

## Energy Conservation and Demand Management Plan



2019-2024



# Energy Conservation and Demand Management Plan 2019-2024

*Town of Whitchurch-Stouffville*



This document was prepared for the Town of Whitchurch-Stouffville by IndEco Strategic Consulting Inc.

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The Climate Action Incentive Fund (CAIF) MUSH Retrofit stream provides funding to municipalities, universities/colleges, schools, and hospitals to help them make energy efficiency improvements and retrofits to reduce energy use, costs, and carbon pollution.

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## Executive summary

### CONTEXT

North American municipalities are increasingly focusing on energy as a strategic priority – to reduce operating costs, prepare for rising utility prices, and to demonstrate their commitment to long-term sustainability. In Ontario, the provincial government is allocating millions of dollars to energy conservation and demand management (CDM) programs, and providing energy consumers with incentives to upgrade their facilities and equipment. The Government of Ontario has also expressed a commitment to greening public sector buildings and developed *Regulation 397/11* under the *Green Energy and Green Economy Act (2009)* to advance this goal. Although that regulation was repealed, it was replaced by an almost identical regulation 507/18 under *the Electricity Act (1998)*. Under the regulation, all public agencies – including the Town of Whitchurch-Stouffville – are required to report their energy use and greenhouse gas (GHG) emissions on an annual basis and are required to submit updates to their 5-year energy conservation and demand management plans in 2019.

The *Energy Conservation and Demand Management Plan (ECDMP)* provides a 5-year roadmap for energy management in the Town of Whitchurch-Stouffville. It focuses on the use of electricity, natural gas and propane in municipal facilities. It covers the period from July 2019 to June 2024.

The ECDMP addresses buildings, and technologies – as well as people, processes, and information.

### OBJECTIVES AND TARGETS

Energy efficiency is a key means to reduce or avoid future costs. Investing in energy management and implementing the actions identified in the ECDMP will provide valuable opportunities for Whitchurch-Stouffville. Not only will it result in energy and GHG savings, but it will also enable staff engagement, lower risk exposure, and demonstrate leadership by the Town.

Five objectives have been set for the next five years:

- To establish corporate structures, policies and practices to ensure continuous improvement in energy management
- To further develop a ‘culture of conservation’ among staff
- To ensure that Council, staff and the public increase their understanding of energy and emission related issues, and are aware of the Town’s efforts and achievements

- To improve energy efficiency at the Town Hall to serve as a model for other corporate facilities
- To reduce energy use and emissions from Town facilities.

All higher levels of government have set targets for energy or emission reductions for years beyond this plan. The Regional Municipality of York has a corporate target of a 17% reduction relative to 2014 by 2031, Ontario and Canada have targets of 30% reduction in emissions by 2030 relative to 2005 for the province or nation as whole, and the federal government has a target of a reduction of 40% by 2030 relative to 2005. Based on a consideration of these targets, historic performance, and energy use by the Town relative to other Ontario municipalities, a reduction target of 11% of energy use relative to 2018 has been set. The target applies to both electricity and natural gas.

In the longer-term the Town of Whitchurch-Stouffville strives to operate as efficiently as possible and to provide leadership in energy efficiency to other municipalities. Even more aggressive actions will be required in the future.

## SCOPE AND METHOD

The ECDMP addresses energy use and Scope 1 and Scope 2 greenhouse gas emissions from buildings, and technologies – as well as people, processes, and information – in the town as a corporate entity.<sup>1</sup> It does not address energy use or emissions in the broader community, nor does it directly address energy use or emissions from the corporate fleet. The plan draws on information from a number of sources: interviews, a strategic planning workshop, three walk-through audits of Town facilities, and a review of Town policies, plans and programs.

The first step in the process was to identify and define the preferred state / vision of energy management for the Town. This was accomplished through three in-person interviews, and a strategic planning workshop held with key Town staff.

The second step involved defining the present state of energy use by reviewing the Town's energy management practices. Information was obtained through interviews with key Town staff and the review of the Town's key policies, plans, programs, and reports related to energy.

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<sup>1</sup> Scope 1 emissions are the direct greenhouse gas emissions associated with fuel use by Whitchurch-Stouffville. Scope 2 emissions also include greenhouse gas emissions associated with generating the electricity used by Whitchurch-Stouffville. Other emissions not included are: upstream oil and gas emissions, methane associated with the transportation and distribution of natural gas, emissions embedded in products used by the City, and employee commuting emissions, for example.



The third step involved developing technical and organizational actions to assist the Town in moving from its present to its preferred state of energy management.

Energy audits were not undertaken as part of the plan preparation, but they are an element of the plan. These audits will further guide the identification of energy efficiency measures to be implemented.

The actions are grouped in the ECDMP according to the following categories:

- **Organizational commitment** – measures related to policies, targets, and resources required to enable energy management and the other actions;
- **Existing buildings and equipment** – measures, both technical and policy based, that impact existing buildings and equipment;
- **New buildings and equipment** – measures, both technical and policy based, that impact new buildings and equipment;
- **Monitoring and tracking** – measures related to evaluating, monitoring, and verifying energy data;
- **Communication and engagement** – measures related to encouraging behavioural modifications to save energy;
- **Other initiatives** – the streetlight retrofit program, the fleet management plan, renewable energy generation, ground source heat pumps and energy storage.

These actions are allocated to three phases for implementation:

Phase 1: Priority actions – Year 1 (July 2019 – July 2020);

Phase 2: Medium-term actions – Years 2 and 3 (July 2020 – July 2022); and

Phase 3: Longer-term actions – Years 4 and 5 (July 2022 – July 2024).

Many of the priority actions are foundational and put in place the structures and practices that will facilitate on-going energy efficiency within the Town.

Priority actions include short-term improvements to the Town of Whitchurch-Stouffville's energy performance. Medium-term or long-term opportunities focus on deeper retrofits, building efficiency, technological innovations, and fuel switching. Medium-term and long-term actions also include the constant monitoring and reporting on implemented actions.

## CAPITAL COSTS

To implement the ECDMP, the Town will need to make capital investments in energy efficiency over the five-year period. However, these investments will yield significant returns.

While the project-specific funding will be developed and refined as the plan is implemented, based on typical costs for energy savings, the annual capital requirement to achieve the targets, potential savings and net cost are shown in Table 1. Assuming an average life of the measures to be implemented of five years, the internal rate of return is 23%.

Table 1 Estimated costs and savings of meeting the targets over ten years

Year	Target reduction	Estimated capital cost	Estimated savings	Net cost
2020	1%	\$45,000	\$10,000	\$35,000
2021	2%	\$85,000	\$35,000	\$50,000
2022	2%	\$85,000	\$55,000	\$30,000
2023	3%	\$130,000	\$90,000	\$40,000
2024	3%	\$130,000	\$125,000	\$5,000
2025			\$125,000	(\$125,000)
2026			\$115,000	(\$115,000)
2027			\$90,000	(\$90,000)
2028			\$70,000	(\$70,000)
2029			\$35,000	(\$35,000)

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## Introduction

There are multiple reasons why Whitchurch-Stouffville wants to reduce its energy use.

The growing concern about climate change is one that exists within the scientific community as well as the public. Climate change directly affects populations and cities by causing serious hazards, such as extreme cold and hot weather, floods, and droughts. Though the Paris Agreement, to which Canada is a signatory, involves national and international decision-makers, without municipal policymakers there will be no limiting global warming (Bazaz et al., 2018).

Financial incentives are available now to assist in energy and emissions reductions, but there is uncertainty about their continuing availability; this may be an opportunity that will be lost. The Ontario 2018 climate change plan has a significant dependence on natural gas conservation through 2030, but there are no details on how this will be achieved or the role of incentives (Ontario Ministry of the Environment, Conservation and Parks, 2018). The Province has already cancelled some electricity incentive programs, increased the threshold for participation in other programs and recently announced reductions to many of the incentives offered by the Retrofit Program. See for example (Independent Electricity System Operator, 2019).

The cost of energy is a significant burden on towns and municipalities. Prices are rising and are volatile. Since December 2018, energy prices in Ontario have risen by 12% (Statistics Canada, 2019). The federal government has also announced that carbon prices will rise each year through 2022 by 10 \$/t of carbon dioxide equivalent from 20 \$/t in 2019 to 50 \$/t in 2022 (Environment and Climate Change Canada, 2017). In 2018, the Town of Whitchurch-Stouffville spent approximately \$1.45M on energy for its 18 corporate facilities. Energy efficiency is often an investment that will temper the impact of energy costs and provide a very attractive return.

As a result of these matters, more aggressive targets and actions should be adopted by the Town.

The Town of Whitchurch-Stouffville's *Energy conservation and demand management plan* (ECDMP) provides a roadmap for energy management in Whitchurch-Stouffville. The ECDMP describes the energy management activities that the Town as a corporation can take over the next 5 years to increase its energy efficiency, reduce its energy demand, and minimize its environmental footprint.

The ECDMP is organized as follows:

- Preferred state of energy management
- Present state of energy management
- Objectives and targets
- Action plan
- Capital costs
- Conclusion and recommendations.

Appendices provide historic energy and emissions data, benchmarking of Whitchurch-Stouffville facilities against other Ontario municipalities, and other supporting material.

## FRAMEWORK FOR PLANNING

The Town's ECDMP addresses buildings and technologies – as well as people, processes, and information. The plan addresses energy use from July 2019 to June 2024 and was developed following a process described in Appendix C. The ECDMP centres on the Town's facilities and technologies. It aims to ensure that existing and any new facilities are built and operated as efficiently and sustainably as possible. The Town's supporting organizational policies and processes, monitoring and tracking systems, and communication and engagement tools allow this to happen.

## PROGRESS SINCE THE PREVIOUS PLAN

The 2014 plan set out targets for energy efficiency reductions by 2019. These targets, and progress to the end of 2018 are as follows:



The Town of Whitchurch-Stouffville did not achieve its targets set in 2014. Reasons for this include longer service periods for rinks (which are energy intensive), staff turnover and uncertain assignment of responsibility for energy management. These increases in energy intensity (energy per unit floor area) happened despite implementing a number of energy efficiency measures. In the absence of those measures, the increases would have been even larger.

