



Energy Conservation and Demand Management Plan for Municipal Buildings

2019-2024

City of Kingston



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Introduction

Ontario Regulation 397/11 under the *Green Energy Act 2009* required public agencies, including municipalities, to report on their energy consumption and greenhouse gas (GHG) emissions annually beginning in 2013 and to develop and implement Energy Conservation and Demand Management (ECDM) plans starting in 2014. The Green Energy Act was revoked January 1st, 2019, but under Ontario Regulation 507/18 the Conservation and Demand Management Plan and Green House Gas annual reporting is still mandatory.

This 5-year ECDM Plan update encompasses all climate controlled facilities used by the City of Kingston for municipal operations except for buildings and facilities related to the treatment or pumping of water or sewage, which are managed by Utilities Kingston. Seasonal buildings which are neither heated nor cooled are not included, nor are buildings leased to non-municipal tenants. The facilities included in this report are listed in Appendix A.

Alignment with Community and Corporate Sustainability

The City of Kingston is a partner to the community-based Sustainable Kingston Plan. The adoption of a Conservation and Demand Management plan contributes to the goals and objectives identified specifically within the environmental pillar of the community plan focused on energy conservation, air quality and the reduction of greenhouse gas emissions.

In 2014, the City led the community through the process of completing the Kingston Climate Action Plan, setting a goal for the community to reduce its overall carbon footprint of 2011 by 15 percent by 2020 and 30 per cent by 2030.

To address its internal operational requirements and engage employees in sustainability, the City also adopted a Corporate Climate Action Plan in 2015 focused on energy conservation and emission reduction. While this Energy Conservation and Demand Management plan concerns only buildings, the Corporate Climate Action Plan has a broader focus, including the environmental impacts of the corporation's vehicle fleet, streetlights, water, waste water and waste management activities.

More recently, in 2019 Kingston's City Council formally adopted a declaration of a climate emergency and has endorsed their strategic priorities implementation plan that seeks to reduce GHG emissions from municipal operations by 15% of 2018 levels by 2022 and aspires to carbon neutrality by 2040.

Kingston City Council's most recent GHG municipal reduction targets imply a need to further reduce facility-related emissions by approximately 410 - 610 tonnes between 2018 and 2022.

Vision

The City of Kingston has a corporate culture of sustainability that values and promotes energy conservation and GHG emission reduction, from Council to senior management down to front line staff.

The City understands how energy is used in each of our facilities and has the right equipment, processes and people in place to manage it effectively.

Goals and Objectives

1. To continuously improve the energy efficiency of our facilities in order to reduce operating costs, energy consumption and greenhouse gas emissions;
2. As a corporation we aim to achieve a 15% reduction in corporate greenhouse gas emissions by 2022 compared to a baseline year of 2018;
3. The City will lead by example with measurable, effective emission reductions to become carbon neutral no later than 2040;
4. To provide our building operators with the equipment and training they need to reduce energy consumption, demand and carbon emissions in the facilities they manage;
5. To continuously implement energy and GHG-saving retrofits in our facilities, and incorporate energy efficient upgrades to all of our projects where financially feasible;
6. To set new, lower energy consumption and demand targets for these facilities based on the expected outcome of the retrofits;
7. To continue an ongoing program of building automation system (BAS) re-commissioning to improve our ability to monitor and track energy use in the City's larger facilities;
8. To ensure that our renovation and construction projects embody best practices in energy-efficient design and are built adhering to the City's Municipal Green Building Policy, with a goal of Net-Zero where practical;
9. To expand our renewable energy generation portfolio, once all conservation efforts have been implemented;
10. To support Smart City interconnected systems and support open data, increasing transparency and public trust.

Organizational Understanding

The Facilities Management and Construction Services (FMCS) department is responsible for energy management within the portfolio of buildings that the department maintains. Others including Utilities Kingston, Kingston Fire & Rescue, Recreation & Leisure Services, Kingston Frontenac Public Library and Kingston Police are responsible for energy consumption in their managed facilities.

Annual greenhouse gas reporting under O. Reg. 507/18 is the responsibility of FMCS.

Achievements to Date

In 2002, the City of Kingston joined the Federation of Canadian Municipalities' (FCM) Partners for Climate Protection (PCP) program. This program is based on a five-milestone framework used to guide Canadian municipalities to pledge to protect our climate and follow a common process to achieve positive action.

