City of Hamilton

2014 Annual Energy Report

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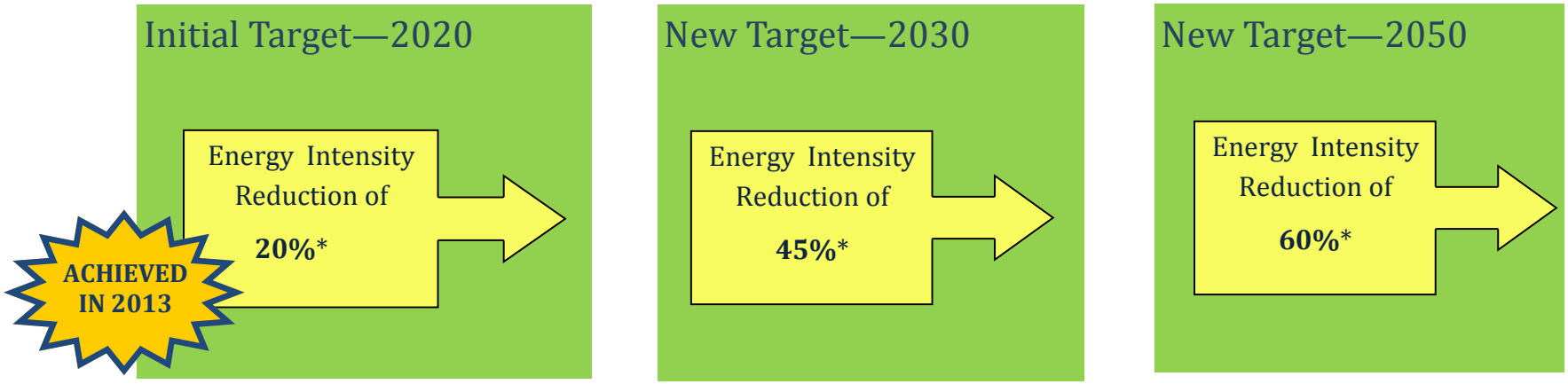
Introduction

The City of Hamilton continues to be a municipal leader in energy conservation and demand management and renewable energy generation. The City's energy program plays an important role in mitigating against rising energy costs, reducing energy consumption, generating renewable energy and reducing the City's environmental footprint.

In 2014, Hamilton City Council approved the City's "New" Corporate Energy Policy (CEP). The City's Corporate Energy Policy is integral to the success of meeting the environmental emission targets adopted by Council through the Board of Health (BOH) Climate Change Actions 2012 Report (BOH13024). The BOH report calls for an 80% reduction in Greenhouse Gas (GHG) emissions by 2050. This result can be achieved through a combination of energy conservation and demand management, renewable energy supply and through the purchase of environmental offsets.

The City's new energy reduction targets for the years 2030 and 2050 are outlined below.



The City's new energy policy calls for new corporate energy intensity reduction targets of 45% by 2030 and 60% by 2050. Achieving the proposed 2030 targets alone is anticipated to deliver an additional $50 million in revenue, direct energy savings and avoided costs. Meeting these targets will put Hamilton on track to become a net zero carbon municipality.

The City of Hamilton's Corporate Energy Policy is designed to:

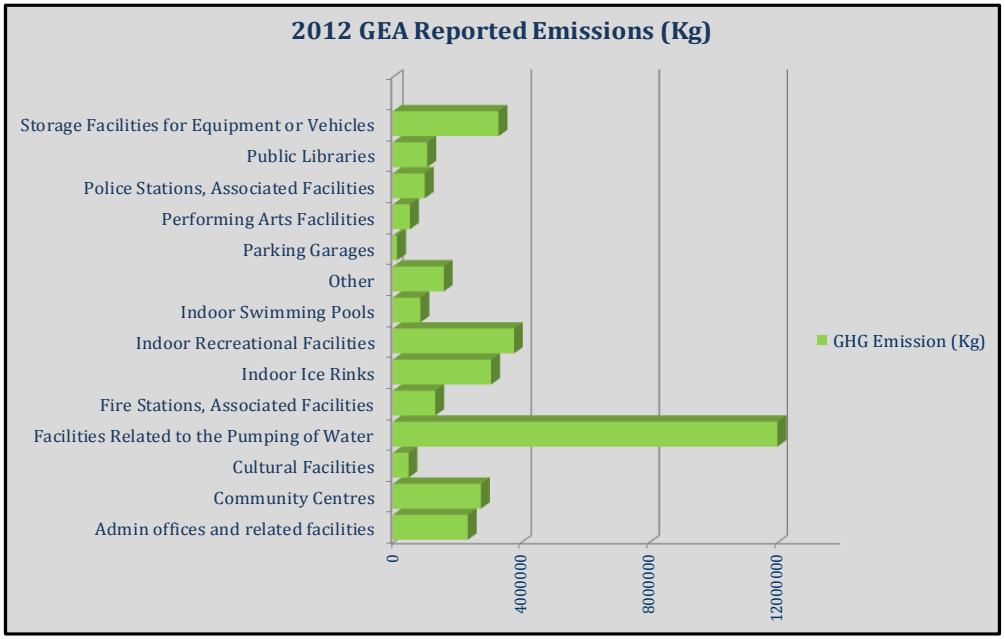
- Facilitate the achievement of City-wide energy and emission reduction targets;
- Address legislated reporting requirements e.g. Green Energy Act;
- Define policies for capital investment related to energy;
- Define policies related to energy procurement;
- Address regulations concerning greenhouse gases (GHG) emissions.

For further information on the City of Hamilton's Corporate Energy Policy please visit: Hamilton.ca/Energy

In 2014, the City re-established its Corporate Energy Steering Committee's within Hamilton Water and City's Facilities Divisions. Energy committees play a pivotal role in providing a vehicle for key staff to work together in meeting targets through the development of energy plans from each of their areas. The new CEP also introduced new efficiency targets for the City's Corporate Average Fuel Economy (CAFE). The reduction in CAFE will be achieved through new technology, a review of fit for purpose fleet vehicles and driver training.

2014 was the second year for reporting of the City's energy use as required by the Provincial Green Energy Act (GEA). Data submitted was for the 2012 calendar year. In addition to the energy use, the City also submitted it's Energy Plan as mandated. According to the GEA's reporting formula, the City-owned corporate facilities are responsible for emitting 34,297 tonnes of Carbon Dioxide equivalent (CO_2e) which is comparable to having 7,220 cars on the road each day.

This graph was part of the GEA submission in 2014 which indicates GHG emissions across facility types. It is appropriate that the "Facilities related to the pumping of water" category is so high as Hamilton Water consumes nearly 40% of the total energy.

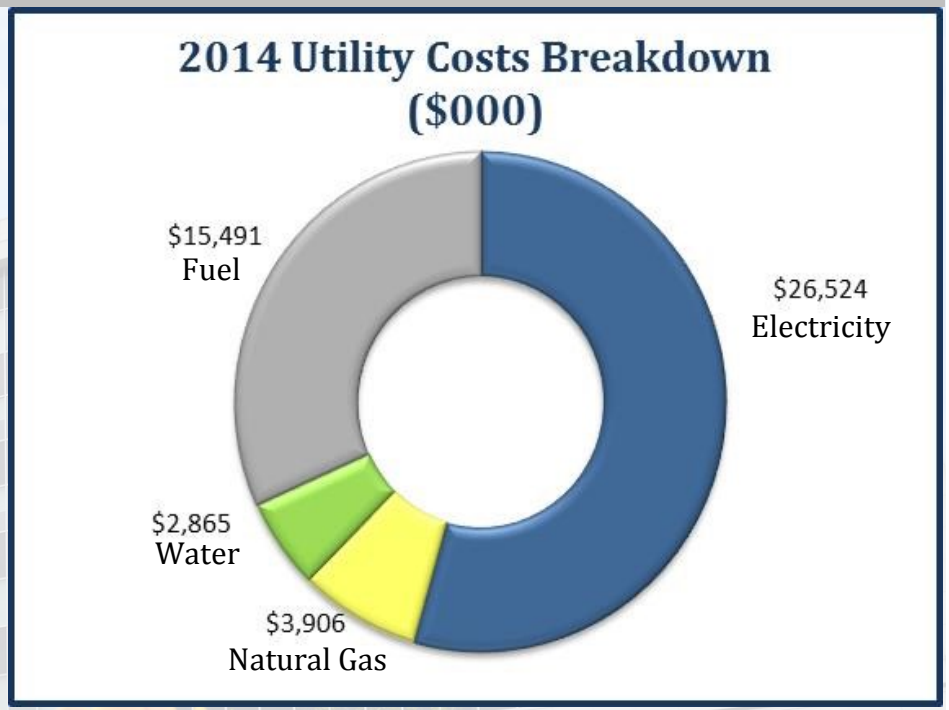


* GHG Emissions– Greenhouse Gas Emissions measured in Kilograms

Executive Summary

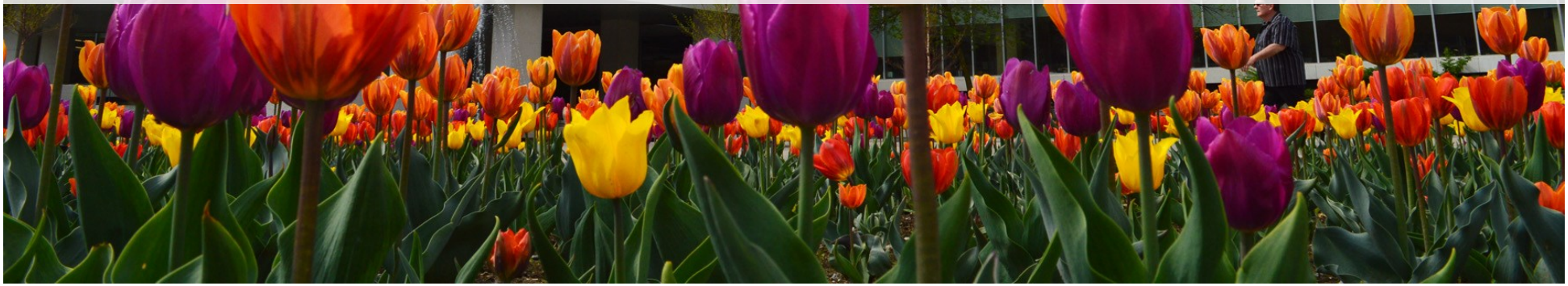
In 2014, the City of Hamilton spent $48.8 million for electricity, natural gas, water and fuel. This reflects an overall year over year cost increase of 7%. Included in these costs are Hamilton Water , Operations, Street and Traffic Lighting, Fleet, Transit and all City-owned facilities and properties.

