2021
ANNUAL ENERGY REPORT

CITY OF MISSISSAUGA - CORPORATE BUILDINGS

Prepared by
Energy Management
Facilities & Property Management

MISSISSAUGA

2021 Highlights

10%

Energy Reduction

($1,921,000)

17%

Water Reduction

($425,000)

9%

GHG Emissions Reduction

(345 cars off the road)

Avoided cost of

$246.100

17 Incentive Applications

($156,000)

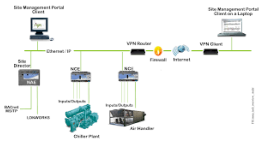
Total Utility Bill of

$17,349,000

Implementation of

Green Building

Standards in 4 Facilities



Implementation of

BAS Standardization

in 5 Buildings

ISO 50001

Certification

Launch Centre of

Excellence

Management of 580

Utility Accounts

Energy Star Certification

Erin Mills Twin Arena

Executive Summary

City of Mississauga has made strides in positioning itself as a leader in the environmental stewardship space with, among other things, the declaration of a Climate Emergency in 2019. This has served to formalize the direction the City is taking over the next 20-30 years and has resulted in the development of important guidance documents and standards including the Climate Change Action Plan and the Corporate Green Building Standard. The City has been preparing for this greater focus on the environment and has been building the required 'bench strength' to undertake the necessary tasks, through the development of its Team, Policies, Procedure, Standards and Systems.

This annual report, provides an update on the progress of the current 5 Year Energy Conservation Plan (2019 – 2023)[1]. That plan focusses on electricity and natural gas consumption and targets 1% reduction in energy use and greenhouse gas emissions (GHGs), each year over the period. Beyond that, the report provides an update on the water utility and outlines some of the key initiatives implemented and currently in process in our facilities.

Many projects are underway, and these have begun to deliver the anticipated improvements in all utility metrics, with reduction in consumption for electricity of 13%, natural gas 8%, and water 17% in 2021. These have assisted in City of Mississauga achieving a 9% reduction in GHG emissions, which is a primary focus going forward. Note that part of the savings is attributed to COVID restrictions throughout the year. Buildings closure to the public allowed the Energy Management team to adjust some of the parameters (temperature, humidity) to unoccupied values which in turn minimized the electricity and gas consumption. In doing that, a truer reflection of the facility's baseload has been achieved in many instances. This provides an important baseline against which to monitor and optimize..

The City's new BAS Standard & Master Specification and the Corporate Green Building Standard are all important tools for guiding the way forward. The implementation of the Corporate Green Building Standard is a potential game changer in the City's approach to major projects, impacting not only those projects to which it is directly applicable, but also the general mindset, and approach to all City projects. The BAS Standard and Master Specifications have streamlined and standardized the approach to our BAS implementation and have opened up the door for building systems integration which facilitates data sharing for a more effective and efficient building operation. Additionally, City's Energy Design Guidelines ensures that each project implementation has a clearly defined set of minimum acceptable equipment performance.

City of Mississauga's first Net Zero Energy Building, Fire Station 125 has progressed nicely, and is currently in the design stages. We are implementing a number of systems, such as air source VRF Heat Pump, which we hope will become mainstream in our other developments, where applicable. Additionally, City now has operational experience with Pathway Lighting-integrated Solar PV and Motion Sensor, with very positive results. These technologies provide a way forward for our extensive Parks Portfolio, to reduce not only GHG but also lighting pollution and operating costs.

[1] *https://www.mississauga.ca/publication/5-year-energy-conservation-plan-2019-2023/*

The executed energy efficiency measures, life cycle replacement projects and operational optimization programs shows City of Mississauga's commitment to achieving the energy and GHG reduction targets set by the 5-year Energy Conservation Plan, along with reducing use of other resources. Further, our comprehensive and structured "Plan-Do-Check-Act" approach to energy management, was recently recognised when Frank McKechnie Community Centre made City of Mississauga the first municipality in Canada to be ISO 50001 certified.

Beyond projects and initiatives, management of energy use begins with a good understanding of the drivers of that use. City of Mississauga has therefore been expanding its real-time monitoring of the utilities as well has improving its analytical tools, including fault detection, and capabilities to process the higher volume of available data, towards actionable information. We have also been increasing the awareness of facility managers and operators, of their utility cost relative to budget and assisting them in identifying opportunities for improvement. The Utilities Management processes employed at City of Mississauga played an important role in the overall reduction in utilities cost through various methods, including hedging, but also through meticulous management of the over 580 accounts to optimize the rate classifications, identify and resolve billing errors and promote storm water best practices resulting in avoided costs.

We are very optimistic that as the City begins to open up causing projects to resume their normal flow, and as more projects benefit from the standards developed, as the analytic tools implementation mature and the BAS and energy use visibility of the facilities expand, the results will continue to improve.

Table of Contents

Energy & Water Conservation - The Big Picture

The 5-Year Energy Conservation Plan 2019-2023, requires that the City-owned facilities portfolio achieves an overall annual energy reduction target of 1% each year compared to the 2018 baseline. The target reduction for 2021 is therefore 3% when compared to the 2018 consumption. City of Mississauga has surpassed the target in 2021 achieving 10% reduction in overall energy use, 9% reduction in green house gas (GHG) emissions, and 17% reduction in water use – totalling $2,347,000 in savings.

Adjusted Consumption*	2018	2021	Change	Change (%)	Savings ($)
Electricity (kWh)	80,161,899	69,710,513	-10,451,386	-13%	-1,712,812
Natural Gas (m^3)	8,299,900	7,675,430	-624,469	-8%	-209,015
Water (m^3)	1,124,415	935,301	-189,115	-17%	-425,583
GHG Emissions (kg of CO_2)	17,859,481	16,257,001	-1,602,480	-9%	-
Total Savings					**-2,347,409**

* Adjusted for differences in weather and facility occupancy. Sites where major renovations were in progress were removed from this analysis.

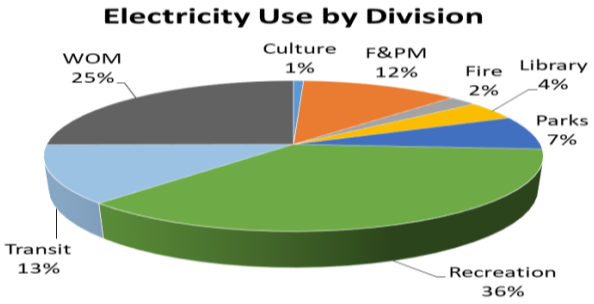
As the COVID pandemic extended into 2021, many of our facilities experienced closures and suspension of community programs. As a result, there was an opportunity to implement the following conservation initiatives while maintaining minimum levels of service for minimal staff complement required to be on-site:

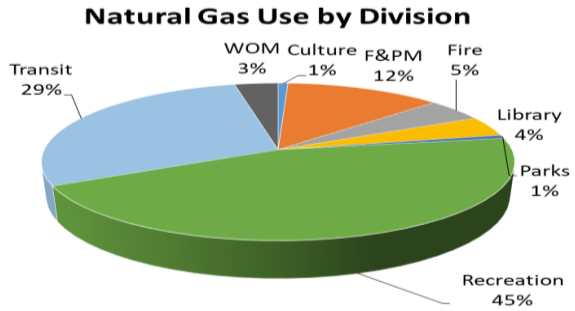
- Setback/shutdown of ice refrigeration plants and pools/arenas dehumidification equipment;
- Shutdown of all non-essential HVAC and lighting equipment;
- Pool water temperature setbacks and where possible, draining of pools, therapy pools and hot tubs,
- Change in scheduling due to reduced occupancy lead to shutdown/setback to parts of the buildings not used