Milestone 1: Create a Baseline Emissions Inventory and Forecast

Milestone 2: Set Emissions Reduction Targets

Milestone 3: Develop a Local Action Plan

Milestone 4: Implement the Local Action Plan

Milestone 5: Monitor Progress and Report Results

In June 2017, the City reached Milestones 5 for both corporate and community greenhouse gas emissions by demonstrating that many initiatives from these Action Plans have been implemented, and progress toward our emission reduction targets has been measured and reported. The City of Kingston was recognized by the FCM in 2017 for our leadership in reducing GHG emissions through our Corporate and Community Climate Actions Plans.

Carbon Neutral by 2040

The City will lead by example with measurable, effective emission reductions to become carbon neutral no later than 2040.

This includes a goal to reduce our corporate greenhouse gas emissions by 15% by 2022, based on 2018 emissions. Key initiatives that will assist in reaching our goal include; increasing our tree canopy and protecting wetlands; incrementally electrifying the City's fleet, including public transit; targeting waste reduction strategies for businesses, institutions and multi-residential buildings; and developing and promoting incentives for residents to reduce their energy use and become part of city wide solutions to meet Kingston carbon neutral target.

Energy Consumption, Energy Intensity, Cost and GHG's 2011-2017

The following table compares the total annual energy consumption, energy intensity cost and greenhouse gas emissions for City facilities in 2011 to 2017, as per the annual reports submitted to the Ministry of Energy. Note that these numbers have not been adjusted for occupancy rates, which can be a significant factor in energy use.

Year	Energy Consumption	Energy Cost (\$)	GHG Emissions (eCO ₂)
2011	55,000 eMWh	\$4.0 M	7,309 tonnes
2017	53,941 eMWh	\$6.0 M	5,799 tonnes

Note that the Energy Intensity (Normalized) has been adjusted for weather.

Year	Energy Intensity (Normalized)	SqFt of Space	GHG Emissions (eCO ₂)
2011	28.58 BTU / HDD / SqFt	1,646,758.2	7,309 tonnes
2017	26.16 BTU / HDD / SqFt	1,777,066.3	5,799 tonnes

Please see Appendix A for the detailed 2017 Energy Consumption and GHG report for City of Kingston facilities.

The City of Kingston is proud to have reduced our Facilities GHG emissions by 21% between 2011 and 2017 through careful planning and execution of projects supported by a strong management team and with recognition and appreciation of the Province's investment in the removal of coal fired electricity generation.

Municipal Green Building Policy

The City of Kingston's Municipal Green Building Policy provides for the design and construction of municipally owned or funded new building and major renovation projects to proceed in a fashion that ensures environmental, economic and social factors are taken into consideration.

This policy introduces the concept that a project may identify an alternate strategy to achieve carbon/GHG emission reductions and energy efficiencies in a more progressive fashion than may result from application of the LEED certification program, and allows for the flexibility for this to be pursued. This would be determined through a comprehensive analysis, and if deemed to substantiate the greater reductions in carbon and energy consumption, it will be implemented and presented in an information report to council. The goal is to minimize energy costs; waste and greenhouse gas emissions, to protect indoor air quality, optimize occupant comfort and seek net-zero performance where practical.

This policy is reviewed every 2 years to ensure the City of Kingston is continuing its efforts to reduce GHG emissions in an environmentally responsible fashion and is using all available technologies and resources.

All new facilities are being designed to have ample southern exposure and adequate roof space and capacity for solar PV, as well as capacity in the electrical system. They are also evaluated for financial and environmental feasibility of Geothermal and Solar Thermal systems.

Please see Appendix B for the detailed list of City of Kingston existing and future LEED or LEED Equivalent facilities.

Renewable Energy

Existing Rooftop Solar PV Projects

The City of Kingston owns 11 Solar Photovoltaic systems which include 2 (Feed In Tariff) FIT projects and 9 MicroFIT projects with a total installed capacity of 380 kW.

FIT and MicroFIT describes the system in place where the renewable energy is generated and supplied to the electricity grid for 20 years at a fixed price paid to the City of Kingston. We are approximately 6 years into our contracts.

Please see Appendix C for the location, energy output, and revenue for these projects.

Planned Rooftop Solar PV Projects

The City of Kingston has planned 5 additional solar Net Metering installations on City facilities over the next 5 years.

