CORPORATE ENERGY MANAGEMENT PLAN 2019 – 2024

JUNE 2019

CITY OF Thunder Bay
Superior by Nature

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Executive Summary

The Corporation of the City of Thunder Bay ("the Corporation") developed its first Corporate Energy Management Plan (formally known as The Strategic Approach to Corporate Energy Management Plan) in 2011 and subsequently updated in 2014 to comply with the provincial *Green Energy Act, 2009*, Ontario Regulation 397/11: Energy Conservation and Demand Management Plans.

The Corporate Energy Management Plan 2019 – 2024, as prescribed under the *Electricity Act, 1998,* Ontario Regulation 507/18: Broader Public Sector: Energy Reporting and Conservation and Demand Management Plans; builds upon the successes of the previous plan, with the integration of green fleet initiatives and the expansion of proven initiatives such as energy efficient equipment and employee engagement to empower all staff to integrate energy management into daily operations.

The Corporation of the City of Thunder Bay committed to reducing corporate emissions by 20% below 2009 baseline year by 2020. In 2015, the Corporation exceeded this target (Figure 1) and continues to meet reduction targets set out within the Corporate Energy Management Plan of a 2% to 5% reduction in energy consumption per year.

In 2018, the Corporation utilized 555,630 gigajoules (GJ) of energy at a cost of approximately $13,307,050 and continues to exceed its reduction target by reducing greenhouse gas (GHG) emissions by 26% compared to the baseline year of 2009. A comprehensive analysis and description of the energy management initiatives undertaken from 2014 to 2019 that contributed to the successful reduction of consumption and greenhouse gas emissions within corporate operations and infrastructure is detailed in Appendix A.

Energy is a manageable cost and managing its use is a critical component of municipal daily operations. It is more than just implementing energy conservation retrofits within our corporate infrastructure: it requires a multi-dimensional approach. It encompasses not only the technical aspects of a facility, but also operational optimization, organizational management, and user behaviours. Going beyond specific facility energy efficient capital projects creates a holistic

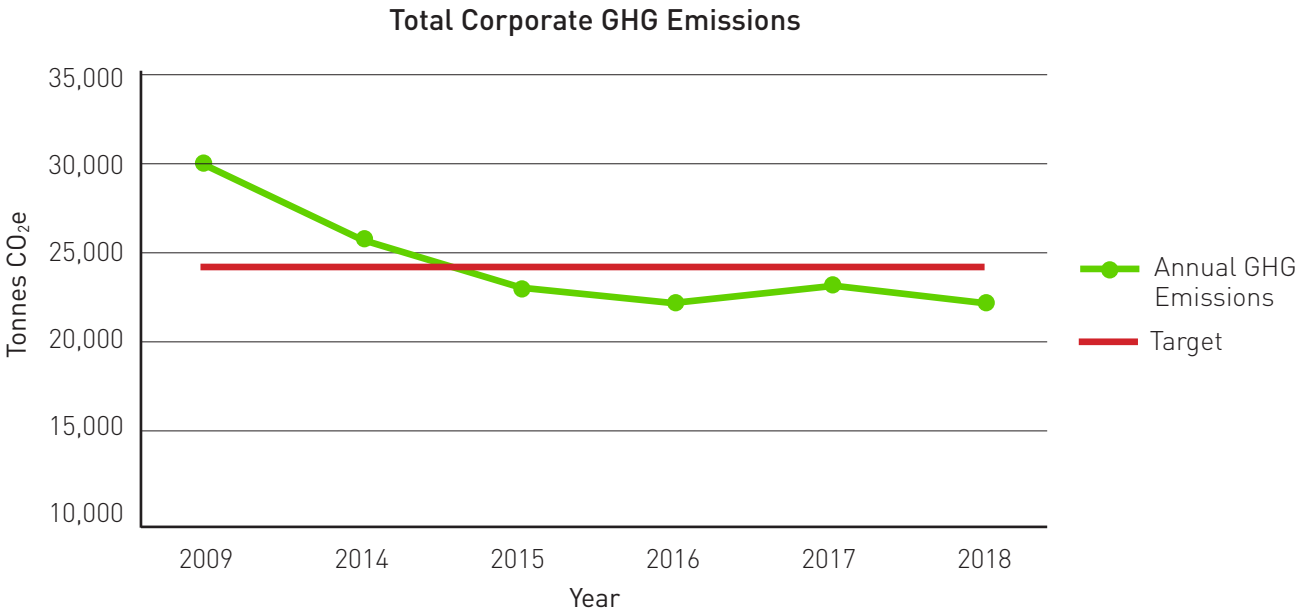
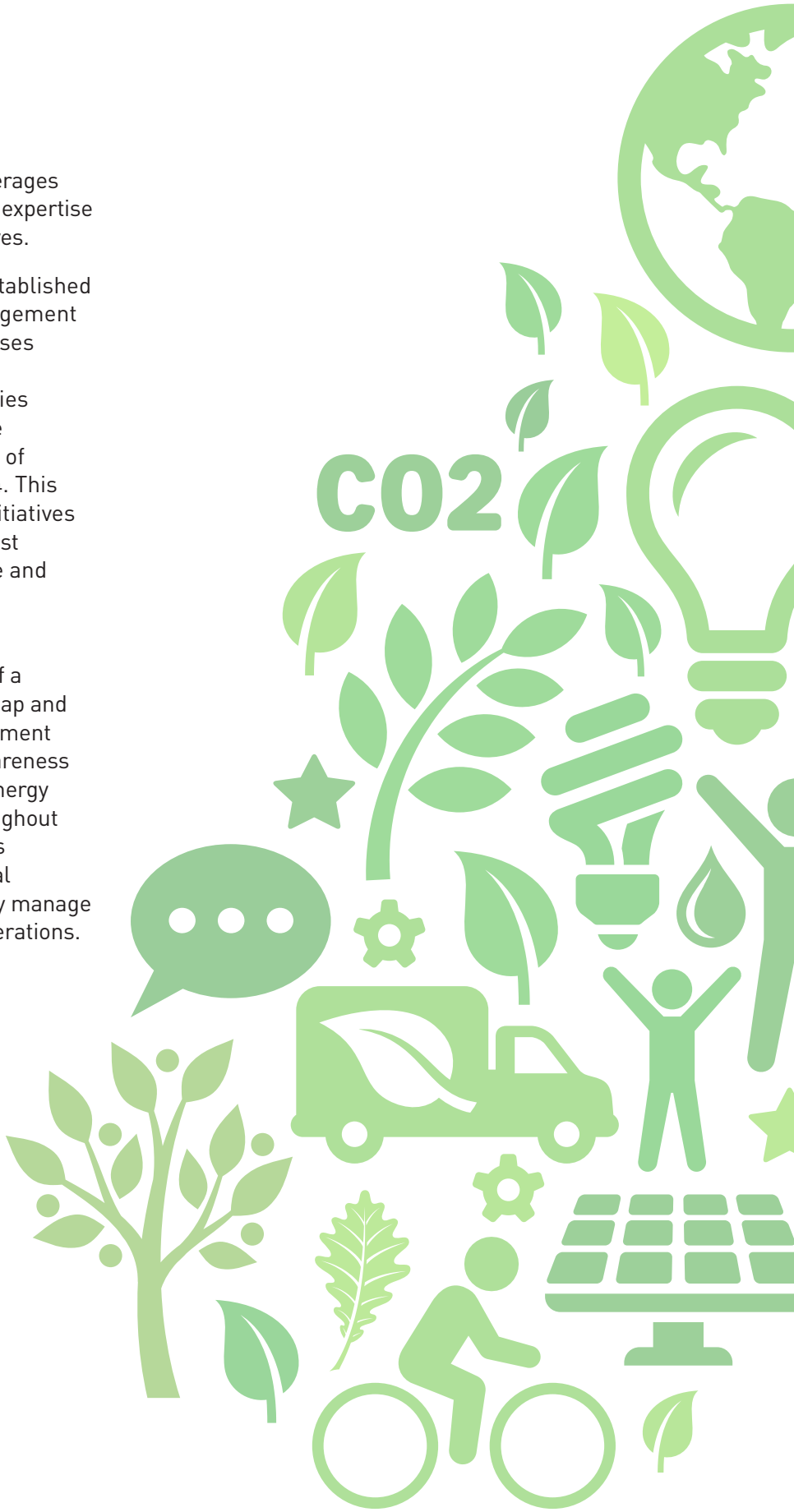