In addition to these numerical targets, the 2014 *Energy Conservation and Demand Management Plan* (ECDMP) also outlined 71 actions for the Town in order to move it towards the preferred state. These actions were separated by priority, ranging from year 1 actions, medium-term actions (years 2-3), and long-term actions (years 4-5). 46 of the 71 actions (65%), remained untouched, and 10 actions are in the process of being implemented. The Town completed a total of 15 actions, shown in Table 2. The action numbers reference actions in the 2014 ECDMP.

Table 2 Recommended actions from the 2014 ECDMP completed in 2014-2019

Preferred state of energy management	Completed actions	Type of action
Dedicated staff are available to implement the energy plan.	(3) Assign the Manager of Facilities and Parks responsibility for overseeing implementation of the ECDMP.	Organizational commitment
	(4) Continue to hold semi-annual meetings with Facilities and Park staff (Manager and Supervisors) to discuss energy efficiency opportunities.	Organizational commitment
The Town has appropriate resources to effectively manage and operate facilities in an energy efficient manner.	(5) Assess staff resources for managing and operating Town facilities and hire additional resources where required.	Organizational commitment
The Town's O&M staff are aware of best practices in energy management and energy efficiency.	(22,42,66) Continue to participate in N6 meetings to share information and best practices.	Communication and engagement
	(23,44,68) Continue to send O&M staff to conferences, trade shows, and industry offered courses for information sharing.	Communication and engagement
All Town streetlights are LED and energy savings are evaluated.	(24) Continue to investigate opportunities for replacing and updating Town streetlights with LEDs.	Streetlights and traffic signals
All buildings operate in an energy efficient manner.	(31) Expand and continue to implement the corporate O&M preventative maintenance program based on the current HVAC program.	Existing buildings and equipment
Staff receive appropriate training on the use of new energy efficiency technologies and equipment.	(41) Continue to implement project specific training for staff as needed.	Communication and engagement

<b>Preferred state of energy management</b>	<b>Completed actions</b>	<b>Type of action</b>
Energy management is highly recognized as a strategic opportunity and priority in relevant policy and planning activities.	(50) Include energy management as a strategic priority for the Town.	Organizational commitment
All buildings operate in an energy efficient manner.	(54) Continue to implement the corporate O&M preventative maintenance program.	Existing buildings and equipment
Staff have the tools and training to identify energy management opportunities and are actively engaged in submitting ideas.	(64) Develop and implement an employee engagement process for all O&M staff.	Communication and engagement

In 2014, energy audits were completed on three of the Town’s highest energy using facilities: The Leisure Centre, the Stouffville Arena, and the Town Hall. A number of Energy Conservation Measures (ECMs) were recommended for each of the facilities, and targets were based on the implementation of these measures. All these measures have been implemented since 2014 or are in the process of being implemented. These measures, along with their yearly estimated energy savings, are shown in Table 3. The percentage of yearly savings based on the 2014 levels is also shown.

Table 3 Recommended ECMs from 2014 audits

Energy Conservation Measure	Estimated yearly energy savings	Yearly savings from 2014 level (%)
<b>Whitchurch-Stouffville Leisure Centre</b>		
VFD controller on Leisure pool filter pump	63,915 kWh	2.6%
Pool lighting retrofit	23,888 kWh	1.0%
Foyer lighting retrofit	19,929 kWh	0.8%
CO <sub>2</sub> testing and adjustment fresh-air makeup	13,169 m <sup>3</sup>	5.6%
Energy monitoring system	62,273 kWh & 5,841 m <sup>3</sup>	5.0%
<b>Town Hall</b>		
Daylight controllers in finance department	11,841 kWh	1.1%
Replace personal space heaters with panel heaters	6,750 kWh	0.6%
Free cooling for server room	5,993 kWh	0.5%
Workstation power management policy & Server virtualization	9,589 kWh	0.9%
Motion sensors for washroom lights	2,819 kWh	0.3%
CO <sub>2</sub> sensor controllers for makeup air on RTUs	1,879 kWh & 13,867 m <sup>3</sup>	13%
Xeriscaping	N/A	-
<b>Stouffville Arena</b>		
VFD controller – Brine pumps	273,268 kWh	10.1%
VFD controller – Condenser fan	17,079 kWh	0.6%
Domestic hot water circulation pump timer	1,335 kWh	0%
Reduce summer gas consumption	7,414 m <sup>3</sup>	2.8%
Energy monitoring system	42,135 kWh & 6,978 m <sup>3</sup>	4.2%

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## Preferred state of energy management

Whitchurch-Stouffville's vision for the future is also known as the preferred state. The preferred state is defined as where the Town wants to be regarding energy management. The preferred state sets out the long-term direction for energy management within the Town.

Whitchurch-Stouffville has set targets and milestones for making progress towards the preferred state. The short and longer-term actions are chosen to bring the Town closer to the preferred state outlined below, which is a refinement of the preferred state defined in the 2014 plan.

### The Town of Whitchurch-Stouffville's preferred state

1. **Whitchurch-Stouffville contributes to the solution of energy and emissions problems beyond the town limits.**
  - a. The Town works toward emissions reductions set by the international community, the federal and provincial government
  - b. The Town supports energy and demand reduction initiatives that are in the best interest of the Province, its businesses and its residents
  - c. The Town's O&M staff work together with other municipalities and public agencies to share technologies and best practices.
2. **Whitchurch-Stouffville has a culture of conservation.**
  - a. Energy management is highly recognized as a strategic opportunity and priority in relevant policy and planning activities.
  - b. Energy is considered at all stages of new building design and development, including considerations of possibilities to allow the Town to add renewable energy technologies in the future.
  - c. Staff have the tools and training to identify energy management opportunities and are actively engaged in submitting ideas.
  - d. Energy and energy efficiency are effectively communicated across the corporation.
  - e. Council is regularly briefed on efforts to manage energy and emissions
  - f. The Town provides information to staff and the public on its successes and progress.
3. **The Town ensures that it manages energy wisely to reduce costs to its taxpayers.**
  - a. The Town takes advantage of available incentive programs from utility companies and others.
  - b. The Town has cost effective and practical means of funding energy efficiency projects.
  - c. The Town strategically implements cost-effective energy efficiency projects in existing buildings.
  - d. Projects are prioritized in a consistent way, using clear criteria and appropriate metrics.
  - e. The Town has real-time building level data for all utilities, at an appropriate level of granularity (e.g. daily) and is able to measure and analyze data.



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## Present state of energy management

### CORPORATE ENERGY AND EMISSIONS

The previous ECDMP was adopted in 2014. In this section, we review changes in energy use over time as a result of the initiatives since then. The data reported in this section draw on utility data for 2014 through 2018. The energy sources graphed in the following sections are electricity, natural gas and propane.

In the 2014 plan, the Town identified objectives to improve energy management and performance, and to promote the efficient use of energy as part of the day-to-day activities of the Town staff through education and training. The plan set targets to reduce energy intensity (kWh/ft<sup>2</sup>) by 7.3% by 2019, and to reduce overall greenhouse gas (GHG) emissions (kg) by 6.9%. These targets were set based on potential actions identified through audits that were to be done at three facilities. These facilities, and changes in energy use are shown in Table 4.

Table 4 Progress against 2014 targets for individual buildings

Facility	2019 target	Progress through 2018
Municipal Office	16% energy intensity reduction	5% energy intensity reduction
Leisure Centre	15% energy intensity reduction	38% energy intensity reduction
Stouffville Arena	18% energy intensity reduction	33% energy intensity increase

At the municipal office, gas use increased by 9% from 2014 to 2018, but this was more than offset by a 3% drop in electricity use. At the Leisure Centre, electricity use fell by 3% but gas use was up by more than 50%. The energy intensity fell because the floor area of the facility was increased significantly, from 39,000 ft<sup>2</sup> to 81,000 ft<sup>2</sup>. However, there was still construction going on in 2018, so 2018 usage may not be typical. Gas use at the arena jumped significantly between 2017 and 2018 and was 85% higher in 2018 than in 2014. These changes cannot be explained by weather, as gas use was up in warmer winters (when heating degree days are fewer) and electricity was down in warmer summers (when cooling degree days are higher). Weather data are shown in Table 5.

Table 5 Weather data for Whitchurch-Stouffville (Buttonville Airport Weather Station)

Year	Heating Degree Days	Relative to 2014	Cooling Degree Days	Relative to 2014
2014	4,238.2	100%	203.6	100%
2015	3,914.5	92%	314.5	154%
2016	3,654.5	86%	461	226%
2017	3,630.3	86%	288.6	142%
2018	3,916.3	92%	429.7	211%

SOURCE: Environment Canada and Climate Change

In this section we review:

- Overall trends in energy use in the Town of Whitchurch-Stouffville;
- Trends amongst specific building types;
- Energy use intensity in the highest energy using buildings; and
- Overall trends in greenhouse gas emissions in Whitchurch-Stouffville.

The graph below shows the electricity, natural gas, and propane usage trends from 2014-2018, since the last ECDMP.

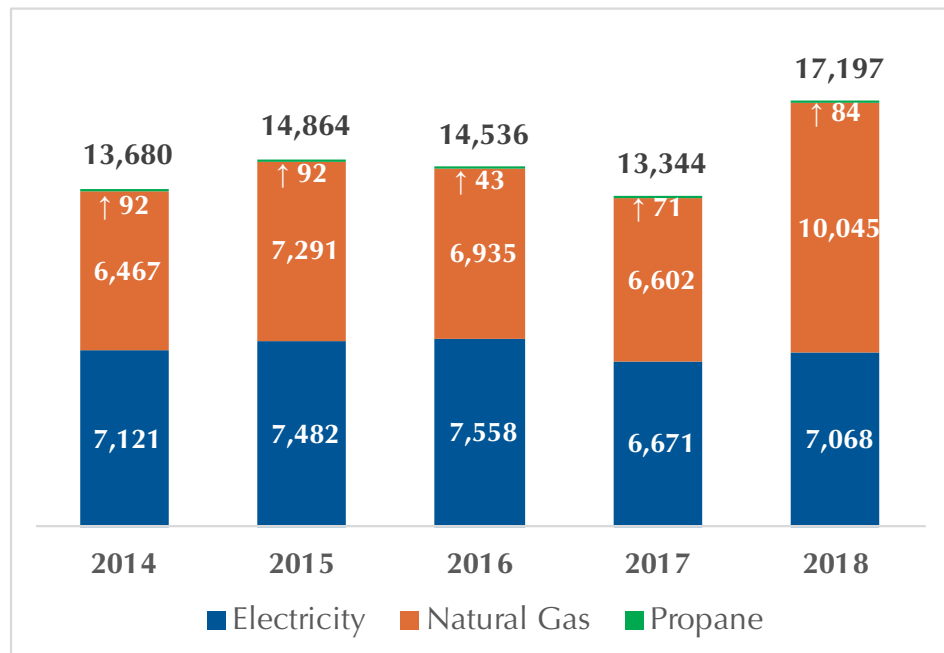


Figure 1 Town of Whitchurch-Stouffville trends on energy use in corporate facilities (eMWh) 2014-2018

Energy use in Whitchurch-Stouffville has increased since 2014. Although there were yearly decreases from 2015 to 2017, the Town saw a large increase in energy use in 2018. From 2017 to 2018, the Town had an increase of almost 4,000 eMWh, mostly due to an increase in natural gas usage. Overall, from 2014 to 2018, the Town's energy use increased by 26%. Per square foot of the corporate facilities in each year, this translates to a 19% increase in energy use intensity (ekWh/ft<sup>2</sup>).