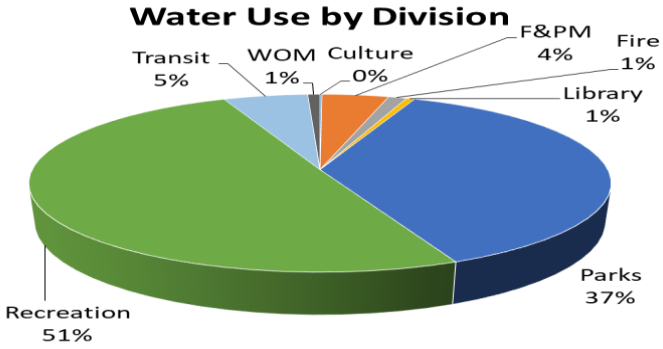
Further, initially hampered by the effects of the pandemic, City of Mississauga has been able to roll out many of its projects and key initiatives over the period and these have also contributed to the significant utility consumption and cost savings in not only energy but also for water. These key initiatives are detailed further in this report, and project progress can be found in the appendix.

Utility Consumption

In 2021, City of Mississauga had a total Energy Use (Electricity & Gas) of 150,302,528 e-kWh of which Natural Gas accounted for the marginally larger portion (53%) relative to Electricity (47%). In the same period, just under 940,000 cubic meters of water was consumed. At the division level, the consumption apportionment varies across all three (3) utilities.



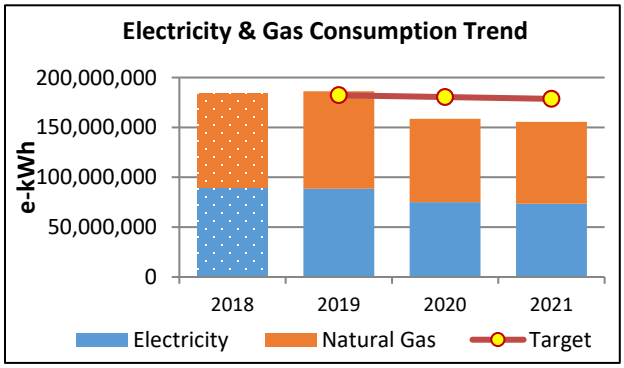


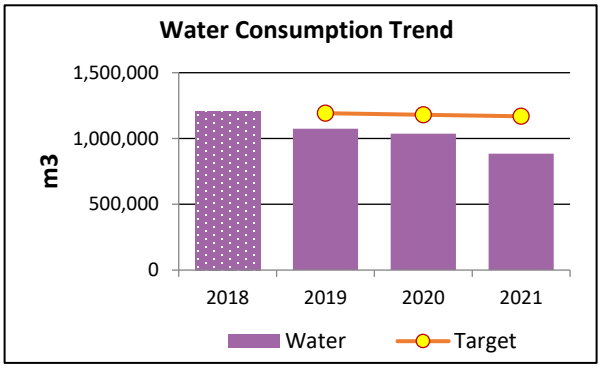


Recreation which provides services to the community via the Community Centres and Arenas, and is the biggest consumer of all three utilities. For electricity, the second largest user is Works Operations and Maintenance (WOM), followed by Transit. For natural gas, the second largest user is Transit, followed by buildings falling under the F&PM Division. For water, the second largest user was Parks, primarily due to the significant amount of green spaces under that portfolio, followed by Transit.

Utility Consumption Trend

Overall, the energy use has reduced in 2021 relative to the baseline year of 2018. This was due to the cumulative effect of multiple measures implemented throughout the facilities as well as reductions due to the effects of Covid-19 on operations and general facility occupancy and use. As depicted in the chart below, the total energy use in 2021 was 150,302,528 e-kWh as compared with 167,310,849 e-kWh in 2018, a 10% reduction.



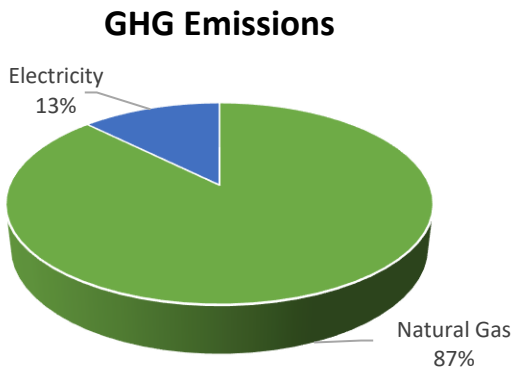


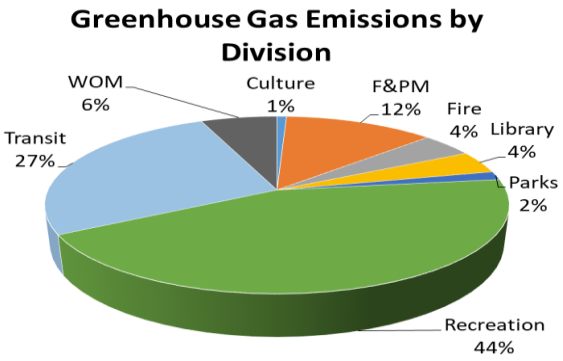
In 2021, of the total Energy Use, electricity consumption was 69,710,513 kWh, which is a reduction of 13% when compared to the adjusted baseline period (2018), realizing approximately 10,450,000 kWh in savings. Natural gas consumption 7,675,430 cubic meters, which is a reduction of 8%, when compared to the adjusted baseline period, achieving approximately 624,000 m3 in savings. During the same period, water consumption was 935,301 cubic meters, which is a reduction of 17%, when compared to the adjusted baseline period, achieving approximately 189,000 m3 in savings.

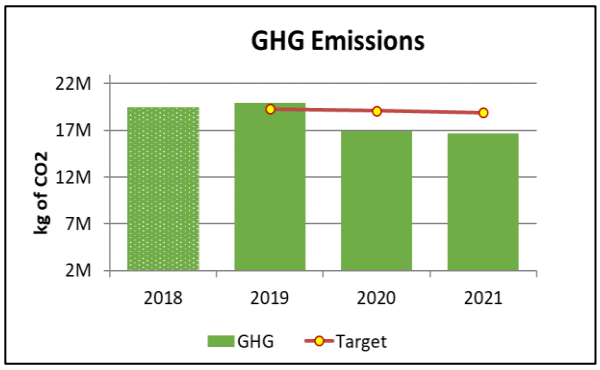
GHG Emissions

GHG Emissions has been deliberately targeted by the City of Mississauga, more so since a Climate Emergency was declared by Council in 2019, resulting in the development and promulgation of a Climate Change Action Plan which identified mitigation and adaptation as the two main goals to becoming a low carbon and resilient community.

In 2021, the GHG Emissions was 16,257,001 kg of CO2 (equivalent) of which Natural Gas accounted for the larger portion (87%) relative to Electricity (13%).







