Stouffville

Energy Conservation and Demand Management Plan 2024-2029








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

Whitchurch-Stouffville staff provided valuable input to the plan. The contributions of Bob Heickert, Carlo LaDuca, Ryan Shannon, Stephen Foster, Peter Wilie, Aisha Nafis and Brian Slater are greatly appreciated.

Special thanks to Aisha who scoured files to assemble energy usage data from utility bills.

Brian Slater was the Whitchurch-Stouffville project manager, and his insights and contribution were invaluable.

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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 costs, 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 enacted Regulation 25/23 under *the Electricity Act* to advance that goal.[1] 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 2024.

The *Corporate 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 2024 to 2029.

The ECDMP is focused on buildings.

OBJECTIVES AND TARGETS

Energy efficiency is a valuable opportunity 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.

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, energy use by the Town relative to other Ontario municipalities, and resource availability a target reduction of 7% of energy use in 2029 relative to 2023 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. More aggressive actions will be required in the future.

[1] That regulation replaces the nearly identical Regulation 397/11 under since repealed *Green Energy and Green Economy Act (2009)*.

SCOPE AND METHOD

The ECDMP addresses energy use and Scope 1 and Scope 2 greenhouse gas emissions from facilities in the town as a corporate entity.[2] 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 several sources: consultation with town staff, and a review of Town policies, plans and programs, and experience of other jurisdictions.

The first step in the process was to review and confirm a previously established preferred state, which sets out where the town would like to be with respect to energy and emissions.

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.

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 conservation measures to be implemented.

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

- Organizational initiatives – around planning and management
- Major renovations and upgrades – facility upgrades that will involve changes in energy use
- Energy efficiency initiatives – retrofit initiatives specifically undertaken to reduce energy use
- Other considerations – plans for fleets, water conservation, and streetlights.

CAPITAL COSTS

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

The project-specific funding will be developed and refined as the plan is implemented. Based on typical costs for energy savings, the capital requirement to achieve the target savings has a net cost are in the order of $500,000 over the five years. Those costs include incremental costs for better energy efficiency equipment where renovations and upgrades are required for other reasons, and expenditures for energy retrofits and audits.

To meet more ambitious long-term objectives of moving to net zero, more substantial investments will be required ideally with support from the higher levels of government.

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[2] Scope 1 emissions are the direct emissions associated with fuel use by Whitchurch-Stouffville. Scope 2 emissions are emissions associated with generating the electricity used by Whitchurch-Stouffville. Scope 3 emissions such as upstream oil and gas emissions, emissions embedded in products used by the City, and employee commuting emissions are not included.

Introduction

This is the third conservation and demand response plan for the Town of Whitchurch-Stouffville designed to address energy use with the Town's own operations.

There previous plan set out reasons why Whitchurch-Stouffville want to improve its energy management:

- 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) The IPPC has said that meeting the Paris Agreement target "requires rapid and deep, and in most cases, immediate greenhouse gas emissions reductions in all sectors this decade."(IPCC, 2023a)
- Financial incentives are available now to assist in energy and emissions reductions. These include incentives for electricity efficiency improvements from the IESO's SaveOnEnergy programs (**https://www.saveonenergy.ca**). For 2024 only, incentives under the Retrofit program are doubled for York Region. The existing framework expires this year; a new framework and programs are scheduled to be announced for 2025 and beyond.
- The cost of energy is a significant burden on towns and municipalities. And the costs can be expected to increase. For example, the federal government has also announced that carbon prices will rise each year through 2029 from 80 $/t in 2024 to 170 $/t in 2030 (Canada, 2021). Energy efficiency is often an investment that will temper the impact of energy costs and provide a very attractive return.

These reasons persist today and are consistent with the values outlined in the 2022 to 2026 strategic plan.(Whitchurch-Stouffville, Town of, 2022):

- Effective energy management is a part of the "Facility management" and "Fleet management" areas of focus within the organizational effectiveness service theme
- Promoting responsible use and protection of natural resources is a key part of the healthy and green town service theme.

A focus on energy efficiency and renewable energy is also consistent with both federal and provincial objectives and requirements:

- At the federal level, Canada has set a goal of net zero emissions by 2050 and a reduction of 40-45% of 2005 levels by 2030.[3]

[3] Canada. 2024. Net-zero emissions by 2024. https://www.canada.ca/en/services/environment/weather/climatechange/climate-plan/net-zero-emissions-2050.html

- *The Planning Act* Section 2(e) requires municipalities to have regard to the supply, efficient use and conservation of energy and water.
- The IESO indicates electricity will be in short supply by 2029.[4]

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

COMPONENTS OF THE PLAN

The Town of Whitchurch-Stouffville's *Corporate 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, minimize its environmental footprint, and be prudent in its spending.

The ECDMP includes the following elements:

- The 'preferred state' of energy in Whitchurch-Stouffville. This was developed in the previous plan and was reviewed and deemed still appropriate and relevant.
- A review of the present state: how was energy used in the most recent year, 2023 and what greenhouse gas emissions are associated with that energy use. A review of how energy use has changed over the last five years.
- Identification of objectives and targets for the coming five years.
- A preliminary list of projects in both new and existing buildings.
- Consideration of where renewable energy or heat pumps might be used in the municipality.
- Anticipated savings and costs associated with the proposed initiatives.
- A look towards the longer term.