This includes 120 kW on the Kingston Police headquarters, 300 kW on the New Kingston Fleet Maintenance Garage, 200 kW on the New Kingston East Community Center, 155 kW on the New Kingston Fire and Rescue Maintenance Center and 40 kW on the New Elliot and Division Fire Hall. The City expects to save \$120,000 in utility costs and offset 65 tonnes of GHG emissions through these new solar systems.

Net metering describes the system in place where the renewable energy generated is used directly on site by the facility, and any excess generation is credited on the utility bill. This system is a cost avoidance framework as opposed to an income generating method.

Solar Thermal

The outdoor pool at the Memorial Centre and the indoor pool at Artillery Park Aquatic Centre use rooftop solar thermal glycol panels to help heat water for the pools and showers. The domestic hot water at Rideau Heights Community Center is heated by solar thermal panels as well. This technology is explored for all new construction projects where applicable.

Ground Source Energy

The terminal building at Norman Rogers Airport uses ground-source heat pumps to supplement the heating and cooling systems.

The future Kingston East Community Center is intending to use ground-source heat pumps for the heating and cooling systems.

Monitoring and Tracking

Monitoring and tracking energy consumption in over sixty buildings has been a challenging and time-consuming task. With the implementation of a powerful Computerized Maintenance Management System and Energy and Sustainability Module the City is able to analyze and verify our data much more effectively.

Monitoring and verification of building systems, energy consumption and demand is an ongoing responsibility of the Facilities Management and Construction Services department.

Building Automation Systems (BAS)

The City of Kingston is continuously optimizing the corporate Building Automation Systems in facilities in order to achieve optimum occupant comfort and ensure maximum energy efficiency. The City currently has 22 Facilities with BAS systems with 4 more facilities coming online by 2024. All of these facilities are monitored and controlled in one central dashboard.

2019 to 2024 Planned or In Progress initiatives

- The first priorities will include boiler replacements, ventilation control, heat recovery and retro-commissioning of facilities by 2022.
- Additional initiatives include, BAS upgrades, VFD's on major equipment, scheduling changes and operational efficiency, LED retrofits, Chiller replacements, window film and solar shading to reduce cooling loads and Geothermal feasibility studies.
- Building a library of energy models using RETScreen Expert to further validate Re-commissioning and energy retrofit projects. We have staff that are trained in this software.
- Connecting the electrical, natural gas and water meters for each building to an analytical software will provide facility managers with the information they need to optimize the systems to reduce energy demand and consumption.
- Implemented a HVAC system service agreement for semi-annual preventative maintenance of all systems. This is expected to improve energy efficiency, equipment performance and occupant comfort.

- Implemented a BAS system service agreement for preventative maintenance of all associated systems in 22 sites. This is expected to improve energy efficiency, system reliability and increase uptime.
- Comprehensive energy audits in collaboration with St Lawrence College Students at City Hall and the Pump house steam museum. More Facilities will be included every year and a part of this partnership.
- Retro-commissioning at 701 and 705 division. Implemented multiple recommendations at 701 division as per above, complete in 2019. An additional 21 sites have been recommended for retro-commissioning over the next 7 years based on energy consumption.
- Please see Appendix D for list of planned initiatives for facilities and timelines.

Major Renovation and New Construction Projects

Kingston Central Library Renovation

The central library in downtown Kingston was in need of a major renovation and was completed early 2019. This building is targeting LEED silver, is using high efficiency building materials, LED lighting, heat pumps, occupancy scheduling for the HVAC system, an integrated BAS system and has a Solar MicroFIT installation.

Kingston Airport Expansion

The Kingston Airport is being expanded and as a part of the runway expansion and is targeting LEED Silver by retrofitting the building with high efficiency heating and cooling systems, an integrated building automation system, LED lighting and has a Solar MicroFIT installation. This facility will be completed by 2019.

Kingston Fleet Maintenance Garage

The City's aging fleet maintenance garage will be replaced with a new facility within the next 2 years. The new facility is being designed to target a high level of energy efficiency with LED lighting, Integrated BAS system and is being built with capacity for a 300 kW solar Net Metered system installed on its roof. This facility will be completed by 2021.

Kingston East Community Center

The Kingston East Community Center is currently in the design process and is aiming to be Net Zero Carbon, with 100 kW of solar PV on its roof space, 80kW of solar PV on its carports, high efficiency windows and glazing, LED lighting, a ground source geothermal system, high efficiency heat pumps and an integrated Building Automation System. This facility will be completed by 2021.