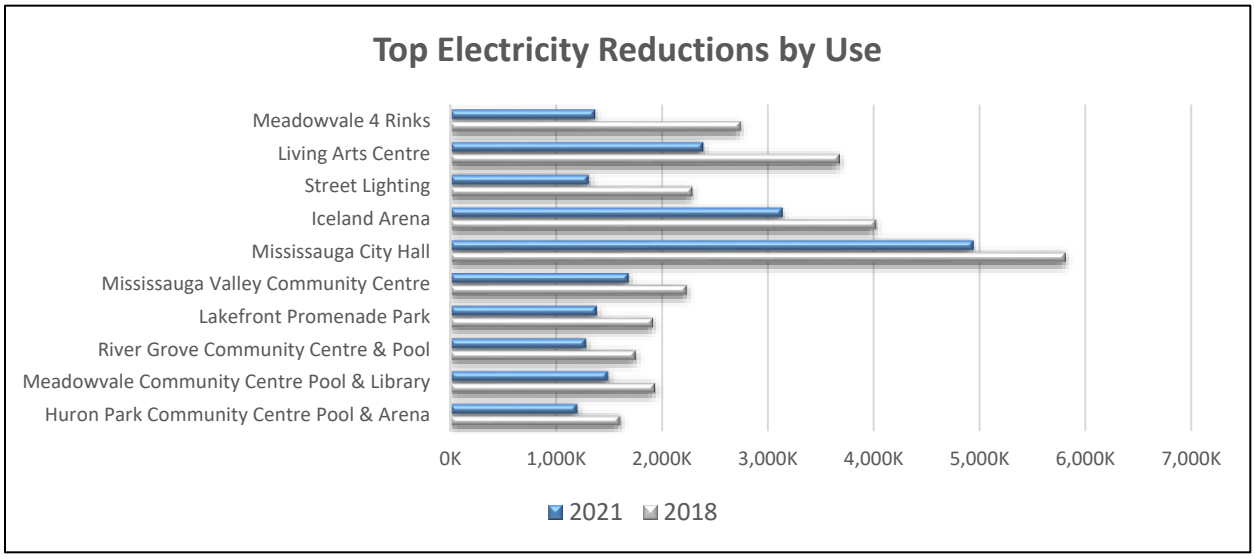
When broken out by Division, Recreation was the biggest user, followed by Transit, then buildings under Facilities & Property Management. In 2021, GHG Emissions decreased by 9%, achieving approximately 1,602,480 in savings, when compared to the adjusted baseline period of 2018.

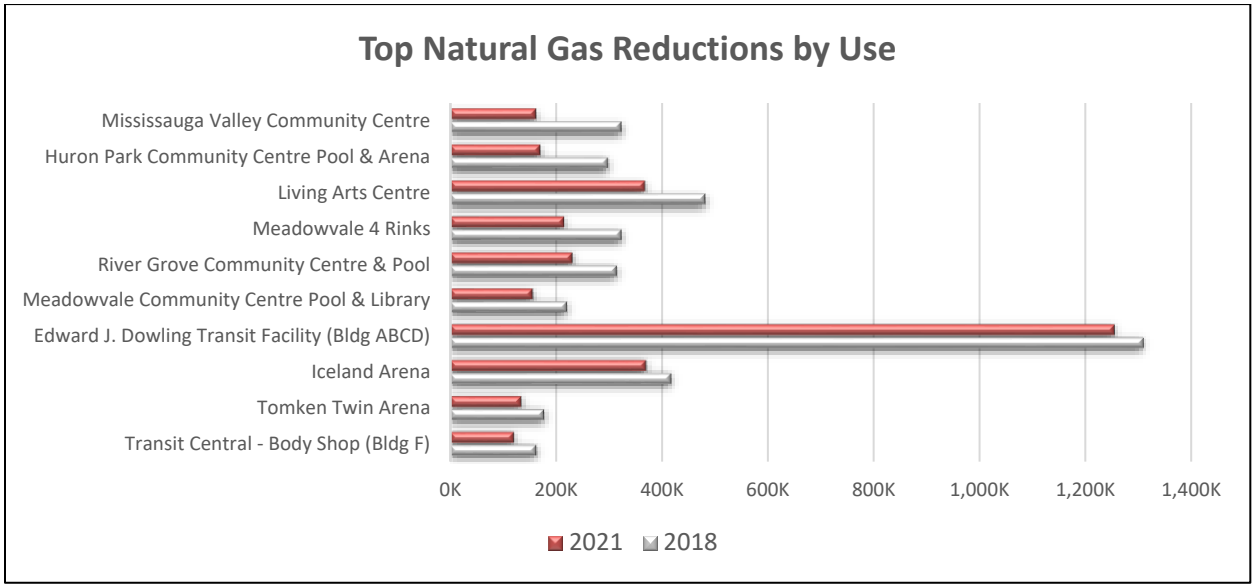
City of Mississauga through its Energy Design Guidelines, Corporate Green Building Standards and Climate Change Action Plan has been signaling the shift away from gas use with each new build, renovation or lifecycle replacement project. For example, electric heat pumps have become more mainstream for space heating and domestic hot water applications. Recreation was the biggest user followed by Transit and F&PM[2].