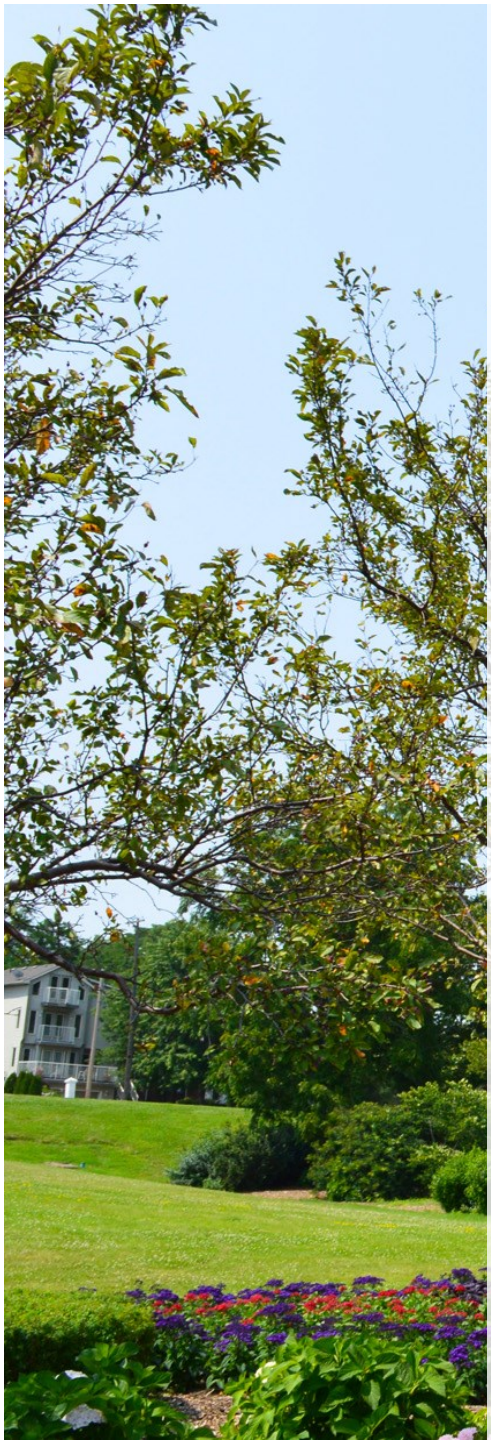
A winter 22% colder than 2013 (measured by heating degree days) along with severe winter weather conditions attributed to an increase in overall energy consumption of 8% for electricity and natural gas and an increased fuel consumption of 4% .



*Utility cost and consumption data estimated for December and is not weather corrected.

* Fuel information in this report does not include Police, GO Transit and DARTS



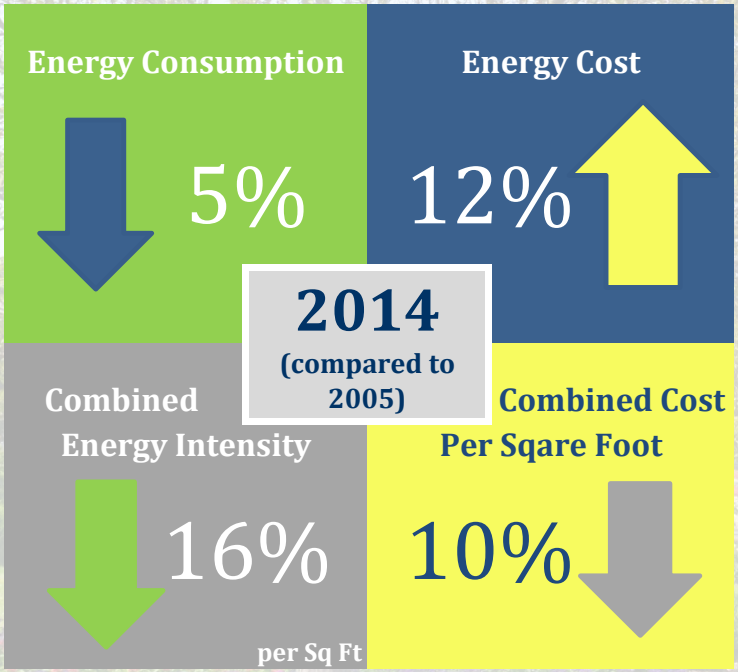


In 2014, the City of Hamilton introduced a revised Corporate Energy Policy that is being used as the frame work for energy management plans in the effort to control or mitigate energy costs, reduce overall energy intensity and reduce Greenhouse Gas (GHG) emissions. These energy management plans will also work to reduce overall energy consumption and mitigate energy costs in all City-owned sites and Hamilton Water.

The policy provides guidelines for base building minimum standards that recommend best practice for building temperatures and sustainable building design. The policy also provides guidelines for new construction, major renovations and other activities that will be key contributors to meeting the City's new targets.

The following highlights the results for City owned sites for 2014 vs. 2005 (base year).

Key Performance Indicator Highlights



- 2014 electricity and natural gas consumption is 5% lower than base year;
- 2014 electricity and natural gas costs are 12% higher than base year;
- Energy Intensity decreased 16% (energy consumption per square foot) vs. base year.

Energy Savings and Avoided Costs

Continued efforts to reduce energy consumed by the various City departments and to mitigate and control their associated costs have demonstrated success in the following major categories of energy management activities.

Utility Rates and Cost Avoidance: With a strategic plan for mitigating the financial risk associated with the commodity portion of energy costs in current and future energy markets, the City of Hamilton has benefited from costs that are lower than other municipalities. This procurement strategy assists in the creation and control of various energy budgets and yields and avoidance of some costs that would have been incurred if no action was initiated. The 2014 savings for this category is $2,705,777.

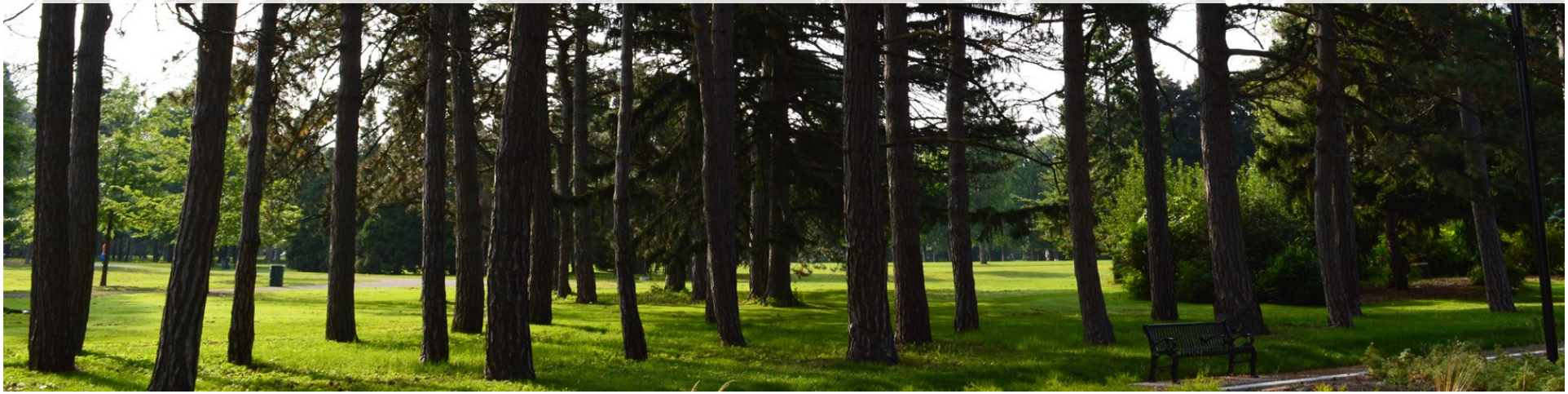
Cost Recovery: The City's continuous efforts to monitor and analyze the more than 2000 City of Hamilton utility accounts has led to recovery of costs stemming from corrections or adjustments made to billing errors, billing anomalies and rate correction analysis. In 2014,this has resulted in $302,615 of cost recovery for the City.

Energy Conservation and Incentives: Implementing energy efficient measures or equipment leads to lower energy consumption which in turn results in energy costs being lower than what they would be by not implementing. Many of these projects that involve capital spending are also eligible for financial incentives from various energy programs delivered by our utility providers Hydro One, Horizon Utilities and Union Gas. 2014's completed projects captured $2,883,862 in savings.

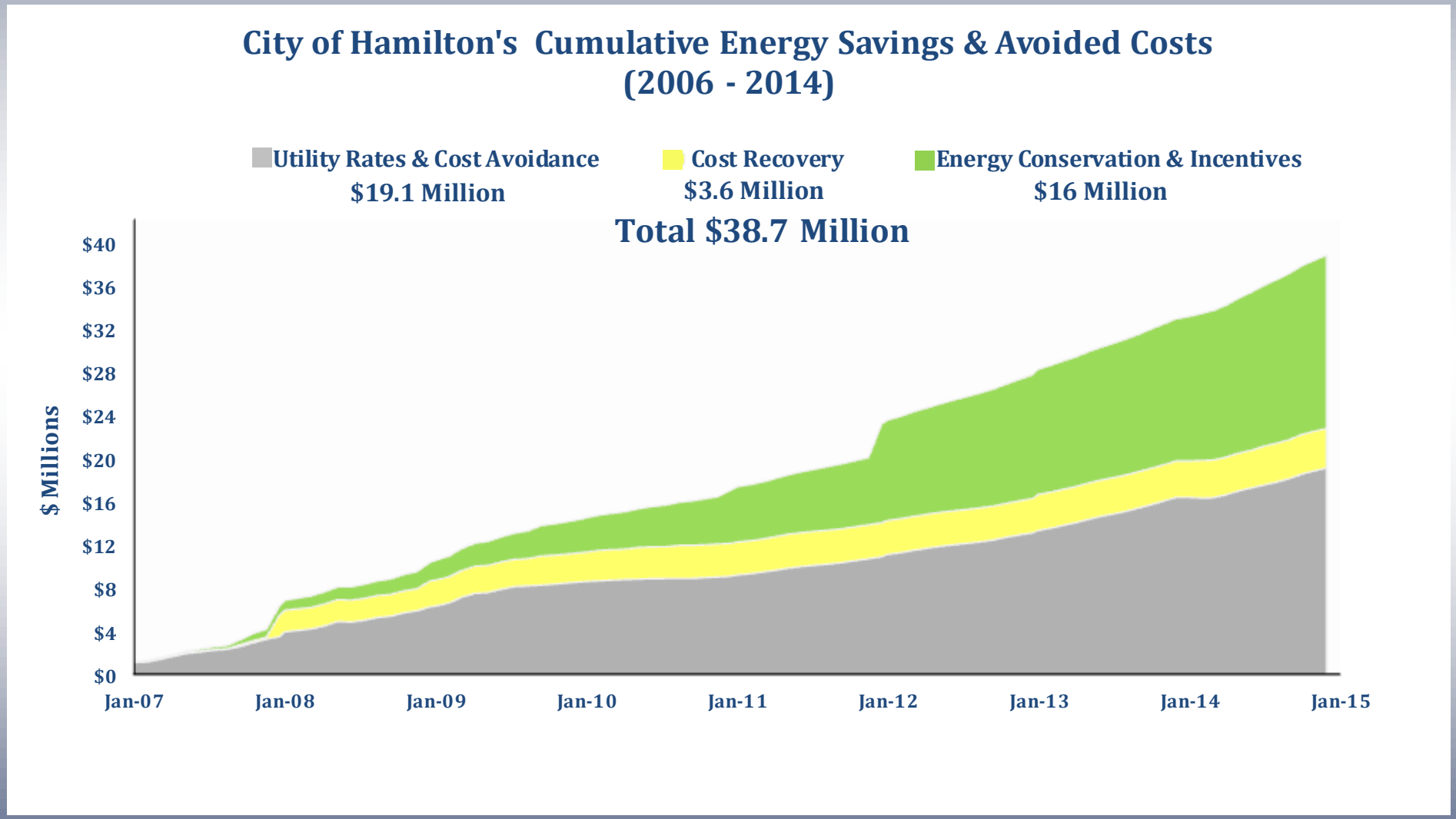
The savings represent the benefit of energy efficient upgrades compared to the City not taking any action.

The total energy savings and avoided costs for 2014 are $5,892,255.

The cumulative total for energy savings and avoided costs from 2005 to the end of 2014 amounts to $38.7 million dollars.