Figure 1: The Corporation of the City of Thunder Bay's target and greenhouse gas emissions (in tonnes of CO_2e) from 2009 to 2018.

approach to energy management and leverages staff knowledge and engagement to build expertise from within as the energy landscape evolves.

The Energy Management Committee, established in 2010, completed various energy management assessment tools to evaluate the successes of the current Energy Management Plan while also highlighting future opportunities and improvements that assisted with the development of the vision and objectives of the Energy Management Plan 2019-2024. This analysis provided feedback to develop initiatives that incorporate energy management best practices within corporate infrastructure and daily operations.

The initiatives set out within the Energy Management Plan 2019 – 2024 are part of a living document that will provide a roadmap and continue to build internal energy management knowledge and strengthen employee awareness providing the foundation for successful energy management decisions and actions throughout all Corporate operations. These initiatives are intended to guide the work for internal departments and divisions to successfully manage energy consumption within their daily operations.



Introduction

Canadians continue to be concerned about climate change as the impact of climate change is becoming evident abroad and at home. Impacts such as coastal erosion; thawing permafrost; increases in heat waves, drought and flooding; and risks to critical infrastructure and food security are being felt in Canada. [1]

In 2018, the United Nations' Intergovernmental Panel on Climate Change (IPCC) Special Report on Global Warming of 1.5°C concluded that human activities are estimated to have caused approximately 1.0°C of global warming above pre-industrial levels and is likely to reach 1.5°C between 2030 and 2053 if it continues to increase at the current rate. The report also contends that "temperature rise to date has already resulted in profound alterations to human and natural systems, including droughts, floods and some other types of extreme weather; sea level rise and biodiversity loss – these changes are causing unprecedented risks to vulnerable persons and populations."[2]

According to the IPCC, "the spread of fossil fuel based material consumption and changing lifestyles is a major driver of global resource use, and the main contributor to rising greenhouse gas (GHG) emissions."[3]

Climate change is a concern that affects nearly every sector of the Canadian economy, including municipal governments. Municipal governments are either in direct or indirect control of over half of Canada's greenhouse gas emissions, through decisions related to public transit, waste management, facility energy efficiencies, and land-use planning.[4] As a major consumer of energy, in 2014 Ontario municipalities consumed more than 6.25 billion kilowatt hours (kWh), at an annual cost of $917 million and 425 million cubic metres (m^3) of natural gas at an annual estimated cost of $105 million.[5] It is essential that as a municipal government, the Corporation of the City of Thunder Bay be fully engaged in initiatives to reduce greenhouse gas emissions.

1 Government of Canada. Pan-Canadian Framework on Clean Growth and Climate Change. 2016. Pg 1. http://publications.gc.ca/site/eng/9.828774/publication.html

2 Allen, M.R., O.P. Dube, W. Solecki, F. Aragón-Durand, W. Cramer, S. Humphreys, M. Kainuma, J. Kala, N. Mahowald, Y. Mulugetta, R. Perez, M.Wairiu, and K. Zickfeld, 2018: Framing and Context. In: Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty [Masson-Delmotte, V., P. Zhai, H.-O. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J.B.R. Matthews, Y. Chen, X. Zhou, M.I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, and T. Waterfield (eds.)]. In Press. Pg 53

3 2

4 Federation of Canadian Municipalities. Partners for Climate Protection. National Measures Report 2018: How Canadian cities and municipalities are taking action on climate change. https://fcm.ca/sites/default/files/documents/resources/report/national-measures-report-2018-pcp.pdf

5 Independent Electricity Systems Operator. Ontario Municipal Energy Profile February 2018. Pg iv-v.

Along with the increasing concern of greenhouse gas emissions, there are a variety of other issues driving the need for the wise use of energy within municipal operations including:

- Energy Supply – Currently, Ontario's electricity system has a capacity of approximately 37,000 megawatts (MW) of power and the Independent Electricity Systems Operator (IESO) forecasts that there will be a significant resource turnover in the coming years driven by nuclear refurbishments and retirements as well as expiring contracts with contracted generating facilities. To help mitigate these future impacts, conservation has become an integral part of energy management planning. [6]

- Energy Costs – With the cost of energy projected to continually increase, the move to increase operational efficiencies and eliminate the wasteful consumption of energy will help mitigate costs.

- Energy Security – To ensure the ever increasing energy demands are met today as well as into the future, a guarantee of a stable and reliable supply of energy at reasonable prices needs to be maintained through a variety of initiatives including conservation and demand management programs.

6 Independent Electricity Systems Operator. (2018) 2018 Technical Planning Conference (online). Toronto. http://www.ieso.ca/en/Sector-Participants/Planning-and-Forecasting/Technical-Planning-Conference

Vision

The Corporation will continue to reduce energy consumption and mitigate costs through the wise use of energy. This will involve a collaborative effort to increase employee engagement and awareness of energy management within the organization.

Through the wise use of energy, employee engagement and awareness, and alignment with Asset Management Plans, the Corporation of the City of Thunder Bay will continue to transition to a carbon neutral future while maintaining Council approved service levels.

Total energy consumption includes electricity, natural gas, diesel, and gasoline.

This vision can be achieved through a holistic approach towards energy management by continuing to integrate and invest in energy efficient facility infrastructure, operational efficiencies and building the foundation for a culture of energy awareness and knowledge within the Corporation.

The continued commitment from City Council and Administration is imperative to demonstrate the leadership required to ensure the implementation of the Energy Management Plan within all Departments. Everyone has a role in the wise use of energy within Corporate facilities and operations.