THE PLANNING PROCESS

The 2024-2029 plan is based on consultation with Whitchurch-Stouffville staff on desired and planned initiatives, a review of historic utility bills, and corporate plans and documents, including planning documents and the Asset Management Plan.

The Town's ECDMP addresses buildings and technologies – as well as people, processes, and information. The plan addresses energy use from July 2024 to 2029. 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.

[4] Independent Electricity System Operator (IESO). 2024. 2024 Annual Planning Outlook. https://www.ieso.ca/-/media/Files/IESO/Document-Library/planning-forecasts/apo/Mar2024/2024-Annual-Planning-Outlook.pdf

Preferred state of energy management

In Whitchurch-Stouffville's earlier plans, a preferred state was identified through interviews with key staff members, review of other plans, reviewing the best practices of energy efficiency in other jurisdiction, and through a strategic planning workshop.

The preferred state is what the municipality aspires to with respect to its energy management.

As part of the preparation of this plan, the preferred state was reviewed and confirmed as still relevant. Actions in the plan are aimed at bringing the municipality closer to the preferred state outlined below.

The preferred state is not something that will be realized immediately but provides the direction to work towards.

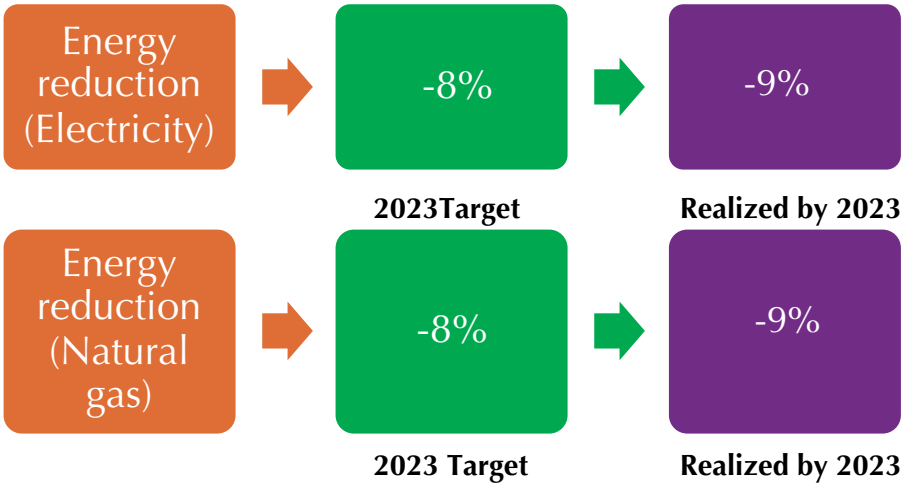
The Town of Whitchurch-Stouffville's preferred state

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 on-going efforts to manage energy and emissions
    f. The Town provides information to staff and 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.
    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.

Present state of energy

PROGRESS SINCE THE PREVIOUS PLAN

The 2019 plan set out targets for energy efficiency reductions by 2024. The target for 2024 was an 11% reduction, with 8% of that to be realized in 2023. That target applied equally to electricity and natural gas. Progress to the end of 2023 are as follows:



In both cases, a substantial reason for the reductions was relinquishing the Soccer City facility. Of the remaining 17 facilities, electricity use fell by 1%, and natural gas consumption increased by 6%.

These changes cannot be fully explained by weather, as gas use was up in warmer winters (when heating degree days are fewer). Weather data are shown in Table 1.

Table 1 Weather data for Whitchurch-Stouffville (Buttonville Airport Weather Station)

Year	Heating Degree Days	Relative to 2018	Cooling Degree Days	Relative to 2018
2018	4,007	100%	368	100%
2019	4,178	104%	235	64%
2020	3,758	94%	361	98%
2021	3,566	89%	304	83%
2022	3,923	98%	251	68%
2023	3,505	87%	214	58%

SOURCE: Environment Canada and Climate Change

The increase in energy use in buildings would likely be higher were it not for the milder weather in 2023; there were 12.5% fewer heating degree days, and 42% fewer cooling degree days.

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 2018-2023, since the last ECDMP.

