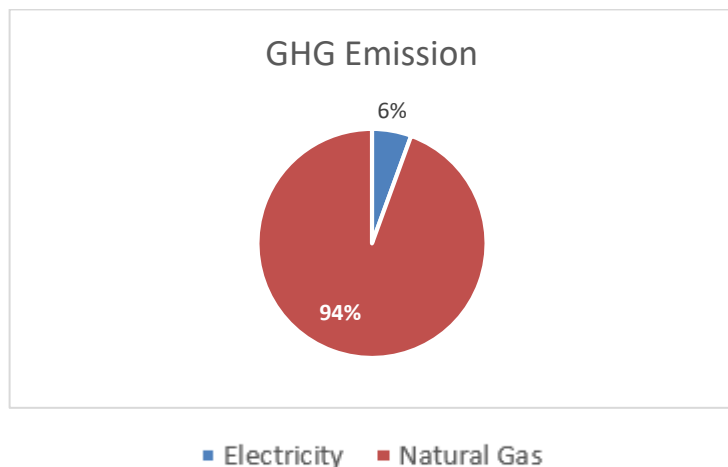


12.2.3 GREENHOUSE GAS (GHG) EMISSIONS

For 2023, **Community Halls, Marinas, and Animal Services** emitted 305,800 kg (or 305.8 tonnes) of CO₂ in 2023. 6% of these emissions were due to the generation of electricity, while the use of natural gas accounted for the remaining 94%.

Community Halls, Marinas, and Animal Services accounted for 1.5% 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



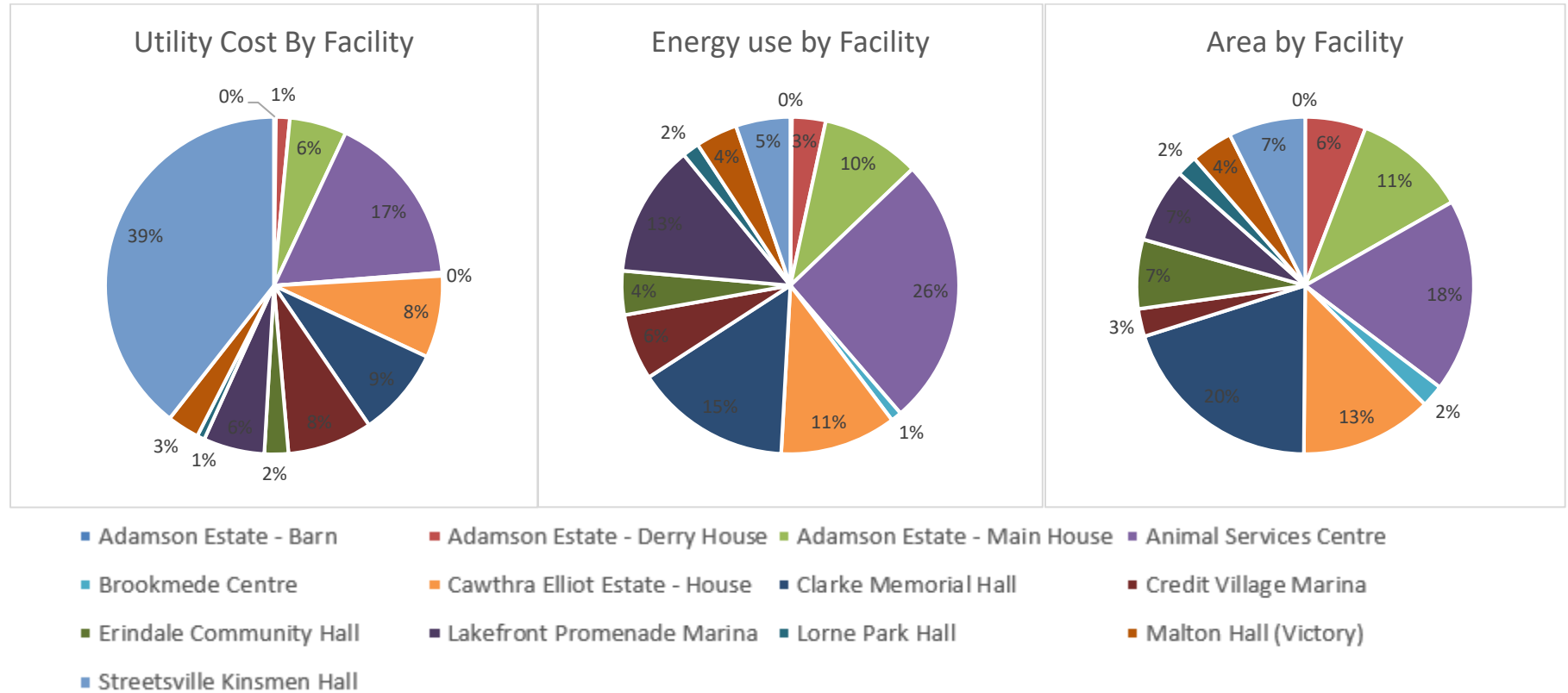
- The two estates: Adamson Estate and Cawthra Elliot Estate, represent 30% of the floor area in the group and contribute 22% and 14% towards the energy consumption and utility consumption in the group
- Animal Services Centre represents the second largest facility by area in this group and contributes 23% and 17% towards the energy consumption and utility consumption in the group

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 2023. Following are the key takeaways:

- Clarke Memorial Hall, Erindale Community Hall, Streetsville Kinsmen Hall, Malton Hall, Lorne Park Hall, represent 40% of the floor area in the group and contribute 27% and 54% towards the energy consumption and utility consumption in the group

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



12.4 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 Halls, Marinas and Animal 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:

- **HVAC Systems Energy Upgrades for Lifecycle Replacements:**
Includes energy upgrades for HVAC equipment that show energy & GHG emission savings.





- **DHW Systems Energy Upgrades for Lifecycle Replacements:**
Includes energy upgrades for DHW equipment that show energy & GHG emission savings.

For the chart below, the **Orange** 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

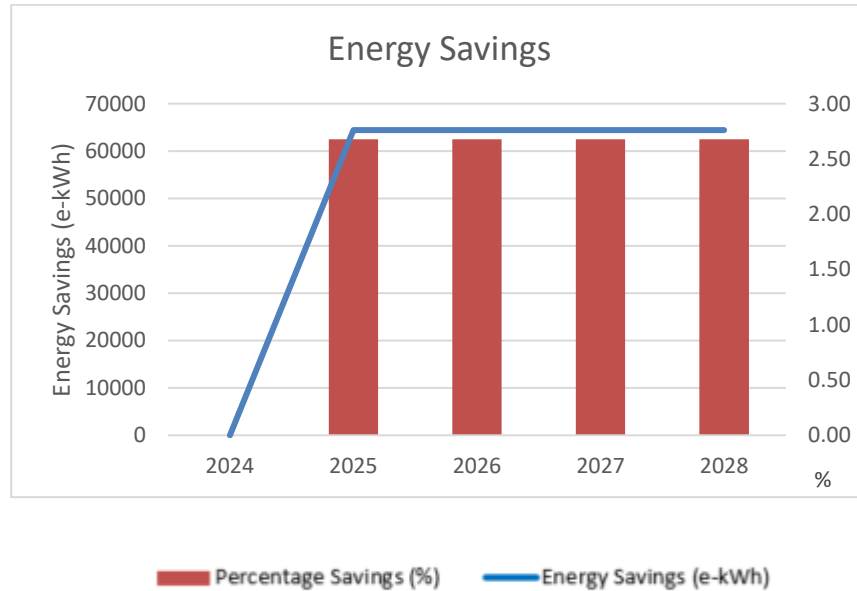
Energy Measure Implementation Plan for Community Halls, Marinas and Animal Services

Energy Measure	2024				2025				2026				2027				2028			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Energy Upgrade For HVAC Systems																				
Energy Upgrade For DHW Systems																				
<div>  Scheduled Implementation  Cancelled Implementation </div>																Q1 = Jan - Mar Q2 = Apr - Jun				
<div>  Status = Completed  Status = Underway </div>																Q3 = Jul - Sep Q4 = Oct - Dec				

12.5 ESTIMATED SAVINGS

At the end of the plan, **Community Halls, Marinas and Animal Services** are expected to save 2.7% over the base year of 2023.

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



12.6 PROGRESS TO TARGETS

The City is targeting a 2.7% reduction in energy use in **Community Halls, Marinas, and Animal Services** by 2028 over the base year, 2023. 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 2024 will be adjusted to match the weather and occupancy of 2023. The figures below show the updated progress for each year against the set target.