Cumulative Savings and Avoided Costs

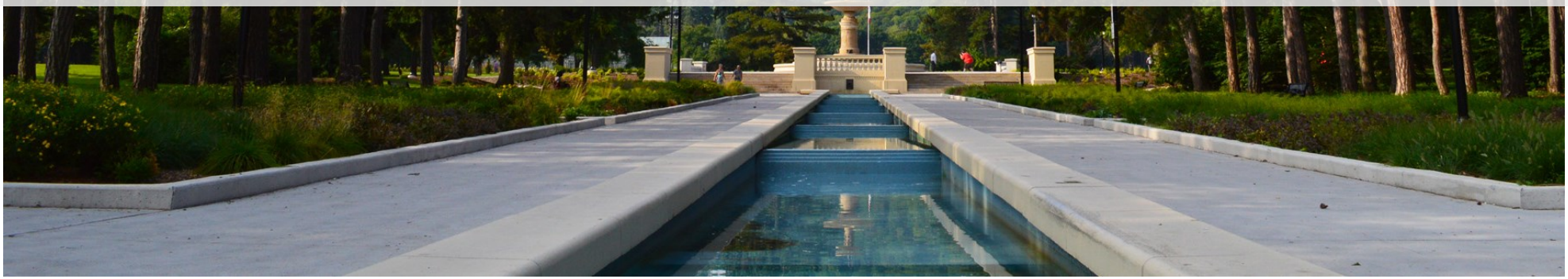


Breakdown of Savings and Avoided Costs

The highlights of the savings and avoided costs achieved in 2014 and the cumulative results over the past 8 years is shown below.

Savings and Cost Avoidance	2014	Cumulative
Utility Rates and Cost Avoidance	$ 2,348,577	$ 13,279,781
Hedging	$ 357,200	$ 5,778,861
Energy Conservation	$ 2,821,665	$ 11,791,344
Incentives	$ 62,197	$ 4,254,943
Cost Recovery	$ 302,615	$ 3,665,482
Total	**$ 5,892,255**	**$ 38,770,410**

Tracking of the savings and avoided costs continues to highlight the efforts made to reduce the City's energy consumption and its impact on energy costs overall.



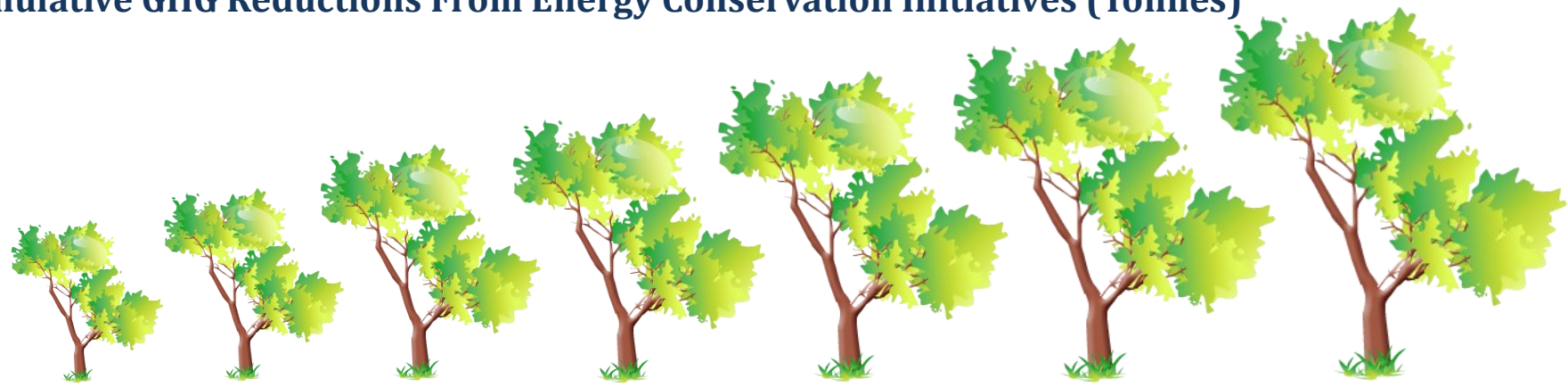
Greenhouse Gas (GHG) Emissions

GHG emissions related to Corporate operations have been inventoried and reported annually since adoption of the Corporate Air Quality and Climate Change Strategic Plan (PED06336(a)) in 2008. The plan established Hamilton's Corporate emission targets at a 10% reduction of 2005 GHG's levels by 2012, followed by a further 20% reduction of 2005 GHG's levels by 2020. The City achieved the 2012 target in 2011, one year ahead of schedule, and the 2020 target in 2012, eight years ahead of schedule.

New GHG emission targets have been established and aligned with the Council approved Corporate Energy Policy (CEP) (PW14050) and the Board of Health Climate Change Actions 2012 report (BOH13024). Both have established an 80% reduction in Greenhouse Gas Emissions by 2050 from a base year of 2005. An interim emission reduction target has been set through the CEP at 50% by 2030. Corporate reporting going forward will monitor progress against these targets.

The resulting cumulative GHG reduction from energy efficiency projects undertaken at City owned sites are indicated below. This is equivalent to 8079 cars being removed from the road.

Cumulative GHG Reductions From Energy Conservation Initiatives (Tonnes)



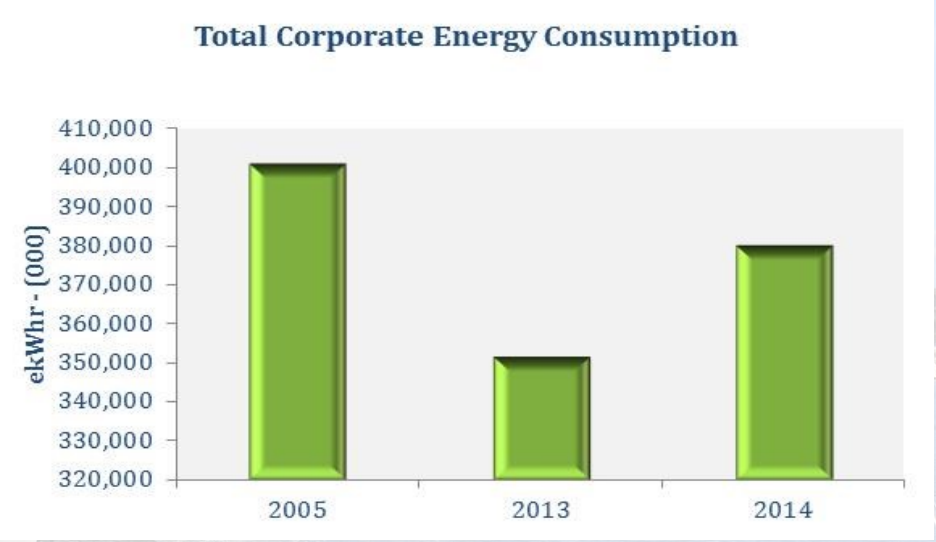
6,970	12,493	18,589	24,685	27,220	33,496	38,377
2008	2009	2010	2011	2012	2013	2014

Energy Performance

Managing and tracking energy requires an in-depth understanding of commodity markets, utility rates and regulatory issues along with regular and thorough analysis. When performing these activities it is important to distinguish between energy consumption , unit energy costs and total energy costs. Focusing on any one of these areas rarely tells the whole story. In the areas of energy consumption, energy costs, and energy intensity levels, we compare the 2014 year to both the base year of 2005 and the previous calendar year.

Energy Consumption

The City's energy consumption data for electricity and natural gas is tracked for all City-owned sites excluding Housing. Overall consumption for the City in 2014, measured in equivalent kilowatt hours (ekWh), was 5% lower than the 2005 base year, and 8% higher when compared to 2013. The large year over year increase is due primarily to an increase in natural gas consumption during the winter of 2014.



Electricity Consumption

Looking at electricity consumption alone for 2014, measured in kWh, was 3% higher than in 2013 and 2% lower than the base year.

Consumption Comparison	2005	2013	2014	Comparisons 2014 vs 2005	Comparisons 2014 vs 2013
Total Electricity (kWh)	236,362,045	225,157,708	231,785,109	-2%	3%

Natural Gas Consumption

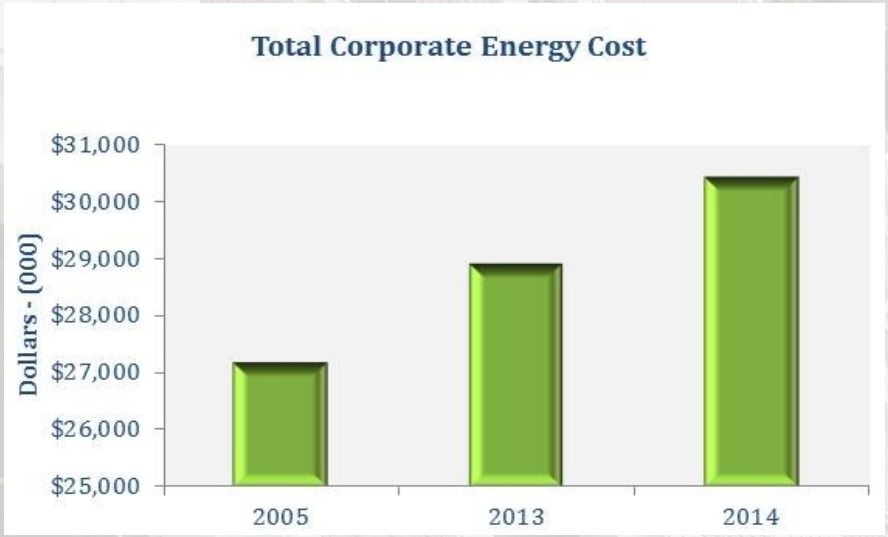
The largest increase in consumption in 2014 was for natural gas. The usage, measured in m^3, increased by 17% over 2013, particularly in the first quarter where the winter was 22% colder than in 2013 (measured in heating degree days). However, compared to the base year, natural gas consumption showed a 8% decrease.

Consumption Comparison	2005	2013	2014	Comparisons 2014 vs 2005	Comparisons 2014 vs 2013
Total Natural Gas (m^3)	15,403,956	12,062,756	14,140,919	-8%	17%

Energy Costs

A large portion of utility costs are regulated by the Ontario Energy Board (OEB). However, when able, the City's energy costs for electricity and natural gas are further managed via hedging programs, conservation programs, rate optimization and bill recovery. This allows the City to mitigate the impacts to energy costs due to regulatory action by the OEB and local distribution companies (Horizon Utilities, Hydro One and Union Gas) when favourable options are available.

The combined energy costs reported are for electricity and natural gas which include both unregulated commodity costs, as well as regulated costs for delivery, transmission, transportation and storage as applicable. The City's energy costs include those from all City-owned sites, excluding Housing. Overall, the total combined energy costs for 2014 were 5% higher than those in 2013 and 12% higher when compared to the 2005 base year.