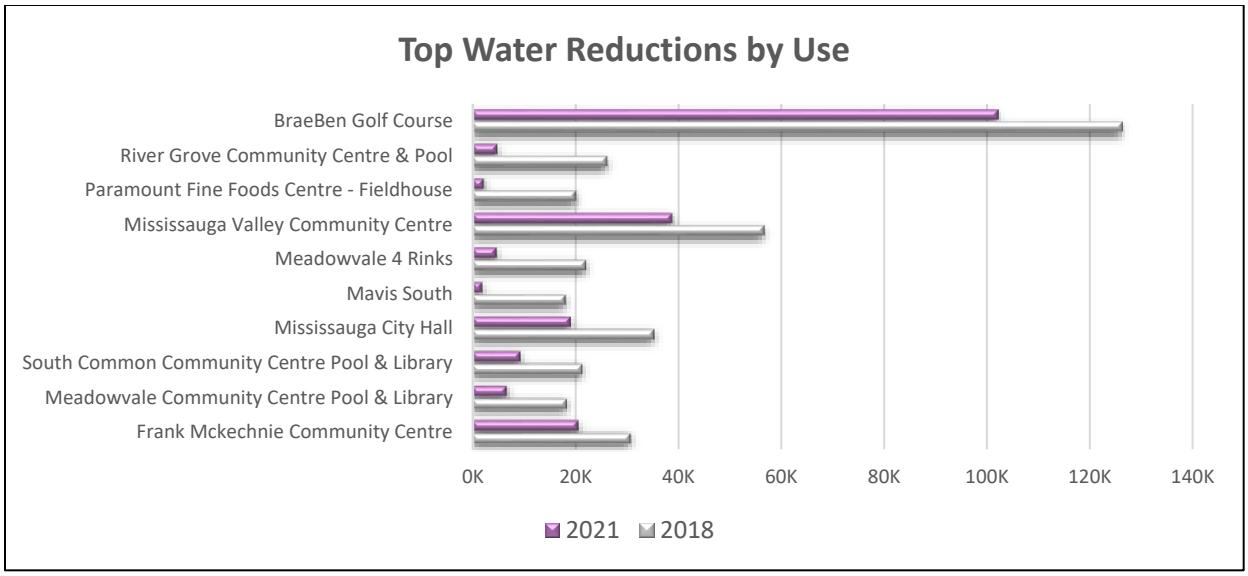
[2] *Facilities & Property Management*

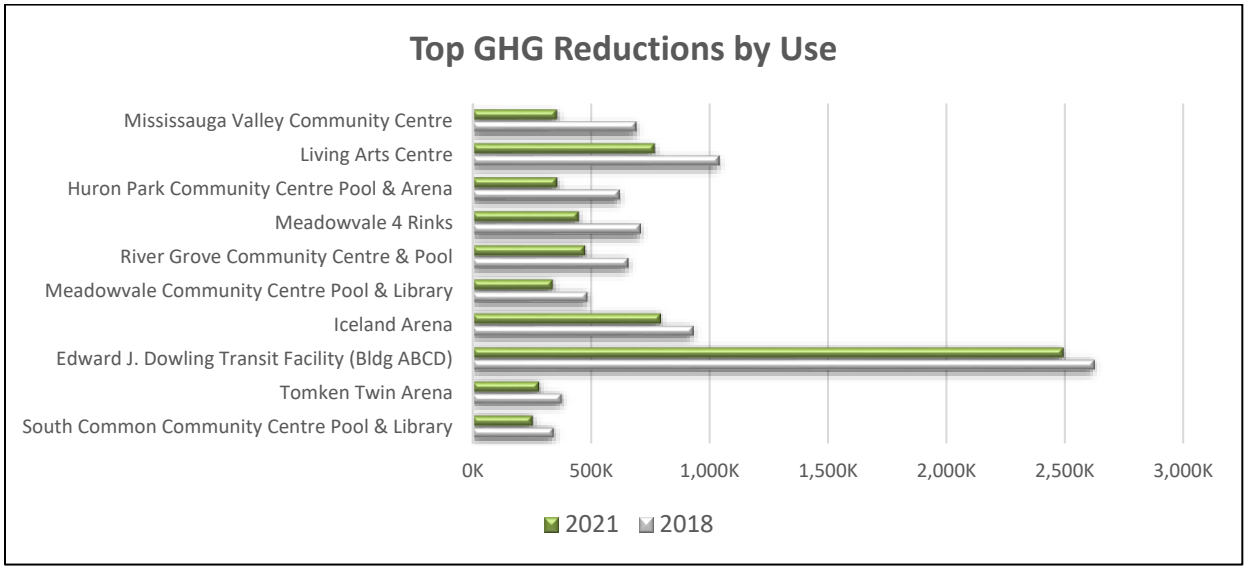
Changes in Consumption

Below is a shortlist of the facilities with the largest absolute change in consumption and GHG.









On the other end of the spectrum, there are a few facilities for which increase in consumption were observed. Energy Management is already working with the facilities to ascertain the specific reasons and implement solutions to bring the consumption in line. Some of the reasons already identified include:

- Addition of new equipment
- Increased operating hours
- Addition of Services (eg. New washroom in some Parks)

New Facilities & Renovations

As population grows in the City, so does the need to expand the City's services and facilities. Since it would be inequitable to compare year-to-year energy consumption as significant deviations in operations occur, such deviations/anomalies were adjusted for in the statistics. A list of the facilities for which adjustments were made can be found in Appendix A.

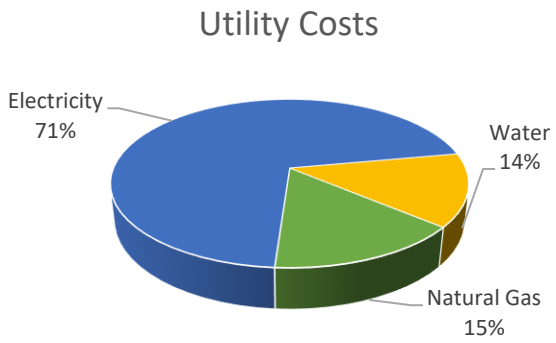
Financials

In 2021, City of Mississauga realized the following financial performance for Utility Savings, Cost Avoidance and Incentives. Utility Savings relates to cost savings due to a reduction in consumption; Cost Avoidance is based on strategies implemented which prevents the City from incurring costs in future time periods; and incentives relates to funds collected from utility partners incentivising improvement in consumption.

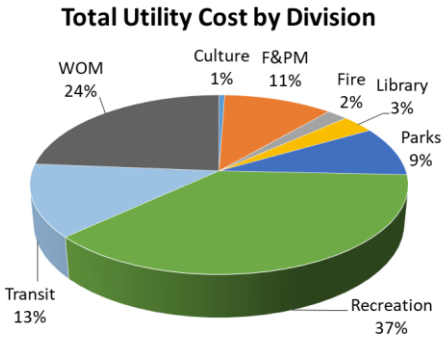
Utility Savings	Cost Avoidance	Incentives in 2021
$2,347,409	$246,100	$156,120

Utility Cost

The utility cost in 2021 of $17,349,000 was largely driven by electricity, which accounted for 71% of the total, with water and natural gas approximately equal for the balance.



Overall the recreation division accounts for more than a third of these cost, followed by WOM which accounts for almost one quarter. The overall utility cost is significant, leading to City of Mississauga providing the requisite focus to manage those costs.



Utility Cost Reduction

City of Mississauga employs different strategies to manage and reduce its utility costs. These costs can be lowered through reduction in consumption as well as the use of an active procurement strategy that takes advantage of some of the tools available for that purpose.

Utility Resource Procurement

Utility resource procurement strategies include plans for utility procurement and hedging (when favourable) as per the "Procurement of Electricity and Natural Gas" corporate policy. Hedging which involved purchasing a set volume of the commodity for a select period of time at a fixed rate was applied mainly to the natural gas procurement. In 2021, the natural gas hedging strategy resulted in avoided costs of approximately $7,400, for November and December.

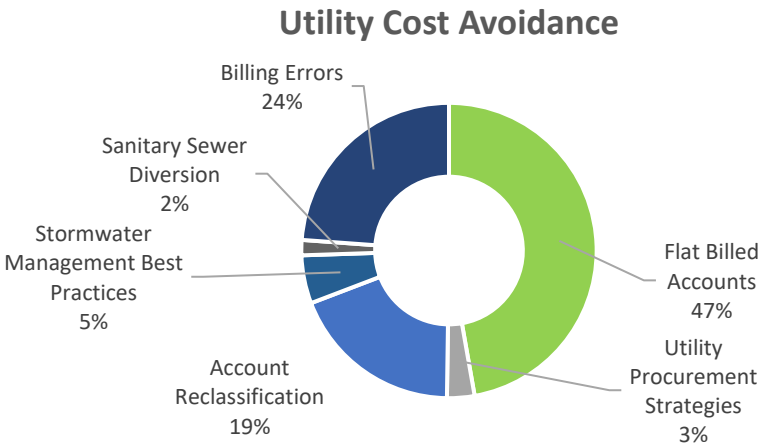
Other Strategies

Other utility cost recovered, and savings are attributed to:

- Utility account reclassification to optimize on utility rates
- Ongoing utility account review to capture bill errors and correct them accordingly, and
- Recovering credits from programs where applicable.

Switching rate classes resulted in $46,700 in savings due to Global Adjustment optimization. Approximately $116,200 in electricity costs were recovered due to updated loads for flat rate billed accounts and an additional annual savings will be realized in future years. Other utilities operational initiatives such as moving to electronic billing and ongoing review of utility accounts to address billing errors, resulted in cost avoidance of $58,700.