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

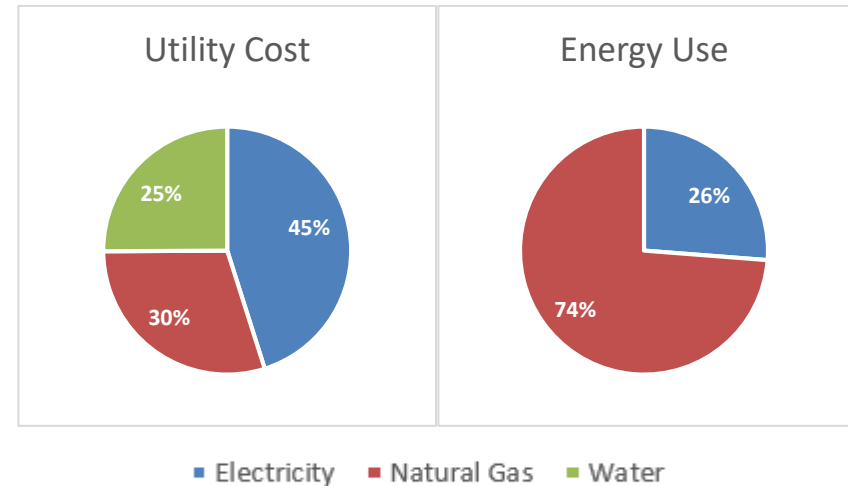
13.2.1 ENERGY USE

The energy use (combined electricity and natural gas) for **Outdoor Pool Buildings** was 2,219,000 equivalent kilowatt hours in 2023. Following are the key takeaways for the energy usage in 2023:

- 26% of the total energy usage was due to electricity use
- 74% of the total energy usage was due to natural gas use
- A total of \$204,000 in utility costs was incurred, out of which 45% is attributed to electricity, 30% to natural gas, and 25% to water

Outdoor Pool Buildings accounted for 1.0% of the City's total utility budget for 2023.

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



13.2.2 ENERGY USE INTENSITY

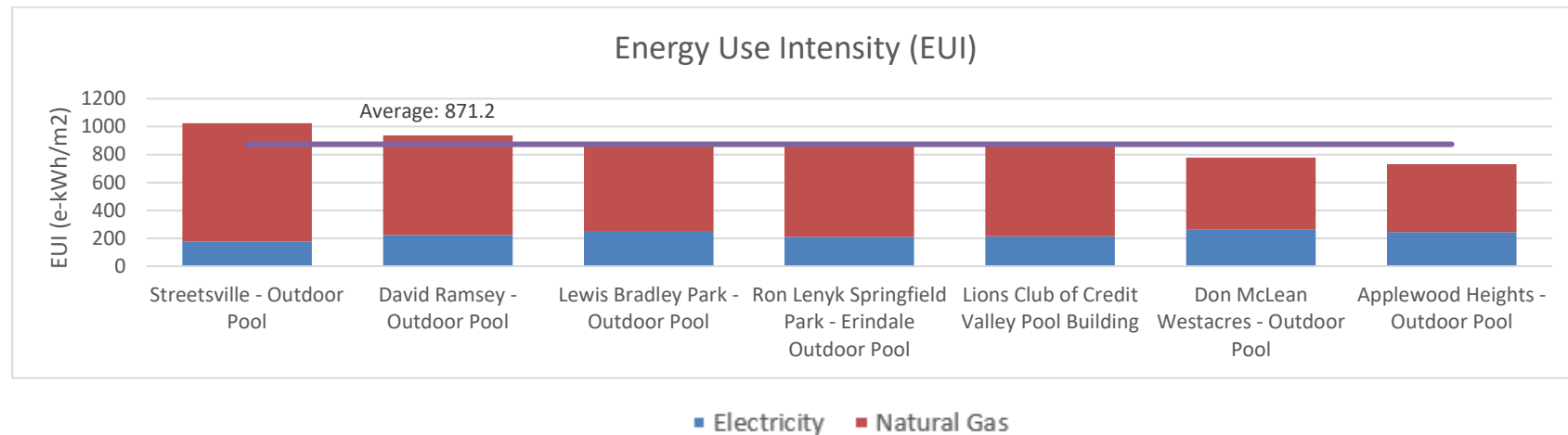
Energy Use Intensity (EUI) is a measurement that expresses a building's energy use as a function of its size or other characteristic. It is used to give a better picture of the energy efficiency of a facility. The lower the EUI, the more efficient the facility is.

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 2023 was 871.2 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

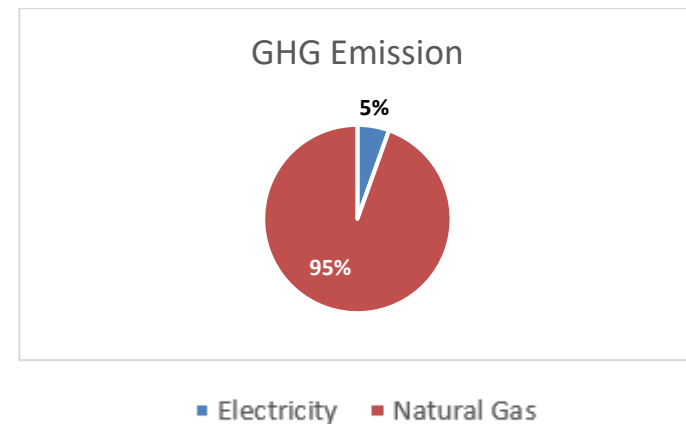


13.2.3 GREENHOUSE GAS (GHG) EMISSIONS

For 2023, **Outdoor Pool Buildings** emitted 317,600 kg (or 317 tonnes) of CO₂ in 2023. 5% of these emissions were due to the generation of electricity, while the use of natural gas accounted for the remaining 95%.

Outdoor Pool Buildings accounted for 1.6% of the City's total GHG emissions for facilities included in the plan.

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

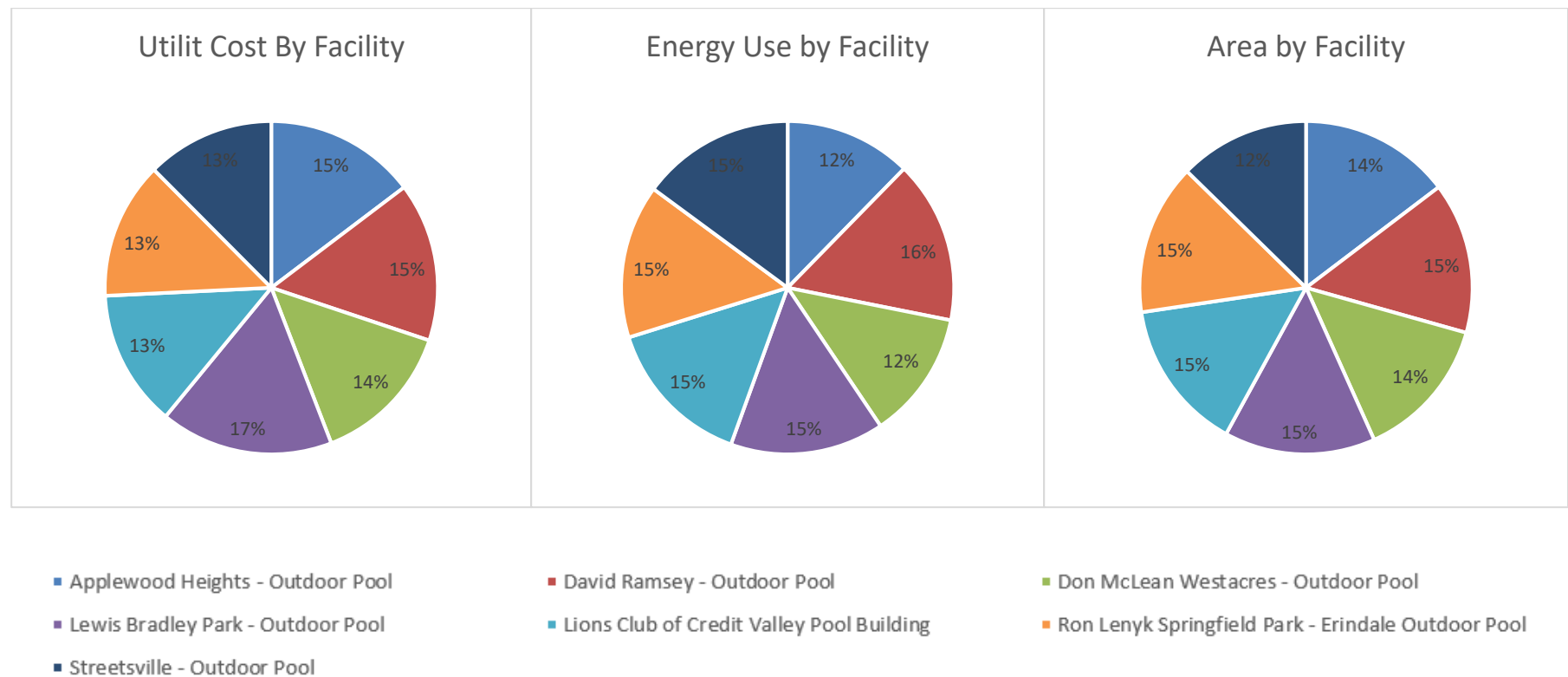


13.3 ENERGY AND GHG BREAKDOWN FOR OUTDOOR POOL BUILDINGS

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 2023. 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