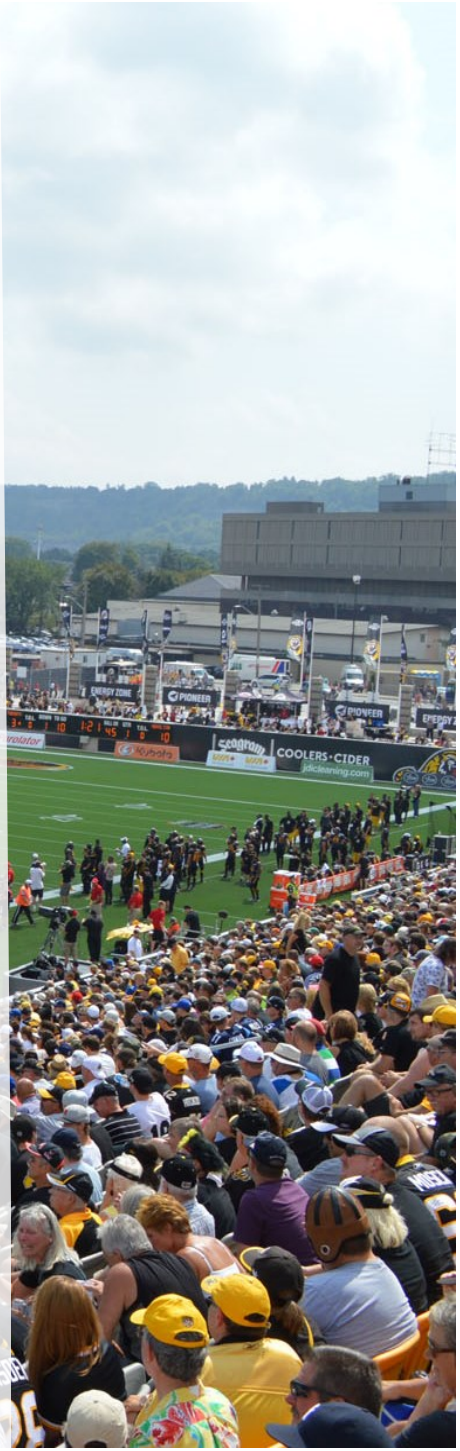


Electricity Costs

The 2014 costs for electricity were 28% higher than in the 2005 base year and 4% higher than 2013.

Cost Comparison	2005	2013	2014	Comparisons 2014 vs 2005	Comparisons 2014 vs 2013
Total Electricity ($)	20,657,050	25,487,156	26,524,222	28%	4%

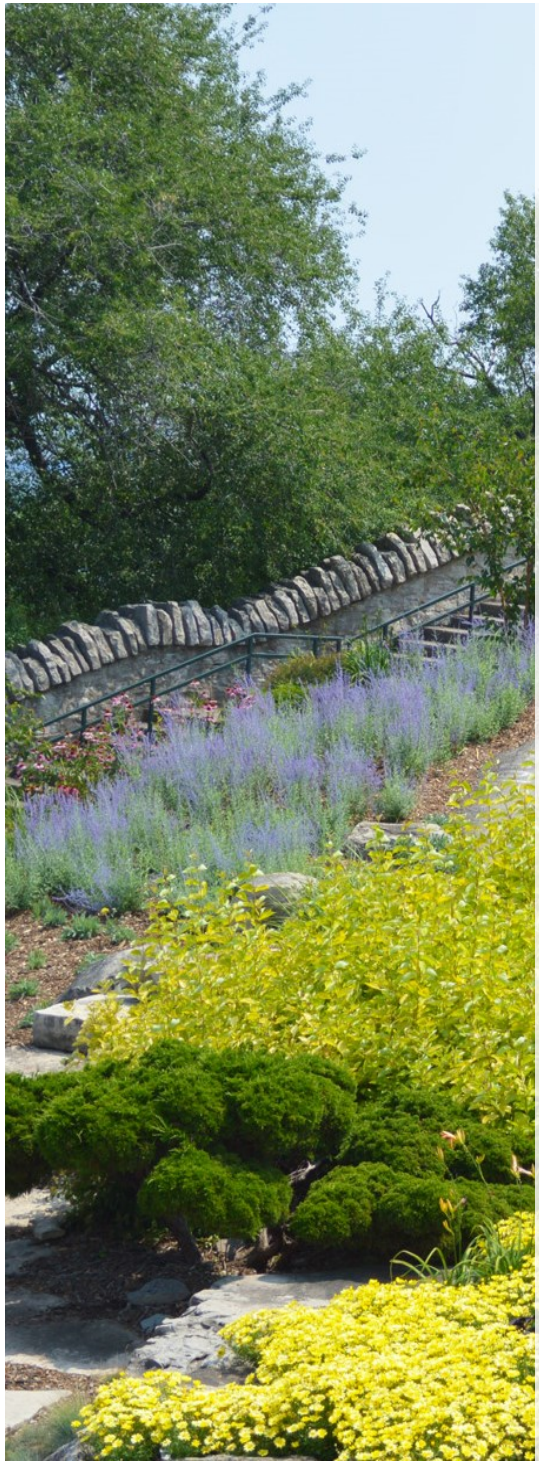
Electricity costs have increased since 2005 in large part due to an increase in the regulated costs, such as transmission and delivery, and particularly the Global Adjustment (GA) charge which is settled monthly to ensure Generator contract obligations are met. As new higher cost generation comes online, GA costs could also increase. However the 2014 increase over 2013 costs are in line with the slight consumption increase year over year.



Natural Gas Costs

In contrast, natural gas costs decreased by 40% compared to 2005, and increased 14% compared to 2013. With natural gas, the City's procurement program has allowed the City to reduce its cost on the unregulated portions, thus reducing costs overall. While costs in 2014 were higher than those in 2013, this was largely weather related and due to an increase in consumption, rather than unit price of natural gas.

Cost Comparison	2005	2013	2014	Comparisons 2014 vs 2005	Comparisons 2014 vs 2013
Total Natural Gas ($)	6,520,253	3,419,210	3,905,673	-40%	14%



Unit Energy Prices

The unit cost of electricity and natural gas here includes both the unregulated costs of the commodity, as well as all the regulated costs associated with an overall utility invoice. For electricity, that includes the Hourly Ontario Energy Price (HOEP), the Global Adjustment (GA), transmission costs and delivery costs. For natural gas, that includes the commodity, transportation costs, storage costs, and delivery costs. Unit prices for electricity have consistently increased year over year, while natural gas has decreased.

The increase in electricity unit price is due in large part to changes in the overall electricity market including changes in the generation mix of Ontario's electricity supply, increases in the Global Adjustment as well as rate-related (transmission and delivery) charges.

Natural Gas on the other hand has decreased mainly due to the City's natural gas procurement program which has enabled the City to hedge the commodity portion when favorable market conditions arise.

Unit Price Comparison	2005	2013	2014	2014 vs 2005	2014 vs 2013
Total Electricity ($/kWh)	$ 0.087	$ 0.113	$ 0.114	31%	1%

Unit Price Comparison	2005	2013	2014	2014 vs 2005	2014 vs 2013
Total Natural Gas ($/$m^3$)	$ 0.423	$ 0.283	$ 0.276	-35%	-3%

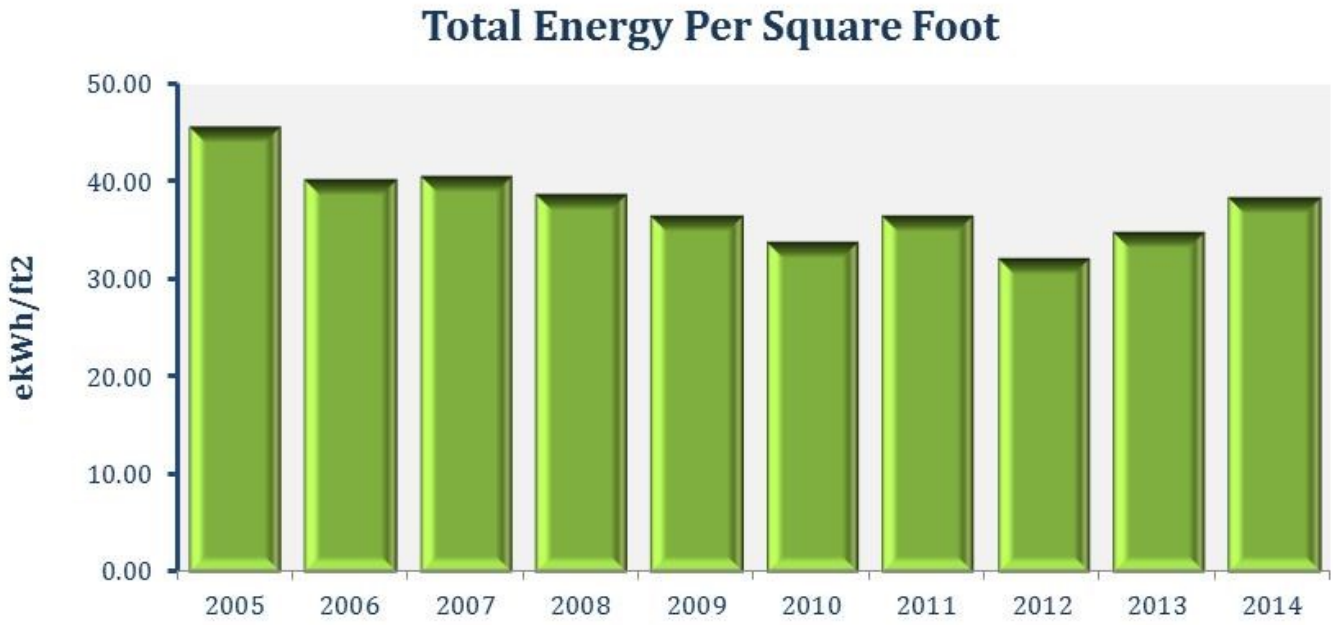
Energy Intensity for City Owned Sites

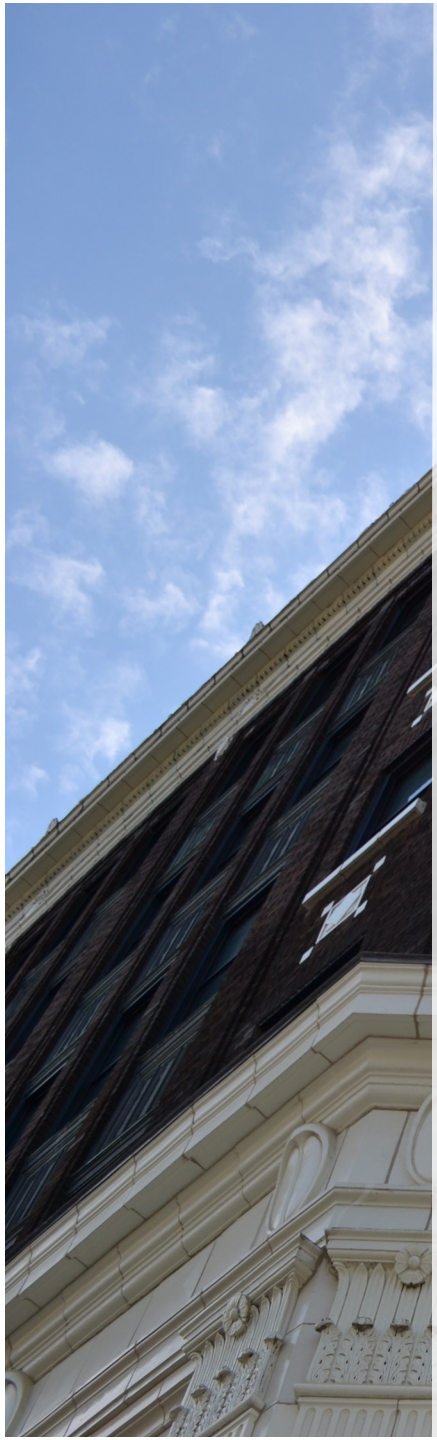
Measurement of the overall energy intensity of a building is calculated annually using total energy per square foot (ekWh/ft²). The data excludes Hamilton Water, Operations and Maintenance, Street Lighting, Traffic Operations and Housing.