Objectives

The objectives of the Energy Plan are as follows:

- Creation of a culture of conservation within the Corporation to reduce energy consumption, greenhouse gas emissions and ensure the wise use of resources.
- Fiscal accountability through savings and cost avoidance which will lead to both direct and indirect savings.
- Demonstrate leadership within the Corporation and Community with respect to energy management and investigation of new and emerging technology.
- Demonstrate sound operating and maintenance practices to complement the energy efficiencies implemented through capital renewal programs.
- Provide a forum for discussion within the Corporation on energy management to explore new ideas and trends.

All Corporate Departments will have a roadmap to ensure energy is a consideration in all operations and facility based decisions. The integration of operational processes, facility based infrastructure improvements, staff engagement and awareness is critical to move the Corporation towards the goal of reducing GHG emissions and transition to a carbon neutral future.

Provincial Regulations

In 2009, the Ministry of Energy passed a regulation under the *Green Energy Act, 2009,* Ontario Regulation 397/11: Energy Conservation and Demand Management Plans that required Ontario's public agencies (municipalities, universities, colleges, schools and hospitals) to demonstrate the leadership role government plays in energy conservation by developing and implementing energy conservation plans.

In 2018 Bill 34, *Green Energy Repeal Act, 2018* repealed the *Green Energy Act, 2009* and re-enacted various provisions of the Act in the *Electricity Act, 1998.*

In recognition of the importance of Conservation and Demand Management Plans,and annual reporting requirements for the municipal sector,the Ministry of Energy, Northern Development and Mines subsequently passed Ontario Regulation 507/18: Broader Public Sector: Energy Reporting and Conservation and Demand Management Plans under the *Electricity Act, 1998.* The regulation provides the Ontario government and public agencies with valuable information on how energy is used within each sector, allowing organizations to benchmark their facilities to similar facilities.

The Electricity Act 1998, s.25(35)(2) mandates Plans to include a:

1. Summary of annual energy consumption for each of the public agency's operations,
2. Description and forecast of the expected results of all conservation and demand management (CDM) activities,
3. Summary of progress made and achievements in energy conservation, and
4. Additional information as may be prescribed by regulation.

Along with the aforementioned requirements, O Reg. 507/18 also requires:

1. The public agency's goals and objectives for reducing energy consumption and managing demand for energy,
2. The public agency's proposed measures for reducing energy consumption and managing demand for energy,
3. The cost and saving estimates for the proposed measures,
4. A description of any renewable energy generation facility operated,
5. A description of any ground source or solar or heat pump/thermal technology operated,
6. The length of time the energy conservation and demand management measures will be in place,
7. Confirmation that the energy conservation and demand management plan has been approved by the public agency's senior management, and
8. The public agency to make available the conservation and demand management plan to the public on the internet/ intranet and in printed form at its head office.

On or before July 1, 2019, along with the annual Energy Consumption and Greenhouse Gas Emissions Reporting requirement, the public agency is required to submit and publish:

1. A description of current and proposed measures for reducing energy consumption and managing demand for energy,
2. A revised forecast of the expected results of the current and proposed measures,
3. A report of the actual results achieved, and
4. A description of any proposed changes to be made to assist the public agency in reaching its targets.

Baseline Energy Data

To efficiently manage energy within the Corporation, the establishment of accurate consumption data from the base year is essential. To set meaningful targets for energy reductions and ultimately, reductions in greenhouse gas emissions, an understanding of where and how the energy is consumed is critical. By establishing a trend analysis, starting with the baseline year of 2009 to the current year to date provides the Corporation with a unique opportunity to monitor consumption as well as assist in bill verification, procurement and budgeting (Table 1).

The 2009 baseline data provides a starting point and template for the continued tracking and monitoring of all Corporate energy data. By continually monitoring and updating the energy management database, trend analysis for all assets to date has been established. With this historical data, models on consumption have been built to highlight areas for potential energy efficiency and conservation efforts.

Energy Type	Consumption	GHG Emissions (tCO_2e)	Cost ($)
Electricity	66,190,104 kWh	7,988	6,684,044
Natural Gas	6,050,780 m^3	11,376	2,538,862
Diesel	2,950,777 L	7,898	2,246,228
Gasoline	1,096,861 L	2,540	911,730

Table 1: The Corporation of the City of Thunder Bay 2009 baseline year energy consumption, GHG emissions and costs.

Energy Sources

As part of the holistic approach to managing energy, it is essential to understand the quantity, type and location of each energy commodity being consumed Without this in-depth understanding and analysis, the management of these commodities will be difficult to achieve and ingrain within our daily operations.

The Corporation will focus its Energy Management Plan on the following commodities: electricity, natural gas, diesel, and gasoline (Table 2).

Energy Type	Consumption	GHG Emissions (tCO_2e)	Cost ($)
Electricity	51,888,599 kWh	2,076	6,886,881
Natural Gas	5,714,655 m^3	10,789	1,782,519
Diesel	2,885,507 L	6,191	3,231,795
Gasoline	1,301,741 L	2,913	1,405,855

Table 2: The Corporation of the City of Thunder Bay 2018 summary of energy type, consumption, GHG emissions and associated costs.

In 2018, the Corporation consumed 51,888,599 kilowatt hours (kWh) of electricity with 42% consumed by corporate facilities, 39% consumed by water and wastewater operations, 16% consumed by traffic control and streetlighting, parking authority, and other outdoor lighting and 3% by outside boards and agencies including Thunder Bay Public Libraries and the Thunder Bay Community Auditorium (Figure 2).

The Corporation of the City of Thunder Bay 2018 Electricity Consumption by Sector

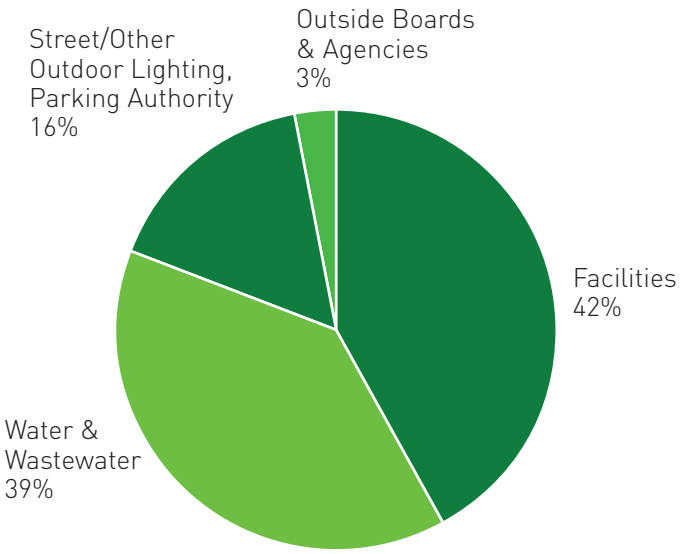


Figure 2: The Corporation of the City of Thunder Bay 2018 electrical consumption by sector.