Additionally, in 2021, storm water management best practices at applicable sites resulted in approximately $13,000 credits recovered and sanitary sewer charge appeals due to diversion measures resulted in approximately $4,100 in avoided costs.



Incentives

Incentives were provided through the Independent Electricity System Operator's (IESO) Save On Energy Retrofit Program as well as Enbridge's Retrofit and Custom Projects Incentives and Conservation Program. A summary of the 2021 application processing is provided in the table below.

Applications	Quantity	Incentive ($)	Savings		
			Demand (kW)	Energy (kWh)	Natural Gas (m3)
Closed in 2021	17	156,120	130	660,732	35,101
New in 2021	15	81,378	83	406,715	97,800
Active in 2021	27	254,206	379	1,980,804	68,242

Key Initiatives

City of Mississauga's 5 year Energy Conservation Plan (2019-2023) follows the principles of ISO 50001 and its Plan-Do-Check-Act continual improvement framework. It outlines the program of work being undertaken to improve our environmental footprint and ensure the city remains on the path to sustainability. These measures have contributed to City of Mississauga meeting and exceeding its goal of 1% reduction in energy consumption and greenhouse gas (GHG) emissions each year over 2018 levels, and positions the corporation for continued success. Some of the key initiatives that have been pursued or are in the development stage include:

- Equipment Upgrades and other Energy Conservation Measures
- Corporate Green Building Standard (CGBS) for New Construction and Major Renovation
- BAS Standard and Master Specification implementation
- Energy Analytics and Fault Detection
- Centre of Excellence
- ISO 50001 certification

Equipment Upgrades and Energy Conservation Measures

Throughout this period there have been numerous projects centered around maintaining and improving the energy profile of our facilities. Some of these include the following, with a detailed Gantt chart included in Appendix B.

Pool Energy Measures

- VFD on Pool Pumps, Air balancing, Dehumidifier Recommissioning, Heat Recovery Recommissioning, Filter Media Study, Pool drain heat recovery, Control Optimization
- Benefits include reduced energy consumption, efficient equipment operation, improved user comfort

Lighting Upgrades

- Upgrade to high performance lighting and controls at various facilities including Community Centres, Parks, Arenas and Service Yards & Maintenance Depot
- Benefits include improved lighting, reduced electricity consumption and maintenance cost

Lifecycle Upgrades

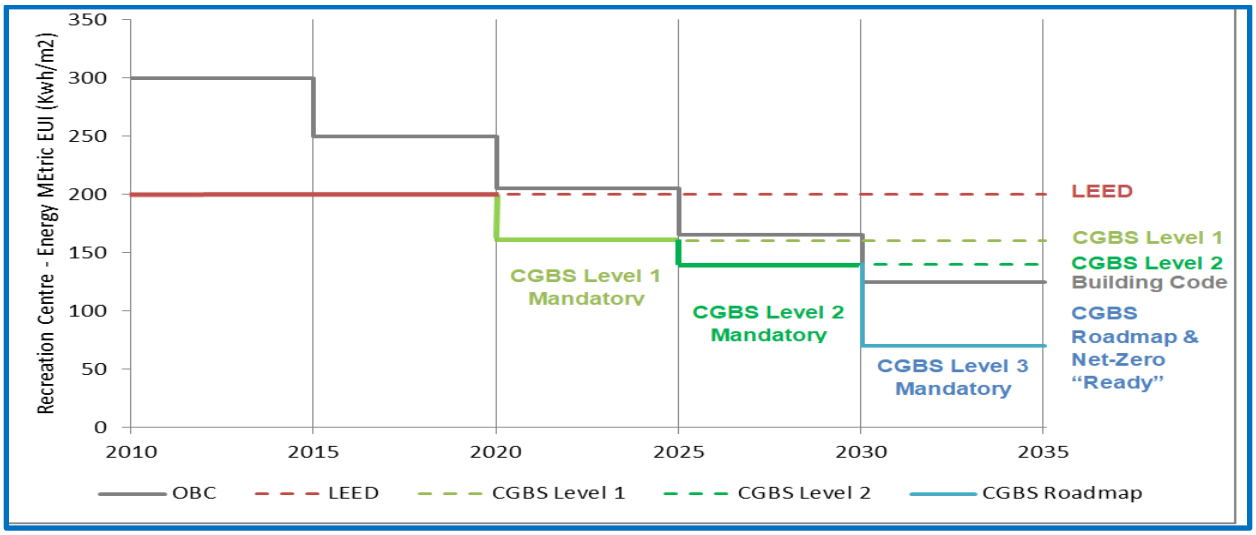
- Hybrid Heat Pumps, High Efficiency Boilers, Motors, Regenerative Pool Filters, Refrigeration Equipment, Envelope Improvement, High Efficiency Packaged Roof Top Units
- Benefits include improved equipment and operational efficiency, Reduced Energy Consumption and Operating Cost

Corporate Green Building Standard (CGBS)

Having previously implemented the LEED Silver Standard, in 2019, City of Mississauga adopted a more ambitious approach to environmental performance in its own buildings and facilities- the **Corporate Green Building Standard (CGBS)**. This standard represents a comprehensive set of environmental performance requirements that establishes City of Mississauga as a leader in sustainable buildings in Canada, and that complement existing policies such as the Green Building Standard for New Construction and Major Renovation.

CGBS has been developed to allow design teams flexibility, with respect to the level of environmental performance that can be achieved on a given project. The Standard sets three (3) increasing levels of performance that design teams can elect to pursue according to a specific project's characteristics and constraints. Targets have been set for seventeen (17) key environmental performance credits grouped in six (6) categories.

The Corporate Green Building Standard was designed to keep pace ahead of the Ontario Building Code (OBC) and LEED going forward, with Level 2 becoming mandatory in 2025, then Level 3 in 2030. Project teams are encouraged to seek the highest level of performance while remaining within a given budget and schedule, even before specific levels become mandatory.



Since its approval, the CGBS has been applied to a number of projects all currently in different stages of completion. All projects will undergo metering and monitoring based commissioning to establish the actual operational baseline and to facilitate long-term management and retention of "like new" EUI performance. KPIs for the environmental parameters tracked include (i) Energy Use Intensity – EUI, (ii) Thermal Energy Demand Intensity – TEDI, and (iii) Green House Gas Intensity – GHGI. Some of the projects include:

Hazel McCallion Central Library (Targeting Level 1)

Parameter	*Target*	*Modelled*
EUI (kWh/m2/year)	140	185.8[3]
TEDI (kWh/m2/year)	50	152.6
GHGI (kgCO2/m2/year)	15	28.3
R48 Roof (effective), Triple Glazed bird-friendly Windows, Solar PV ready, Air Tightness Testing, Efficient Boiler, Fan Power VAV Boxes, Electric Humidification, BAS Upgrade, Sub-Metering, at least 75% Waste Diversion Planned		

Project Status: Started in 2019 the project is currently in the Construction Phase and is expected to be completed in 2023

Project Summary: This project involves renovation and addition to the existing library for a lounge and quiet study area. The CGBS Standard is only being applied to the addition.