Square footage is updated annually to accommodate for changes to individual facility size, as well as changes to department portfolios themselves. This could be due to buying or selling of properties, or restructuring of reporting groups. When major projects are underway, they may not be included in the total square footage numbers. For example, Ivor Wynn Stadium, now Tim Horton's Field has not been included in 2013 or 2014. The City has increased its square footage by 2% from 5,138,852 ft² in the 2005 base year to 5,247,455 ft² in 2014.

When comparing the 2014 energy intensity to 2005 base year the results show:

- Electricity consumed per square foot was lower by 8%;
- Natural Gas consumed per square foot was lower by 19%;
- Combined Energy intensity per square foot was lower by 16%.





Comparing the 2014 energy intensity to 2013:

- Electricity consumed per square foot saw no change;
- Natural Gas consumed per square foot was higher by 18%;
- Combined Energy intensity per square foot was higher by 10%.

Total Cost per Square Foot ($/ft²)

Measurement of the overall energy cost per square foot of a building is also calculated annually.

				Comparisons	
	2005	2013	2014	2014 vs 2005	2014 vs 2013
City Total ($/sqft)	$ 2.67	$ 2.26	$ 2.40	-10%	6%

Breakdown Perspective

The City has a diverse group of facilities and departmental groups, with varying usage patterns and costs. By breaking out the data, the City can make decisions on where to target conservation efforts, or to make operational changes as required in order to reduce costs and consumption.

Energy Consumption

The combined energy consumption includes electricity and natural gas (if applicable). Changes in consumption can be due to several factors such as weather-related consumption (colder winters, hotter summers), conservation efforts, occupancy changes, program activity or operational changes.

Total Energy	in 000's of ekWhs			Comparisons	
Consumption	2005	2013	2014	2014 vs 2005	2014 vs 2013
City/Town Halls	13,775	7,076	7,686	-44%	9%
Corporate Facilities	17,188	11,085	11,057	-36%	0%
Street Lighting	33,603	35,401	34,998	4%	-1%
Traffic Lighting	5,688	1,906	1,979	-65%	4%
Other O&M	5,618	5,924	6,460	15%	9%
Hamilton Water	121,040	126,170	134,925	11%	7%
Yards	39,589	25,330	30,020	-24%	19%
Arenas	39,904	35,063	38,080	-5%	9%
Community/Senior Centers	3,834	3,682	4,009	5%	9%
Rec Centres/Pools	26,789	24,114	29,026	8%	20%
Rec Parks/Stadiums/Golf	8,332	4,979	5,274	-37%	6%
Lodges	24,938	17,074	16,663	-33%	-2%
Culture	5,383	4,691	5,006	-7%	7%
Fire/ EMS	10,698	11,413	13,932	30%	22%
Libraries	9,343	10,292	10,817	16%	5%
First Ontario Centre	10,122	8,805	9,966	-2%	13%
Hamilton Convention Centre	4,656	3,769	4,402	-5%	17%
Hamilton Place	5,466	4,459	5,453	0%	22%
Police	14,757	10,221	10,087	-32%	-1%
Total Energy Use	**400,722**	**351,455**	**379,841**	**-5%**	**8%**

Data is estimated for December 2014

Energy Costs

The combined energy costs include the total utility costs for electricity and natural gas (if applicable). Changes in costs can be related to increases or decreases in consumption, changes to regulated rates or commodity costs or a combination.

Total Energy-$	in 000's of $			Comparisons	
Cost	2005	2013	2014	2014 vs 2005	2014 vs 2013
City/Town Halls	$860	$566	$652	-24%	15%
Corporate Faclities	$866	$772	$782	-10%	1%
Street Lighting	$2,895	$5,378	$5,444	88%	1%
Traffic Lighting	$462	$315	$345	-25%	9%
Other O&M	$534	$799	$874	64%	9%
Hamilton Water	$9,590	$10,615	$11,172	16%	5%
Yards	$2,205	$1,448	$1,519	-31%	5%
Arenas	$2,455	$2,572	$2,597	6%	1%
Community/Senior Centers	$224	$219	$235	5%	7%
Rec Centres/Pools	$1,192	$1,064	$1,240	4%	17%
Rec Parks/Stadiums/Golf	$564	$336	$349	-38%	4%
Lodges	$1,087	$906	$862	-21%	-5%
Culture	$338	$248	$257	-24%	4%
Fire/ EMS	$614	$761	$837	36%	10%
Libraries	$827	$858	$947	14%	10%
First Ontario Centre	$840	$741	$822	-2%	11%
Hamilton Convention Centre	$387	$287	$366	-5%	27%
Hamilton Place	$454	$322	$447	-2%	39%
Police	$783	$697	$682	-13%	-2%
Total Energy Cost	**$27,177**	**$28,906**	**$30,430**	**12%**	**5%**

Data is estimated for December 2014

Energy Intensity

Similar to breaking down the energy consumption and energy cost data, examining the energy intensity per group allows for better understanding of where the City could concentrate efforts to reduce usage. Street Lighting, Traffic Lighting, Hamilton Water, Other Operations and Maintenance (O&M) are not included in the intensity numbers, as they do not have reported square footage.

Energy Intensity By Grouping						Reported Square Footage		
	2005	2013	2014	2014 vs 2005	2014 vs 2013	2005	2013	2014
City/Town Halls	39.6	21.2	23.0	-42%	9%	347,996	334,261	334,261
Corporate Faclities	44.6	22.3	22.2	-50%	0%	385,055	497,805	497,805
Yards	38.1	30.5	36.0	-5%	18%	1,039,589	830,470	833,002
Arenas	51.3	43.2	46.9	-9%	9%	778,466	812,477	812,477
Community/Senior Centers	31.1	22.7	24.7	-21%	9%	123,276	162,304	162,304
Rec Centres/Pools	78.6	79.2	78.4	0%	-1%	340,894	304,296	370,141
Rec Parks/Stadiums/Golf	36.5	39.5	47.4	30%	20%	228,173	125,903	111,285
Lodges	113.6	49.2	48.0	-58%	-2%	219,588	347,278	347,278
Culture	35.5	37.2	40.1	13%	8%	151,601	126,039	124,999
Fire/ EMS	45.2	34.5	41.8	-7%	21%	236,935	330,630	333,355
Libraries	25.2	24.1	26.7	6%	10%	371,494	426,266	405,548
First Ontario Centre	22.5	19.6	22.2	-2%	13%	449,345	449,345	449,345
Hamilton Convention Centre	49.2	40.2	46.9	-5%	17%	94,564	93,779	93,779
Hamilton Place	43.7	35.6	43.6	0%	22%	125,101	125,101	125,101
Police	59.8	41.4	40.9	-32%	-1%	246,775	246,775	246,775
Total	**45.7**	**34.9**	**38.4**	**-16%**	**10%**	**5,138,852**	**5,212,729**	**5,247,455**

Data is estimated for December 2014

Procurement

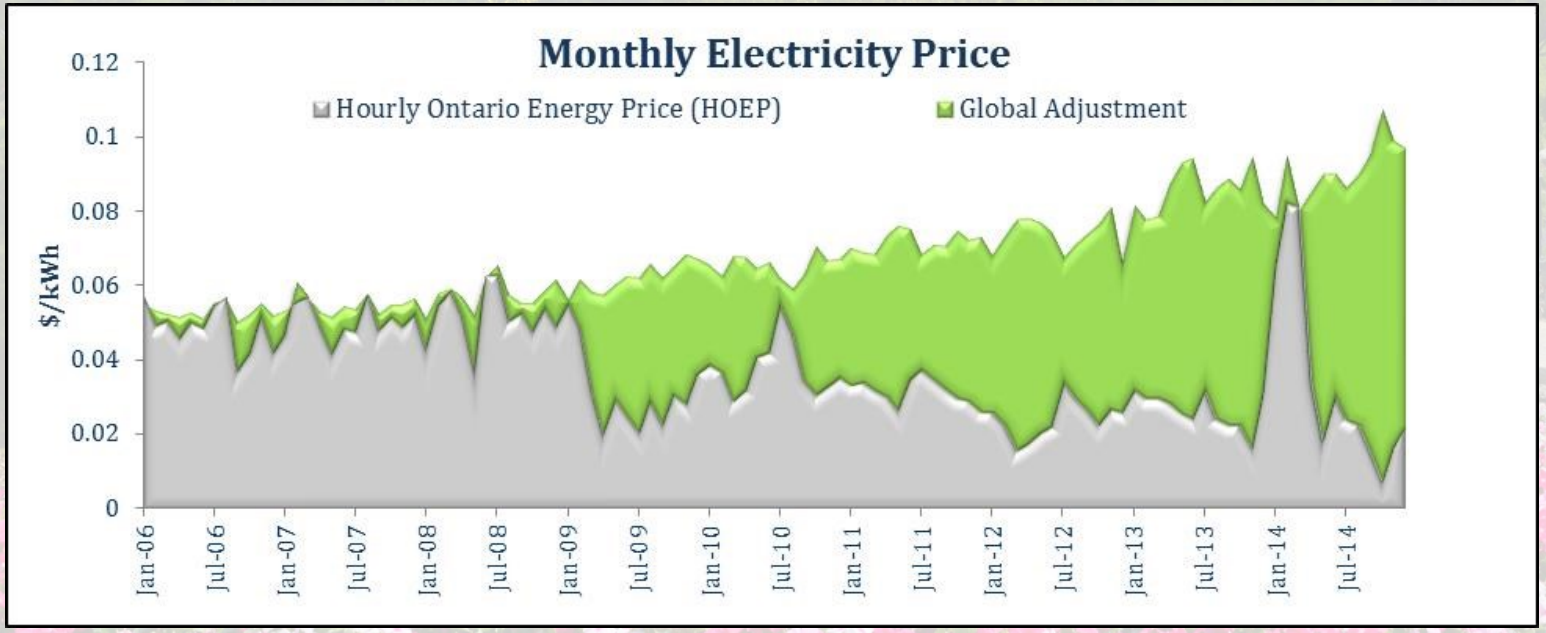
- **The City of Hamilton consumed over $45.9 million of Electricity, Natural Gas and Fuel (excluding Water utilities) in 2014. These commodities are managed and secured through a strategic procurement plan.**

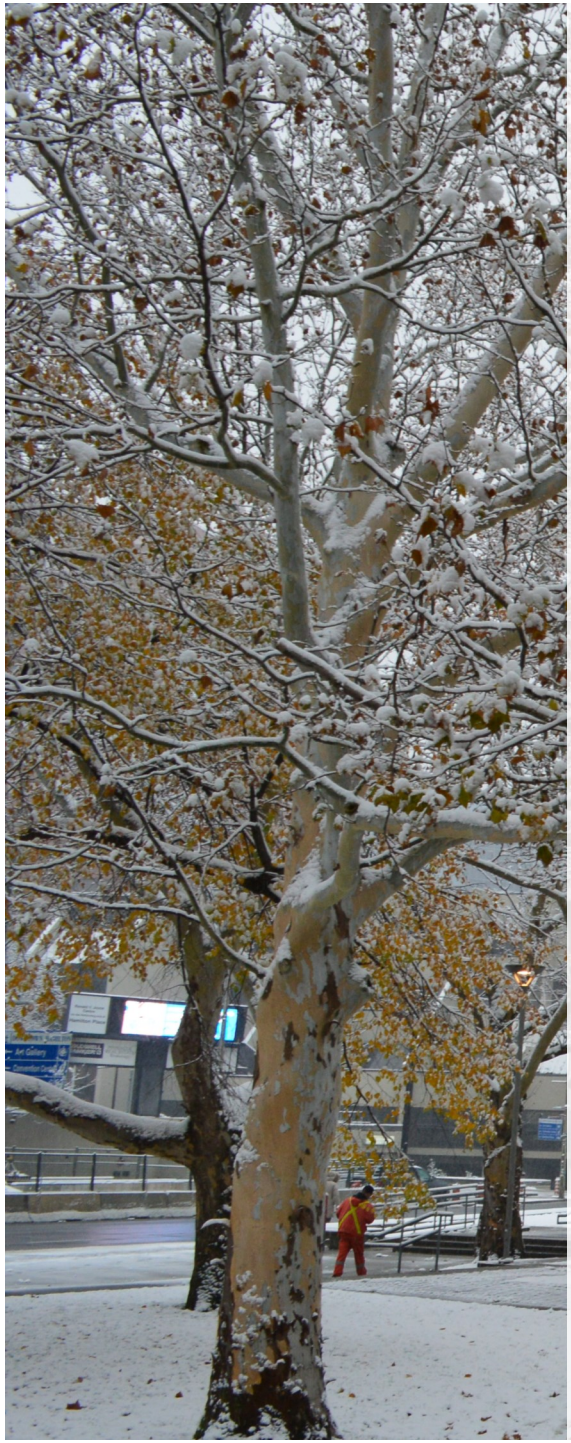
Electricity

The electricity price is a combination of the market-based Hourly Ontario Energy Price (HOEP) and the regulated Global Adjustment (GA). While the HOEP is deregulated, there is little reason to hedge against electricity commodity prices as the bulk of the overall price is heavily influenced by the Global Adjustment. Also, due to the provincial elimination of coal fired electricity generation, natural gas is becoming the marginal price setter more often during peak days.