In 2018, the Corporation consumed 5,714,655 cubic meters (m^3) of natural gas with 68% consumed by corporate facilities, 29% consumed by water and wastewater operations, 0.1% consumed by parking authority, and 3% by outside boards and agencies including Thunder Bay Public Libraries and the Thunder Bay Community Auditorium (Figure 3).

The Corporation of the City of Thunder Bay 2018 Natural Gas Consumption by Sector

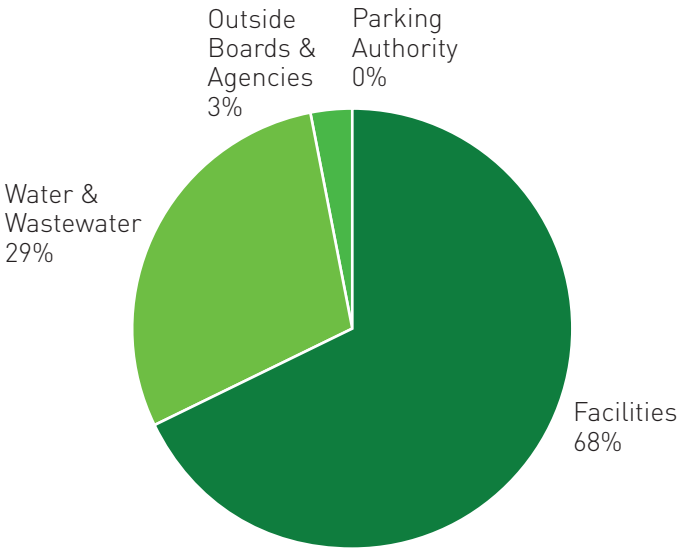


Figure 3: The Corporation of the City of Thunder Bay 2018 natural gas consumption by sector.

In 2018, the Corporation consumed a total of 2,855,507 litres (L) of diesel with 63% consumed by Community Services Department, 34% consumed by the Infrastructure and Operations Department, 3% by Development and Emergency Services Department (Figure 4).

The Corporation of the City of Thunder Bay 2018 Diesel Consumption by Department

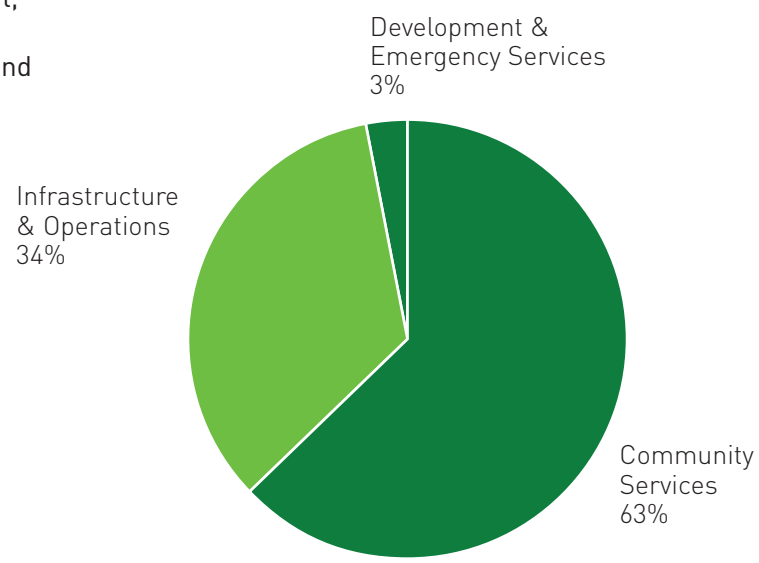


Figure 4: The Corporation of the City of Thunder Bay 2018 diesel consumption by Department.

In 2018, the Corporation consumed a total of 1,301,741 L of gasoline with 47% consumed by Development and Emergency Services Department, 33% consumed by the Infrastructure and Operations Department, 19.7% by Community Services Department, and 0.3% by Corporate Services and Long Term Care Department (Figure 5).

The Corporation of the City of Thunder Bay 2018 Gasoline Consumption by Department

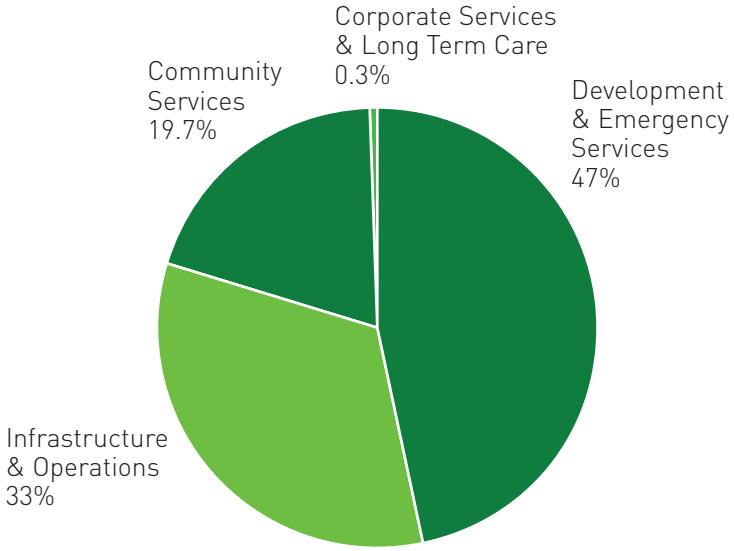


Figure 5: The Corporation of the City of Thunder Bay 2018 gasoline consumption by Department.

Current Energy Assessment

In order to determine the energy management initiatives to be incorporated into the Energy Management Plan and to develop the foundation to evaluate future initiatives, energy management focused assessment tools were completed by the Energy Committee. The assessment tools provided an opportunity for each Committee member to assess the success of the current plan and recommend future opportunities and improvements for alignment with the main objectives of the Energy Management Plan. A comprehensive analysis and description of the energy management initiatives undertaken from 2014 to 2019 that contributed to the successful reduction of consumption and greenhouse gas emissions is detailed in Appendix A.

Each initiative was reviewed based on:

1. Assessment tools with a focus on energy management best practices.
2. Alignment with Corporate strategic directions, plans, goals and objectives.
3. Opportunities identified through analysis of baseline consumption data.
4. Strength, weakness, opportunities and threat (SWOT) analysis using assessment tools data.

The results of the assessment tools provided information to complete a SWOT analysis on the current culture of energy management while highlighting target areas for continued improvements (Table 3).