2023 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	91,682	14,632	17,337	\$6,765	273,721	3,457	\$8,680	\$30,078	36,055
David Ramsey - Outdoor Pool	374	83,562	13,336	25,449	\$9,930	350,777	3,306	\$8,301	\$31,568	51,394
Don McLean Westacres - Outdoor Pool	355	92,466	14,758	17,496	\$6,827	276,174	2,821	\$7,083	\$28,668	36,384
Lewis Bradley Park - Outdoor Pool	374	94,462	15,076	22,627	\$8,829	332,046	4,180	\$10,496	\$34,401	46,300
Lions Club of Credit Valley Pool Building	374	80,417	12,835	23,309	\$9,095	325,162	2,090	\$5,248	\$27,178	47,189
Ron Lenyk Springfield Park - Erindale Outdoor Pool	374	78,718	12,563	24,034	\$9,378	331,075	2,110	\$5,298	\$27,239	48,531
Streetsville - Outdoor Pool	323	56,956	9,090	26,079	\$10,176	330,786	2,480	\$6,227	\$25,493	51,806
Totals	2,548	578,263	92,291	156,331	\$61,000	2,219,739	20,444	\$51,333	\$204,624	317,660
Usage / Costs per m²:		226.9	36.2	61.4	23.9	871.2	8.0	20.1	80.3	124.7

13.4 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.

13.5 ESTIMATED SAVINGS

Since no action plan has been identified for outdoor pool buildings. There will be no expected savings.

14.0 PARKS AND SPORTS FIELDS

14.1 SCOPE AND BOUNDARY

For the purposes of this report, the City of Mississauga has 218 facilities/locations that fall under this category. The group has a total floor area of approximately 13,387 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

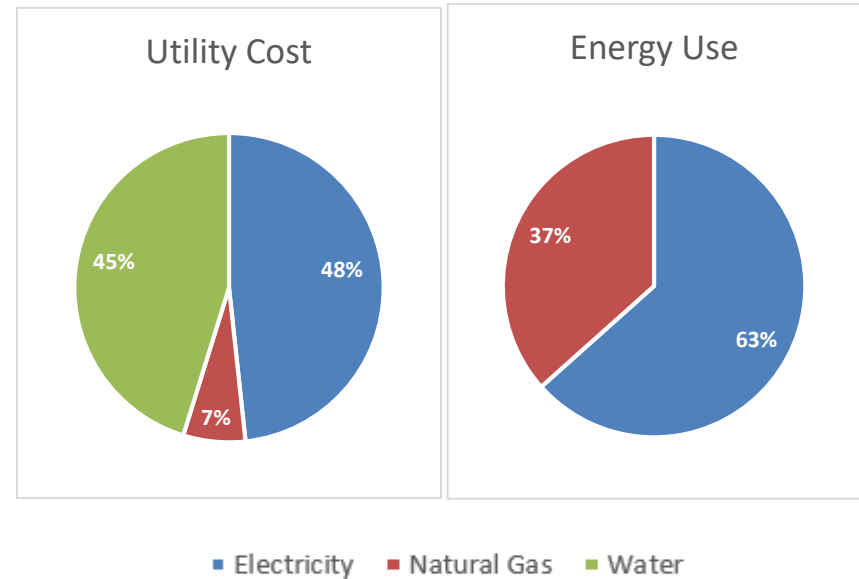
14.2.1 ENERGY USE

The energy use (combined electricity and natural gas) for **Parks and Sports Fields** was 9,078,932 equivalent kilowatt hours in 2023. Following are the key takeaways for the energy usage in 2023:

- 63% of the total energy usage was due to electricity use
- 37% of the total energy usage was due to natural gas use
- A total of \$1,902,000 in utility costs was incurred, out of which 48% is attributed to electricity, 7% to natural gas and 45% to water

Parks and Sports Fields accounted for 9.6% of the City's total utility budget for 2023.

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

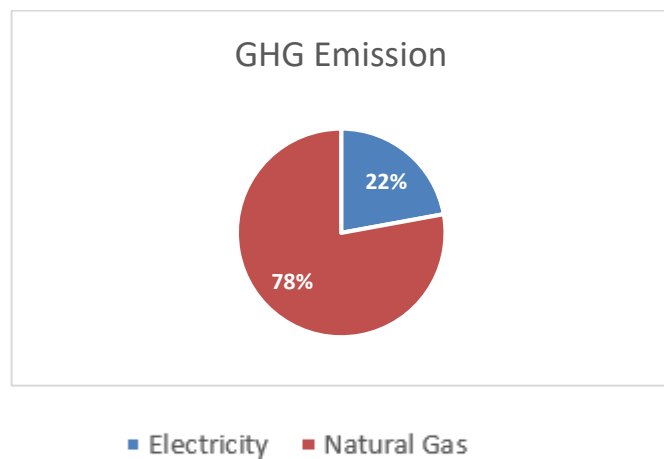
located within the facility, as they would add to the facility's area footprint. For **Parks and Sports Fields** the average EUI in 2023 was 678 e-kWh/m².

14.2.3 GREEN HOUSE GAS (GHG) EMISSIONS

For 2023, **Parks and Sports Fields** emitted 780,624 kg (or 781 tonnes) of CO₂ in 2023. 22% of these emissions were due to the generation of electricity, while the use of natural gas accounted for the remaining 78%.

Parks and Sports Fields accounted for 3.9% of the City's total GHG emissions for facilities included in the plan. 218
Figure 14-2: GHG Emissions Breakdown for Parks and Sports Fields

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



2023 Annual Report for Parks and Sports Fields

Facility	# Facilities	Area m ²	Electricity		Natural Gas		Total Energy e-kWh	Water		Total Costs \$	GHG Emissions kg
			kWh	\$	m ³	\$		m ³	\$		
Parks and Sports Fields	218	13,387	5,755,965	\$918,652	316,473	\$123,488	9,078,932	342,577	\$860,177	\$1,902,316	780,624
Usage / Costs per m ² :			429.97	68.62	23.64	9.22	678.19	25.59	64.25	142.10	58.31

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

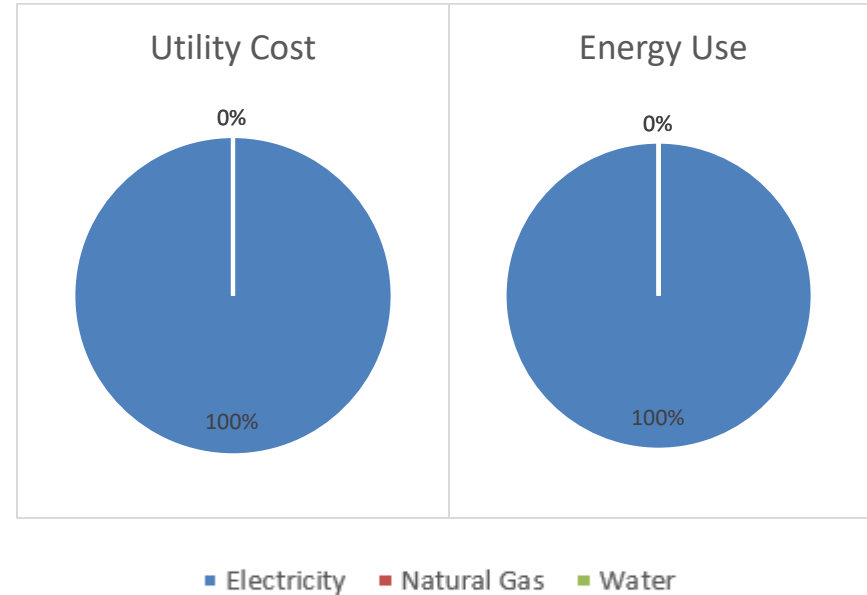
15.2.1 ENERGY USE

The energy use (combined electricity and natural gas) for **Traffic and Street Lighting** was 15,913,000 equivalent kilowatt hours in 2023. Following are the key takeaways for the energy usage in 2023:

- 100% of the total energy usage was due to electricity use
- A total of \$2,540,000 in utility costs was incurred, out of which 100% is attributed to electricity

Traffic and Street Lighting accounted for 12.8% of the City's total utility budget for 2023.