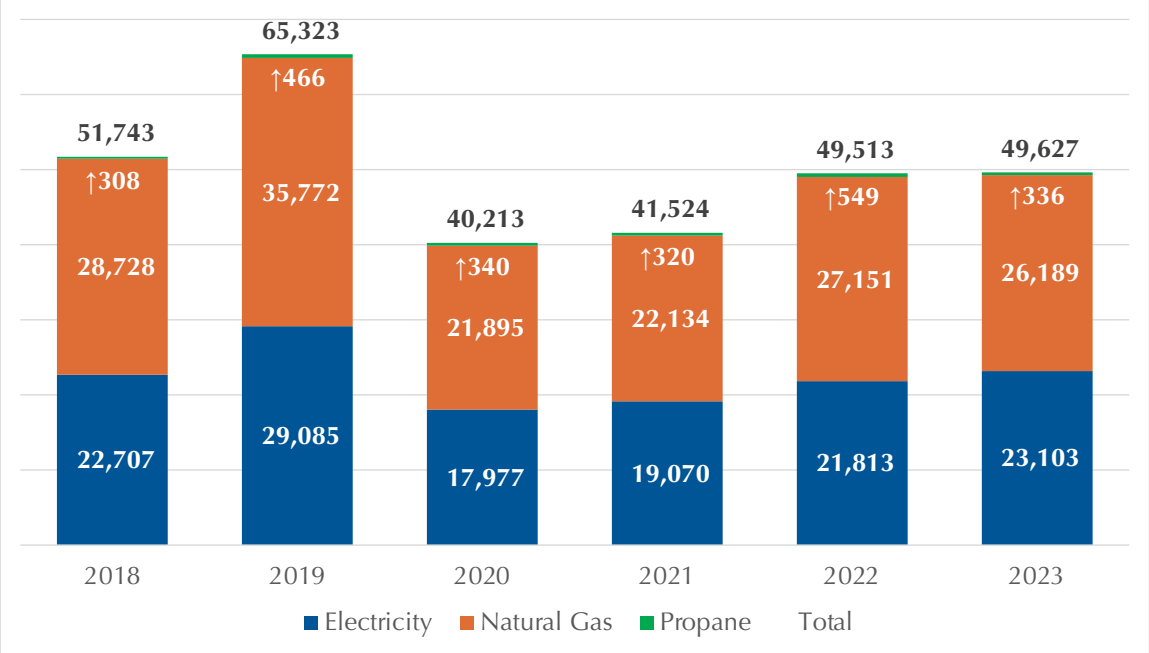


Figure 1 Town of Whitchurch-Stouffville trends on energy use in corporate facilities (GJ/a) 2018-2023

Energy intensive buildings in the Town

Arenas and pools are typically the facilities that use the most energy within municipalities. The buildings with the highest energy use are shown on Table 2.

Table 2 Whitchurch-Stouffville facilities with the highest energy use (GJ in 2023)

	2023 GJ
Leisure Centre	10,819
Stouffville Arena	9,553
Stouffville Clippers Sports Complex	9,340
Town Hall	5,292
Fire Station 51	4,316
Operations Centre	3,588
Ballantrae Fire Station 52	1,138
Nineteen on the Park	1,009
Stouffville Museum	843
Latcham Hall	834

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

Table 3 Corporate buildings with the highest 2023 energy use intensities (GJ/m^2)

	Energy use (GJ)	Floor area (m2)	Intensity (GJ/m2)
Fire Station 51	4,316	1,740	2.48
Nineteen on the Park	1,009	623	1.62
Latcham Hall	834	534	1.56
Leisure Centre	10,819	7,521	1.44
Stouffville Clippers Sports Complex	9,340	7,110	1.31
Bethesda Sports Field & Fieldhouse	399	307	1.30
Stouffville Arena	9,553	7,339	1.30
Parks Depot	323	279	1.16
Ballantrae Community Centre	740	669	1.11
Seniors Centre	813	753	1.08

GHG EMISSION TRENDS IN WHITCHURCH-STOUFFVILLE

Figure 3 shows the greenhouse gas emissions from corporate facilities in the Town of Whitchurch-Stouffville. The figure also shows the amount of equivalent CO_2 emitted by each type of energy.