STRENGTHS	Support for energy management from Council and Senior Management Team Implementation of energy data management software Consolidation of energy management into one Division Successful grant funding application process Corporate reduction target set and achieved Successful implementation of many energy efficient projects through Corporate facilities Developed RFP for energy audits at larger facilities to plan future projects Internal team support in implementing energy management opportunities - technical Existing partnership with local utilities Existing energy management reserve fund Successful models for energy budgeting Existing proactive partnership with energy professionals Existing energy agreements for procurement flexibility with Corporate hedge policy	Lack of documented policies/procedures related to energy management operations and procurement Concern over enforcement of policies Limited buy in from staff for behavioural or operational changes Limited staff awareness Lack of sustainable funding from all levels of government Funding competition with other municipal priorities Limited benchmarking for facilities Informal evaluation of energy efficiency projects Lack of staff incentives for behaviour changes Minimal visibility of energy management in Corporation Size and structure of Energy Committee Aging infrastructure Limited internal reporting and performance metrics	WEAKNESS
OPPORTUNITIES	External technical operations training for staff Energy reporting to staff Documented policies and procedures related to energy management Leveraging energy audits for funding opportunities Leverage existing communications tools within Corporation to promote energy management Utilization of energy management reserve fund Internal integration of energy management practices into daily operations and behaviours Cooperation between Facility/Fleet Asset and Operational/Behavioural Communication between Divisions on significant energy management issues	Conflicting strategic priorities Changing governmental regulations on energy management affecting funding and budgets Climate change	THREATS

Table 3: SWOT analysis results.

Financial Assessment

The Corporation of the City of Thunder Bay's 2018 energy expenditures including electricity, natural gas, diesel, and gasoline was $13,307,050 (Figure 6).

Energy costs are manageable and can lead to additional savings as the culture of energy efficiency and the wise of use energy becomes fully integrated into the Corporation. The initiatives outlined within the Energy Management Plan can yield individual savings, but as a whole a more efficient process, asset and/or operation can lead to accumulated sustainable savings not only in consumption, and GHG emissions, but also cost savings or avoidance. It is anticipated the cost of energy will continue to increase in the future; however, though sustainable investment and implementation of initiatives within the Energy Management Plan, costs can be mitigated.

Due to the continued volatility in the energy sector, it is important that the Corporation continue to invest in energy management through both technological efficiencies and behavioural changes to reduce energy consumption. A properly resourced Energy Management Plan can reduce the Corporation's risk, thereby increasing the Corporation's resiliency to energy price volatility.

The savings achieved through energy reductions can be utilized as an offsetting model to account for the continued growth of the Corporate portfolio of assets, referred to as "avoided costs."

To date, the success achieved in energy efficiencies and the wise use of energy within the Corporation has helped to mitigate and avoid costs associated with the addition of assets to the Corporate portfolio. Since the inception of the Energy Management Plan, the Corporation has avoided/saved approximately $11,191,000 in electrical and natural gas costs cumulatively from the baseline year of 2009.

In building upon the success of consumption and dollar savings and/or avoidance that has already been achieved, the Energy Management Plan will strive to implement consumption savings within the 2%-5% target. This would result in an estimated annual savings or cost avoidance from $175,000 to $450,000.

In addition, energy efficiency upgrades and new projects as part of the capital asset renewal plan and operating budgets will continue to be brought forth to Council for approval within the designated budget year.

The Corporation of the City of Thunder Bay 2018 Energy Expenditures

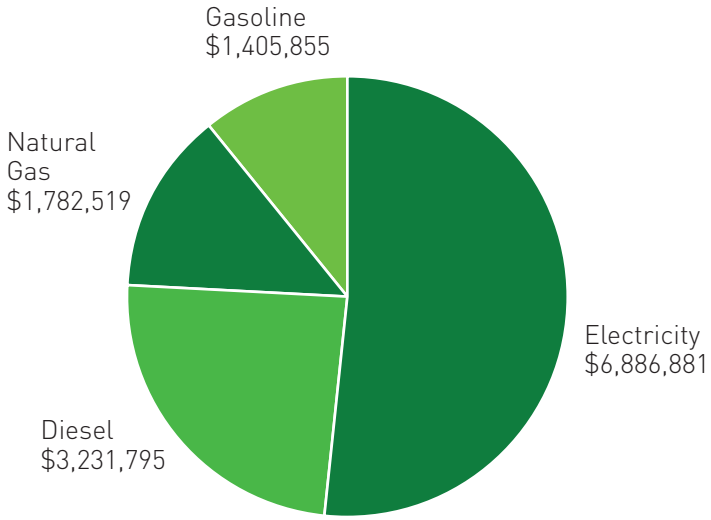


Figure 6: The Corporation of the City of Thunder Bay Energy Expenditures, 2018 including Outside Boards and Agencies.

Reduction Targets

The Corporation will continue to strive to achieve a 2% to 5% savings in energy consumption per year as we continue to focus on building the foundation for successful energy management practices while increasing employee engagement and awareness. The focus on behaviours and operational efficiencies will complement the continued savings anticipated through the sustained investment in the Corporate capital asset renewal program.

As of 2018, the Corporation has achieved a 26% reduction in total greenhouse gas emissions from the baseline year of 2009. The continued reduction target of 2-5% reduction in consumption will align with the Province of Ontario's target to reduce emissions by 30% below 2005 levels by 2030 as outlined in the Ministry of Environment, Conservation and Parks, "A Made in Ontario Environmental Plan, 2018." This target also aligns with Canada's 2030 target under the Paris Agreement.

Incentive Funding

To ensure the Corporation's ability to take advantage of all funding and grant opportunities related to energy efficient programs and projects, Corporate staff will work collaboratively with representatives from Synergy North, the Independent Electricity Systems Operator (IESO), Union Gas and any other provincial or federal agency. By participating in a variety of workshops and training sessions, staff and utility representatives regularly review current and future Corporate projects for alignment with current or future funding opportunities. This working relationship allows utility representatives to determine the potential for customized programs that may not fall into the prescribed funding models. All funding for energy efficient initiatives is coordinated, documented, and managed by the Energy Analyst.

Energy Management Initiatives

The Energy Management Plan is a living document that provides a roadmap for the Corporation. It is not static but continuously evolving to build upon the success of the previous plan. The Energy Management Plan 2019-2024 initiatives are high level actions that align with the objectives of the Energy Management Plan and will continue to build the internal capacity and knowledge base to increase energy efficiency and eliminate energy waste.

Each of the energy management initiatives corresponds to one of the five focus areas of the Energy Management Plan:

1. Energy Data Management
2. Energy Supply Management
3. Energy Consumption
4. Equipment Efficiency
5. Corporate Energy Integration

1. Energy Data Management

To reinforce the concept that energy is a manageable cost and to make individuals accountable and empower them to control energy use, corporations require effective monitoring systems that provide accurate feedback.

2014 – 2019 Progress:

Accurate and relevant energy data is the foundation for any energy efficiency project and integrated energy management plan. The Corporation has a comprehensive energy data management software system (AMERESCO) for tracking energy data and performance, monitoring excessive variations, targeting facility follow-up evaluations, and generating areas that could be candidates for energy efficiency improvements. Monthly billing analysis also provides an opportunity to identify and recover any billing errors, or usage that requires further investigation. The energy management software system is one component of the database that integrates facility maintenance and capital planning into a robust reporting and analytical tool for Corporate Facilities. The energy management data module can be customized for other departments to access to better understand their respective consumption and cost impacts of energy efficiency activities.