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

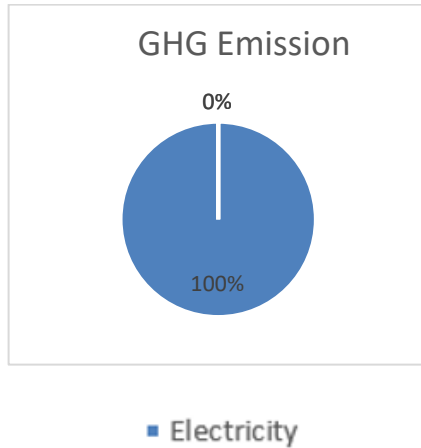


15.2.2 GREENHOUSE GAS (GHG) EMISSIONS

For 2023, **Traffic and Street Lighting** emitted 477,000 kg (or 477 tonnes) of CO₂ in 2023. 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 2.4% of the City's total GHG emissions for facilities included in the plan.

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

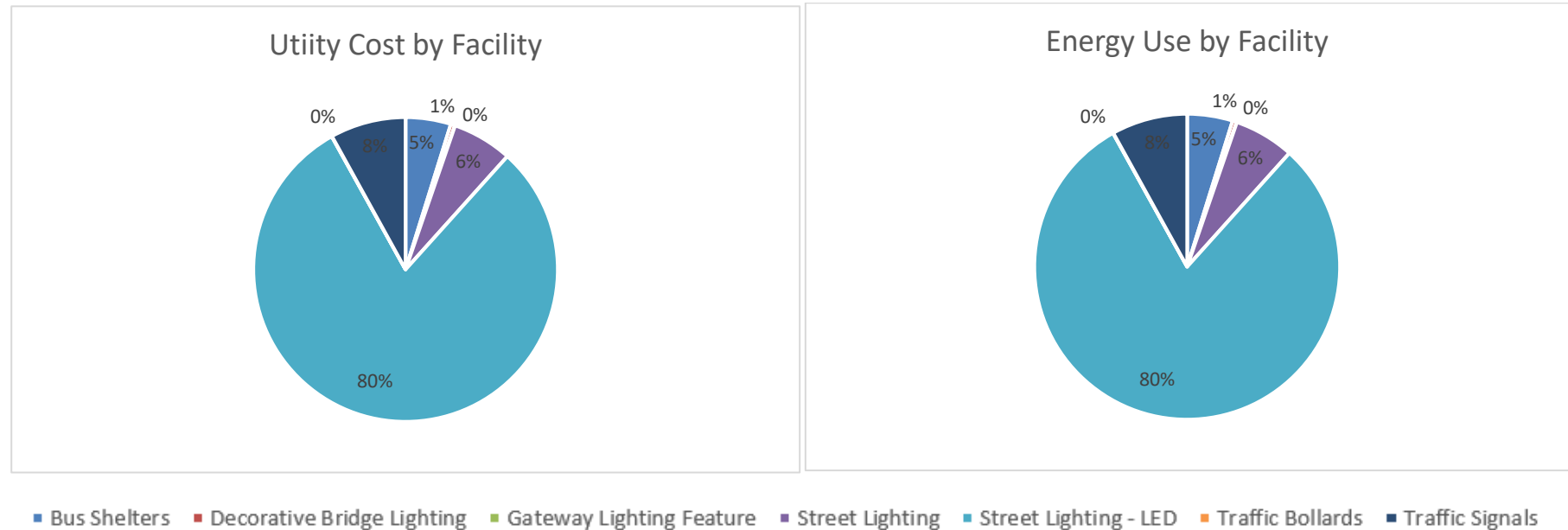


15.3 ENERGY AND GHG BREAKDOWN FOR TRAFFIC AND STREET LIGHTING

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 2023. 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



2023 Annual Report for Traffic and Street Lighting

Facility	Area	Electricity		Natural Gas		Total Energy	Water		Total Costs	GHG Emissions
	m ²	kWh	\$	m ³	\$	e-kWh	m ³	\$	\$	kg
Bus Shelters	0	765,655	\$122,199	0	\$0	765,655	0	\$0	\$122,199	22,970
Decorative Bridge Lighting	0	71,148	\$11,355	0	\$0	71,148	0	\$0	\$11,355	2,134
Gateway Lighting Feature	0	3,674	\$586	0	\$0	3,674	0	\$0	\$586	110
Street Lighting	0	1,015,635	\$162,095	0	\$0	1,015,635	0	\$0	\$162,095	30,469
Street Lighting - LED	0	12,773,785	\$2,038,696	0	\$0	12,773,785	0	\$0	\$2,038,696	383,214
Traffic Bollards	0	4,509	\$720	0	\$0	4,509	0	\$0	\$720	135
Traffic Signals	0	1,278,867	\$204,107	0	\$0	1,278,867	0	\$0	\$204,107	38,366
Totals	0	15,913,273	\$2,539,758	0	\$0	15,913,273	0	\$0	\$2,539,758	477,398
Usage / Costs per m ² :		-	-	-	-	-	-	-	-	-

16.0 TRANSIT AND ASSOCIATED FACILITIES

16.1 SCOPE AND BOUNDARY

For the purposes of this report, the City of Mississauga has 15 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
- 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)

The above listed locations have a total floor area of approximately 54,717 square meters. This would account for 11.7% of the total building area for City of Mississauga facilities included in this Plan.

16.2 BASELINE

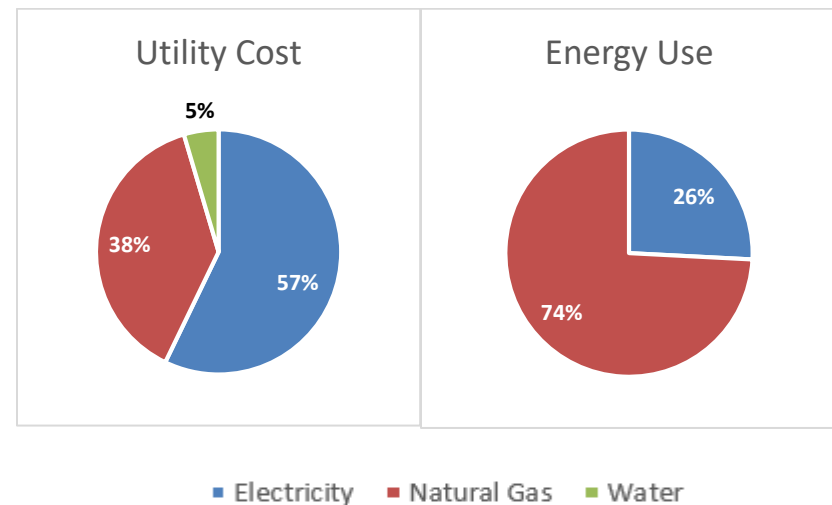
16.2.1 ENERGY USE

The energy use (combined electricity and natural gas) for **Transit and Associated Facilities** was 30,497,695 equivalent kilowatt hours in 2023. Following are the key takeaways for the energy usage in 2023:

- 26% of the total energy usage was due to electricity use
- 74% of the total energy usage was due to natural gas use
- A total of \$2,198,000 in utility costs was incurred, out of which 57% is attributed to electricity, 38% to natural gas, and 5% to water

Transit and Associated Facilities accounted for 11.0% of the City's total utility budget for 2023.

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.