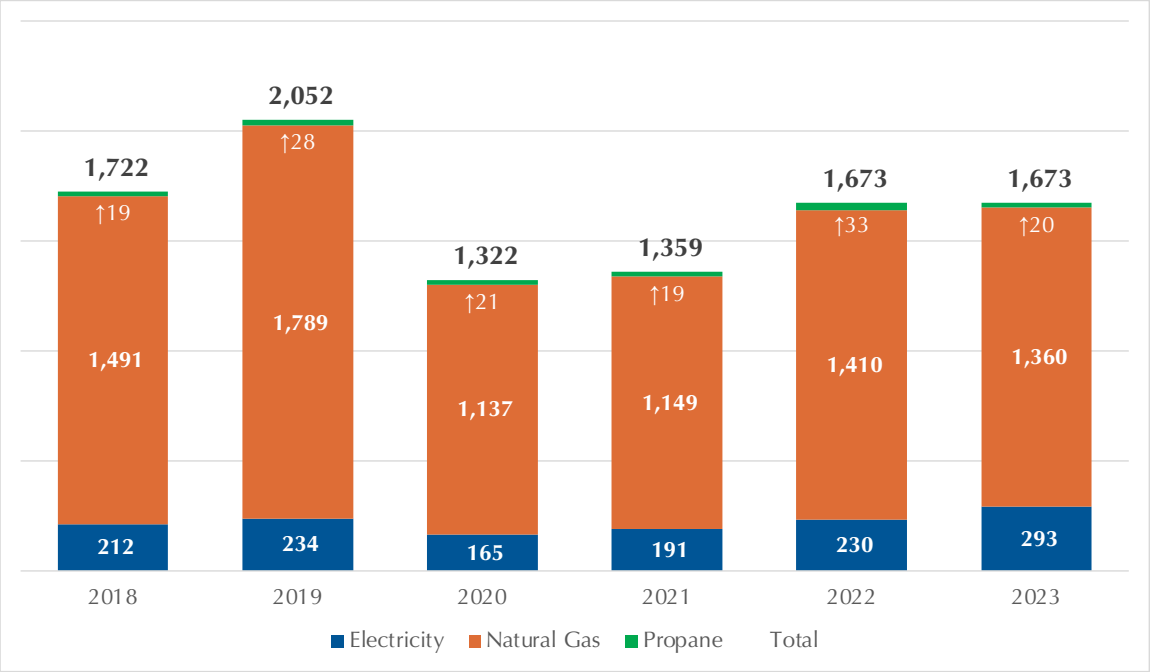


Figure 2 Town of Whitchurch-Stouffville greenhouse gas emissions, 2018 to 202 (t CO_2e)

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 is small. However, the Ontario electricity system is increasing the share of electricity of natural gas used to generate electricity, and consequently the emissions per kilowatt-hour of electricity are increasing. Emission rates are shown on Table 12, in the appendix.

ACTIONS TAKEN TO IMPROVE ENERGY PERFORMANCE AND REDUCE EMISSIONS

In addition to the numerical targets discussed above, the 2019 *Energy Conservation and Demand Management Plan* (ECDMP) outlined several actions of different types to be undertaken. The status of these actions is shown on Table 4.

Table 4 Status of actions identified in the 2019 ECDMP

Corporate organizational initiatives	Status	Comments
Establish an inter-departmental energy committee	Abandoned	Has not been formed and no plans to implement.
Integrate energy into corporate policies	Partial	A Strategic Plan was developed for 2022-2026 and it identifies a healthy and greener town as a service theme, but neither energy nor emissions are mentioned. Neither are the mentioned in the 2022 Asset Management Plan which focuses on road conditions and water, wastewater and stormwater services. Expect integration of energy efficiency into the updated Asset Management Plan in 2024 dealing with community facilities.
Consolidate work & update the plan in Phase 3	Done	
Energy monitoring and tracking	**Status**	**Comments**
Implement software to track energy use	Done	Search for suitable software that was affordable was challenging. The Town is using Portfolio Manager
Develop protocols to track efficiency effectiveness	Not-started	
Audit two buildings a year	Planned	Was deferred. Plan to undertake audits in 2024-2029
Develop dashboards for staff and managers	Not-started	
Develop targets for individual facilities and action plans	Partial	Targets for existing buildings not started yet.
Evaluate the tracking system	Done	Not completely satisfied with Portfolio Manager, but do not see a better alternative
Communication and engagement	**Status**	**Comments**
Inform staff on how to interpret tracked energy use	Not started	
Quarterly reports to Council on energy initiatives	Not started	
Publish information for public and staff	Not started	In the Loop is undergoing a facelift. Energy dashboard consideration has been requested.
Develop mechanism to invite employee suggestions	Not started	
Recognize employee successes	Planned	
Enhance training for front-line staff	Not started	Resource constrained
On-going efficiency improvements	**Status**	**Comments**
Lighting upgrades	Done	See Table 8. Other upgrades planned.
Establish temperature set points		Our HVAC techncian has been diligent in establishing these set points and ensuring temperature fluctuations cannot be manipulated by staff members.
Motion sensors and timers	In-progress	Replaced switches in high-traffic areas with motion sensors or timers in offices and facilities. In parks and parking lots, the majority of lights are on timers.
Building automation systems	In-progress	Our HVAC technician has been working with Veridian to understand best practices inside our BAS software to ensure he can maximize efficiency. In many facilities, he has locked out staff's ability to make controller adjustments at the ground level.
Upgrade insulation and windows at the Operations Centre	Planned	Insulation planned to be replaced in Fall of 2024. Window replacement deferred.
Upgrade Town Hall as 'model' facility	Planned	Major upgrading of Town Hall budget approved for next four years.
Smart pumps that tie into BAS		
Smart compressors		
Building optimization systems/recommissioning		
Other initiatives	**Status**	**Comments**
Continue street light conversions	Partial	Cobraheads converted. Decorative lamps next. Proposed budget for 2025 +
Water conservation programs	On-going	Support Regional efforts. No-touch faucets, toilets installed during COVID
Develop fleet efficiency plan	Planned	Fleet management plan budgeted for 2024
Develop new building standards	Partial	No explicit standards, but new firehall to be meet LEED Silver equivalency
Establish a watch list for renewables, GSHP & energy storage	Planned	Resource constrained

As the table indicates, several of the proposed actions are still in progress or planned. Their implementation has been delayed by resource limitations, compounded by the challenges of the COVID-19 pandemic.

The lighting efficiency measures are summarized on Table 5. In addition to the lighting projects, Whitchurch-Stouffville completed several other efficiency projects, as shown on Table 6. Energy savings associated with these projects are not available.