2019 – 2024 Initiatives:

ENERGY DATA MANAGEMENT							
INITIATIVE	OBJECTIVE	ACTION	PERFORMANCE MEASURES	**Short Term** Year 1 - 2	**Medium Term** Year 3 - 4	**Long Term** Year 5	**Ongoing**
Access to Energy Data	Train identified staff on the AMERESCO Energy Software Module	Provide training to identified staff for reporting and data capabilities of AMERESCO Energy Software Module	Number of staff trained and using energy module				x
Reporting of Energy Data	Develop an energy management reporting format for identified Departments	Provide an energy management report to identified staff with relevant, meaningful data and metrics	Staff utilizing reports in making daily operating decisions with consideration for energy management	x			
Energy Benchmarks and Metrics	Establish meaningful and relevant comparative benchmarks and key performance metrics for energy data	Define comparative benchmarks and key performance metrics for energy data	Benchmarks utilized to improve performance of assets and operations		x		
Energy Management Database	Establish an internal database for energy policies and procedures	Develop an energy management internal database with accessibility by staff to make informed energy management decisions	Policies and procedures added to database and utilized by staff in decisions				x

2. Energy Supply Management

The procurement of energy is a critical component to the Energy Management Plan. A proactive, informed approach to optimizing energy pricing in a volatile marketplace, while minimizing the associated risks, is integral to managing energy costs and meeting the Corporation's energy portfolio requirements.

2014 – 2019 Progress:

With a Council approved commodity hedging policy, the Corporation continued to leverage a purchase commitment for commodities including electricity and natural gas to provide price stability by fixing a component of the future prices. As an existing member of the local Lakehead Purchasing Consortium (LPC), the Corporation leveraged existing agreements and services to provide a comprehensive review of our electricity portfolio and supplier contracts to allow for competitive supply contracts. The Corporation worked with existing energy procurement specialists to customize monthly commodity reporting relevant to the continuing changes within the energy sector and future impacts to the corporate energy portfolio. The procurement of energy, under the direction of Supply Management, continues to manage the price of the commodity effectively with the assistance of the Energy Committee: Finance subcommittee. Quarterly meetings are held to review any cost and consumption variances, project the upcoming year's cost per commodity for budgeting and consumption load profiles.

2019 – 2024 Initiatives:

ENERGY SUPPLY MANAGEMENT							
INITIATIVE	OBJECTIVE	ACTION	PERFORMANCE MEASURES	**Short Term** Year 1 - 2	**Medium Term** Year 3 - 4	**Long Term** Year 5	**Ongoing**
Energy Supply Management	Establish a process to communicate the factors affecting the purchase of energy	Develop a communication strategy to facilitate an understanding of the factors affecting the purchase of energy	Developed energy procurement communication strategy		x		
Energy Account and Load Profile Management	Establish a notification procedure for any significant changes in operations that will affect consumption load requirements	Develop a communication process for notification of significant changes to operations that will impact commodity purchases and load profiles	Developed communication process for staff to utilize when changes in operation or process will affect energy purchasing	x			
Energy Rate Optimization	Establish metrics and parameters for successful purchase of all commodities	Develop conservative metrics and parameters for the continuous review and successful purchase of all commodities for short term and long term purchases	Average commodity price vs spot market price	x			
Demand Management Optimization	Investigate opportunities for demand management programs	Review and determine feasibility of implementing demand management opportunities where feasible	Implementation of demand management programs Documented demand savings				x
Supply Risk Management	Establish metrics to evaluate the success of the purchasing strategy	Review and determine appropriate metrics to determine the success, challenges and improvements to energy purchasing strategy	Successful and cost effective procurement of all purchased commodities		x		
Green Fuels	Investigate the viability of alternative fuels to reduce emissions in City fleet	Evaluate the feasibility of alternative fuels, as appropriate in reducing emissions while maintaining services levels	Successful evaluation completed outlining emissions reductions, cost savings or avoided and maintenance savings/avoided				x

3. Energy Consumption

The evaluation of the systems and operations that contribute to the consumption of energy related to an asset allows for the identification of potential areas of energy efficiency opportunities and process optimization.

2014 – 2019 Progress:

Each facility within the corporate portfolio has various controls in place for key systems. Preventative maintenance programs and the integration of capital asset renewal into the day-to-day operations plays a role in ensuring the efficient use of energy. Staff continues to be engaged and knowledgeable on energy use within their respective operations and continue to incorporate energy management into daily decisions and operations. To complement the existing knowledge and quantify the energy consumption of equipment within a corporate facility, each year comprehensive energy audits are completed at facilities identified through analysis of the energy data management system (AMERESCO). Recommendations for efficiencies are then considered as part of the life cycle renewal of the equipment.

2019 – 2024 Initiatives:

ENERGY CONSUMPTION							
INITIATIVE	OBJECTIVE	ACTION	PERFORMANCE MEASURES	**Short Term** Year 1 - 2	**Medium Term** Year 3 - 4	**Long Term** Year 5	**Ongoing**
Equipment Operating Procedures	Development of written operating procedures for equipment to optimize energy efficiency and eliminate wasted energy	Document operating procedures outlining energy efficiencies in order to optimize energy consumption and maintenance	Procedures documented optimizing energy efficiency in processes		x		
Customer Awareness	Energy conservation awareness campaign development for external customers utilizing Corporate facilities	Develop an awareness campaign for external customers using Corporate facilities	Successful implementation of awareness campaign for external users of City facilities			x	
Comprehensive Energy Audits	Development of a strategy for undertaking comprehensive audits within Corporate Facilities	Develop specific criteria for comprehensive energy audits within Corporate facilities portfolio	Successful completion of energy audits for Corporate facilities	x			
Facility Commissioning and Recommissioning	Documentation of protocols to ensure systems and equipment operate optimally	Develop comprehensive testing and written documentation to verify that systems and equipment operate to specific parameters for new and retrofit buildings	Implementation of commissioning and recommissioning guidelines to ensure facility operates to specifications during initial installation and after retrofits		x		

4. Equipment Efficiency

The evaluation of the equipment in systems for energy efficiency opportunities that could be implemented through preventative maintenance programs, system controls, retrofits, system upgrades and investigation into new and emerging technology.

2014 – 2019 Progress:

The Corporation has implemented a variety of energy efficient initiatives within Corporate facilities, many of which have been embedded within the Corporate capital asset renewal program. Initiatives include interior/exterior lighting retrofits, increased insulation levels, HVAC improvements, implementation of building automation systems, variable speed drives on motors, improvements to boiler plants and domestic hot water heating systems.