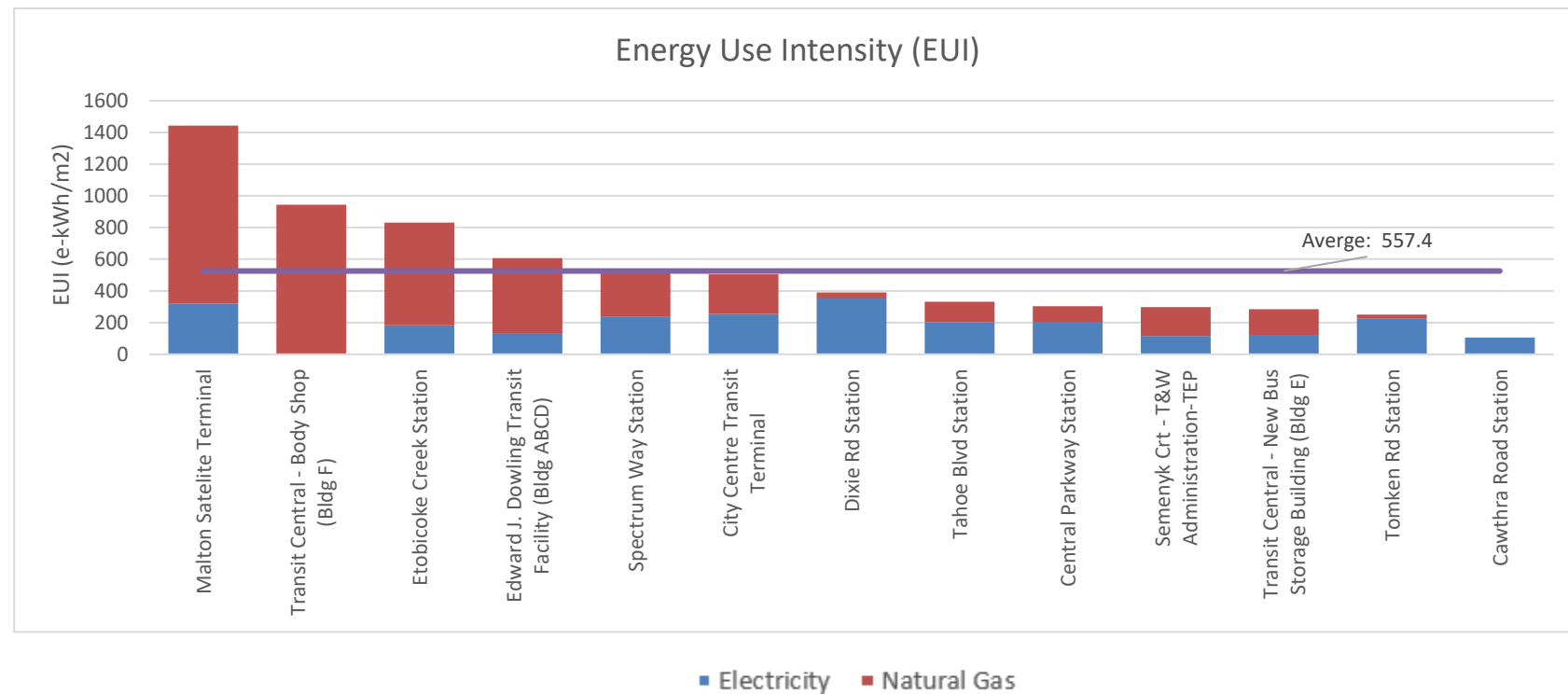
When reviewing EUI, the facility operation type and hours should be taken into account. For example, a facility that operates 24 hours a day will most likely have a higher EUI than a similar one that operates 8 hours a day. Similarly, a facility that has high energy using systems that do not contribute to the building area, such as an outdoor pool or outdoor ice rink, will have a higher EUI than a facility where those 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 2023 was 557.4 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.

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

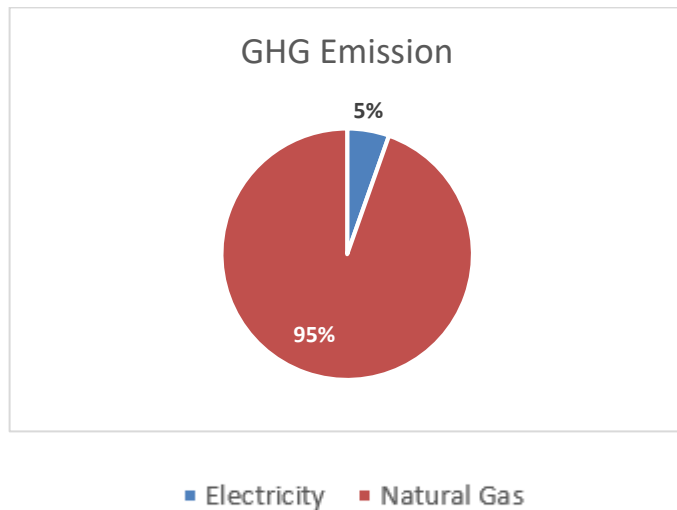


16.2.3 GREENHOUSE GAS (GHG) EMISSIONS

For 2023, **Transit and Associated Facilities** emitted 4,375,421 kg (or 4,375 tonnes) of CO₂ in 2023. 5.0% of these emissions were due to the generation of electricity, while the use of natural gas accounted for the remaining 95.0%.

Transit and Associated Facilities accounted for 21.7% of the City's total GHG emissions for facilities included in the plan.

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

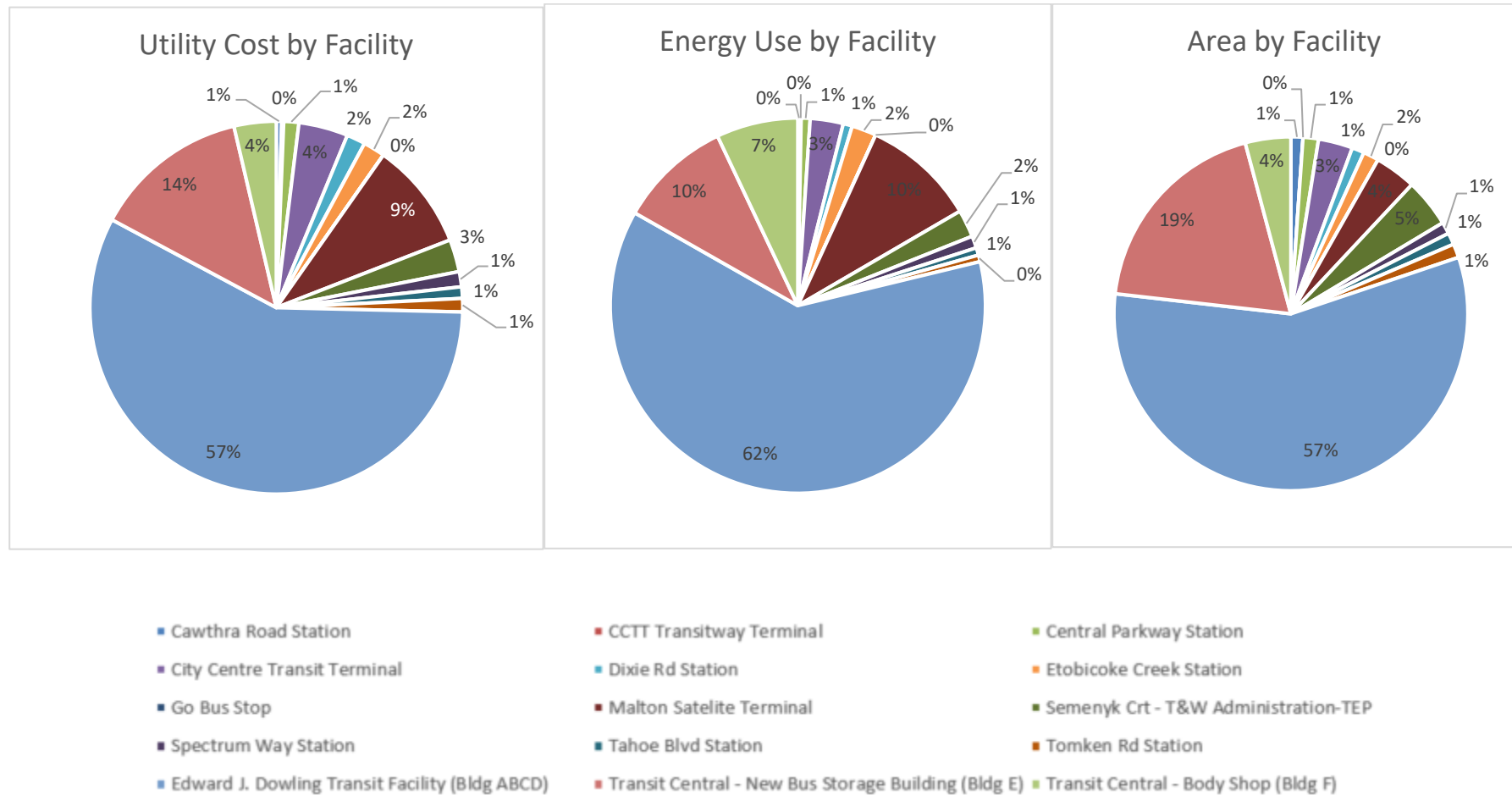


16.3 ENERGY AND GHG BREAKDOWN FOR TRANSIT AND ASSOCIATED FACILITIES

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 2023. 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 (79%) and utility consumption (75%) in this group
- The following stations were removed from the City of Mississauga portfolio: Orbitor Drive Station and Transit Drivers Lounge & WC
- Natural gas-fired space heating loads dominate the energy usage in this group, major renovation project was completed in 2023 to reduce the gas consumption in Transit facilities
- For this reason, priority was given to reduce the electrical consumption in the next 5 years.