There are only two facilities using propane, the Lemonville Community Centre and the Bethesda Parks Shop. The lowest amount used was in 2016, when the Bethesda facility's consumption dropped substantially as compared to other years. The propane usage increased again from 2016 to 2018.

The table below shows the quantity of propane, in litres, used in each facility from 2014 to 2018.

Table 6 Propane usage in Whitchurch-Stouffville by facility 2014-2018 (L)

Facility	2014	2015	2016	2017	2018
Lemonville Community Centre	7,404	6,250	5,269	3,831	2,487
Bethesda Parks Shop	5,694	6,814	856	6,281	4,588
<b>Total</b>	<b>13,098</b>	<b>13,064</b>	<b>6,124</b>	<b>10,112</b>	<b>7,075</b>

### *Energy saving initiatives taken*

In addition to the actions completed from the 2014 plan for Whitchurch-Stouffville shown in Table 3, some additional energy saving initiatives were taken:

- All rinks were converted to T5 lighting and now benches are heated using heat recovered from operations.
- Motion sensors were installed in buildings.
- Remote tracking for facilities was instituted.
- LEDs were installed in many facilities.

### *Energy savings due to LED replacements*

Whitchurch-Stouffville upgraded lighting to energy efficient LEDs at the following facilities, and realized the indicated energy savings:

- Operations Centre – 62,019 kWh savings
- Fire Station 5-1 – 27,724 kWh savings
- Ballantrae Community Centre – 21,975 kWh savings
- Fire Station 5-2 – 14,811 kWh savings
- Latcham Hall – 9,081 kWh savings
- Town Hall SMT Offices – 8,147 kWh savings

- Town Hall Council Chambers – 4,873 kWh savings

Additionally, one third of streetlights have been upgraded to LEDs.

### *Trends among specific building types*

Energy use in administrative buildings did not change significantly from 2014 to 2018; the lowest use occurred in 2017. The Whitchurch-Stouffville Museum, making up the Town’s cultural facilities, had the largest decrease in energy use of 19%, also with the lowest use in 2017.

With the closing of the Silver Jubilee in 2015, the Town’s community centres saw a 1% decrease in energy consumption from 2014 to 2018.

Indoor ice rinks and fire stations increased their energy usage from 2014-2018. With the opening of Soccer City in 2014 there were immense increases in energy consumption. The Leisure Centre also used more energy in 2018. For indoor ice rinks, there was a 16% increase as a result of changes from the Stouffville Arena, whereas the Clippers Complex had a lower consumption in 2018 than in 2014.

The Lebovic Centre for Arts & Entertainment increased its energy use over the five years by 8%.

The table below shows how energy usage changed in each facility type from 2014 to 2018 in the Town, where the changes in overall energy use are expressed as percentages.

Table 7 Whitchurch-Stouffville percentage change in energy use by facility type, 2014 to 2018

Facility type	% change
Administrative offices and related facilities	+1%
Community centres	0%
Cultural facilities	-19%
Fire stations and associated offices and facilities	+9%
Indoor ice rinks	+16%
Indoor recreational facilities	+99%
Performing arts facilities	+8%
Storage facilities and garages	-18%

### *Energy intensive buildings in the Town*

Energy use intensity (EUI) is a measure of the energy use per unit. For buildings this is typically measured in energy units per unit floor area. By accounting for floor area, it is possible to compare buildings of different sizes. This benchmarking helps to identify high energy using facilities.

Table 8 shows an overview of corporate facilities with the highest energy use intensity.

Table 8 Corporate buildings with the highest 2018 energy use intensities

Building	2018 Energy use (ekWh)	Gross floor area (ft <sup>2</sup> )	2018 Energy use intensity (ekWh/ft <sup>2</sup> )
Lebovic Centre for the Arts & Entertainment, Nineteen on the Park	350,534	6,700	52
Stouffville Arena	3,655,288	79,000	46
Whitchurch-Stouffville Leisure Centre	3,345,604	81,000	41
Stouffville Clippers Sports Complex	2,932,442	76,534	38
Ballantrae Community Centre	262,591	7,200	36
Parks Depot	107,344	3,000	36
Latcham Hall	203,595	5,750	35
Bethesda Sports Field & Fieldhouse	110,882	3300	34

Although the Stouffville Clippers Sports Complex has the highest average yearly energy use, it does not have the highest EUI, due to its large size. The Leisure Centre expanded from 39,000 to 81,000 ft<sup>2</sup> in 2018, and therefore increased its energy usage by a large amount. The Stouffville Arena was the largest energy user in 2018, and also had one of the highest EUIs.

Some of the smallest buildings have high energy intensities. Although it is not among the highest energy users, the Lebovic Centre’s EUI is the highest. The Bethesda Sports Field and Fieldhouse, the Ballantrae Community Centre, the Parks Depot and Latcham Hall are all among the lowest energy using facilities in the Town but have high EUIs.

### GHG emission trends in Whitchurch-Stouffville

Figure 2 shows the greenhouse gas emissions from corporate facilities in the Town of Whitchurch-Stouffville. The figure also shows the amount of equivalent CO<sub>2</sub> emitted by each type of energy.<sup>2</sup>

<sup>2</sup> Different greenhouse gases contribute to climate change to varying extents. Accepted practice is to express the contributions in units of equivalent carbon dioxide (CO<sub>2</sub>) using a factor called the Global Warming Potential (GWP). For example, a gram of methane (CH<sub>4</sub>) is estimated to contribute 25 times as much to climate change over 100 years as a gram of carbon dioxide. Thus emissions of methane are multiplied by 25 to convert them into CO<sub>2</sub>eq.

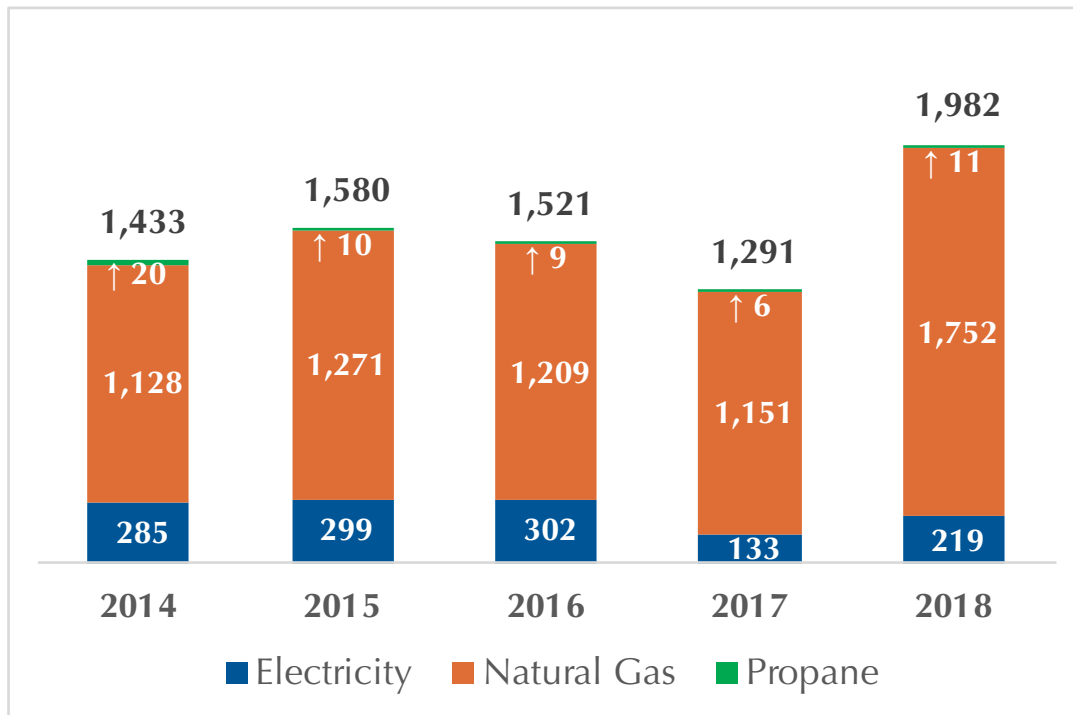


Figure 2 Town of Whitchurch-Stouffville greenhouse gas emissions, 2014 to 2018 (t CO<sub>2</sub>eq)

Of the three types of energy used by the Town, natural gas accounts for most of the greenhouse gas emissions. Electricity is relatively clean since the phase out of coal, and the amount of propane used is small.

Whitchurch-Stouffville's GHG emissions increased by 39% from 2014 to 2018, primarily due to the large increase in the consumption of natural gas in 2018.

Cultural facilities saw a large decrease of 38% in their GHG emissions, due to the Whitchurch-Stouffville Museum's decrease in its use of natural gas. The Bethesda Storage building only uses electricity, and by decreasing its usage from 2014 to 2018 it was able to reduce emissions for the Town's storage facilities by 43%.

Soccer City opened in 2014, and to 2018 there was a 99% increase in the facility's GHG emissions. In 2018, the building increased its natural gas consumption to almost twice the amount from 2017.

The Whitchurch-Stouffville Leisure Centre is the Town's second highest emitter of GHGs, and from 2014 to 2018 saw a 40% increase in its emissions. The facility was expanded from 39,000 to 81,000 square feet and was under construction during 2018.