Kingston Area Recycling Center

Kingston Area Recycling Center will be undergoing a major upgrade of its mechanical waste sorting systems to convert from a 4 stream to a dual stream processing to provide more efficient operations. This renovation will ensure the current and future waste disposal needs of the community are met. Energy efficiency is being made a priority for all aspects this renovation. This project will be completed by July 2021.

Kingston Transit Expansion

The Kingston transit campus will be undergoing a large expansion of its administration building, maintenance garage and storage building. The expanded facilities will be designed to target the highest level of energy efficiency with LED lighting, Integrated BAS system and the capacity to expand the existing rooftop solar system. The integration of additional electrical supply and infrastructure to support the electrification of transit and fleet vehicles will be included. This project is anticipated to begin construction in 2021.

Kingston Fire and Rescue Maintenance Center

This facility is in the early planning phase is expected to use high efficiency mechanical equipment, LED lighting, a net metered solar system and an integrated BAS system.

Elliot and Division Street Fire Hall

This facility is in the early planning phase is expected to use high efficiency mechanical equipment, LED lighting, a net metered solar system and an integrated BAS system.

Asset Rationalization Process

Demolishing, selling or repurposing surplus buildings reduces the overall floor area to be serviced by the City resulting in energy and operating cost savings. The City of Kingston is planning demolishing or repurposing facilities over the next few years.

Other Initiatives

LED Lighting Conversion

The City of Kingston continues to convert facilities interior and exterior lighting to LED in City facilities as assets are reaching end of life or during renovation projects.

The City of Kingston's will be phasing out all T8 fixtures in our Facilities as assets reach their end of serviceable life and will be replaced with LED's.

The City of Kingston has also begun a pilot with exterior solar powered pole lights to determine their feasibility in Canadian weather and usable service life.

Window Coverings

Films, window coatings and solar shading can be an effective way to reduce unwanted solar heat gain and improve occupant comfort. Several new construction projects have utilized windows that will reduce solar heat gain while allowing for natural light to illuminate spaces.

Passive solar is evaluated where possible in new construction projects, but has proved to be difficult to implement in heritage buildings.

Electric Vehicle (EV) Charging Stations

The City of Kingston has installed 48 level 2 EV charging stations at 22 locations for public use in the City and plans on installing 2 more level 3 fast charging stations this year.

The City of Kingston's vehicle Fleet uses 7 level 2 Charging stations for City of Kingston vehicles with plans on installing up to 18 more over the next year.

Electrifying the City's Fleet

The City of Kingston aims to incrementally electrify the corporate vehicle fleet, along with public transportation, expecting to have 13% of transit's fleet electric by 2022 and to have a fully electric public transit fleet by 2033.

Through adherence to the City 's Electric Vehicle Strategy 8 light duty fleet vehicles, 3 ice resurfacers and 2 City buses will be replaced with EV units by 2022 as these assets reach end of working life. The 2 electric Buses are expected to reduce community GHG emissions by 210 Tonnes per year. The City is also undertaking a feasibility analysis of electrical charging capacity to potentially support a desire for ordering 10 additional EV buses by 2022.

The installation of power supply and charging infrastructure to support fleet electrification is being incorporated into the design and construction of all municipal facilities where warranted.

This plan was endorsed by the City of Kingston's Corporate Management Team on June 21st, 2019.