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



2023 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	63,417	\$10,121	0	\$0	63,417	0	\$0	\$10,121	1,903
CCTT Transitway Terminal	0	23,845	\$3,806	0	\$0	23,845	0	\$0	\$3,806	715
Central Parkway Station	773	153,801	\$24,547	7685	\$2,999	234,494	514	\$1,291	\$28,836	19,377
City Centre Transit Terminal	1,718	437,032	\$69,750	41,054	\$16,019	868,099	3,296	\$8,276	\$94,046	91,976
Dixie Rd Station	614	216,678	\$34,582	2,213	\$864	239,915	84	\$211	\$35,656	10,752
Etobicoke Creek Station	781	142,202	\$22,695	48,192	\$18,805	648,218	11	\$28	\$41,528	96,843
Go Bus Stop	0	559	\$89	0	\$0	559	0	\$0	\$89	17
Malton Satellite Terminal	2070	661828	\$105,628	221,288	\$86,347	2,985,352	5358	\$13,453	\$205,428	444,949
Semenyk Crt - T&W Administration-TEP	2,422	280,686	\$44,797	42,062	\$16,413	722,337	214	\$537	\$61,747	89,222
Spectrum Way Station	591	138,838	\$22,159	17,042	\$6,650	317,779	27	\$68	\$28,876	36,903
Tahoe Blvd Station	591	119,023	\$18,996	7,329	\$2,860	195,978	9	\$23	\$21,878	17,650
Tomken Rd Station	693	155,003	\$24,738	1,802	\$703	173,924	73	\$183	\$25,625	8,112
Edward J. Dowling Transit Facility (Bldg ABCD)	31,178	4,199,712	\$670,274	1,400,985	\$546,664	18,910,055	18,190	\$45,673	\$1,262,612	2,817,284
Transit Central - New Bus Storage Building (Bldg E)	10,412	1,280,248	\$204,328	160,591	\$62,663	2,966,454	12,046	\$30,246	\$297,236	346,903
Transit Central - Body Shop (Bldg F)	2,274	0	\$0	204,502	\$79,797	2,147,271	228	\$572	\$80,369	392,848
Totals	54,717	7,872,872	\$1,256,510	2,154,745	\$840,781	30,497,695	40,050	\$100,562	2,197,853	4,375,451
Usage / Costs per m²:		143.9	23.0	39.4	15.4	557.4	0.7	1.8	40.2	80.0

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:






- **Ongoing Commissioning:** Conduct regular commissioning to the city's high consuming building using the data analytics/fault detection tools that collects, manages, and analyzes data from various building systems, to identify operation irregularities and ensure optimum operation.
- **Controls Upgrades:** Includes controller upgrades, optimized sequence of operations, and additional points to better manage and control building systems

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

For the chart below, the **Orange** 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

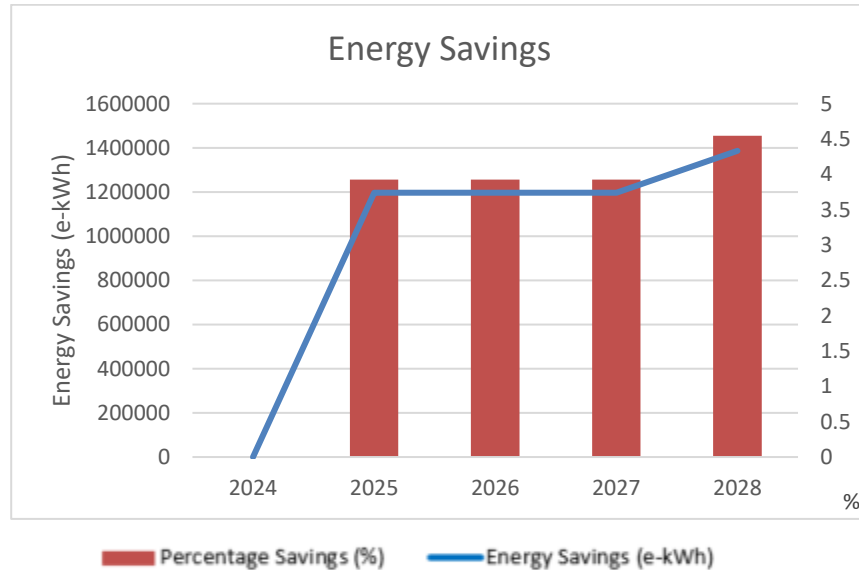
Figure 16-5: Energy Measure Implementation Plan for Transit and Associated Facilities

Energy Measure Implementation Plan for Transit and Associated Facilities																					
Energy Measure	2024				2025				2026				2027				2028				
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	
Building Ongoing Commissioning																					
Control upgrade																					
Renewable Energy Generation																					
Planned Implementation  Scheduled Implementation  Cancelled Implementation 																Q1 = Jan - Mar Q2 = Apr - Jun Q3 = Jul - Sep Q4 = Oct - Dec					
Community Cent  Status = Completed  Status = Underway																					

16.5 ESTIMATED SAVINGS

At the end of the plan, **Transit and Associated Facilities** are expected to save 4.55% over the base year of 2023.

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



consumption data. Therefore, actual consumption data for each year starting 2024 will be adjusted to match the weather and occupancy of 2023. The figures below show the updated progress for each year against the set target.

16.6 PROGRESS TO TARGETS

The City is targeting a 4.55% reduction in energy use in **Transit and Associated Facilities** by 2028 over the base year, 2023. 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

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 15,750 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

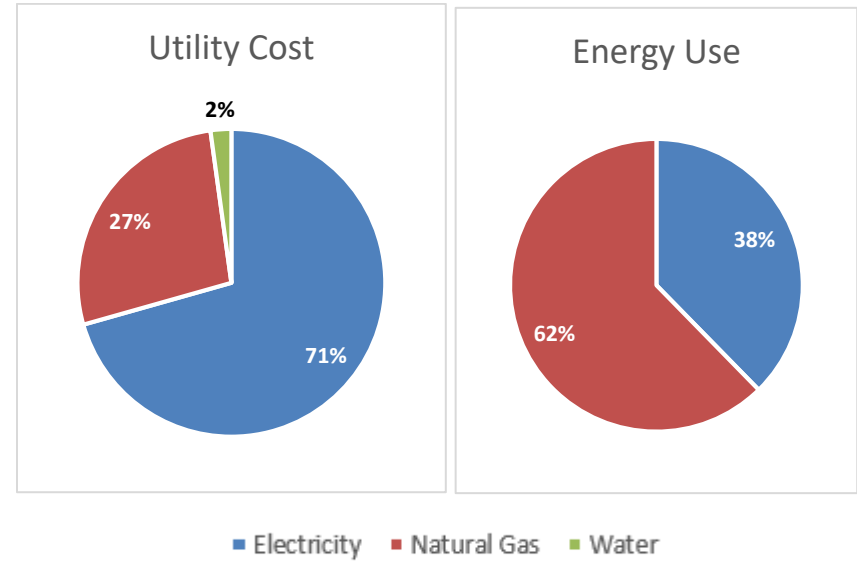
17.2.1 ENERGY USE

The energy use (combined electricity and natural gas) for **Service Yards, Central Stores, and Maintenance Facilities** was 5,419,000 equivalent kilowatt hours in 2023. Following are the key takeaways for the energy usage in 2023:

- 38% of the total energy usage was due to electricity use
- 62% of the total energy usage was due to natural gas use
- A total of \$461,000 in utility costs was incurred, out of which 71% is attributed to electricity, 27% to natural gas, and 2% to water

Service Yards, Central Stores, and Maintenance Facilities accounted for 2.3% of the City's total utility budget for 2023.