2019 – 2024 Initiatives:

EQUIPMENT EFFICIENCIES							
INITIATIVE	OBJECTIVE	ACTION	PERFORMANCE MEASURES	**Short Term** Year 1 - 2	**Medium Term** Year 3 - 4	**Long Term** Year 5	**Ongoing**
Operating System Controls and Upgrades	Development of written documentation for operating system controls to optimize energy performance	Develop implementation plans for system/ process improvements incorporating energy efficiencies	Process developed with energy management as a critical component				x
Energy Efficient Facility Standards	Development of policy for energy efficient guidelines and equipment specifications for retrofits and major renovations projects	Develop policy for energy efficiency guidelines and equipment specification for retrofits and renovation projects	Policy developed with energy efficiency guidelines for all retrofits and renovations undertaken in corporate facilities		x		
Energy Efficient Equipment Procurement	Development of a procurement policy for purchase of energy efficient equipment	Develop a policy for the purchase of new and replacement equipment focusing on energy efficiency where feasible	Policy developed that requires and/ or encourages the purchase of energy efficient equipment for new or replacement equipment where feasible		x		
Equipment and Building Operational Improvements	Equipment and building operation retrofits and improvements are energy efficient	Undertake equipment and building operation retrofits and improvements so energy efficiency is incorporated	Implementation of energy efficient equipment and retrofit resulting in consumption reduction or avoidance				x
Innovative Energy Management Strategies within Facilities	Evaluation of opportunities for any new and emerging energy technologies as applicable for Corporate facilities	Review and evaluate opportunities for energy related technologies or projects to improve operations/maintenance and/or reduce consumption	Successful evaluation completed outlining emissions reductions, cost savings/avoidance and maintenance savings/avoidance				x

EQUIPMENT EFFICIENCIES							
Energy Efficiency – Capital Asset Management Plan	Development of a strategy and sustainable funding to ensure energy management opportunities outlined with the energy audits are incorporated within the capital asset management plan	Develop strategy with sustainable funding for the continued implementation of energy management opportunities outlined within the energy audits	Successful implementation of energy management opportunities as identified in energy audits Sustainable funding for energy efficiency capital asset management plan	x			
Green Fleet Efficiencies	Investigate strategies to optimize the performance and efficiency of the City fleet	Review existing and/ or new policies and procedures such as idling, vehicle use optimization, and personal vehicle use with a focus on reducing consumption and emissions	Staff awareness and incorporation of policies and procedures into daily operations for fleet efficiencies				x
Innovative Energy Management Strategies for Fleet Operations	Investigate and pilot viable options for technology alternatives	Evaluate the feasibility of alternative technologies, as appropriate in reducing emissions while maintaining services levels within the Corporate fleet	Successful evaluation completed outlining emissions reductions, cost savings/avoidance and maintenance savings/avoidance				x
Procurement of Energy Efficient Fleet Assets	Investigate the procurement of fleet and components with viable options for emissions reduction	Evaluate the procurement of fleet and existing and/ or new policies to optimize emission and consumption reductions	Successful evaluation completed outlining emissions reductions, cost savings/avoidance and maintenance savings/avoidance				x

5. Corporate Energy Integration

All levels and areas within the Corporation need to participate in the implementation of the Energy Management Plan. Energy is a manageable cost. Departments need to understand the impacts of their operation on energy usage and how they can participate in managing energy within their division. The roles and expectations for energy management need to be clearly defined with regular communications.

2014 – 2019 Progress

The day-to-day responsibility of energy management in Corporate Facilities is the primary responsibility of Facility Services Section with a few exceptions including Pioneer Ridge Long Term Care Facility, Parks Division: Seasonal Facilities, Fort William Gardens Arena, Environment Division, Thunder Bay Community Auditorium and Thunder Bay Public Libraries. Although not directly involved, Facility Services provides technical guidance to those exceptions when requested. The Energy Analyst provides assistance with energy data management and budgets for all Corporate Facilities.

The CONSERVE. *a little goes a long way energy engagement and awareness workshop* is open to all Corporate departments to learn how small changes within their own operations can contribute to a more energy efficient environment.

The structure of the Energy Committee allows for a more direct communication of energy efficiency to create a culture of conservation within the Corporation. This living interactive approach to energy management provides unique opportunities for awareness and employee engagement.

2019 – 2024 Initiatives:

CORPORATE ENERGY INTEGRATION							
INITIATIVE	OBJECTIVE	ACTION	PERFORMANCE MEASURES	**Short Term** Year 1 - 2	**Medium Term** Year 3 - 4	**Long Term** Year 5	**Ongoing**
Corporate Energy Management Policy	Development of a Corporate Energy Management Policy	Develop a Corporate Energy Management Policy	Policy developed and communicated to all staff Successful implementation of policy	x			
Employee Engagement and Awareness Workshop	Build internal capacity allowing Departments to make informed energy management decisions	Continue to deliver the Corporate Energy Awareness Workshop	Increased staff awareness towards energy efficient decisions within daily operations Consumption reduction or avoidance				x
Operations Focused Training	Train staff on specific operations with a focus on energy efficiency and optimization	Deliver operations specific energy efficiency training for staff in operational areas	Number of staff trained				x
Incentive Awareness	Development of a communication process to ensure all Departments are aware of the available energy incentives	Develop a communication strategy for increased awareness of potential funding opportunities for implementing energy efficient equipment	Incentives applied for and successful application approvals	x			

Employee Accountability	Embed energy management into the accountability of employee's daily operations	Develop a process to embed energy management accountability into employee's daily operations as applicable	Successful incorporation of energy management practices integrated into employees daily operations				x
Energy Awareness for External Service Providers	Development of policies to incorporate energy management into the requirements of all external service providers	Develop a policy to include energy management requirements into agreements and contracts of external service providers	Implementation of policies and processes to ensure energy management considerations are communicated and implemented as required by external service providers			x	
Energy Management for New Employees	Incorporation of energy management training into employee orientation and future training opportunities offered through Human Resources	Include a session on energy management into employee orientation and future training opportunities at Human Resources	Number of staff trained Increased awareness of energy management in Corporation			x	
Green Fleet Operator Training and Awareness	Education of fleet users on preferred driver behaviours to reduce energy consumption and improve driver performance	Continue to deliver the fleet driver training modules	Increased staff awareness towards preferred fleet behaviours and operations Consumption reduction or avoidance				x
Energy Management Reserve Fund	Development of communication strategy to encourage staff to implement energy initiatives that qualify for funding under the reserve fund	Develop a communication strategy to increase awareness of projects available for funding through the energy management reserve fund	Number of projects funded Consumption reduction or avoided	x			
Energy Reduction Facility Competitions	Development of a consumption reduction competition program between similar facilities	Develop and implement a consumption reduction competition for staff within similar facilities with an emphasis on behaviour changes and optimizing operations	Successful implementation of a competition themed project integrating behavioural changes		x		
Energy Outreach	Development of a process by where all employees can participate in development of 2024-2029 Energy Management Plan	Develop a broader outreach platform for employee engagement in the development of the 2024-2029 Energy Management Plan	Number of employees engaged			x	

Along with the importance of providing sustainable funding for energy efficient initiatives, the prioritization of the initiatives will also need to be considered. Over the next five years, the Energy Committee will work to implement the actions and objectives outlined within the five focus areas for the successful delivery of the Energy Management Plan.