The Stouffville Arena is the facility with the highest emissions. In 2018, its use of natural gas almost doubled from 2017, while its electricity consumption decreased. This resulted in a 73% increase of emissions from 2017 to 2018.

The Clippers Sports Complex is also one of the highest emitting facilities, though it managed to keep GHG levels relatively stable over the years.

Indoor ice rinks accounted for 35% of all emissions in 2018. This includes the Stouffville Clippers Sports Complex and the Stouffville Arena. The Town’s Leisure Centre, with the only indoor pool, accounted for 21% of all GHG emissions in 2018. Administrative offices and related facilities accounted for 17% of emissions, while indoor recreational facilities – Soccer City – emitted 12% of the Town’s GHGs in 2018.

Community centres, cultural facilities, fire stations, performing arts facilities and storage garages made up the last 15% of 2018 GHG emissions in Whitchurch-Stouffville.

GHG emissions from electricity are impacted by two factors: the quantity of electricity used, and the greenhouse gas intensity of the electricity, over which Whitchurch-Stouffville has no control. The change in GHG emission intensity of Ontario electricity is illustrated in Table 9. In 2018, the Independent Electricity Systems Operator (IESO) predicted a rise in the GHG intensity of electricity, since more natural gas was used to generate electricity than in the previous year.

Table 9 Greenhouse gas intensity of Ontario electricity 2012-2018

Year	GHG intensity of electricity (g CO <sub>2</sub> eq/kWh)
2012	110
2013	80
2014	40
2015	40
2016	40
2017	20
2018	31

SOURCE: (Environment and Climate Change Canada, 2019; The Atmospheric Fund, 2019)

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## Objectives and targets

### OBJECTIVES

Five objectives have been set for the next five years:

- To establish corporate structures, policies and practices to ensure continuous improvement in energy management
- To further develop a 'culture of conservation' among staff
- To ensure that Council, staff and the public increase their understanding of energy and emission related issues, and are aware of the Town's efforts and achievements
- To improve energy efficiency at the Town Hall to serve as a model for other corporate facilities
- To reduce energy use and emissions from Town facilities.

### TARGETS

Targets identify specific results that one wishes to achieve to advance towards the preferred state. There are multiple ways of setting targets including:

- Using 'science-based' targets
- As an intermediary step towards long-term goals
- Based on benchmarking
- Based on a set of investment criteria for cost effectiveness
- Based on a consideration of what resources – money, people and others – are available and what can be accomplished with those resources
- Combinations of the above

#### *Science-based targets*

Science-based targets draw on climate science to identify targets that will keep the planet from heating up to unacceptable levels.<sup>3</sup> In the Paris Agreement, that meant keeping the planet from heating to more than 2°C; recently there is concern that a heating of 2°C is too dangerous, and society should be aiming to keep global heating below 1.5°C (Rogelj et al., 2018). In practical terms, that means reducing greenhouse gas

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<sup>3</sup> An organization called "Science Based Targets" ( [sciencebasedtargets.org](http://sciencebasedtargets.org) ) works with large companies on setting science based targets, but does not have a program for municipalities. However, the organization has developed a number of tools that municipalities may find useful. Companies who have participated in the program report that it has driven innovation and cost savings.



emissions to net zero by 2050, and by about 45% of 2010 levels by 2030.

For Whitchurch-Stouffville with emissions from facilities in 2011 of 2,100 t CO<sub>2</sub>eq, that would mean a reduction of more than 40% relative to 2018 levels by 2030. The 2024 target would therefore be a greenhouse gas emission reduction of about 20%.

### *Progress towards long-term goals*

Whitchurch-Stouffville has not set long-term goals for energy use or emission reductions. Higher levels of government have set goals that the Town may wish to use in establishing its own goals for greenhouse gas reductions. York Region’s Corporate Plan targets a reduction of 17% of 2014 emissions by 2031. Ontario has a target of a 30% reduction relative to 2005, which is based on Canada’s targets under the Paris Agreement (Ontario Ministry of the Environment, Conservation and Parks, 2018). Canada’s federal government has set a target of 40% reduction relative to 2005 for its own operations by 2030 (Treasury Board of Canada Secretariat, 2017). What these targets suggest for Whitchurch-Stouffville is shown in Table 10.

Table 10 Estimated Whitchurch-Stouffville reductions required by 2024 relative to 2018 levels to meet targets set by higher level jurisdictions

Jurisdiction	Target	Target year/Base year	GHG reduction	Energy reduction
York Region (corporate)	17%	2031/2014	17%	18%
Ontario/ Canada national	30%	2030/2005	5%	5%
Canada (corporate)	40%	2030/2005	10%	11%

NOTE: Whitchurch-Stouffville reduction estimates are based on facility emissions in the base year and pro-rating required reductions from others’ target year to 2024. Energy target assumes the same energy source mix and is slightly higher than the GHG target because electricity is expected to be have a higher carbon content in 2024 than in 2018 (The Atmospheric Fund, 2019).

### *Benchmarking*

Targets could be set relative to performance of others. These might be at the individual facility level, based on energy intensity (energy use per unit floor area), as is discussed in Appendix B or in aggregate based on population. For example, comparing Whitchurch-Stouffville to other York Region municipalities suggests that to match the average per capita energy use of other municipalities in the Region, Whitchurch-Stouffville would need to reduce its energy use by 22%, as shown in Table 11.

Table 11 Per capita energy use of York Region municipalities (2016)

Municipality	Energy use (ekWh)	Population	Per capita energy use
Town of Aurora	136,991,045	55,445	2,471
Town of East Gwillimbury	31,940,855	23,991	1,331
Town of Georgina	59,366,129	45,418	1,307
Township of King	61,133,180	24,512	2,494
City of Markham	509,088,368	328,966	1,548
Town of Newmarket	175,752,252	84,224	2,087
City of Richmond Hill	86,451,075	195,022	443
City of Vaughan	436,598,158	306,233	1,426
<b>Average of other York municipalities</b>	<b>1,497,321,062</b>	<b>1,063,811</b>	<b>1,408</b>
Town of Whitchurch-Stouffville	82,733,150	45,837	1,805
Reduction required to match average performance of others			22%

SOURCES: Energy use from Ministry of Energy, Northern Development and Mines for 2016, Population from 2016 Census.

Given that these municipalities are planning to undertake other initiatives to reduce their use, reductions of greater than 22% by 2024 may be required to equal the average per capita municipal energy use of other municipalities in the Region.

### *Targets based on cost effectiveness criteria*

Whitchurch-Stouffville might choose to establish targets based on cost effectiveness criteria. This approach requires an inventory of possible actions and their likely costs and benefits, as well as a threshold for deciding which actions to adopt.

There are multiple potential cost effectiveness criteria to be used. A common one is 'payback'. Although relatively simple to calculate, the payback method has two main downsides: it does not take into account the time value of money, nor does it consider the lifetime of the project: a four year payback is not particularly attractive if the project will only last for one year. Similarly, a project with a five-year payback that lasts for twenty years, is likely a better investment than a project with a three-year payback that lasts only for three years.

A better criterion is the internal rate of return which can be compared to alternative costs of capital.

Whichever of these accounting procedures is used, ideally the analysis will take into account the full range of costs and benefits such as employee comfort, reduced maintenance costs, tax implications, and environmental and health costs, not just energy costs and energy savings. Further, the organization may wish to undertake 'strategic investments', that do not meet the financial criteria but have other value, such as piloting a new technology, demonstrating leadership to the community, being highly visible, that relate to initiatives that will be around a long time (when reduction requirements will be greater) such as new buildings, or that piggyback on other initiatives, such as renovation projects.

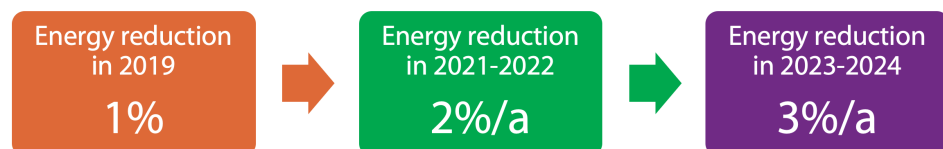
### Targets based on resource constraints

Where an organization does not have access to capital, it may be unable to undertake all the efficiency improvements that may be suggested by its investment criteria. Rather the initiatives to be undertaken will be limited by the available resources. In this case, the portfolio of energy efficiency projects may consist of those performing best against the investment criteria within the resource constraints.

Between 2014 and 2018, the Town spent approximately \$250,000 on energy efficiency upgrades (not including staff time). If the Town needed to limit its investments in energy efficiency to this level over the next five years, the energy savings at a typical cost for savings of 0.25 \$/kWh, the savings would be about 100,000 ekWh, representing a reduction of approximately 6%.<sup>4</sup>

### Overall target

In practice, all the above considerations go into setting the target for Whitchurch-Stouffville energy reductions by 2024. The town will want to help move towards targets set by higher level jurisdictions, perform well relative to other local municipalities, operate cost efficiently while recognizing constraints on spending. To this end, a target of 11% reduction in energy use by 2024 is proposed, with that reduction applying to both natural gas and electricity equally. Reducing natural gas use makes the greatest contribution to greenhouse gas emissions; reducing electricity use makes the greatest contribution to dollar savings. The estimated capital costs of achieving these reductions are presented in the Capital Costs section below (p. 37).



<sup>4</sup> This assumes other things being equal. In the last five years, in spite of this expenditure of this amount, absolute reductions were not reported, due to factors such as new larger facilities, and longer service times for rinks.

It is proposed that the reductions will ratchet up over time and are relative to 2018 levels.

## KEY PERFORMANCE INDICATORS

The targets suggest key performance indicators:

- Scope 1 GHG emissions – kilograms of carbon dioxide equivalent emitted by the Town
- Scope 2 GHG emissions – kilograms of carbon dioxide equivalent emitted by the Town, including emissions associated with generating the electricity used by the Town
- Total energy use – gigajoules or megawatt-hour equivalent
- Total electricity demand – gigajoules or megawatt-hours
- Total fossil fuel demand for buildings – natural units (e.g. cubic metres of natural gas) and gigajoules or megawatt-hour equivalent
- Total propane demand – natural units (i.e. litres)

Secondary performance indicators include:

- Energy intensity of buildings – energy use per unit floor area
- Thermal energy intensity of buildings – thermal energy (in particular fossil energy) per unit floor area
- Weather normalized energy use – weather corrected total energy use

Disaggregated data are desirable wherever possible, e.g. per building, per function, etc.