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

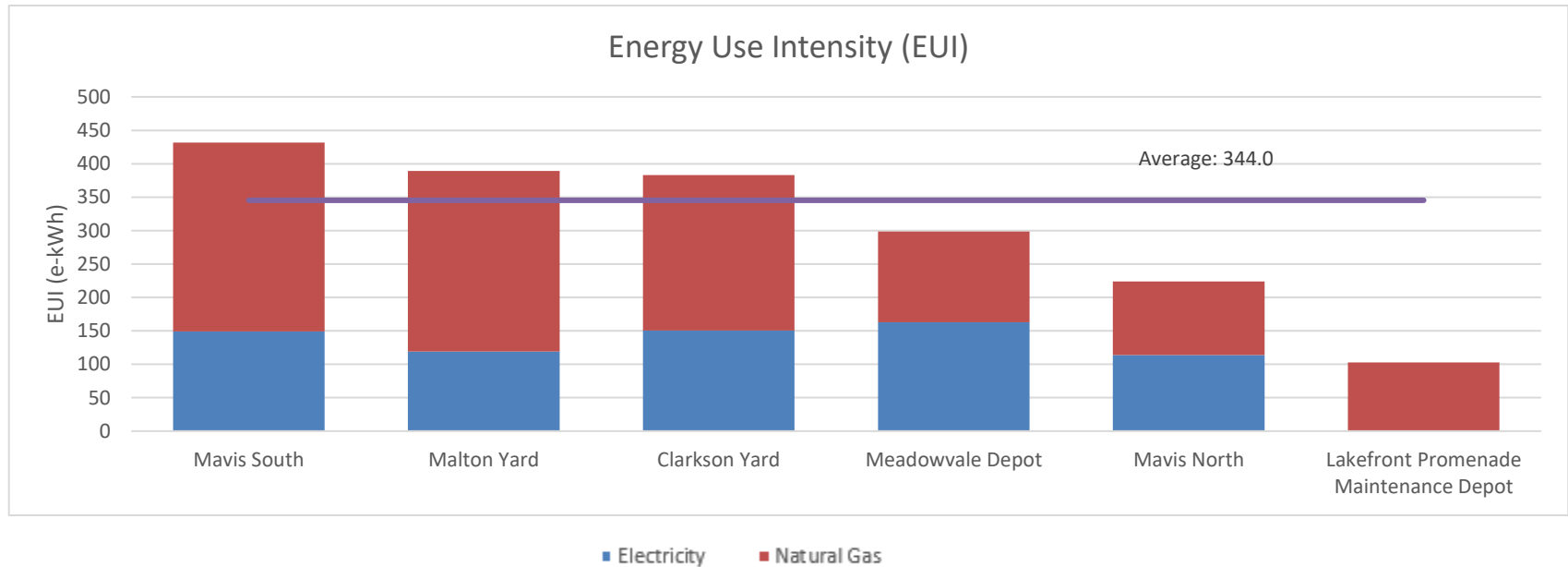
located within the facility, as they would add to the facility's area footprint.

For **Service Yards, Central Stores, and Maintenance Facilities** the average EUI in 2023 was 344 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

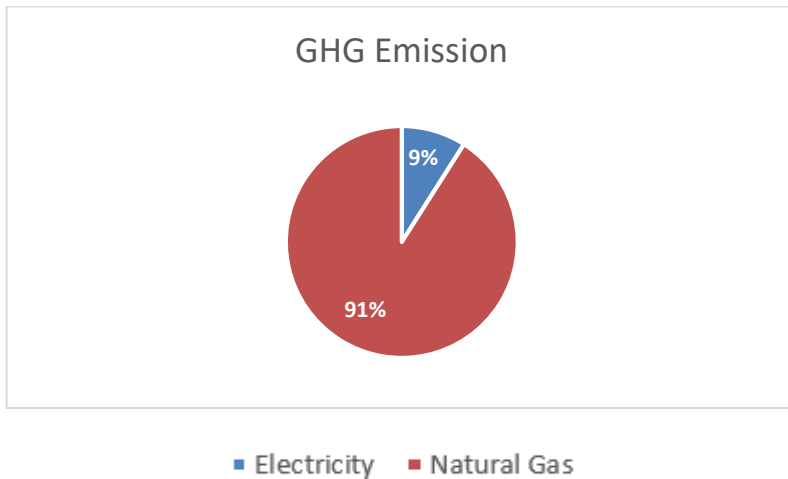


17.2.3 GREENHOUSE GAS (GHG) EMISSIONS

For 2023, **Service Yards, Central Stores, and Maintenance Facilities** emitted 679,400 kg (or 679 tonnes) of CO₂ in 2023. 9.0% of these emissions were due to the generation of electricity, while the use of natural gas accounted for the remaining 91.0%.

Service Yards, Central Stores, and Maintenance Facilities accounted for 3.4% 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

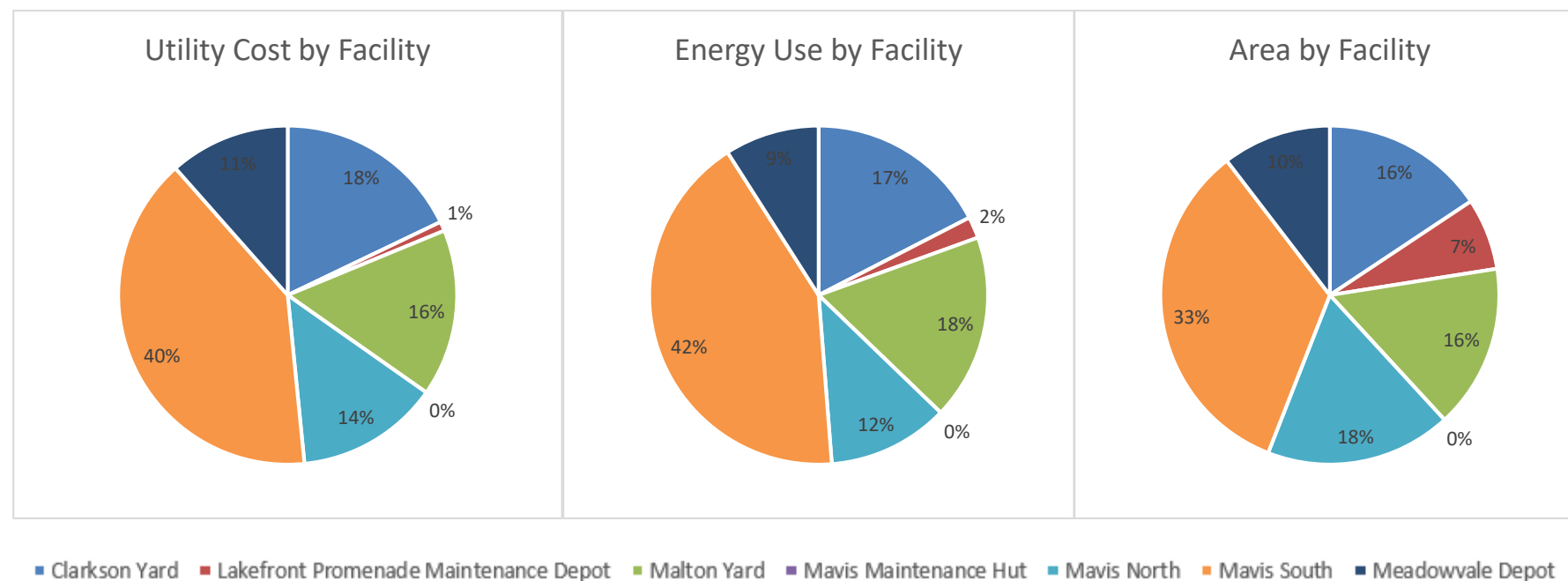


17.3 ENERGY AND GHG BREAKDOWN FOR SERVICE YARDS, CENTRAL STORES, AND MAINTENANCE FACILITIES

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 2013. Following are the key takeaways:

- The Mavis Yards are the largest facility in this group by area and contribute 54% and 54% towards energy consumption and utility consumption in this group
- The Clarkson Yard is the second largest facility in this group by area and contribute 17% and 18% towards energy consumption and utility consumption in this group
- The Malton Yard is the third largest facility in this group by area and contribute 18% and 16% 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 11% and 13% towards the energy consumption and utility consumption in the group

Figure 17-4: Utility Costs and Energy Use Breakdown by Facility



2023 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	371,092	59,226	54,664	21,330	945,064	796	1,999	82,555	116,142
Lakefront Promenade Maintenance Depot	1,078	-	-	10,546	4,115	110,733	-	-	4,115	20,259
Malton Yard	2,466	293,457	46,836	63,461	24,762	959,798	819	2,056	73,655	130,712
Mavis Maintenance Hut	0	-	-	-	-	-	-	-	-	-
Mavis North	2,799	318,373	50,812	29,351	11,453	626,559	324	814	63,079	65,934
Mavis South	5,299	791,673	126,351	142,419	55,572	2,287,073	1,154	2,898	184,820	297,337
Meadowvale Depot	1,640	266,933	42,603	21,234	8,286	489,890	918	2,305	53,193	48,799
Totals	15,748	2,041,528	325,828	321,675	125,518	5,419,116	4,011	10,071	461,417	679,184
Usage / Costs per m²:		130	21	20	8	344	0	1	29	43