The higher the HOEP price, the lower the GA price. The HOEP averaged 3.3¢/kwh for 2014 compared to 2.5¢/kwh in 2013. The GA averaged 8.9¢/kwh for 2014 compared to 8.5¢/kwh in 2013.

The overall price (HOEP + GA) for electricity for 2014 was 5% higher than in 2013. The HOEP typically shows no sustained risk that warrant putting a hedge in place at this time with the existing market conditions.



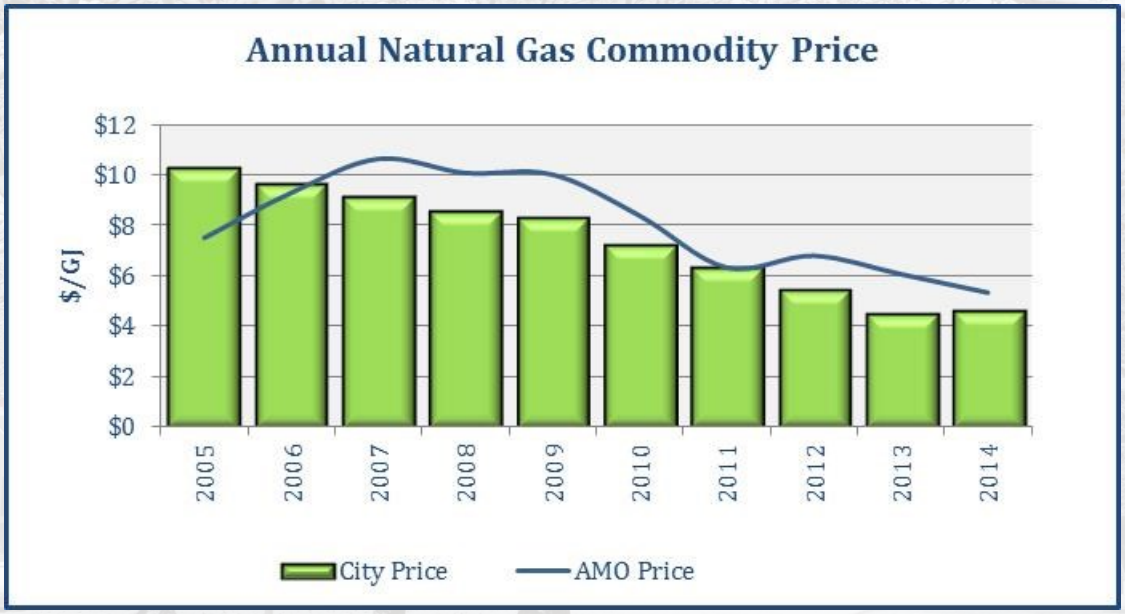


Natural Gas

The City purchases its natural gas commodity from wholesale suppliers, which offer a variety of hedging products. The City uses a disciplined forward hedging strategy to mitigate the exposure to a volatile natural gas market. Fixing the price on a portion of the City's natural gas volumes has allowed for better budget predictability, and protection against high priced spot market fluctuations as seen in February of 2014 where tight supply lead to daily prices upwards of $100 per GJ.

The City's average commodity price for natural gas in 2014 was $4.56 per GJ, (or $0.173/m3) a 2% increase over that of 2013.

When benchmarked against the Natural Gas Procurement programs offered by the Association of Municipalities, as seen below, the City has fared well over the past 7 years.



GJ = gigajoule

Fuel

The City of Hamilton purchases fuel for its fleet of vehicles such as buses, waste collection, snow removal trucks, street sweepers, roads and park vehicles, as well as Fire and Emergency Medical Services (EMS) vehicles. The volumes reported exclude GO Transit, DARTS and Police. The majority of these vehicles use traditional petroleum based fuel products (diesel and unleaded gasoline) while a small volume of dyed diesel is purchased for small equipment.

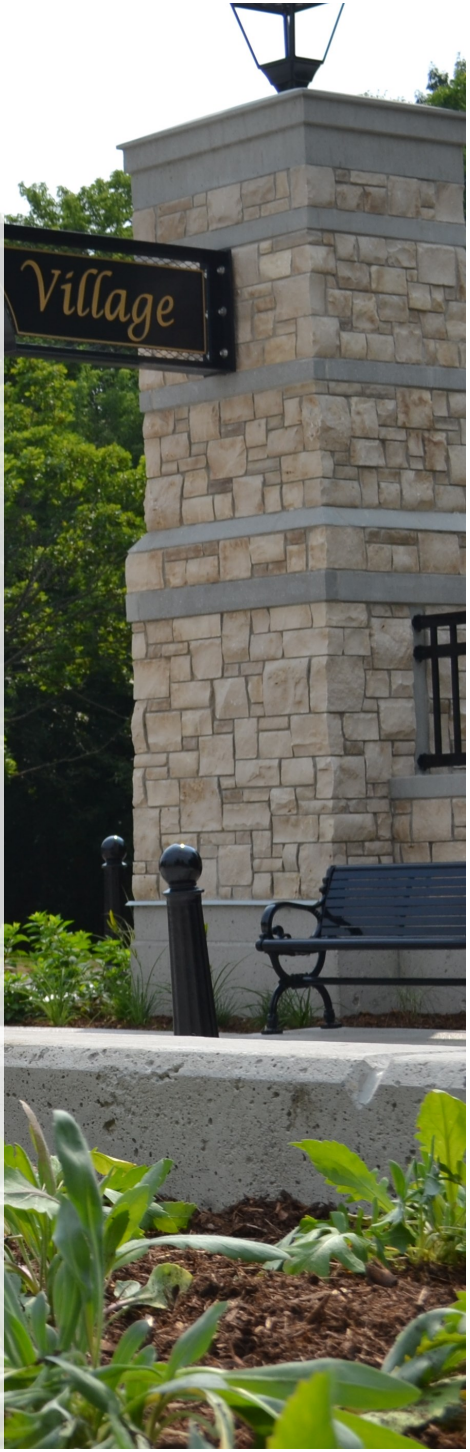
In an effort to control costs, the City purchases its fuel directly from large suppliers, and secures discounts through wholesale contracts. In 2014, the City departments used approximately 12 million litres of diesel fuel, a 3% increase over 2013 purchases. The City also used 2 million litres of gasoline, an increase of 11% over 2013. Increases in fuel usage partially attributed to harsh winter conditions that led to more frequent use of winter control vehicles. The unit costs of fuel showed an increase of 2% in 2014 for diesel and a 1% increase for gasoline from 2013.

At the beginning of 2014 , an internal fuel audit was conducted reviewing fuel processes and procedures. Recommendations and improvements were implemented within the year.

In 2014, the City received a fuel tax rebate of $122,631 that relates to a credit for non-engine powered fuel usage.

Compressed Natural Gas will have a significant impact on reducing operating costs and have a favorable impact on Greenhouse Gas Emissions.

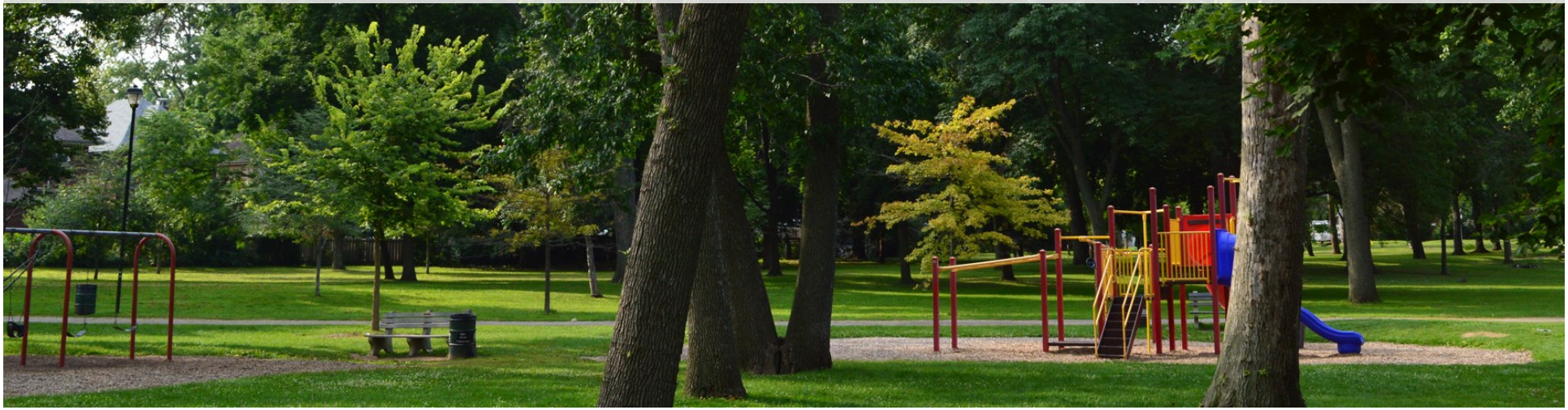
In 2015, in partnership with Union Gas, the City is constructing a new CNG station to accommodate its increasing fleet of CNG transit vehicles.



2014 Fuel Usage

User Group	Diesel Usage Litres	Unleaded Usage Litres	Total Usage Litres
Corporate Assets and Strategic Planning	126,838	179,939	306,777
Public Works Engineering	26	40,118	40,144
Public Works Environmental Services	432,859	346,825	779,684
Hamilton Water	170,554	211,446	382,000
Public Works Operations	2,256,485	395,238	2,651,723
Other	426,357	759,012	1,185,369
Transit (Excluding DARTS and GO Transit)	8,617,614	69,326	8,686,940

The chart above reflects fuel usage by various user groups. Transit was the highest consumer of fuel using 64% of the City's total usage followed by Operations using 19% and the "Other" group with 8%. Transit includes, Transit Operations, Route Planning and Transit Yard Support. Operations include Waste Management and Collections, Landfill, Roads and Support Services. The "Other" group includes Public Health, Recreation, Tourism and Culture, Library, By-Law Services, Mayor's Office, City Clerk, Digital Technology, and Information Services.