## UPDATING AND REPORTING ON THE PLAN

The ECDMP is a living document and should be reviewed at least once a year. As part of the annual review, the following steps should be completed:

- Track the activities that have been implemented, based on a checklist of all of the actions included in the ECDMP;
- Track quantitative progress towards targets;
- Note any updates to the ECDMP, based on audits, organizational changes, or lessons from past projects;
- Identify the priority actions for the upcoming year, and secure funding and resources for their implementation;
- Compile an updated report annually describing projects implemented, progress towards targets, updates to the ECDMP, and priority actions for the upcoming year; and

- Update the public reports to highlight projects completed, status of ECDMP, and corporate commitment to energy management;
- In 2024, report on implementation of the ECDMP as required under *Regulation 507/18*. Include details on: energy and GHG emissions for 2022 or 2023; current and proposed energy conservation and demand management measures; results achieved; and a revised estimate of the expected results of the current and proposed measures.

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## Action plan

Many of the key elements for energy planning were put in place in the previous five years, and the next five year focus will be on extending these and more effectively integrating them into the day to day operation of the Town. Actions are grouped into five main program initiatives:

- Corporate organizational initiatives
- Energy monitoring and tracking
- Communication and engagement
- On-going efficiency improvements
- Other considerations, including fleets, streetlights, new buildings, water conservation and renewable technologies.

### CORPORATE ORGANIZATIONAL INITIATIVES

Although individuals and departments have taken action, there hasn't been an overall focus on energy efficiency as a corporate initiative, and this will be a priority in the 2019-2024 timeframe. Key initiatives are as follows:



In the first phase of the plan, Whitchurch-Stouffville will establish an inter-departmental energy committee to oversee implementation of the plan, to track progress, and to provide overall direction to the Town on energy (and emissions) related issues. The committee will also coordinate the more detailed planning for phase 2. The primary focus of the committee, like the plan, will be on energy use since the Town has only indirect control over emissions associated with energy (in particular, electricity).

In phase 2, from 2020 to 2022, work will be done on integrating energy and greenhouse gas emission considerations into the broader corporate plans, policies and procedures, including in particular:

- Integration into the Town's strategic planning
- Integration into the asset management system
- Integration into a fleet management plan
- Integration into procurement practices

Integration into the Town's strategic planning could include the establishment of a longer-term vision for energy and sustainability within the plan, possibly including the establishment of long-term targets, such as emission reduction targets for 2050.

As part of asset management, the Town recognizes it is important to take advantage of opportunities to improve energy efficiency when assets are being upgraded for other reasons, for example to piggyback insulation additions as part of needed roof replacements. These sorts of initiatives may not be justified on their own but make sense as part of an overall upgrading of facilities.

The Town is only beginning to develop a fleet management plan. Energy considerations that might be incorporated into the plan include:

- Policies and practices for replacing vehicles with zero- or low-emission alternatives and more efficient vehicles
- Adoption of anti-idling policies and technologies
- Addition of training on energy efficiency driving into the defensive driving training simulator.

The town recognizes that procurement practices can have a significant impact on energy use and costs over time. The energy committee will work with finance on how considerations of energy efficiency and emissions can be part of the decision-making process around new investments, for example through the financial evaluation process (e.g. internal rate of return, life cycle costing, or a shadow price for carbon<sup>5</sup>).

Phase 2 will also see the committee refine the plan for Phase 3.

In phase 3, from 2022 to 2024, the corporate organizational initiatives will involve consolidating the work on the above and beginning work on an overall update to the Energy Conservation and Demand Management Plan.

## ENERGY MONITORING AND TRACKING

For multiple reasons, energy use has not been tracked very effectively in recent years, and this is the second major focus of the ECDMP. There is significant variation in energy use in individual facilities from year to year. Although some of this relates to changes in activity patterns, such as hours of service, other components of this variation are likely related to operating practices. If each building performed at its lowest level in the 2014-2018 period, overall use would be 24% lower than the 2018 total.

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<sup>5</sup> A shadow price adds a surcharge to the price of major projects based on their estimated greenhouse gas emissions for evaluation purposes. Canada's Treasury Board and other government organizations use this in their decision-making. The current Treasury Board shadow price is 50 \$/t but it will be reviewed in the future (Treasury Board of Canada Secretariat, 2018).



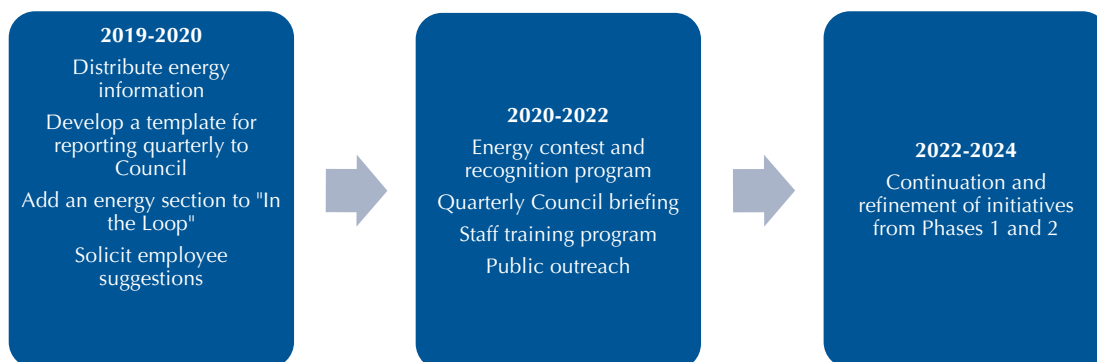
In Phase 1, the Town will implement software to track energy use on a monthly basis. Software options are being explored, and may include EnergyCap, PortfolioManager, or others.

Concurrently, protocols will be developed to better track the effectiveness of energy efficiency initiatives. In the past, evaluation of initiatives taken was not always practiced, and it was therefore difficult to determine which initiatives performed according to expectations and which did not.

Finally, the Town will undertake audits of two buildings each year. The Town Hall and the Operations Centre have been selected for audits in year 1. The Town plans to make the Town Hall a model of its energy efficiency program, and to ensure that it is below the provincial median for town halls by 2024.

In Phase 2, more user-friendly dashboards will be developed for staff and managers, and members of the Interdepartmental Committee will work with facility managers to develop targets for individual facilities and means of achieving those. The building audit program of two audits per year will continue. The recently expanded Leisure Centre will be audited in year 2.

In Phase 3, the evaluation and tracking systems will be evaluated, and user views on whether or not they are meeting their needs will be solicited and addressed. The building audits will continue.





## COMMUNICATION AND ENGAGEMENT

An important part of creating a 'culture of conservation' is ongoing communication and engagement with all members of the Town corporation.

In addition to practices already in place, such as meeting regularly with the N6 group of energy managers from neighbouring jurisdictions to share experiences, staff participation in conferences and events related to energy, and basic energy training and orientation, a number of new programs are planned.

During Phase 1, with the energy management software in place, information and how to interpret it will be distributed to key staff to ensure they understand and are tracking energy use over which they have control.

A template will be developed for quarterly reporting to Council on progress towards the energy goals. It is anticipated that this will have both a qualitative component (explaining what is happening in the broader municipal environment on energy and emissions), and a backward and forward looking quantitative component, reporting on what happened in the previous quarter, and what is anticipated in the next quarter.

In addition to the plan and energy reports being posted on the public website and intranet (In the Loop), articles with reports on progress and energy saving tips will be developed for posting on the intranet.

Finally, mechanisms for inviting and evaluating employee suggestions will be developed and implemented.

During Phase 2, an additional program to engage employees and recognize successes will be developed, possibly including energy saving contests.

The staff training related to good energy management practices for all staff will be enhanced, particularly for front-line staff.

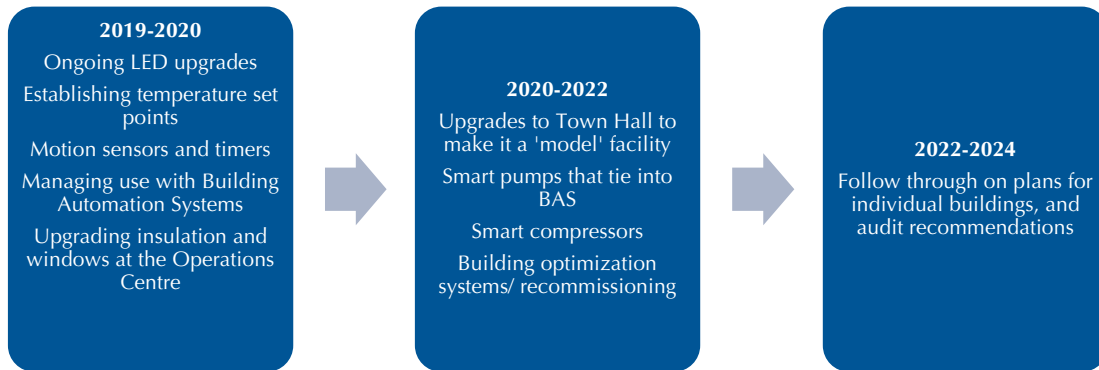
Finally, the Town will report to the public on initiatives and their successes.

In Phase 3, the programs and initiatives started in earlier phases will be continued and refined.

Additional description of communication and engagement mechanisms are discussed in the next section of this document.

## ON-GOING EFFICIENCY IMPROVEMENTS

The town has in place processes for upgrading facilities, based on opportunities identified through the 2014 audits, and through the knowledge and experience of town staff. These will continue through the plan implementation. Specific measures being considered for the three phases include:



As discussed above, the Town plans to undertake audits of two buildings each year, which will provide recommendations on cost-effective measures and target-meeting measures throughout the duration of the plan.

The Town will continue to track incentives offered by utilities, the IESO, the FCM and others for opportunities to leverage its spending on energy efficiency, particularly as changes to these are anticipated in the near term.

### “OTHER” INITIATIVES

The Town has plans for other initiatives that are outside the scope of the ECDMP, including:



The town has converted approximately one-third of its streetlights to LED fixtures, and plans to do a second-third over the course of the five-year plan.