Appendix A - 2017 Energy Consumption and GHG Report

Operation Name	Address	Total Floor Area (m2)	Electricity (kWh)	Natural Gas (m3)	Fuel Oil 1 & 2 (liter)	Propane (liter)	GHG Emissions (Kg)	Energy Intensity (ekWh/sq ft)
1211 John Counter Blvd. & 85, 91 95 Lappan's Lane (Campus)	1211 John Counter Blvd.	8,702.00	1,847,222.50000	124,014.95000			266,419.26768	33.79211
362 Montreal Street	362 Montreal St.	3,438.00	534,661.31000	60,550.06000			123,726.14963	31.83708
Artillery Park Aquatic & Fitness Centre	382 Bagot St.	2,427.00	1,098,654.04000	85,926.56000			181,459.59194	77.01197
Belle Park Fairways Clubhouse	731 Montreal St.	366.00	122,597.14000		3,102.00000		10,605.13924	39.60557
British Whig Building	310 King St. East	2,620.00	383,084.53000	26,027.38000			55,834.66357	23.39233
Catarauqui Community Centre	1030 Sunnyside Road	8,826.00	1,187,538.40000	68,475.75000			150,004.14104	20.16039
Centre 70	100 Days Road	2,705.00	464,312.80000	25,964.18000			57,120.26256	25.42397
City Greenhouse	99 Norman Rogers Drive	764.00	23,589.49000	38,587.45000			73,362.52583	52.73684
City Hall	216 Ontario Street	4,408.00	805,854.53000	54,754.58000			117,460.15898	29.24872
Cooks Brothers Youth Centre	692 Bagot St./421 Montreal St.	2,474.00	152,440.68000	9,509.52000			20,615.87415	9.51958
Creekford Equipment Storage Building	2709 Creekford Road.	7,336.00	24,736.40000	21,065.00000			40,253.94800	3.14840
Creekford Garage and Workshop	2711 Creekford Road	1,009.00	12,183.00000	37,406.00000			70,931.53510	37.72521
Fire Station #10	127 Days Rd.	1,133.00	48,802.18000	8,888.55000			17,649.11273	11.74757
Fire Station #1	1648 Joyceville Rd.	456.00	55,317.85000		16,547.00000		46,215.51450	47.60417
Fire Station #2	3505 Brewers Mills Rd.	268.00	22,590.95000		4,473.00000		12,625.13104	24.54301
Fire Station #3	211 Gore Rd.	824.00	34,074.50000	18,923.47000			36,366.64402	26.51669
Fire Station #4	271 Brock St.	2,301.00	138,703.90000	28,482.22000			56,248.55421	17.82181
Fire Station #5	170 Railway St.	729.00	29,284.58000	9,193.40000			17,887.85493	16.18347
Fire Station #6	262 Palace Rd.	455.00	35,664.85000	13,835.10000			26,773.94418	37.30437
Fire Station #7	905 Woodbine Road	1,848.00	177,320.45000	25,929.14000			52,089.62131	22.76775
Fire Station #8	1485 Unity Rd.	754.00	38,978.98000	14,313.07000			27,734.93499	23.54550
Fire Station #9	2835 Hwy 38	613.00	66,020.28000			17,815.90000	28,596.03565	28.98876
Forestry Garage	1643 Hwy. 15	802.00	23,174.93000	15,332.30000			29,388.54029	21.56035
Frontenac County Court House	21 Court St.	2,424.00	248,839.95000	52,911.64000			104,340.60865	31.08928
Frontenac County Land Registry Office	1 Court St.	523.00	3,422.42000				59.20102	0.60794
Gaoler's Residence	150 West St.	455.00	1,702.02000	8,486.35000			16,073.96398	18.76295
Grand Theatre	218 Princess St.	2,601.00	470,721.35000	22,838.82000			51,322.22765	25.48304
Harold Harvey Centre	42 Church Street	2,165.00	72,174.61000	30,459.03000			58,835.14092	16.98801
INVISTA Centre	1350 Gardiners Rd.	16,723.00	4,696,131.90000	357,249.43000			756,659.10770	47.18148
JK Tett Centre	370 King St. West (JK Tett Centre)	3,696.00	233,867.73000	80,003.82000			155,302.82619	27.25080
KFPL - Calvin Park Branch	88 Wright St.	1,021.00	137,027.06000	15,800.27000			32,242.71115	27.74795
KFPL - Central Branch	130 Johnson St.	5,577.00	77,210.87000	3,713.00000			8,355.49168	1.94355
KFPL - Isabel Turner Branch	935 Gardiners Rd.	3,013.00	463,602.87000	29,434.07000			63,668.24991	23.94022
KFPL - Pittsburgh Branch	80 Gore Rd	622.00	75,364.45000	8,021.01000			16,468.39233	23.98898