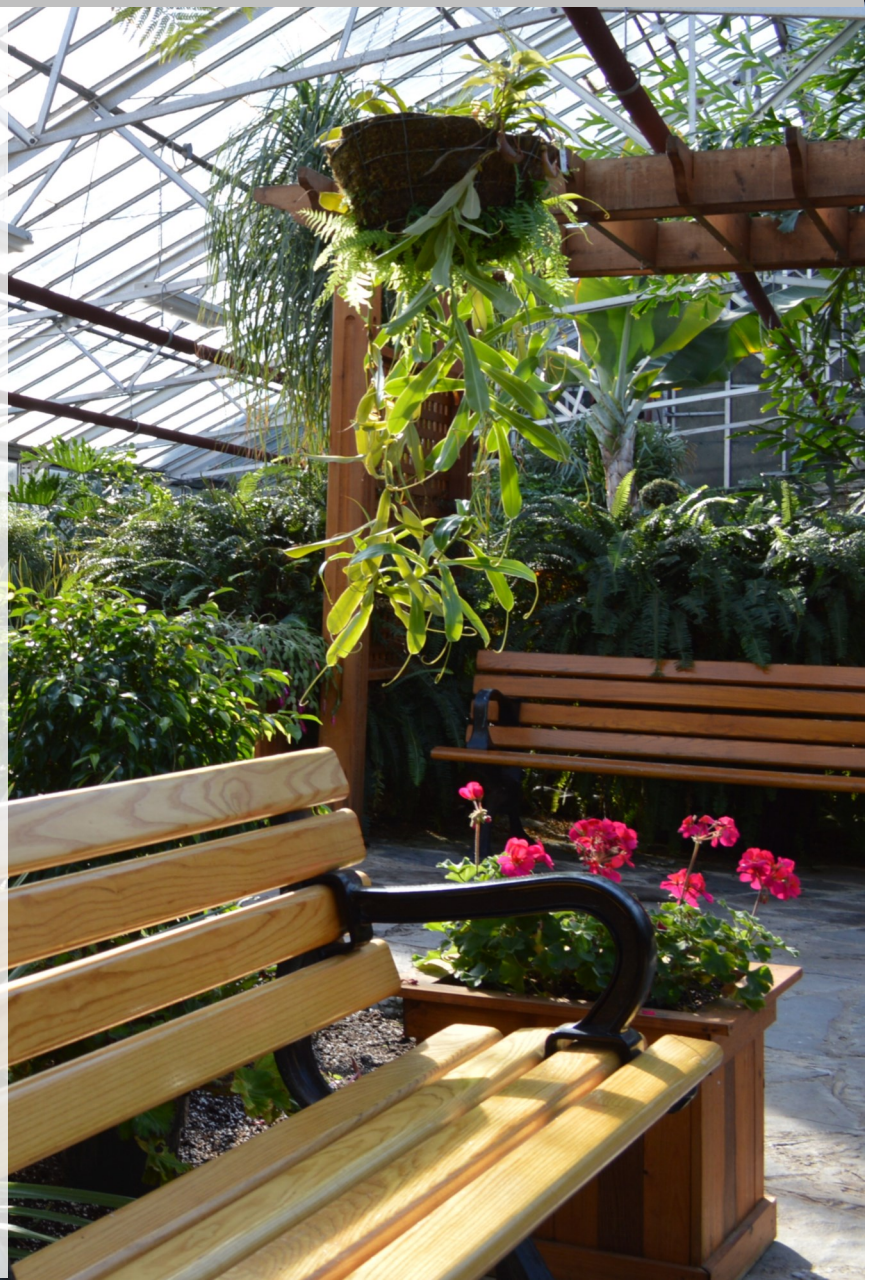


Energy Conservation

With new targets established in the recently updated Corporate Energy Policy, commitment to conservation efforts are even more critical to achieve success.

The following outlines the various initiatives undertaken by the City, and the required reporting on conservation targets:

- Renewable Energy;
- Project Updates for 2014;
- Project Highlights for 2015;
- Committees and Associations;
- Recognitions.



Renewable Energy

When it comes to renewable energy, The City of Hamilton continues to be a leader among Ontario Municipalities. Technologies and systems that capture emissions (previously released into the atmosphere) are today utilizing more energy from waste and have lowered our overall emissions.

Hamilton Renewable Power Inc. (HRPI)

The City is the sole shareholder of the private company, Hamilton Renewable Power Inc. (HRPI). This firm owns and operates three 1.6MW renewable gas fueled units. Two units are located at the Glanbrook landfill site. The third unit is located at the Hamilton Water site on Woodward Avenue, and is a cogeneration unit that produces electricity and heat. These units use methane as a renewable fuel source to produce electricity which is secured through long term contracts with the province.

The 2014 revenue from all HRPI operations generated $1.7 million. An annual emission reduction of over 100,000 tonnes CO_2 comes from these renewable gas fired units producing electricity that would otherwise be provided from the electricity grid. This equates to 21,053 cars being removed from the road annually.

Since it began operation in 2006 HRPI has generated over $12 million in incremental net benefit to the City, above and beyond the contributions made from the energy reduction and cost avoidance savings stated in this report.

Annual Emission Reduction of over 100,000 tonnes CO_2

Biogas Purification Unit

The Biogas purification unit at the Hamilton Water wastewater treatment facility converts methane into pipeline-quality natural gas. It continues to yield benefits to the City and captured over 1,100 tonnes of CO_2e in 2014 and produced roughly 20,000 GJs of natural gas used for the City's own requirements or sold to outside parties.

Rooftop Solar Photo Voltaic Project

The City has a 250 kilowatt (AC) solar installation on the roof at 330 Wentworth Street North that generated 368,500 kilowatt hours of electrical power in 2014. This is equivalent to the electrical consumption of 37 homes in one year which is equivalent to offsets of 73,700 kilograms of Carbon Dioxide (CO_2) GHG Emissions.

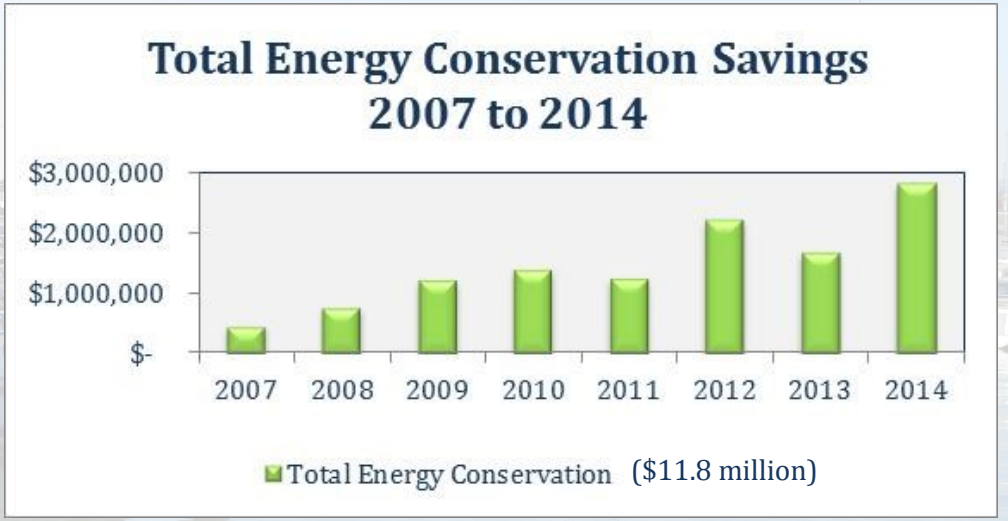
The City's financial benefits are derived through a leasing arrangement with Horizon Energy Solutions to accommodate the 1204 solar panels that make up the solar array.

Project Updates

The City continues to track energy savings after a project has been completed and paid for. Project energy savings are calculated using an approved protocol, International Protocol for Monitoring and Verification (IPMV), in order to consistently track the savings. In addition, any energy incentives that have been applied for must have approved Monitoring and Verification (M&V) plans and/or be approved by the appropriate government agency, such as the Ontario Power Authority (OPA) or the Independent Electricity System Operator (IESO).

Project teams work in conjunction with consultants, engineers, utilities personnel and other industry experts to maximize energy savings.

The cumulative savings of projects that have been completed since the 2005 base line is $11.8 million. 2014's energy savings contribution to this total is $2.8 million. The savings represent the benefit of energy efficient upgrades compared to the City not taking any action.



Macassa Lodge

Chiller Optimization System

A chiller optimization system has been installed at Macassa Lodge, a long-term care non-profit organization owned and operated by the City of Hamilton. The system has been operating successfully and data has been collected and analysed, providing efficiency measures to optimize the systems.

Good analytical tools and methods are the basis for optimizing the operation and minimising the downtime of equipment. The chiller optimization system monitors real-time performance of the chiller plant and its components allowing wear and pending failure to be detected in advance for pre-emptive action to be taken. This allows for repairs to be conducted in a planned and cost effective manner thus reducing loss of functionality associated with an unexpected failure of the refrigeration system.

Operational efficiency measures were implemented at Macassa Lodge prior to the 2014 cooling season and the energy savings obtained were 120,660 kWh which is approximately a 17% reduction in seasonal electrical energy usage.

Street Lighting Upgrades

2014 was another busy year for LED street lighting conversion projects. Several key areas throughout the City were converted from high pressure sodium (HPS) to LED in efforts to both reduce energy consumption and improve lighting quality. LED streetlights are more energy efficient and require less maintenance then the standard HPS street lights still widely in use. The energy reduction from 2014 projects is expected to be over 1.2 million kWh annually with a savings of $120,000.

Additional projects are being assessed and only contemplated if and when the business case makes sense, often this is only the case when incentives are available.

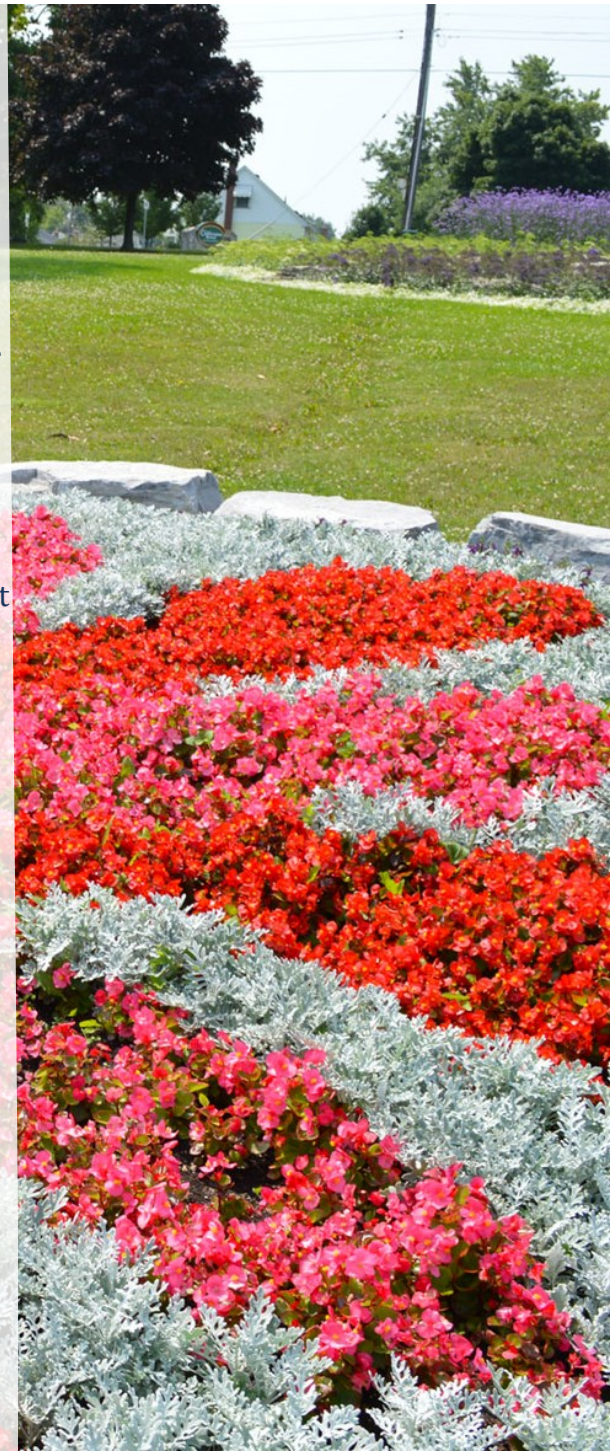
LED Fast Facts*

The light-emitting diode (LED) is one of today's most energy-efficient and rapidly-developing lighting technologies.