The town will work with York Region on water conservation initiatives. Some water uses – particularly splash pads – are a significant cost to the town and reducing water use will reduce energy use for water pumping upstream.

As discussed above, the town is developing a fleet management plan, and plans to incorporate energy efficiency and emission considerations into it in Phase 2 of the ECDMP plan. Over that time period, it is anticipated that measures to reduce the energy use by fleets will be adopted and plans for electric vehicle charging facilities will be developed.

Whitchurch-Stouffville plans to establish energy performance standards for new buildings and major retrofits. The Town recognizes that high performing buildings save money over the long-term and may even have lower initial costs. For example, in an analysis of a base office building, construction costs for reducing greenhouse gas emissions by 34% were estimated to increase construction costs by 3.1%, but reducing greenhouse gas emissions by 82% increased construction costs relative to the base building by only 2.2% (Provident, Morrison Hershfield, & Integral Group, 2017). Given that new buildings and buildings undergoing major renovations are likely to be in use over a long time frame, it is particularly important that they be designed for very high levels of efficiency, considering long-term reductions that will be required, not just the short-term targets.

Finally, although the Town does not have immediate plans to implement renewable generation, ground-source heat pumps or energy storage, it will continue to monitor these and other new technologies for potential future adoption.

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## Communication and engagement

The following section focuses on employee engagement, behaviour changes, and communication. This section complements and explores the high-level communication actions that are required to implement the plan.

### STAFF TRAINING

The types of training that are needed in the Town of Whitchurch-Stouffville fall into four categories:

- General training on energy efficiency for all O&M staff;
- Project specific training for Facilities staff, as needed (e.g. new technology, new piece of equipment, etc.);
- General energy efficiency training for all new hires; and
- Energy efficiency training for fleet drivers.

#### All staff training

Management and operational staff need to be provided training on energy efficiency. The training can be provided as a half-day or full-day workshop or offered monthly. It would be a great idea to provide staff with interactive quizzes or test to ensure that staff members are completing the requiring training and learning as they do. Once completing a series of training programmes, staff members can be eligible to receive a certificate.

Staff training should include discussion of the Town's energy targets. Staff should be familiar with what they are, and what they mean. This is important especially for operators.

#### Facilities staff training

General energy training should be provided to all O&M staff to ensure that they have the knowledge and skills to contribute to efficient energy management within the Town. Training options should be developed and implemented in Years 2 to 3. The training could be provided as a half-day or full-day workshop, or through multiple weekly / monthly sessions.

Training may address:

- Energy basics (cost of energy, how and where energy is used);
- Lighting and mechanical equipment basics;
- Building automation systems and re-commissioning;
- Metering, monitoring, and the energy management system;
- How to spot energy saving opportunities;

- The Town’s building policies, preventative maintenance program, and re-commissioning plan; and
- The Town’s employee engagement program (including how to submit ideas and what types of ideas can be submitted).

O&M staff should receive an internal certificate upon completion of the training, recognizing that they have gained important knowledge and skills.

The Town should provide general energy management training to all O&M staff every two to three years (or more often, if staff turnover is high). The content of the training can be updated to reflect “state of the art” knowledge about energy management, and to reflect changes in the Town’s buildings, equipment, and practices.

More specific training on energy management and energy efficiency should be provided to all O&M staff responsible for operating and maintaining specific buildings. This training would be catered toward specific features of the operator’s building, allowing the operator to manage energy more effectively within individual buildings.

Additionally, project specific training on energy should be provided to operators, as needed, when new equipment or a new piece of technology is installed. This includes any updates to the building and its systems.

The program(s) may be designed and delivered by in-house staff, trainers may be hired from outside the organization and/or staff could be sent to more generic training.

### Training for new hires

Training for energy management should be built into the existing training and orientation process for all new hires. General training on energy efficiency should be provided for all new staff while more specific training on energy efficiency should be provided to new staff that will be operating and maintaining buildings. Training could be more or less formal, as appropriate given current training and orientation practices.

### Fleet driver training

Regular driver training has been demonstrated to reduce fuel consumption by 5-10% (Federation of Canadian Municipalities, 2010). All staff that drive Town vehicles should be trained to operate vehicles in a fuel-efficient manner. Fuel-efficient driving will not only reduce GHG emissions and other pollutants, but it will also reduce fuel costs and save the Town money. Natural Resources Canada offers a program called *SmartDriver in the City* for professional drivers and managers in urban and municipal fleets that is offered at no charge (Natural Resources Canada, 2018). The driver-training program should be implemented in the long-term of the ECDMP.

## BEHAVIOURAL CHANGES AND COMMUNICATION

Understanding and encouraging one another to talk about energy efficiency, and what staff are doing at the local scale is fundamental to improving the Town of Whitchurch-Stouffville's energy management. Establishing and implementing a behaviour change program would be the most effective for communicating the importance of behaviour change and energy awareness.

There are various initiatives that can be taken in order to shift energy-conscious behaviour within facilities:

- Ongoing monitoring and reporting;
- Operator training;
- Energy training for all staff;
- Updating the public on ECDMP progress;
- Engaging the public in the Town's achievements;
- Working together with other municipalities and public agencies; and
- Having a process for Town staff to make suggestions regarding energy conservation efforts, actions, and ideas.

### *Communication with other municipalities and utilities*

The Town will continue to engage with the N6 group on municipal energy efficiency initiatives. It will also be important to maintain regular contact with the IESO, Enbridge, and others on the evolution of incentive programs.

### *Public engagement*

One of the main priorities of the Town of Whitchurch-Stouffville identified through the staff interviews and workshop was to educate and inform the community on the Town's successes and progress as the plan is implemented. It should be conveyed to the public that the Town plans conservation efforts, and the successes should be announced. It is important that update reports be made to Council, as well as to the community of Whitchurch-Stouffville.

A page on the Town's website would be an optimal way to educate the public. This could link to articles, explanations of the Town's efforts, and tips for the public on their own conservation efforts. Various social media outlets could also be used.

## Capital costs

In order to achieve the targets indicated for the next 5 years, and for the Town of Whitchurch-Stouffville to move towards its preferred state, funding will be required by the Corporation to follow through with the projects. Specific costs for the particular projects will need to be determined and refined over the course of the plan.

A preliminary estimate can be made for overall costs based on typical energy saving costs of 0.25 \$/kWh. At current energy prices, and assuming an average five-year life for the measures implemented, the costs, savings and net costs over ten years are shown in Table 12.

Table 12 Estimated costs and savings of meeting the targets over ten years

Year	Target reduction	Estimated capital cost	Estimated savings	Net cost
2020	1%	\$45,000	\$10,000	\$35,000
2021	2%	\$85,000	\$35,000	\$50,000
2022	2%	\$85,000	\$55,000	\$30,000
2023	3%	\$130,000	\$90,000	\$40,000
2024	3%	\$130,000	\$125,000	\$5,000
2025			\$125,000	(\$125,000)
2026			\$115,000	(\$115,000)
2027			\$90,000	(\$90,000)
2028			\$70,000	(\$70,000)
2029			\$35,000	(\$35,000)

NOTES: Estimated savings are at current energy prices, and do not account for announced carbon taxes for example. A five year average life for energy efficiency measures is assumed.

The stream of costs shown in Table 12 have a very attractive internal rate of return of 23%.

Actual funding needs will require additional assessment of projects and their associated costs and may be significantly different from those shown here.

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## Conclusion and recommendations

Over the past 5 years, the Town of Whitchurch-Stouffville did not decrease its corporate energy usage. Despite the Town's efforts and the actions completed from the previous plan, the targets were not attained, and emissions increased.

Although taking additional measures to reduce energy use is important, the experience over the last five years demonstrates that some of the 'softer' actions are equally important: ensuring that energy use is being tracked, and the information is provided to staff with responsibility, and that they feel engaged and know how to use the information. These are key areas to focus on in the next five years.

Although natural gas is much less expensive than electricity, natural gas is the primary driver of greenhouse gas emissions, and thus the Town needs to focus on both energy sources: reducing electricity use to reduce costs and reducing natural gas use to reduce emissions.

Over a longer time horizon, very substantial reductions in emissions will be required. The Town needs to be looking ahead to these reductions, and the costs associated with them.



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## Appendix A. Facility GHG emissions 2014-2018

The table below shows the GHG emissions for each corporate facility in the Town of Whitchurch-Stouffville, from 2014 to 2018. The emissions are given in kilograms of equivalent CO<sub>2</sub>. The sparklines on the right column show the trends of emissions over the 5 years since the previous plan for each facility. The facilities are organized in the table from highest to lowest emissions in 2018.

Table 13 GHG emissions in Whitchurch-Stouffville from 2014-2018 (kg CO<sub>2</sub>eq)

Facility	2014	2015	2016	2017	2018	
Stouffville Arena	296,743	295,087	288,217	279,676	483,513	
Whitchurch-Stouffville Leisure Centre	296,614	322,073	288,565	249,835	421,548	
Soccer City	-	116,973	159,927	94,469	230,614	
Stouffville Clippers Sports Complex	216,697	229,320	217,461	171,518	224,187	
Whitchurch-Stouffville Operations Centre	151,122	152,462	143,938	110,420	169,505	
Town of Whitchurch-Stouffville Municipal Office	141,799	149,289	146,227	118,912	138,208	
Stouffville Fire Station 51	62,092	58,083	61,522	62,413	78,087	
Ballantrae Fire Station 52	40,355	42,604	39,298	40,636	42,713	
Lebovic Centre for the Arts & Entertainment, Ni	39,951	38,468	39,002	36,224	40,485	
Ballantrae Community Centre	22,765	27,086	21,736	25,774	34,092	
Latcham Hall	32,278	31,483	27,483	24,379	29,183	
Senior Centre	25,871	31,805	28,380	29,271	28,846	
Whitchurch Stouffville Museum	38,778	33,278	25,884	21,008	25,008	
Parks Depot	13,881	14,540	11,217	9,838	12,338	
Lemonville Community Centre	11,909	10,124	8,629	6,088	11,695	
Bethesda Sports Field & Fieldhouse	13,155	4,466	6,418	2,348	3,437	
Train Station	7,199	7,016	6,666	7,594	8,326	
Bethesda Parks Shop / Storage Building	504	451	535	232	340	
Silver Jubilee	21,054	15,699	-	-	-	

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## Appendix B. Whitchurch-Stouffville benchmarked against provincial means

Table 14 shows how the energy intensity of Whitchurch-Stouffville facilities compares to the rest of Ontario.<sup>6</sup>

The measurements for the energy intensity of the buildings takes into account heating degree days (HDD) which are a measure of the heating requirement for the buildings, to help account for the influences of seasonal temperature differences.