Kingston (Norman Rogers) Airport Operations Garage	1095 Len Birchall Way	510.00	364,680.00000	20,729.00000			45,499.04172	106.56214
Kingston (Norman Rogers) Airport Passenger Terminal	1114 Len Birchall Way	1,360.00	17,170.00000	20,048.00000			38,200.29676	15.72764
Kingston Area Recycling Centre	196 Lappans Lane	2,676.00	519,824.20000	99,023.43000			196,208.28940	54.58305
Kingston Fire & Rescue Headquarters	500 O'Connor Dr.	1,455.00	390,745.09000	50,674.42000			102,565.53523	59.33670
Kingston Fire & Rescue Unity Road Storage Building	2117 Unity Road	491.00	1,604.99000	5,316.61000			10,079.48953	10.99486
Kingston Memorial Centre (& Pool Building)	303 York St.	5,714.00	1,057,801.85000	170,476.23000			340,604.81970	46.65612
Kingston Police Headquarters	705 Division street	11,282.00	2,132,665.06000	140,098.48000			301,764.80915	29.82251
Kingston Police Storage	717 Division St.	446.00		3,694.61000			6,985.12942	8.17911
Kingston Transit Maintenance Centre, Office Building and Bus Storage G	1181 John Counter Blvd.	2,631.00	726,629.07000	164,762.00000			324,072.71543	87.48923
MacLachlan Woodworking Museum	2993 Hwy 2 @ Grasscreek Pk	113.00	125,204.00000		579.20000		3,749.98115	108.06879
Portsmouth Olympic Harbour	53 Yonge Street	5,987.00	880,469.11000	90,275.07000			185,906.83943	28.55045
Portsmouth Town Hall	623 King St.	186.00	8,933.13000	3,500.79000			6,773.21338	23.04531
Public Works Administration Office (Friendship)	141 Railway St.	334.00	56,617.00000	105,473.00000			200,389.46244	327.54163
Public Works Office Building and Fleet Maintenance Garage	701 Division Street	3,035.00	475,916.00000	41,961.95000			87,566.79061	28.21919
Pump House Steam Museum	23 Ontario St.	697.00	73,599.86000	17,228.29000			33,845.40062	34.21527
Rideaucrest Home	175 Rideau St.	10,577.00	3,355,039.00000	248,712.04000			528,257.16267	52.68598
Rodden Park Barn	111 Norman Rogers Drive	820.00	23,441.00000	4,171.48000			8,292.19514	7.67861
Rodden Park House	87 and 89 Norman Rogers Drive	309.00	1,012.00000				17.50558	0.30426
Rogers K-Rock Centre	1 Barrack Street	15,445.00	2,546,169.54000	246,952.94000			510,939.53680	31.10239
Utilities Kingston Office Building (Electricity included in 1211 JCB Campu	85 Lappan's Lane	2,304.00		44,759.00000			84,622.57389	19.18095

Appendix B – City of Kingston Facilities achieved LEED or Greater

Existing

- Utilities Kingston Office Building (Achieved LEED Silver)
- Artillery Park Recreation Centre (targeting LEED Silver)
- Transit Facility Expansion (LEED Certified)
- Public Works Operations Centre (targeting LEED Gold)
- Ravensview Administration Building (LEED Certified)
- INVISTA Centre (LEED Gold)
- Rogers K-Rock Centre (LEED Silver)
- Calvin Park Library (LEED Gold)
- Kingston Police Headquarters (LEED Gold)
- Rideau Heights community Center (Targeting LEED Silver)
- Kingston Central Public Library (Targeting LEED Silver)

Future

- Fleet maintenance garage (Targeting LEED Silver)
- Kingston East Community center (Targeting Net-Zero Carbon)
- Kingston Fire and Rescue Maintenance Center (Targeting Net-Zero Carbon)
- Transit Garage repurposing and expansion (Targeting LEED Silver)
- Elliot and Division Street Fire Hall (Targeting LEED Silver)
- Kingston Transit Expansion (Targeting LEED Silver)

Appendix D – 7 1/2 Year Energy and Asset Management Plan

	2020	2021	2022	2023	2024	2025	2026	Total
Cumulative GHG Reductions - Retrofits	2.1%	4.1%	6.2%	8.3%	10.3%	12.4%	14.4%	14.4%
Cumulative GHG Reductions - RCx	0.7%	1.5%	2.2%	2.9%	3.6%	4.4%	5.1%	5.1%
Cumulative GHG Reductions (Tonnes)	140	281	421	561	702	842	982	982
Cumulative Reduction from 2018 Baseline	2.8%	5.6%	8.4%	11.2%	13.9%	16.7%	19.5%	19.5%
Total Program Cost Per year	\$ 1,300,000.00	\$ 1,300,000.00	\$ 1,300,000.00	\$ 1,300,000.00	\$ 1,300,000.00	\$ 1,300,000.00	\$ 1,300,000.00	\$ 7,800,000.00

The Energy and Asset Management Plan is an internal program created by FMCS to reduce the corporate facilities energy consumption over a 7 ½ year period. This plan holistically includes the top 21 energy consuming facilities and follows industry best energy management practices. We will use this plan to achieve our current councils strategic priority, this ECDM plan goals and our departmental KPI of reducing Facilities Energy Intensity.