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 **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:

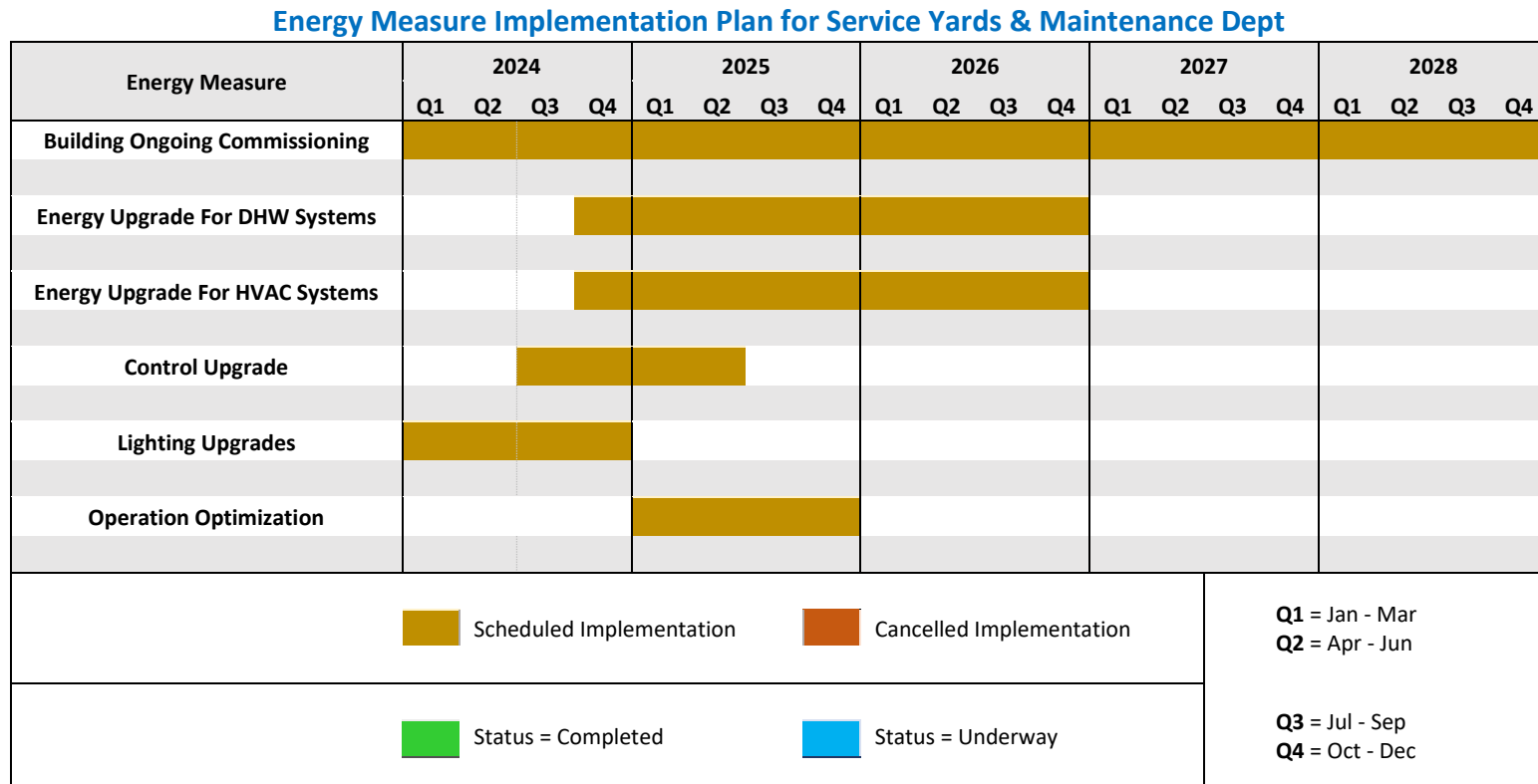
- **Ongoing Commissioning:** Conduct regular commissioning to the city's high consuming building using the data analytics/fault detection tools that collects, manages, and analyzes data from various building systems, to identify operation irregularities and ensure optimum operation.
- **HVAC Systems Energy Upgrades for Lifecycle Replacements:** Includes energy upgrades for HVAC equipment that show energy & GHG emission savings.
- **DHW Systems Energy Upgrades for Lifecycle Replacements:** Includes energy upgrades for DHW equipment that show energy & GHG emission savings.
- **Controls Upgrades:** Includes controller upgrades, optimized sequence of operations, and additional points to better manage and control building systems
- **Lighting Upgrades:** Includes replacement of existing lighting technologies to newer technologies like LEDs, and better controls through localized sensors and BAS scheduling

- **Operation Optimization:** Add additional sensors such as CO₂ sensors and motion sensors to optimize the operation of HVAC units to satisfy the occupant needs.

For the chart below, the **Orange** 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.

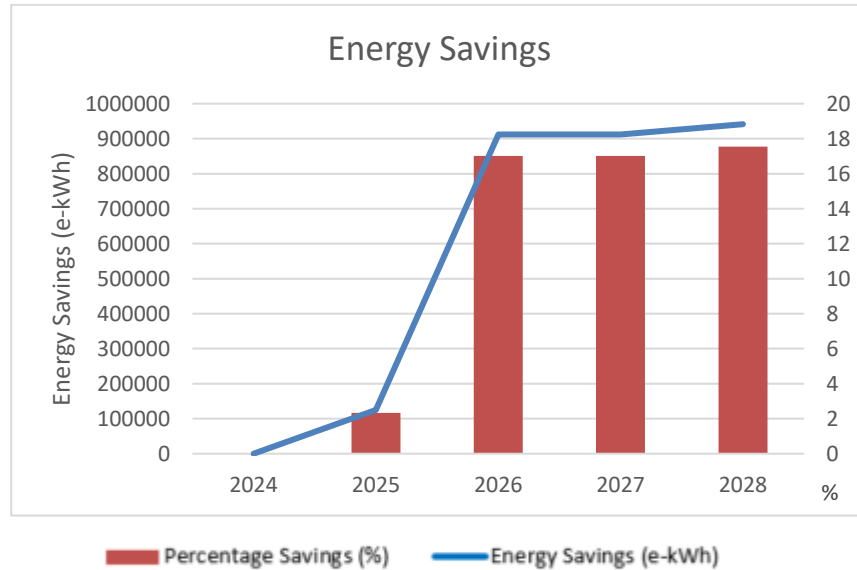
Figure 17-5: Energy Measure Implementation Plan for Service Yards, Central Stores, and Maintenance Facilities



17.5 ESTIMATED SAVINGS

At the end of the plan, **Service Yards, Central Stores, and Maintenance Facilities** are expected to save 17.55% over the base year of 2023

Figure 17-6: Energy Measure Annual Savings for Service Yards, Central Stores, and Maintenance Facilities



17.6 PROGRESS TO TARGETS

The City is targeting a 17.55% reduction in energy use in **Service Yards, Central Stores, and Maintenance Facilities** by 2028 over the base year, 2023. 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 2024 will be adjusted to match the weather and occupancy of 2023. The figures below show the updated progress for each year against the set target.

18.0 PUMP STATIONS AND MISCELLANEOUS

For the purposes of this report, the City of Mississauga has 2 pumps stations and two miscellaneous sites. This group contributes to 1% of the total portfolio area and 0.18% of the total utility cost. The group has a total energy consumption of 247,870 e-kWh and 7,436 kg of CO₂.

Facility	# Facilities	Area m ²	Electricity		Natural Gas		Total Energy e-kWh	Water		Total Costs \$	GHG Emissions kg
			kWh	\$	m ³	\$		m ³	\$		
Pump Stations	2	557	30,127	\$4,519	0	\$0	30,127		\$0	\$4,519	904
Miscellaneous	2	3,988	217,743	\$32,661	0	\$0	217,743	630	\$0	\$34,236	6,532
Totals	4	4,545	247,870	\$37,180	0	\$0	247,870	630	\$1,575	\$38,755	7,436
Usage / Costs per m²:			54.5	\$8.18	0	\$0	54.5	0.14	\$0.35	\$8.53	1.64

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.

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 Maintenance

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

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 10.5equivalenet kilowatt hours of energy (1 m ³ = 10.5 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 watts-hours, or 2 kilowatt-hours (10 x 100 watt x 2 hours = 2,000 watt-hours = 2 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.