The data in the tables is for 2016, the latest year for which Ontario medians are available.

The energy intensity averages for most facilities in Whitchurch-Stouffville were greater than those for the province, meaning that most of the Town's facilities are less efficient energy users.

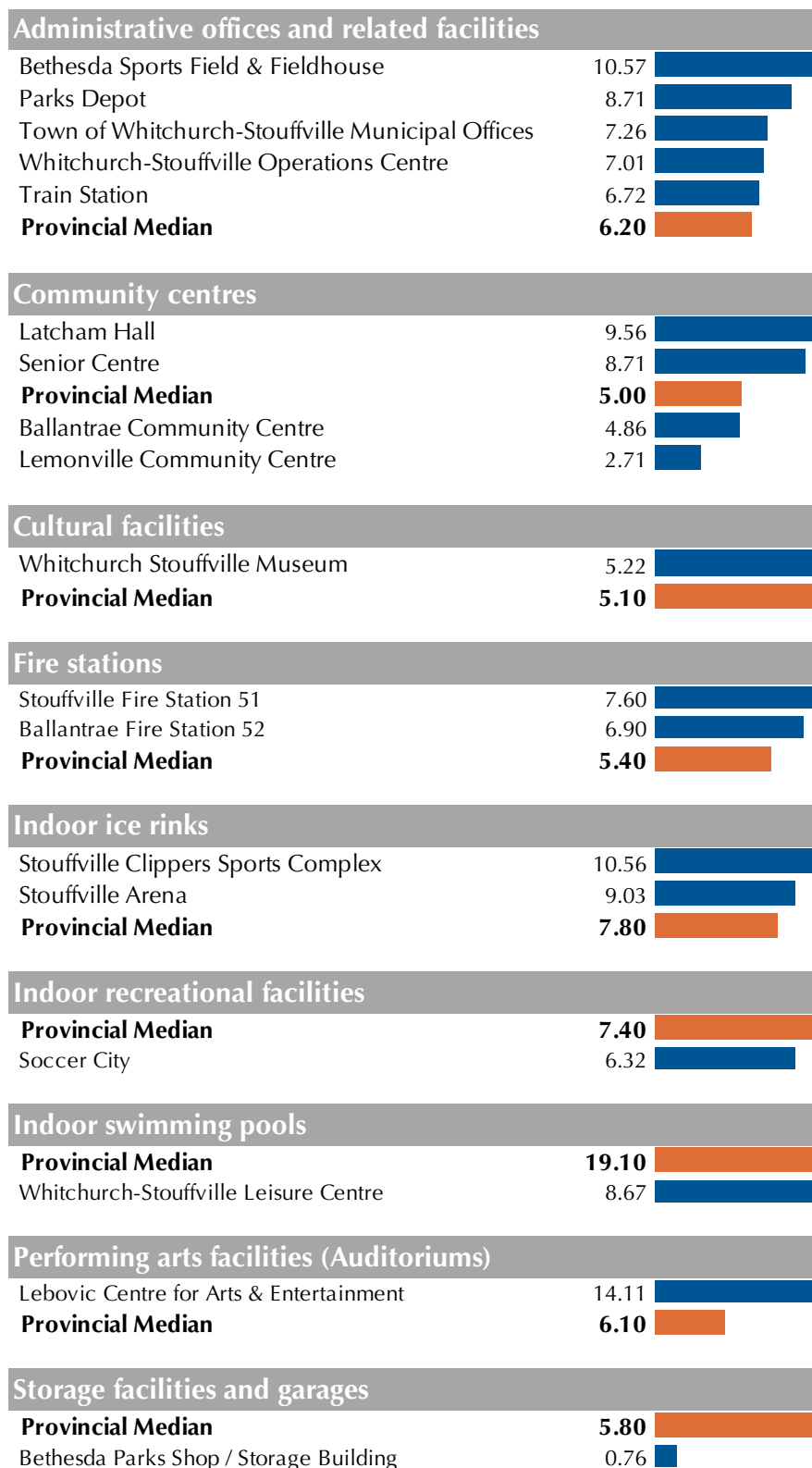
The Lebovic Centre was the highest over the provincial normal, under performing arts facilities. The Town's fire stations were the second highest over the provincial average. Since 2016, the electricity use of both fire stations has decreased significantly. For Station 1, there was a 13% increase in energy usage from 2016 to 2018. Station 2's energy use remained relatively stable over the years, increasing by less than 1% from 2016 to 2018. Both of these facilities increased their natural gas consumption from 2016 to 2018, also leading them to have higher GHG emissions.

The tables below show the energy intensity (eWh/HDD/ft<sup>2</sup>) of each of the Town's facilities compared to the provincial median for that operation type. Under each operation type, the facilities are ranked with the provincial median from highest to lowest intensity. This uses the same data as above, from 2016.

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<sup>6</sup> Although the Ministry has cleaned up the raw data provided by municipalities to some extent, within the facility types there may be considerable variation in the characteristics of the buildings that will explain some of the energy use patterns.

Table 14 Energy intensity of Whitchurch-Stouffville facilities versus the provincial medians in 2016 (eWh/HDD/ft<sup>2</sup>)



SOURCE: (Ontario Ministry of Energy, Northern Development and Mines, 2019)

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## Appendix C. The planning process

The ECDMP for the Town of Whitchurch-Stouffville is a 5-year plan covering the period from July 2019 to June 2024.

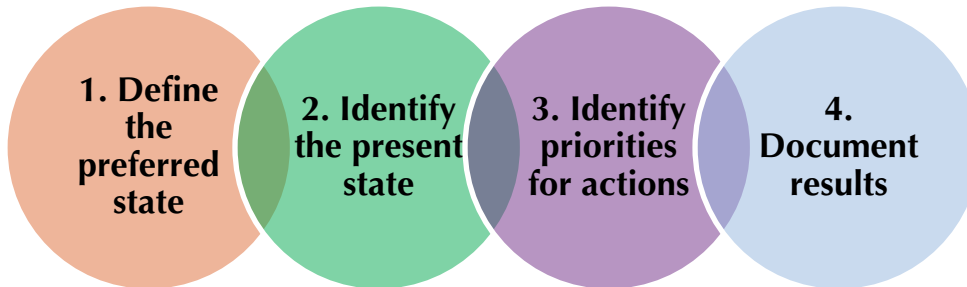


Figure 3 The key steps of our strategic approach for developing the plan

**Defining the preferred state** involved exploring where the Town of Whitchurch-Stouffville would like to be with respect to energy management. The elements of the preferred state were identified through interviews with staff, a review of jurisdictional best practices, and during the strategic planning session. The preferred state informs the ECDMP's objectives, targets, and actions.

**Identifying the present state** involved exploring where the Town is now with respect to energy management. Energy data analysis; interviews; a review of the Town's existing policies, plans, and past energy efficiency projects; and benchmarking were among the inputs that were used to identify the present state.

**Developing actions** involved a consideration of technical measures and organizational measures (i.e. measures related to corporate processes that also produce real energy savings and help to enable the technical measures) to help the Town move towards the preferred state. Actions were identified through interviews, the strategic planning session, and the jurisdictional review of best practices. They were grouped according to the following categories:

**Organizational commitment** – measures related to policies, targets, and resources required to enable energy management and the other actions;

**Existing buildings and equipment** – measures, both technical and policy based, that impact existing buildings and equipment;

**New buildings and equipment** – measures, both technical and policy based, that impact new buildings and equipment;

**Monitoring and tracking** – measures related to evaluating, monitoring, and verifying energy data;

**Communication and engagement** – measures related to encouraging behavioural modifications, and educating about modifications to save energy;

**Procurement and renewables** – measures related to the procurement of energy and renewable technologies; and

**Setting priorities** involved determining the timeframe for implementation of each action in the ECDMP. All operations and measures were prioritized based on their importance and ease of implementation.

**Preparing the Draft and Final Plan** involved documenting the results of the planning process. As described in the section of this report, *Updating and reporting on the plan*, the ECDMP will be reviewed annually and updated at the end of the five years.

Inputs to the planning process included:

- Analysis of Whitchurch-Stouffville's utility energy use data;
- Review of existing policies, plans, and the 2014 ECDMP;
- Interviews with Town staff;
- A strategic planning workshop with key staff members.

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## Appendix D. Incentive programs

This section describes the financial incentives that are available to the Town of Whitchurch-Stouffville. These incentives include:

- utility incentives for electricity savings offered by the Independent Electricity System Operator (IESO)
- utility incentives for natural gas savings offered by Enbridge Gas,
- incentives offered at the federal level,
- incentives offered by The Atmospheric Fund.

The Town of Whitchurch-Stouffville can take advantage of these incentives to implement some of the suggested technical measures. Forming partnerships with energy utilities allows for the expansion and access to energy efficiency programs within the Town.

For electricity, applicable technical measures fall under the Save on Energy programs offered by the IESO.

For natural gas, applicable technical measures fall under the programs offered by Enbridge Gas. The Town can improve its long-term energy and environmental performance by considering these financial incentives.

There are also many federal incentives offered by the Government of Canada.

It is recommended that Whitchurch-Stouffville take advantage of all these incentives as soon as possible. Some programs have limited lives or funding, and the continuation of others cannot be assured.

### *Independent Electricity system Operator (IESO)*

Full details are available at: <https://saveonenergy.ca>.

#### *Retrofit Program*

The Retrofit programs provides incentives for electricity savings from lighting retrofits, lighting controls, HVAC redesigns, chiller replacements, variable speed drives, or improvements to the thermal performance of a building envelope. There are two types of project applications: Prescriptive Track and Custom Track.

#### *Process & Systems Program*

This program provides incentives for innovative changes, equipment retrofits, financial assistance for engineering studies, technical expertise from energy managers.

#### *Energy Performance Program*

This incentive is ideal for improving the energy performance of an entire building.

### *Enbridge Gas*

Full details are available at:

<https://enbridgesmartsavings.com/business-energy-management>



### The Commercial Custom Retrofit Program

The program allows you to work with Enbridge Gas to identify energy efficiency opportunities. The program opportunities focus on reducing natural gas while saving money, and it includes financial assistance.