- **Quality LED light bulbs last longer - up to 25 times longer than incandescent light bulbs;**
- **Are more durable—emitting very little heat;**
- **Offer comparable or better light quality than other types of lighting—emit directional light reducing the need for reflectors and diffusers that can trap light.**

***U.S. Department of Energy**

2015 Project Highlights for Council Approved Future Projects



Compressed Natural Gas (CNG) Station Replacement

CNG technology has continued to improve over the last several years and the price spread between diesel and natural gas continues to grow. In partnership with Union Gas, the project proposes a new CNG fuelling station be constructed to replace the existing station built in 1984. This would ensure reliable and cost effective service to the City's new CNG bus fleet.

The cost of diesel vs. CNG as a fuel comparator is a 4:1 ratio.

Macassa Lodge– Combined Heat and Power

This project proposes a Combined Heat and Power (CHP) cogeneration system that will use natural gas as the primary fuel source to produce 600kW of electricity and utilize the waste heat for laundry operations and an absorption chiller for space conditioning.

The annual savings is expected to be $139,000.

Aquatic Centres Energy Efficient Lighting

Lighting will be upgraded to more energy efficient systems that will yield a net benefit of approximately $50,000 to the City.

Refrigeration Controls and Low Emissivity Ceilings

Refrigeration Controls- This project will reduce energy consumed by the refrigeration system in eighteen ice arenas.

Low Emissivity Ceilings– To reduce the cooling load in three high use arenas, this project proposes to install low emissivity ceilings. The combined annual savings for the two projects is $305,000.

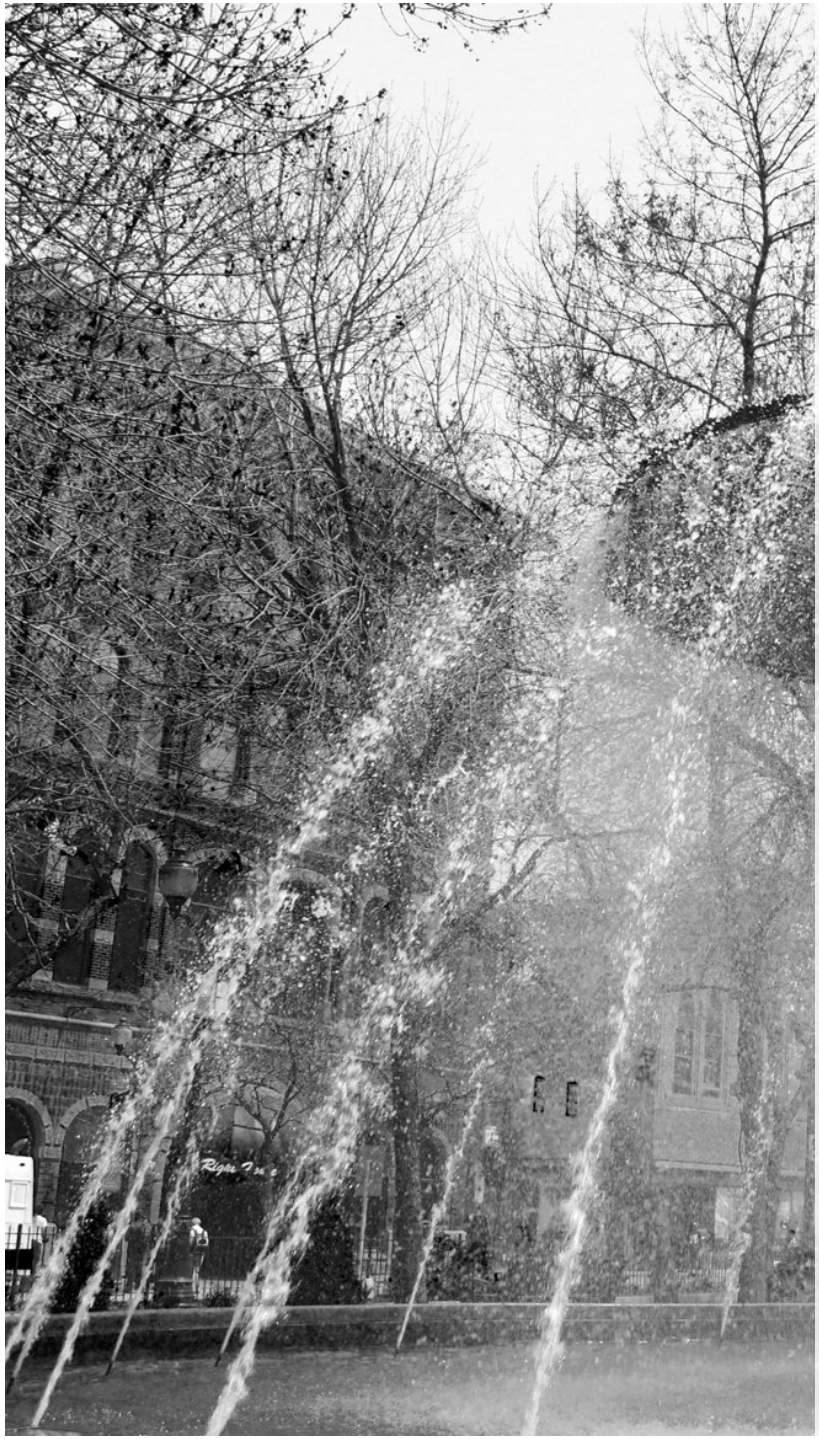
Parking Garage LED Lighting

City parking garages at York Street, Hamilton Convention Centre and Summers Lane are illuminated on a 24 hour continuous basis. This project will result in the same or better light levels while reducing energy usage and maintenance costs. A $125,000 savings per year can be expected .

Committees and Associations

Energy staff actively participate with industry, regulatory committees, working groups and perform speaking engagements that include:

- Electric Vehicle Plug and Drive Project with Horizon Utilities;
- Strategic Advisory Committee with Ontario Power Authority;
- Building Owners and Managers Association Energy Committee;
- Ontario Energy Board;
- Clean Air Hamilton;
- Climate Change Action Plan;
- Association of Municipalities of Ontario Energy Task Force;
- Local Authority Services Energy Advisory Committee.



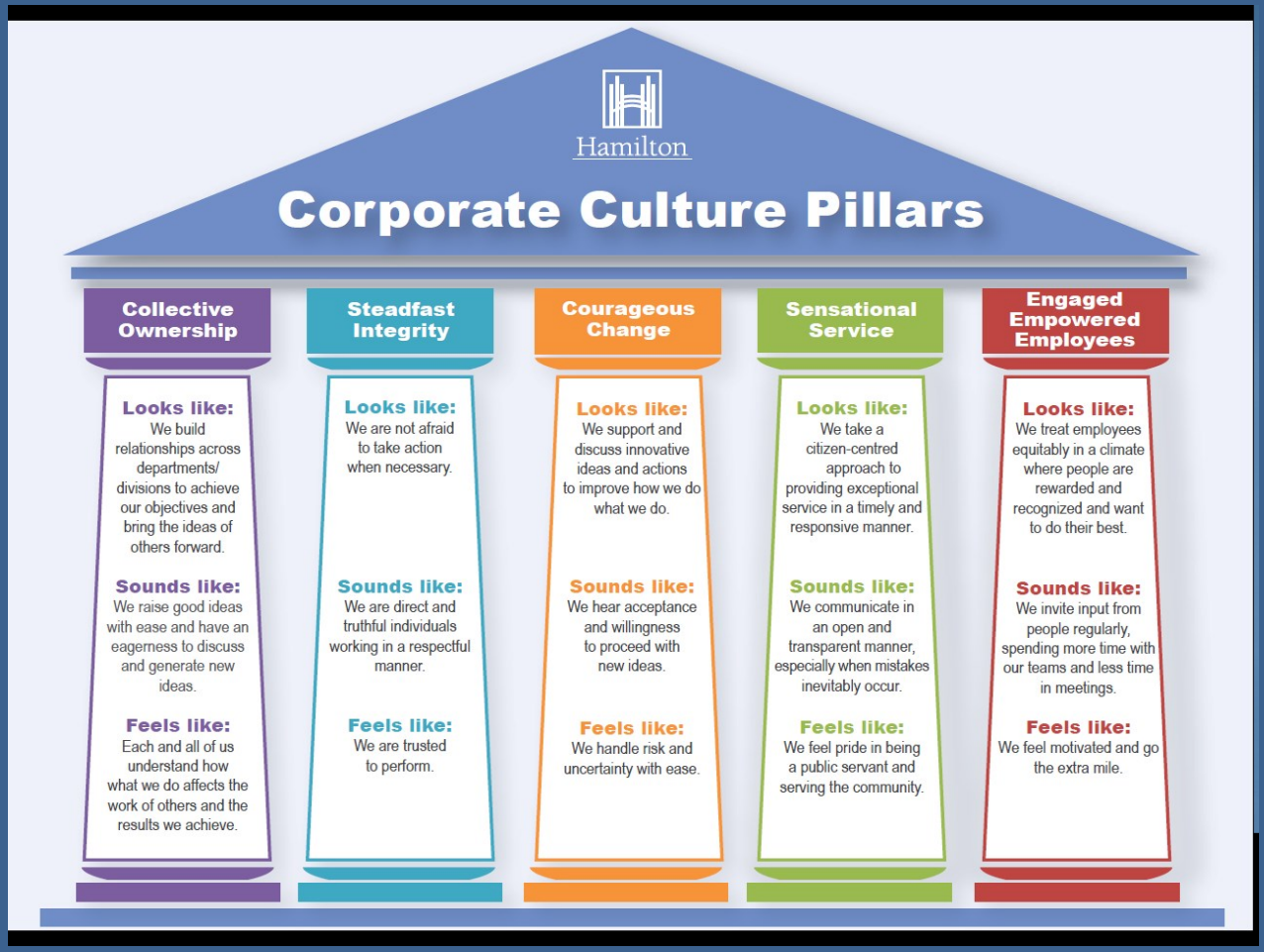
Recognition

Nominated as one of three municipalities by the Ontario Power Authority, the Community Conservation Awards acknowledge exemplary conservation efforts of municipalities across Ontario for the past year. Hamilton was assessed against other communities that have a population of over 500,000 people and were measured against results in the following categories:

- Leadership;
- Innovation;
- Corporate/Internal & Community Engagement;
- Conservation Achievements.

The City of Hamilton was the inaugural winner of the Community Conservation Award in 2012.

Ontario Power Authority Community Conservation Award Finalist



City of Hamilton Public Works

www.hamilton.ca/energy

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Public Works

Special Thanks to Andy Zimmerman for his photo contributions