Carmen Corbasson Community Centre (Targeting Level 1)

Parameter	*Target*	*Modelled*
EUI (kWh/m2/year)	570	265
TEDI (kWh/m2/year)	45	44.8
GHGI (kgCO2/m2/year)	83	19
Heat recovery on all Air Handling Units, R24.4 Walls (effective), R41.7 Roof (effective) , 50 Bike Racks, 14 EV Charging Station Infrastructure, Cross Laminated Timber (CLT) on the Roof Deck , pool drain heat recovery from both pools, heat pumps with backup condensing boilers, solar PV ready		

Project Status: Started in 2021 the project is currently in the Construction Documents Phase and is expected to be completed in 2025

Project Summary: This project involves expansion of the existing building with addition of a natatorium consisting of a Therapy pool and a 25m Lap pool as well as a fitness centre and aerobics studio. Additionally, it will connect the community centre to the nearby Seniors Centre for easy access. The CGBS Standard is only being applied to the addition.

[3] *a higher modeled EUI was accepted as an exception since the systems for the expansion are being connected with existing HVAC.*

Burnhamthorpe Community Centre (targeting Level 1)

Parameter	*Target*	*Modelled*
EUI (kWh/m2/year)	612.9	553.1
TEDI (kWh/m2/year)	45	43.3
GHGI (kgCO2/m2/year)	89.6	69.8
Triple Glazed Windows, R 12.4 Wall (effective), R 47.6 Roof (effective), solar PV, heat recovery - Ice plant and Dehumidifier, Green Roof, Pool Drain Heat Recovery, Gas-Hybrid Heat Pump, 8 EV Chargers, 26 Bicycle racks		

Project Status: Started in 2019 the project is currently in the Construction Phase and is expected to be completed in 2023

Project Summary: Expansion and renovation and of the existing building. Addition of multi-use pools, fitness and multi-purpose rooms, and is expected to be 30% more efficient than if it were built according to the Ontario Building Code. The CGBS Standard is only being applied to the addition.

Fire Station 125 (Targeting Level 3 for Energy – Net Zero Energy)

Parameter	*Target*	*Modelled*
Net Zero Energy Building		
TEDI (kWh/m2/year)	30	28.3
GHGI (kgCO2/m2/year)	5	1.5
Triple Glazed Windows, Air Sourced VRF Heat Pumps with Electric Resistance heating for backup, Solar PV, R-25 Wall (effective) , R-60 Roof (effective), Green Roof, Cross-Laminated Timber, Bio-swales,		

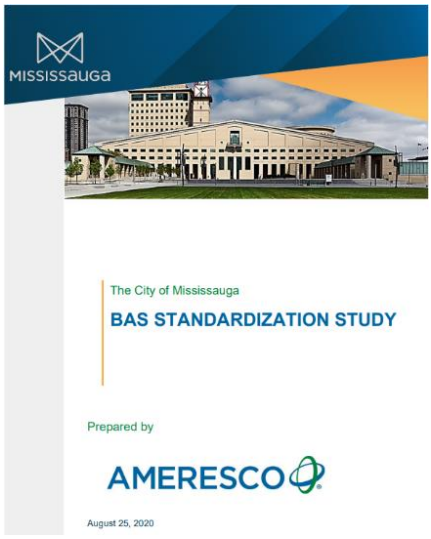
Project Status: Started in 2021 the project is currently in the Design Phase and is projected to be completed in 2024

Project Summary: Fire Station 125 is a new development that is targeting Net Zero Building Status. It is one of six new fire stations planned over the next 12 years to optimize emergency response times.

New Building Automation System Standard

The Building Automation System (BAS) is primarily used to control building HVAC, lighting, ice-making and other systems. Standardization of BAS provides the minimum requirements to design, configure, install, label and operate BAS, and includes the effective control algorithms for energy efficient operation of equipment. Point naming conventions and unified Graphical User Interface (GUI) across all City facilities enables the seamless transition of staff between facilities and promotes on-going optimal operation. Trend logs & alarms settings allows easier troubleshooting, minimize downtime and increases energy conservation in City's facilities.

There are 40 city buildings currently equipped with BAS, supplied by different vendors. These systems are of different generations and technical capabilities and, while the systems offer some controllability of HVAC, lighting and ice-making equipment, they present various challenges such as:Non-competitive procurement for maintenance contracts limited reliability and serviceability



- Different operator interface across city buildings
- Different communication protocols;
- Different architecture and hierarchy among the systems;
- Limited interoperability with other systems used by the City,

To address these issues, to the Energy Management team:

- Reviewed all current BAS systems and vendors in the City buildings
- Selected a BAS platform, open communication protocol and architecture
- Established a Corporate BAS Standard and Master Specifications
- Pre-Qualified BASproducts and vendors

A 5 year plan has been prepared to replace all existing BAS with systems that follows the new Master Specifications. BAS replacements are in progress in the following buildings:

Building	Status and Completion
Malton Community Centre	Completed February 2022
Paramount Fine Foods Centre	Completed March 2022
Living Arts Centre	In progress; Expected completion July 2022
Edward J. Dowling Transit Facility	In progress; Expected completion Sept. 2022
Clarkson Community Centre	In progress; Expected completion Sept. 2022

The new Niagara N4 front-end will have a modern 'look and feel', which is more user friendly and standardized across all sites delivering many benefits, contributing to and improved BAS system.

City of Mississauga (CoM) anticipates energy savings, Green House Gas (GHG) emission reductions, and operational cost savings to be associated with the BAS upgrades and replacements. These savings will be realized through the many features including timed override, global scheduling for statutory holidays or other events, easier troubleshooting, availability of longer trend logs for easy diagnostics as well as interoperability, among other things.

Renewable Energy

Renewable energy installations allow the facility to substitute some of the energy from the utility with greener alternatives. Where suitable, all future major renovations within the city are planned to have either a renewable energy system installed or the required infrastructure to facilitate installation of the renewable energy system at a future date. The table below shows some of the developments on the horizon:

Site	Status	Type	Solar PV Size (kW)	Annual Facility Elect./[Gas] Offset %	Comments
Paramount Fine Foods Centre	Existing	Solar PV	25	1.2%	
Lion Club of Credit Valley Pool	Existing	Solar Water Heater		[38%]	47,000 ekWh p.a.
Duncairn Solar Pathway Lighting	Existing	Solar PV	4	100%	Off-Grid Pathway Lighting
Burnhamthorpe CC	New	Solar PV	165	11%	
Hazel McCallion Central Library	New	Solar PV	15	-	Readiness
Carmen Corbasson CC	New	Solar PV	TBD	-	Readiness
Burnhamthorpe CC	Existing -Leased	Solar PV	175	-	Owned by others
Huron Park Recreational Centre	Existing -Leased	Solar PV	150	-	Owned by others

Energy Analytics and Fault Detection

The real-time Energy Management System that monitors electricity, gas and water consumption in City facilities, was expanded over the past 4 years. In the case of electricity, equipment level metering was implemented in select facilities to now capture large process loads and high electricity demand. This has provided City of Mississauga with a large amount of utility consumption data which is being used in tandem with the City's Building Automation System to further identify energy conservation opportunities at the system level, to eliminate detected anomalies in equipment operation, and further improve facility management processes.

The system is currently being revamped to bring multiple data sources together for more detailed and streamlined building analytics and use insights within a fault detection software. The faults will be detected as they occur in real-time paving the path to proactively circumvent and prevent any energy and water waste. The table below indicates the facilities currently fitted with sub-meters.