### The Fixed Incentive Program

Enbridge Gas offers incentives to help offset the costs of implementing more efficient natural gas technologies in facilities, in both new and existing buildings. The program offers incentives for technologies such as heating and ventilation, air curtains, high efficiency boilers, rapid air doors, a payback period calculator, insulation, and many more.

### The RunitRight program

The program identifies low or no-cost efficient energy operational improvements to implement in the Town. These improvements help reduce the amount of natural gas that will be used, as well as save money.

### *Federal incentives*

Full details are available at:

<https://fcm.ca/en/programs>

<https://www.nrcan.gc.ca/cleangrowth/20254>

The Federal Government of Canada offers funding, grants and incentive programs to encourage energy innovation, a clean economy, and to promote climate change action. The Federation of Canadian Municipalities (FCM) offers programs and tools to help municipalities build stronger communities. FCM supports a variety of opportunities such as plans, studies, pilot projects, capital projects, asset management grants, and partner grants. Additionally, through Natural Resource Canada's (NRCan) Innovation and Clean Growth Programs, there are incentives for projects that support key energy innovative areas. Below is a description of each.

### The Green Municipal Fund-Energy

Full details are available at:

<https://fcm.ca/en/funding/gmf/pilot-project-retrofit-municipal-facilities>

<https://fcm.ca/en/funding/gmf/study-energy-recovery-district-energy>

This program funds studies, pilot and capital projects for different environmental sectors. Both grants and loans are available for municipal projects. Recipients can receive additional grant of up to 15 percent of their loan amount. The Green Municipal Fund can fund pilot projects of retrofits that improve energy efficient by at least 30% in municipal facilities or provide the funding for capital projects where renewable thermal energy is used in new or existing facilities, to help the municipality reduce its greenhouse gas emissions.

### Municipalities for Climate Innovation Program (MCIP)

Full details are available at:

<https://fcm.ca/en/programs/municipalities-climate-innovation-program>

The Municipalities for Climate Innovation Program delivered by the Federation of Canadian Municipalities (FCM) is a five-year, \$75 million program that provides funding, training and resources to help Canadian municipalities adapt to the impacts of climate change and reduce greenhouse gas emissions.

The MCIP was launched in February 2017 and is scheduled to end in 2021-2022.

### iZEV Program – incentives for zero emission vehicles

Full details are available at:

<http://www.tc.gc.ca/en/services/road/innovative-technologies/zero-emission-vehicles.html>

The government has allocated \$300 million over the next three years to Transport Canada for the administration of the iZEV program. Transport Canada will offer an incentive of up to \$5,000 for electric battery or hydrogen fuel cell vehicles with a manufacturer's suggested retail price of less than \$55,000.

### Electric Vehicle Infrastructure Demonstrations

Full details are available at:

<https://www.nrcan.gc.ca/energy/funding/icg/18386>

The Electric Vehicle Infrastructure Demonstrations are available for projects that need to investigate and understand the impacts and potential hurdles in the deployment of the next generation of charging infrastructure for electric vehicles.

### The Low Carbon Economy Fund

Full details are available at:

<https://www.canada.ca/en/environment-climate-change/services/climate-change/low-carbon-economy-fund.html>

The Low Carbon Economy Fund supports the Pan-Canadian Framework on Clean Growth and Climate Change by leveraging investments in energy efficiency projects. The fund is designed to support projects that will generate clean growth, reduce greenhouse gas emissions, and align with Canada's Paris Agreement commitments. The fund is made up of two components:

1. Low Carbon Economy Leadership Fund
2. The Low Carbon Economy Challenge

### Climate Action Incentive Fund: Municipalities, Universities, Schools and Hospitals (MUSH) Retrofit stream

Full details are available at:

<https://www.canada.ca/en/environment-climate-change/services/climate-change/carbon-pollution-pricing-proceeds-programming/climate-action-incentive-fund/municipalities-universities-schools-hospitals.html>

The Climate Action Incentive Fund (CAIF) MUSH Retrofit stream provides funding to municipalities, universities/colleges, schools, and hospitals to help them make energy efficiency improvements and retrofits to reduce energy use, costs, and carbon pollution. The first round of funding for 2019-2020 supported energy efficiency projects in schools. Funding for municipalities will be announced later in 2019-2020.

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## Appendix E. List of acronyms

CDM – Conservation and Demand Management

CO<sub>2</sub>eq – a quantity of a greenhouse gas or collection of greenhouse gases expressed as a carbon dioxide (CO<sub>2</sub>) equivalent

ECDMP – Energy Conservation and Demand Management Plan

ECM – energy conservation measure

ekWh – equivalent kilowatt-hour, a measure of energy. Electrical energy is typically measured in kilowatt-hours (kWh), but other forms of energy are not. ekWh is sometimes used to indicate that some or all of the energy quantity being reported is not electrical.

EUI – energy use intensity, for buildings it is typically measured in energy use per unit of floor area

GHG – greenhouse gas, compounds that contribute to climate change

GJ – gigajoule, a billion joules. A measure of energy.

GWh – gigawatt-hour, a million kilowatt-hours. A measure of energy

HDD – heating degree days, measure of heating requirement for buildings

HVAC – heating, ventilation and air conditioning

IESO – Independent Electricity System Operator

KPI – key performance indicator

LED – light emitting diode

MWh – megawatt-hour, a thousand kilowatt-hours. A measure of energy

NPV – net present value

## Appendix F. Greenhouse gas reduction targets adopted by municipalities and other levels of government

Municipality	Target	by	Relative to	Set in
Toronto	30%	2020	1990	2017
Toronto	65%	2030	1990	2017
Toronto	80%	2050	1990	2017
Burlington	Carbon neutral	2040		2015
Oxford County	100% renewable energy	2050		2015
Hamilton	20%	2020	2005	2014
Hamilton	50%	2030	2005	2014
Hamilton	80%	2050	2005	2012
Guelph	28%	2031	2011	2012
Markham	Net zero emissions	2050		2011
York Region	6%	2021	2014	2016
York Region	17%	2031	2014	2016
York Region	44%	2041	2014	2016
York Region	72%	2051	2014	2016
St. Catharines	30%	2030	2011	2014
Durham Region	80%	2050	1990	2012
London	10%	2020	2014	2014
Oakville	20%	2030	2014	2014
Oakville	80%	2050	2014	2014
Kingston	15%	2020	2011	2014
Kingston	30%	2030	2011	2014
Kingston	50%	2041	2011	2014
Vaughan	22%	2031	2013	2016
Ottawa	80%	2050	2012	2016
Greater Sudbury	80%	2050	1990	2016
Windsor	40%	2041	2014	2017

Region	Target	by	Relative to	Set in
Canada	40%	2030	2005	2017
Canada	80%	2050	2005	2017
Ontario	17%	2020	2005	2009
Ontario	30%	2030	2005	2018
Ontario	80%	2050	2005	2017

## Appendix G. Energy density and conversion factors, and GHG emission factors

### Global Warming Potential

GHG	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	Reference
GWP	1	25	298	ECCC 2019, PT1, p.18

Note: 100-year GWPs

### Emissions of Ontario fuels

Fuel	Units	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2</sub> eq	Reference
Natural gas	g CO <sub>2</sub> eq/m <sup>3</sup>				1,891	MENDM 2019
Light fuel oil (Residential)	g CO <sub>2</sub> eq/L				2,735	MENDM 2019
Fuel oil 4&6	g CO <sub>2</sub> eq/L				3,145	MENDM 2019
Diesel	g CO <sub>2</sub> eq/L	2,681	0.133	0.4	2,804	2018NIR PT2 p. 212
Motor gasoline	g CO <sub>2</sub> eq/L	2,307	0.1	0.02	2,315	2018NIR PT2 p. 212
Propane	g CO <sub>2</sub> eq/L	1,531	0.027	0.108	1,548	MECP 2018 p.98

NOTE: CO<sub>2</sub>eq is the sum-product of the emission factor of each contaminant and the global warming potential

### GHG intensity of Ontario electricity (g CO<sub>2</sub>eq/kWh)

Year	Generation intensity	Consumption intensity
2011	98.040	110
2012	96.096	110
2013	76.012	80
2014	40.011	40
2015	35.011	40
2016	35.548	40
2017	17.298	20
2018	26.237	31
2019		34
2020		40
2021		41
2022		45
2023		63
2024		53

SOURCES: (Environment and Climate Change Canada, 2019), (A. Kirschbaum, personal communication, May 6, 2019), (The Atmospheric Fund, 2019)

NOTE: Consumption intensity which takes into account emissions and losses related to transmission and distribution is used for this analysis. The Ministry of Energy, Northern Development and Mines uses the generation intensity in its reporting.

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## Appendix H.2019 Energy Conservation and Demand Management (CDM) Plan update checklist as required under O. Reg. 507/18

### *CDM Results*

- The annual energy consumption during the last year for which complete information is available for a full year (2017) for the public agency and its operations.
- The public agency's goals and objectives for conserving and otherwise reducing energy consumption and managing its demand for energy.
- The public agency's actual results.

### *Current and proposed measures*

- The public agency's current and proposed measures under its energy conservation and demand management plan.
- The revised forecast of the expected results of the current and proposed measures.
- Cost and saving estimates for its proposed measures.
- The estimated length of time the public agency's energy conservation and demand management measures will be in place.
- A description of any proposed changes to be made to assist the public agency in reaching any targets it has established or forecasts it has made.

### *Generation*

- A description of any renewable energy generation facility operated by the public agency and the amount of energy produced on an annual basis by the facility.
- A description of:
  - The ground source energy harnessed, if any, by ground source heat pump technology operated by the public agency.
  - The solar energy harnessed, if any, by thermal air technology or thermal water technology operated by the public agency.

- The proposed plan, if any, to operate heat pump technology, thermal air technology or thermal water technology in the future.

### *Approval and posting*

- Confirmation that the energy conservation and demand management plan has been approved by the public agency's senior management.
- By July 1, 2019 the CDM plan needs to be:
  - Published on the public agency's website (if there is one).
  - Published on the public agency's intranet site (if there is one).
  - Made available to the public in printed form at its head office.

SOURCE: Ontario Ministry of Energy, Northern Development and Mines, 2019







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