By using this 7 ½ year Energy and Asset Management plan, the City of Kingston has strategically planned how to reduce our corporate facilities carbon footprint by 400 tonnes by 2022, 700 tonnes by 2024 and 900 tonnes by 2026. With Council supporting this Energy and Asset Management Plan, we have vertical support throughout the corporation to enact positive change.

By 2026 we aim to have created \$500,000 in sustainable operational savings through the centralization of all utility budgets, ensuring that all operational savings will be reinvested into proactive/planned maintenance, operational efficiencies and further energy retrofits, increasing the impact of the program.

This Energy and Asset management plan compliments the Energy Conservation and Demand Management plan, and is in line with this council's strategic priorities.

Appendix E – 2014 Conservation and Demand Management plan completed initiatives

INVISTA Centre

- Retrofit 32-watt T8 lamps and standard ballasts to 28-watt T8 and high efficiency electronic ballasts. [In progress](#)
- Replace existing metal halide fixtures in the parking lot and wall-mounted fixtures with new LED fixtures. [Complete](#)
- Replace the high intensity discharge metal halide fixtures over the ice pads with fluorescent T5HO fixtures. [Complete](#)
- Upgrade the ice plant controls to a CIMCO 6000E, including floating head pressure controls. [Complete](#)
- Implement a time-of-day schedule on heat recovery ventilator (HRV-1) to match HRV-2. [Complete](#)
- Re-commission the controls system to optimize operating sequences. [Complete](#)

Rogers K-Rock Centre

- Retrofit 32W T8 lamps and standard ballasts to 28W T8 and high efficiency electronic ballasts. [In progress](#)
- Retrofit existing exterior lighting with LED lamps. [In progress](#)
- Upgrade the ice plant controls system including floating head pressure controls to improve energy efficiency. [In progress](#)
- Implement a time-of-day schedule on all air handling units to reduce equipment operation. [Complete](#)
- Re-commission the building automation controls system to optimize operating sequences. [Complete](#)
- Seal windows, caulk or foam roof-wall intersection and seal penetrations through the building shell to reduce air leakage. Weather-strip interior doors to ice surface and heated change rooms. [Complete](#)

Kingston Police Headquarters

- Retrofitting compact fluorescent lights with LED's in common areas. [In progress](#)
- Retrofitting exterior lights with LED's. [Complete](#)
- Retrofitting 32W lamps with 25W high performance lamps in corridors. [In progress](#)
- Installing task light occupancy controls. [Complete](#)

Cataraqi Community Centre

- Floating head pressure upgrade to the ice plant controls; 2017 update. [Complete](#)
- Modifications to improve the efficiency of the dehumidification unit. [Complete](#)
- Parking lot lighting LED conversion. [Complete](#)
- Replacing the aging electric hot water system for the lobbies with a boiler. [Complete](#)

Grand Theatre

- Install LED lamps or new LED fixtures to replace compact fluorescent and incandescent sources. 2017 update. [Pending](#)
- Replace existing incandescent lighting under the marquee with LED lamps. 2017 update. [Pending](#)
- Implement a time-of-day schedule on all air handling units to reduce equipment operation. [Complete](#)

British Whig Building

- BAS system integrated into buildings HVAC and Mechanical systems. [Complete](#)

Monitoring and Tracking

- Optimizing building automation systems to enhance occupant comfort while reducing energy consumption and demand. [Complete](#)
- Establishing energy monitoring, tracking and reporting processes. [Complete](#)
- Establishing preventive maintenance programs for HVAC systems. [Complete](#)
- Conducting technical analyses of building equipment. [In Progress](#)
- Creating monthly building performance reports for the larger facilities. [Complete](#)
- Verifying utility bills for the larger facilities. [Complete](#)
- Identifying energy retrofit and re-commissioning opportunities. [Ongoing](#)
- Implementing energy retrofits and re-commissioning. [Ongoing](#)

- Monitoring and maintaining the rooftop solar PV systems. [Complete](#)
- Producing annual energy and greenhouse gas emissions reports. [Complete](#)
- Using energy management software to monitor and track energy consumption and demand, verify utility bills and track savings from re-commissioning efforts and energy retrofit projects. [Ongoing](#)