FACILITY	MAJOR ELECTRIC LOADS SUB-METERED			
	Lighting	HVAC	Ice Plant	Miscellaneous[4]
Burnhamthorpe CC	✓	✓	✓	✓
Carmen Corbasson CC	✓	✓	✓	✓
Celebration Square	✓	✓	✓	✓
Clarkson CC	✓	✓	✓	✓
EJD Transit Complex	✓	✓	*N/A*	✓
Erin Mills Twin Arena	✓	✓	✓	✓
Frank McKechnie CC	✓	✓	✓	✓
Huron Park CC	✓	✓	✓	✓
Malton CC	✓	✓	✓	✓
Meadowvale 4 Rinks Arena	✓	✓	✓	✓
Mississauga Valley CC	✓	✓	✓	✓
Paramount Fine Foods Centre	✓	✓	✓	✓
Paramount Fine Foods Centre – Sports Zone	✓	✓	✓	✓
Port Credit Arena	✓	✓	✓	✓
River Grove CC	✓	✓	*N/A*	✓
Tomken Twin Arena	✓	✓	✓	✓

[4] *Includes plug loads, exhaust fans, unit heaters, pool dehumidification*

Centre of Excellence

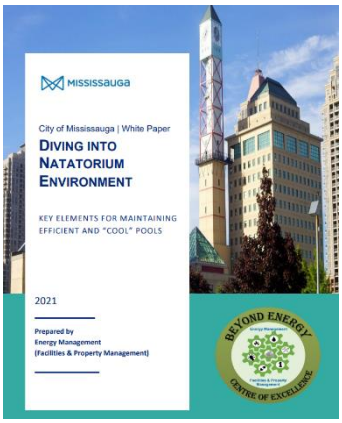
Beyond Energy - Center of Excellence was created to support Facilities & Property Management's vision of "Partnering for Success" through advancement of its mission of "optimizing our in-house expertise in property management excellence". The objective is to drive innovation and improvement of F&PM's processes by promoting more collaboration, transparency and shared results to foster alignment around business goals.

Fundamentally, given City of Mississauga's Climate Change priorities, Beyond Energy will address not only current questions, but also upstream aspects that affect F&PM effectiveness in this regard. With that in place, buildings will be better positioned to achieve optimal performance and high efficiency for the long term.

In the first instance, Beyond Energy will focus on improvements/standardization in processes, and adding/improving new/existing technology, or adding a new service. Summarized as:

- Technology improvement
- Process improvement
- Cost (material & time) savings

Diving into the Natatorium Environment



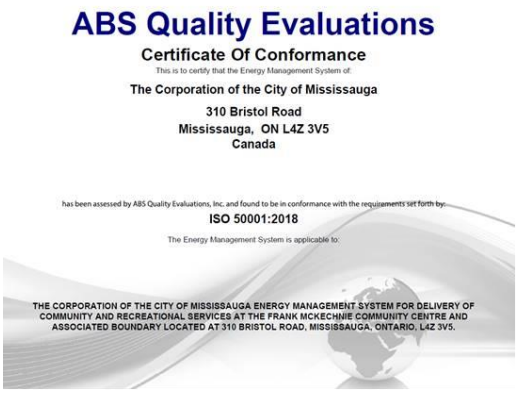
Beyond Energy has published its first white paper, 'Diving into Natatorium Environment – Key Elements of Maintaining Efficient and Cool Pools'. This white paper evaluates the relative merits of the two prominent pool dehumidification technologies used within the city to provide the City's experience with the main issues for consideration and will serve as a guide for future project implementations

Since its formation, the Centre has since gotten a number of staff volunteers from different Sections to sign-on to tackle some of the biggest Facilities and Property Management Questions within our portfolio.

ISO 50001 Certification

City of Mississauga's Energy Management System is comprised of the energy team, energy policy, green standards, set energy efficiency objectives, action plans, Key Performance Indicators (KPIs), as well as tools and technology essential to support energy and carbon reduction. The Energy Management System follows the principles of ISO 50001 by applying a systematic and data-driven approach to energy performance and the "Plan-Do-Check-Act" continual improvement framework. The framework is used in implementing technical and management strategies that significantly reduce energy costs and greenhouse (GHG) emissions.

The Energy Management System is used as a roadmap for achieving and documenting energy performance improvements at City facilities as the City works to advance its vision of combatting climate change and creating resilient, low-carbon communities.



City of Mississauga's Frank McKechnie Community Centre is the first municipal facility to achieve the ISO 50001 certification in Canada validating that the Corporation makes better use of energy-consuming assets, promotes best practices in energy management and utilization of energy efficient technologies, and creates transparency and energy awareness. It also demonstrates the City's commitment and progress towards the City's long term vision of becoming a "zero carbon" municipality.