Table 5 Energy savings from lighting projects completed 2018-2023

Facility	Action	Quantity	Original wattage	New wattage	Savings (W)	h/wk	kWh/a	Expected lifetime (a)
Ballantrae Community Centre	replace 2x2 lights and 6" pot light fixtures with LEDs	75	96	30	4950	40	10,324	19
	parking lot fixtures	12	400	167	2796	28	4,082	20
Fire station 51	Replace high bay lights - 9 fixtures							6
	Replace office 2x2 fixtures with LED Rat panels	15	96	30	990	128	6,608	6
Lawn bowling	Lighting upgrade	7	96	54	294			19
Lemonville	Lighting upgrades	18	96	54	756	35	1,380	19
Memorial Park Baseball Diamond	Lighting upgrades	26	1500	600	23400	15	18,302	20
Operations Centre	Lighting upgrades	35	250	120	4550	75	17,794	14
	Lighting upgrades	60	128	54	4440	75	17,364	14
	Parking lot light upgrades	25	320	186	3350	28	4,891	20
Stouffville Arena	Lighting upgrades	5	250	120	650	90	3,050	10
		50	40	33	350	90	1,643	10
	Lighting upgrades (office)	40	64	27	1480	35	2,701	14
	Lighting upgrades (Ice pad)	60	172	75	5820	90	27,312	10
	Lighting upgrades (parking lot)	13	400	167	3029	28	4,422	20
Stouffville Clippers Sports Complex	Lighting upgrades	6	78	45	198	35	361	19
	Lighting upgrades (troffer fixtures)	172		81		130	-	19
	Lighting upgrades (pot lights)	40	54	33	840	130	5,694	8
	Lighting upgrades (ice pad)	100	172	75	9700	130	65,752	8
	Lighting upgrades (parking lot)	27	320	167	4131	28	6,031	20
Town Hall	Lighting upgrades	100	128	54	7400	50	19,293	14
	Lighting upgrades (parking lot)	10	400	167	2330	28	3,402	20
Leisure Centre	Lighting upgrades (parking lot)	3	400	167	699	28	1,021	20
	Lighting upgrades (office)	40	128	54	2960	95	14,663	14
	Lighting upgrades (pot lights)	50	40	33	350	95	1,734	14
TOTAL							237,823	

Table 6 Non-lighting efficiency measures implemented 2018-2023

Heat pumps

Facility	Action
Memorial Parks Shop	Ductless split system heat pump, 20 seer rating
Museum	Multi-zone heat pump system for main building

HVAC system upgrades

Facility	Action
Latcham Hall	Rooftop unit replacement. 5-ton SEER EFF rating
	Setback thermostat
	Rooftop unit replacement
Memorial Parks Shop	Replace unit heater with high eff power vented unit
Operations Centre	Radiant floor heat boiler operational upgrade to 87% efficiency
Stouffville Arena	Replaced boilers 2019,2020,2024
	Replaced pumps and boilers for radiant heating system
	HVAC technician and electrician ensure efficient operation
Stouffville Clippers Sports Complex	HVAC technician and electrician ensure efficient operation
Town Hall	Adjust rooftop HVAC to intake 10% fresh air
	Clean condensor coils
Museum	High efficiency AC 16 SEER in Brown House

Other measures

Facility	Action
Fire station 51	New high efficiency 100 gal water heater
	BAS system enabled
Stouffville Arena	Motion sensors in dressing room
	Installed touchless sensors on taps, toilets and urinals
	Replaced exterior sliding doors
	Replaced major components of the refrigeration system
Stouffville Clippers Sports Complex	Motion sensors installed in rooms
	Installed VFD for heat recovery systems
	Use BAS to adjust ice temperature
	Dehumidifer units service to reduce electricity use
	BAS for entire HVAC system
Museum	Set back thermostats

Objectives and targets

OBJECTIVES

Over the next five years, significant renovations and upgrades are proposed to multiple buildings. The objective is to ensure when these are done that the opportunity is taken to enhance the facility's energy efficiency.

The town also aims to enhance its understanding of where energy is being used and where savings can be made, and to communicate those to relevant staff.

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
- What is necessary to make adequate progress towards long-term targets
- 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.[5] In the Paris Agreement, that meant keeping the planet from heating to more than 2ºC; recently there is concern that a heating of 2ºC is too dangerous, and society should be aiming to keep global heating below 1.5ºC .[6] In practical terms, that means reducing greenhouse gas 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 CO2eq, that would mean a reduction of more than 40% relative to 2023 levels by 2030.

Progress towards long-term targets

Whitchurch-Stouffville has not set long-term goals for energy use or emission reductions. Higher levels of government have set targets for greenhouse gas reductions. York Region's

[5] An organization called "Science Based Targets" (sciencebasedtargets.org) works with large companies and cities on setting science based targets. They have developed a guide for cities on setting targets. (Science Based Targets Network, 2020)

[6] Rogelj et al., 2018

Corporate Plan targets a reduction of 17% of 2014 emissions by 2031.[7] Ontario has a target of a 30% reduction relative to 2005, which is based on Canada's targets under the Paris Agreement.[8] Canada's federal government has set a target of 40% reduction relative to 2005 for its own operations by 2030.[9] What these targets suggest for Whitchurch-Stouffville is shown in Table 7.