APPENDIX A

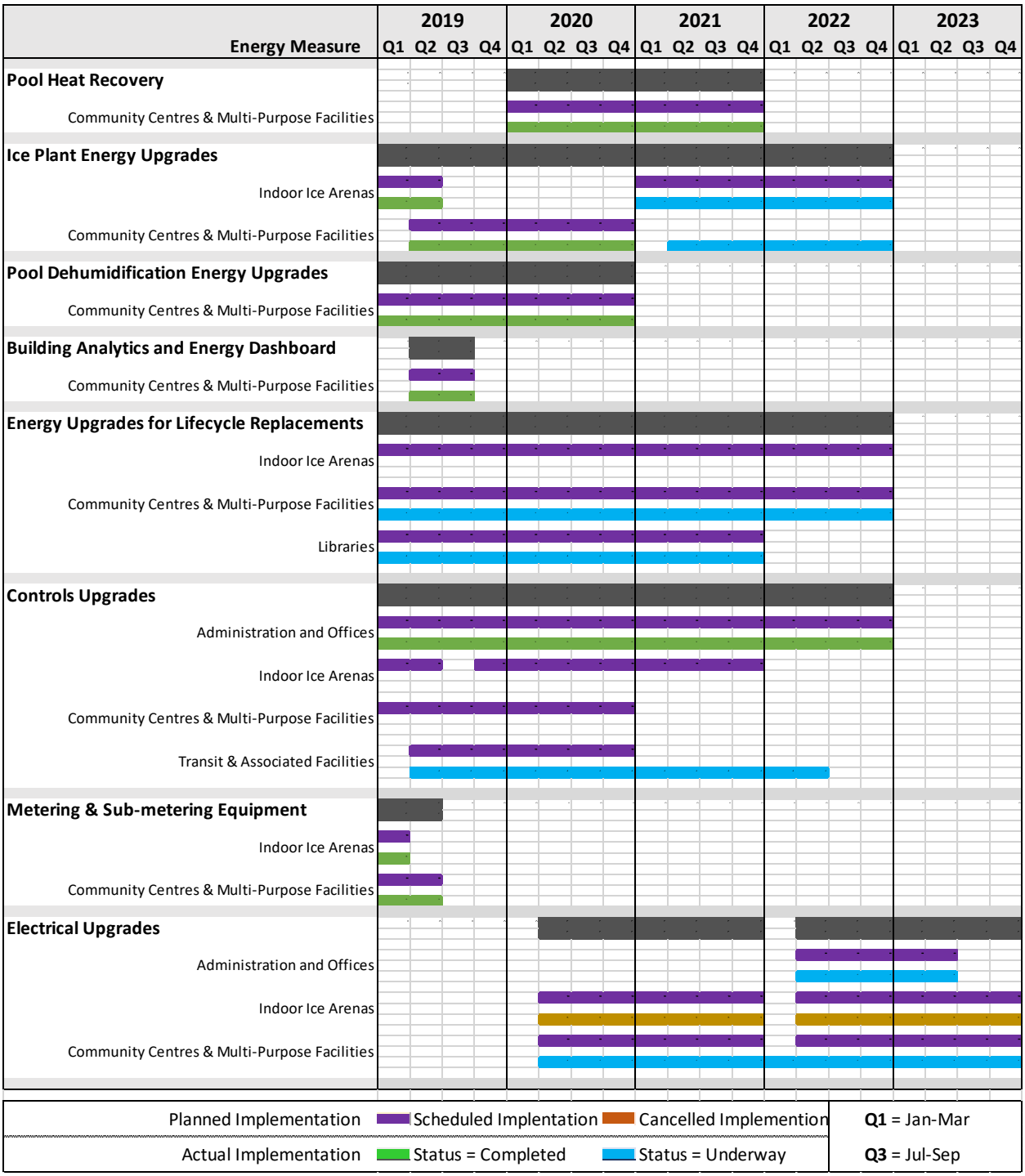
New Facilities & Renovations

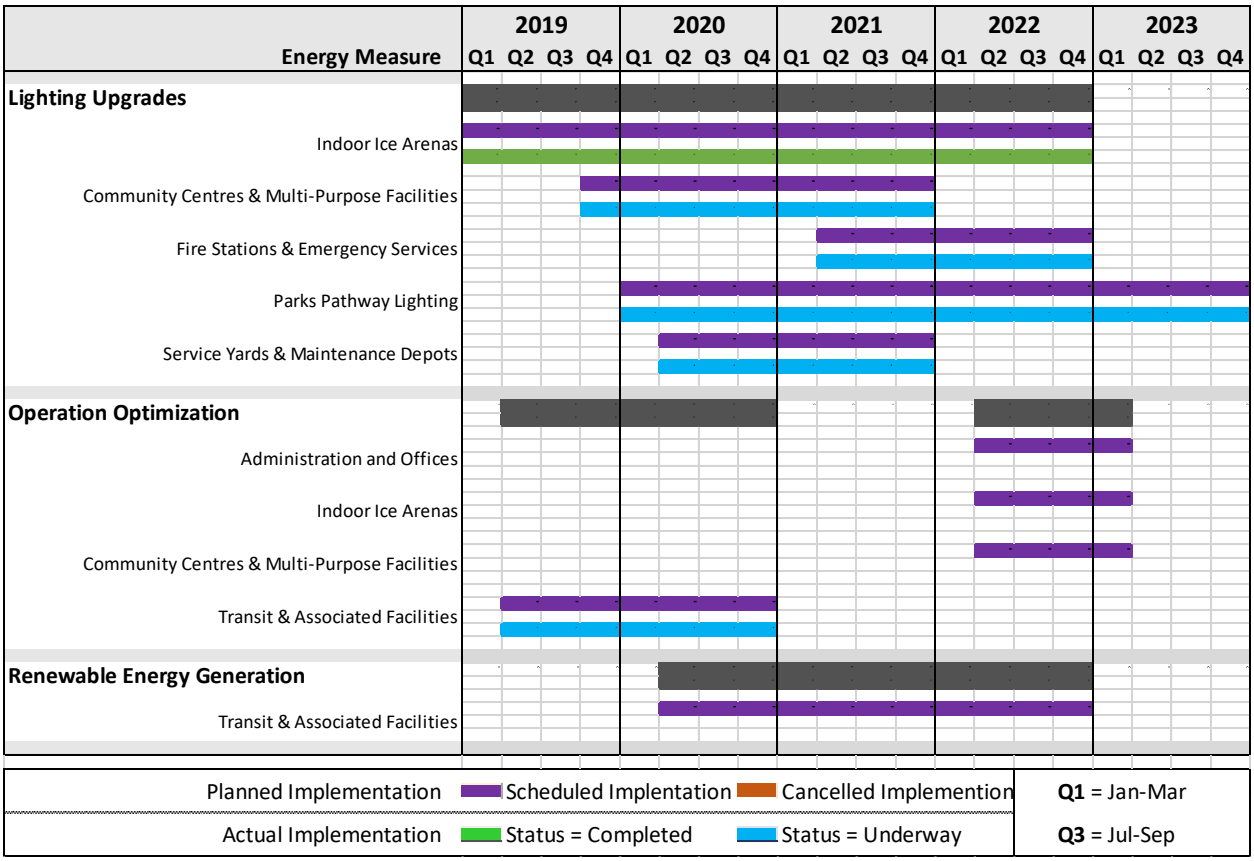
Site Name		2021 Annual Consumption
Churchill Meadows Community Centre		937,963 kWh 14,026 m3 9,268 m3
Fire Station 120		92,580 kWh 20,381 m3 782 m3
Pheasant Run Park		4,930 kWh - m3 17,625 m3
Small Arms Ltd Inspection Building		111,527 kWh 53,350 m3 414 m3
Cactus Gate Pumping Station & Torbram Pumping Station		48,303 kWh - m3 - m3

Paramount Fine Foods Centre - Main Bowl and Community Rinks		2,132,179 kWh 299,058 m3 8,045 m3
Hazel McCallion Central Library		1,726,090 kWh 153,222 m3 3,223 m3
Burnhamthorpe Community Centre & Arena		306,034 kWh 44,627 m3 557 m3

APPENDIX B

Schedule of Energy Measures


2019
2020
2021
2022
2023
Q1 Q2 Q3 Q4
Energy Measure
Pool Heat Recovery
Community Centres & Multi-Purpose Facilities
Ice Plant Energy Upgrades
Indoor Ice Arenas
Community Centres & Multi-Purpose Facilities
Pool Dehumidification Energy Upgrades
Community Centres & Multi-Purpose Facilities
Building Analytics and Energy Dashboard
Community Centres & Multi-Purpose Facilities
Energy Upgrades for Lifecycle Replacements
Indoor Ice Arenas
Community Centres & Multi-Purpose Facilities
Libraries
Controls Upgrades
Administration and Offices
Indoor Ice Arenas
Community Centres & Multi-Purpose Facilities
Transit & Associated Facilities
Metering & Sub-metering Equipment
Indoor Ice Arenas
Community Centres & Multi-Purpose Facilities
Electrical Upgrades
Administration and Offices
Indoor Ice Arenas
Community Centres & Multi-Purpose Facilities
Planned Implementation
Scheduled Implentation
Cancelled Implemention
Actual Implementation
Status = Completed
Status = Underway
Q1 = Jan-Mar
Q3 = Jul-Sep


2019
2020
2021
2022
2023
Energy Measure
Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4
Lighting Upgrades
Indoor Ice Arenas
Community Centres & Multi-Purpose Facilities
Fire Stations & Emergency Services
Parks Pathway Lighting
Service Yards & Maintenance Depots
Operation Optimization
Administration and Offices
Indoor Ice Arenas
Community Centres & Multi-Purpose Facilities
Transit & Associated Facilities
Renewable Energy Generation
Transit & Associated Facilities
Planned Implementation
Scheduled Implentation
Cancelled Implemention
Actual Implementation
Status = Completed
Status = Underway
Q1 = Jan-Mar
Q3 = Jul-Sep