Table 7 Estimated Whitchurch-Stouffville reductions required by 2029 relative to 2023 levels to meet targets set by higher level jurisdictions

Jurisdiction	Target	Target year/Base year	Equivalent Whitchurch-Stouffville GHG reduction required	Equivalent Whitchurch -Stouffville Energy reduction
York Region (corporate)	17%	2031/2014	30%	32%
Ontario/ Canada national	30%	2030/2005	5%	5%
Canada (corporate)	40%	2030/2005	25%	30%

NOTE: Whitchurch-Stouffville reduction estimates are based on facility emissions in the base year and pro-rating required reductions from others' target year to 2029.

Benchmarking

Targets could be set relative to performance of others. In general, Whitchurch-Stouffville's facilities are using more energy per square metre than the median of buildings in Ontario, as illustrated on Table 11 in the appendix.

Given that these municipalities are likely planning to undertake other initiatives to reduce their use, reductions of amounts greater than shown there may be required to stay above the median. Further it might be argued that the median is not a sufficiently aggressive target.

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.

[7] (Regional Municipality of York, 2021)

[8] (Ontario Ministry of the Environment, Conservation and Parks, 2018)

[9] (Environment and Climate Change Canada, 2021)

There are multiple potential cost effectiveness criteria to be used. A common one is 'payback'. 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 consider the full range of costs and benefits such as employee or facility user comfort, reduced maintenance costs, and tax implications, 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 such as new buildings, or that piggyback on other initiatives, such as renovation projects.

Targets based on resource constraints

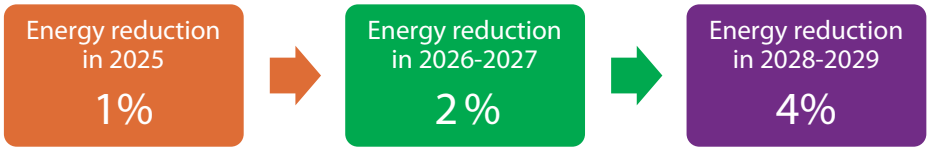
Where an organization does not have access to capital, it may be unable to undertake all the efficiency improvements that may be suggested by its investment criteria. Rather the initiatives to be undertaken will be limited by the available resources. In this case, the portfolio of energy efficiency projects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

The town has budgeted $50,000 per year for energy efficiency initiatives, as well there are funds for major renovations and upgrades to incorporate upgrading to more efficient technologies and systems. Assuming an overall resource availability of $500,000 over the five years, the energy savings at a typical cost for savings of 140 $/GJ, the savings would be about 36,000 GJ, representing a reduction of approximately 7%.

Overall target

In practice, all the above considerations go into setting the target for Whitchurch-Stouffville energy reductions by 2029. 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. However, the target is primarily driven by resource availability and thus a reduction of 7% in energy use by 2029 is adopted, 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 reductions will ratchet up over time, and are relative to 2023 levels.



KEY PERFORMANCE INDICATORS

The targets suggest key performance indicators:

- Total GHG emissions – kilograms of carbon dioxide equivalent
- Total energy use – gigajoules
- Total electricity demand – gigajoules
- Total fossil fuel demand for buildings –gigajoules

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 *Corporate energy management plan* is a living document and will be reviewed at least once a year. As part of the annual review, the following steps will 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; and
- Compile an updated report annually describing projects implemented, progress towards targets, updates to the ECDMP, and priority actions for the upcoming year.

Renewable and alternative energy

Whitchurch-Stouffville does not have any renewable energy installations. The town will be monitoring technology and cost trends and assessing the feasibility of adopting solar technologies in the future.

As noted above on Table 6, the town has installed heat pumps in the Stouffville Museum and the Memorial Parks Shop. The suitability of adding additional heat pumps will be assessed, both for any new buildings, and as the heating and cooling systems of existing buildings need to be replaced.

Anticipated actions, savings and costs

Many of the key elements for energy planning were put in place in the previous five year, 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
- Major renovations and upgrades
- Efficiency improvements
- Other considerations, including fleets, streetlights, new buildings, water conservation and renewable technologies.

CORPORATE ORGANIZATIONAL INITIATIVES

Several organizational initiatives are planned for the coming years, some of which were identified in the previous plan but are yet to be implemented. These include:

- Explicitly incorporating energy considerations into the new asset management plan being developed, possibly including energy efficiency design criteria[10]
- Undertaking ASHRAE level 2 audits of two buildings per year
- Developing energy targets for individual building, drawing on findings from the facility audits
- Incorporating an 'energy dashboard' into the staff newsletter, *In the Loop*
- Monitoring the availability of grants and incentives for improving energy efficiency, reducing emissions, or adopting renewable energy technologies.

MAJOR RENOVATIONS AND UPGRADES

The town has numerous major renovations and upgrades to facilities planned over the planning horizon. When these are done, the opportunity will be taken to adopt more energy efficient technologies. Initiatives and estimated savings are set out on Table 8.

These renovations and upgrades are needed for performance and operational reasons. The costs to realize greater energy efficiency are incremental costs. The incremental cost is estimated to be approximately $300,000.

[10] Although specific efficiency design criteria have not yet been developed or adopted, the new fire hall is being design for equivalency to LEED Silver standards.

Table 8 Renovation and upgrade plans, and estimated energy savings

Facility	Action	Planned date	Estimated electricity savings (%)	Estimated gas savings (%)	Estimated electricity savings (kWh)	Estimated gas savings (m3)	Estimate savings (GJ)
Leisure Centre	Replace DHW boiler in pool area	2024					
	Boiler replacement pool #2 & 3	2027		10%		17,000	600
	Boiler replacement pool #1	annual					
Latcham Hall	Rooftop Unit replacement	2024					
	Replace HVAC	2026		5%		1,000	40
Stouffville Arena	Continue lighting upgrades to LEDs						
	Replace VFD on mail boiler circulation		10%	10%	109,500	15,000	1,000
	New furnace and A/C being installed	May-24					
Stouffville Clippers Sports Complex	Continue lighting upgrades to LEDs						
	Continue installation of touchless taps, toilets and urinals						
	Replace HVAC	2027					
	Boiler room pump & motor replacement	2026	5%	10%	94,000	7,000	600
	Replace ammonia plant compressor	2025					
	Replace lower roof	2029					
	Replace condenser	2028					
	Replace HW holding tank and boiler						
Ballantrae Community Centre	Replace HVAC	2026	5%		3,000		10
	Replace roof	2026					
Stouffville Arena	Lobby roof replacement	2026					
	Pad A roof replacement		4%		43,500		200
	Pad B roof replacement						
	HVAC replacement (3 units)						
General	Window replacements	Annual					
Total					**250,000**	**40,000**	**2,450**

ENERGY RETROFITS

In addition to these major upgrades, additional energy retrofits will be undertaken where feasible. For example, several smaller facilities – some of which were on the high energy use intensity list – are suitable for upgrades under the Small Business Program offered by SaveOnEnergy. Estimated savings from these programs are shown on Table 9. This program offers an assessment of retrofits and install of up to $3,000 worth of lighting and $2,500 of non-lighting measures at no cost to the municipality.

The town has budgeted $50,000 per year which will cover the audits, and participation in the Small Business Program, as well as other programs that are suitable for Whitchurch-Stouffville's needs.

Table 9Facilities to participate in the Small Business Program

Potential lighting initiatives	Estimated electricity savings (kWh)	Estimate savings (GJ)
Parks Depot	2,000	7
Ballantrae Community Centre	7,500	27
Seniors Centre	5,500	20
Ballantrae Fire Station 52	3,500	13
Total	**18,500**	**67**

"OTHER" INITIATIVES

The town plans initiatives in three other areas beyond facilities:

- Fleets
- Water conservation
- Streetlights.

The town will be developing a fleet strategy that will address all issues related to vehicles used by the town, including electrification, and right-sizing.

The town will continue to support the Region's water conservation initiatives. These will include further installation of touchless water equipment, as well as water-efficient landscaping.

All the cobra-head streetlights have already been replaced. The town is planning to replace the decorative streetlight, starting in 2025.

The outlook beyond 2029

Whitchurch-Stouffville is aware that since the last plan, there has been increasing urgency from the scientific community on the need to reduce greenhouse gas emissions.[11] Further, governments – including Canada – have made commitments to substantially reduce emissions across the economy. Canada has a target of a 40-45% reduction in emissions relative to 2005 by 2030, and a goal of net zero by 2050.[12]

The municipality recognizes that there are long-term economic as well as environmental benefits to achieving these goals, though there are near-term challenges, particularly around resources.

Getting to net zero is a challenge in new buildings, and an even bigger challenge in existing buildings, but is achievable, as demonstrated in multiple buildings. Within the Whitchurch-Stouffville community is one of the earliest, verified net zero buildings – the Bill Fisch Stewardship and Education Centre. And work has been done in identifying how to get to net zero in arenas[13] and swimming pools[14], two of the building types with the largest energy demands.

To date the municipality has largely been pursuing the 'easy' measures, such as lighting and motors, but as those opportunities are exhausted, the focus will need to shift to such measures as electrification – e.g. of the fleet, and buildings through heat ground-source or air-source heat pumps – passive design, deep retrofits, and renewable generation.

The town wants to be a willing partner in this transition to a greener economy. The municipality will be looking to its partners at the provincial and federal levels to provide support in making this transition.

[11] (IPCC, 2023b)

[12] (Environment and Climate Change Canada, 2022)

[13] (Federation of Canadian Municipalities, n.d.-a)

[14] (Federation of Canadian Municipalities, n.d.b), (Maxwell, 2022)

Conclusion and recommendations

Town of Whitchurch-Stouffville has decreased its energy use and emissions associated with facilities significantly in the last five years, though much of that reduction was associated with the sale of Soccer City. Further progress in realizing reductions can be attributed to resource limitations – both financial and human.

Over the next five years, the major focus will be on improving the energy efficiency of facilities as they are renovated and upgraded. These will reduce both electricity use and natural gas use.

Although natural gas is currently much less expensive than electricity, natural gas is the primary driver of greenhouse gas emissions, and thus the Town will 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 2018-2023

The table below shows the GHG emissions for each corporate facility in the Town of Whitchurch-Stouffville, from 2018 to 2023. The emissions are given in tonnes of equivalent CO_2.

Table 10 GHG emissions in Whitchurch-Stouffville from 2018-2023 (t CO_2eq)

Facility	2018	2019	2020	2021	2022	2023
Ballantrae Fire Station 52	34	44	45	42	40	46
Fire Station 51	95	79	60	49	83	202
Stouffville Arena	373	516	176	207	306	342
Stouffville Clippers Sports Complex	162	227	186	207	287	219
Soccer City	225	234	-	-	-	-
Bethesda Sports Field & Fieldhouse	3	3	2	3	3	5
Operations Centre	198	174	154	129	150	119
Parks Depot	11	14	17	11	12	9
Town Hall	113	136	117	155	177	168
Train Station	6	11	6	6	6	5
Bethesda Parks Shop	8	16	13	11	14	10
Leisure Centre	343	425	404	389	424	386
Nineteen on the Park	32	42	30	37	34	31
Ballantrae Community Centre	34	34	27	26	32	29
Latcham Hall	25	30	25	25	28	34
Lemonville Community Centre	12	13	8	9	21	11
Seniors Centre	33	30	29	30	32	34
Stouffville Museum	16	24	23	24	25	20
Total	**1,722**	**2,052**	**1,322**	**1,359**	**1,673**	**1,673**

By energy source	2018	2019	2020	2021	2022	2023
Electricity	212	234	165	191	230	293
Natural Gas	1,491	1,789	1,137	1,149	1,410	1,360
Propane	19	28	21	19	33	20
Total	**1,722**	**2,052**	**1,322**	**1,359**	**1,673**	**1,673**

Appendix B. Whitchurch-Stouffville benchmarked against provincial medians

Table 11 shows how the energy intensity of Whitchurch-Stouffville facilities compares to the rest of Ontario.[15]

The provincial data in the table are for the year of 2021, the latest year for which Ontario data are available. The Whitchurch-Stouffville data are also for 2021.

The energy intensity averages for most facilities in Whitchurch-Stouffville were greater than the provincial medians for the same facility type, meaning that most of the Town's facilities are less efficient energy users.

The tables below show the energy intensity (GJ/m^2) of each of the Town's facilities compared to the provincial median for that operation type.

Table 11 Energy intensity of Whitchurch-Stouffville facilities versus the provincial medians in 2021 (GJ/m^2)

Facility	Facility type	Median Provincial EUI (GJ/m2/a)	Facilities of this type in dataset	This facility EUI (GJ/m2/a)	Energy reduction to match median (GJ/a)	Energy reduction required to match median (%)
Ballantrae Fire Station 52	Fire Station	0.790	875	0.935	167	15%
Fire Station 51	Fire Station	0.790	875	0.793	6	0%
Stouffville Arena	Ice/Curling Rink	0.875	309	0.773	-	-
Stouffville Clippers Sports Complex	Ice/Curling Rink	0.875	309	1.188	2,225	24%
Soccer City	Indoor Arena	0.815	446	-	-	-
Bethesda Sports Field & Fieldhouse	Office	0.790	843	1.037	76	19%
Operations Centre	Office	0.790	843	0.893	433	12%
Parks Depot	Office	0.790	843	1.195	113	35%
Town Hall	Office	0.790	843	0.925	738	14%
Train Station	Office	0.790	843	1.089	60	32%
Bethesda Parks Shop	Other - Public Services	1.020	2360	0.352	-	-
Leisure Centre	Other - Recreation	1.085	189	1.417	2,493	23%
Nineteen on the Park	Performing Arts	0.765	33	1.735	604	60%
Ballantrae Community Centre	Social/Meeting Hall	0.650	826	1.050	267	36%
Latcham Hall	Social/Meeting Hall	0.650	826	1.149	267	32%
Lemonville Community Centre	Social/Meeting Hall	0.650	826	0.367	-	-
Seniors Centre	Social/Meeting Hall	0.650	826	0.928	209	26%
Stouffville Museum	Social/Meeting Hall	0.650	826	1.316	565	67%

SOURCE: Broader Public Sector report for 2021, Whitchurch-Stouffville data for 2021

[15] 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.

Appendix C. List of acronyms

CDM – Conservation and Demand Management

CO_2eq – a quantity of a greenhouse gas or collection of greenhouse gases expressed as a carbon dioxide (CO_2) equivalent

ECDMP – Corporate Energy Conservation and Demand Management Plan

ECM – energy conservation measure

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 D. GHG emission factors

Table 12 Greenhouse gas emission factors by energy source and year

Energy source	Emission factor	Unit
Natural gas	1,931	g CO2eq/m3
Propane	1,544	g CO2eq/L
Fuel oil	2,755	g CO2eq/L
Electricity 2018	30.0	g CO2eq/kWh
Electricity 2019	29.0	g CO2eq/kWh
Electricity 2020	33.0	g CO2eq/kWh
Electricity 2021	36.0	g CO2eq/kWh
Electricity 2022	38.0	g CO2eq/kWh
Electricity 2023	45.7	g CO2eq/kWh

SOURCES: Fossil fuels[16], electricity 2018-2022[17], electricity in 2023 estimated from change in percentage of natural gas used for electricity generation[18]

[16] (Environment and Climate Change Canada, 2023)

[17] (Environment and Climate Change Canada, 2024)

[18] (Independent Electricity System Operator, 2024)

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