Continuing to build internal energy management awareness is paramount for any successful Energy Management Plan. For that reason focus will continue to be on employee engagement and integrating energy management into the corporate culture.

Measures of Success

The measures of success will be based on a number of key performance indicators (KPIs) including:

- Reduction of energy consumption and GHG emissions from 2009 baseline data;
- Integration of energy management into daily operation processes and facility based infrastructure decisions;
- Energy Efficiency projects included in capital asset management decisions;
- Increased capacity and awareness regarding energy management within the Corporation and;
- Unique project specific performance indicators dependent on the project, for example kilometres travelled per litres consumed

Monitoring and Reporting

Continuous monitoring and reporting is an essential tool in the Energy Management Plan to verify and track our measures of success.

As part of the Energy Management Plan, the implemented initiatives will be documented and reviewed annually to update data against the baseline year. By continuing to monitor and report consumption, dollar savings and cost avoidance to Departments, the outcomes of their participation in energy initiatives can be quantified, and feedback can be obtained for any new ideas.

The Energy Management Plan Annual Update will continue to be presented to City Council along with proposed future energy budgets each year prior to commencing budget deliberations.

This monitoring and reporting aligns with the requirements of the *Electricity Act, 1998* for annual consumption reporting of prescribed facilities and five year development of conservation and demand management plans.

Corporate Energy Management Committee

To ensure the Energy Management Plan remains a priority within each Division, a Corporate Energy Management Committee ("Energy Committee") was established. The Energy Committee is comprised of a cross-functional team of Corporate stakeholders having direct responsibility for the consumption of energy within their respective Departments.

The Energy Committee objectives are to:

- Work collaboratively to implement energy efficient actions within daily operations to reduce energy consumption;
- Promote employee engagement and awareness towards energy management initiatives and opportunities;
- Integrate best practices into daily operations, and where feasible reduce energy consumption;
- Provide a forum for discussion of energy management strategies that may benefit all divisions;
- Actively participate in the implementation of initiatives, and documentation as it pertains to members respective operations and energy management initiatives;
- Increase corporate awareness of the consumption of energy within each department; and
- Provide information for the Energy Management Plan Annual Report.

The Director of Asset Management serves as the Chair of the Energy Committee. Refer to Appendix B for Committee membership and roles and responsibilities of each member and the Terms of Reference of the Committee.

Corporate Strategic Direction and Alignment with Other Plans

The Corporation has undertaken many initiatives to improve the environmental health of our City. Through this commitment to a cleaner, greener and more beautiful Thunder Bay, the Corporation has adopted a number of strategic initiatives as summarized in Table 4. These programs and policies align with the implementation of the Energy Management Plan. For further information on each program and policy and their link to the Energy Management Plan, refer to Appendix C.

Program/Policy	Program/Plan Objective	Year
City of Thunder Bay Environmental Policy	To provide leadership and continual improvement in environmental management and performance.	2005
Clean, Green and Beautiful Policy	To foster and promote our quality of life, which is directly linked to establishing and nurturing a healthy community that is environmentally sustainable.	2007
Partners for Climate Protection (PCP)	Commitment to reduce GHG in municipal operations by 20% below 2009 levels.	2014
Earthcare Sustainability Plan	To promote the wise use of energy and the transition to a carbon-neutral future.	2014
City of Thunder Bay Facility Design Standards Policy	To demonstrate commitment to environmental, social and economic improvements and to provide leadership and support in the application and development of sustainable building practices for the Corporation of the City of Thunder Bay.	2014
Global Covenant of Mayors for Climate and Energy	Committed mayors and local governments – in alliance with partners – accelerate ambitious, measurable climate and energy initiatives that lead to an inclusive, just, low emission and climate resilient future, helping to meet and exceed the Paris agreement objectives.	2015
City of Thunder Bay Asset Management Plan	To identify the state of the City of Thunder Bay's infrastructure and the projected funding required to maintain and replace the infrastructure needed in a fiscally responsible and environmentally sustainable framework while preserving our quality of life.	2016
City of Thunder Bay Strategic Asset Management Policy	To provide leadership in and commitment to the development and consistent implementation of the City's asset management program. The policy will promote informed infrastructure investment decisions based on sound asset management practices and will include social, environmental and economic considerations.	2019

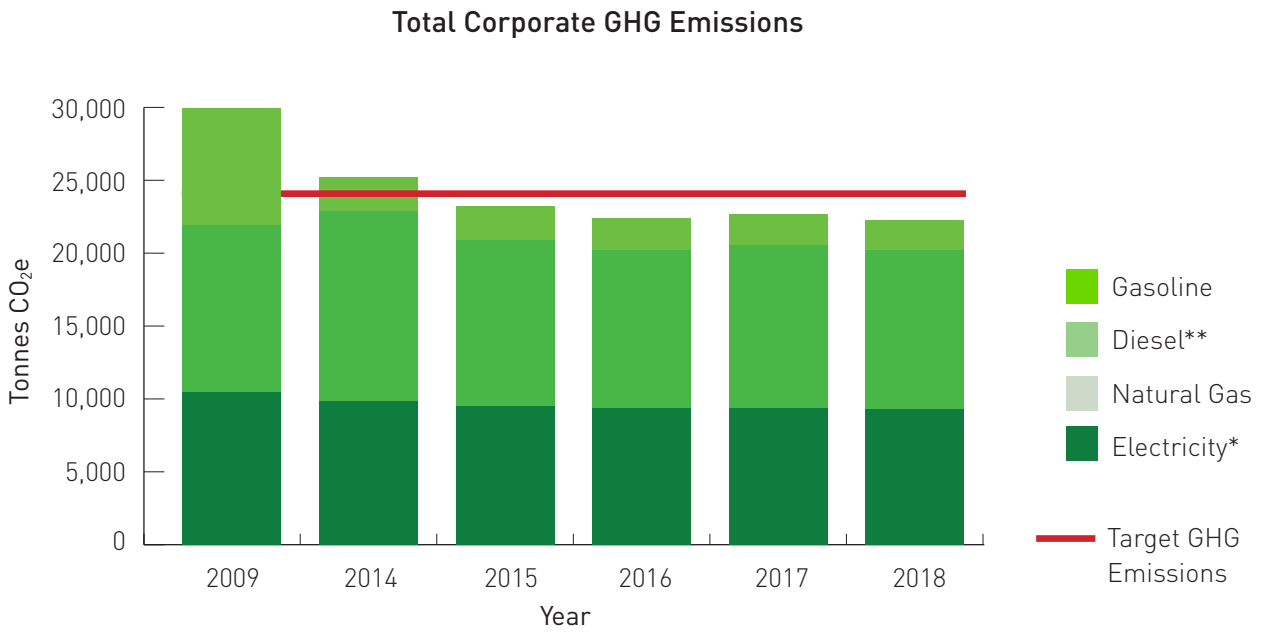
Table 4: Summary of Corporate Strategic Directions and Policies supporting the development Corporate Energy Management Plan.

APPENDICES

APPENDIX A

2014 – 2019 Energy Management Successes

The City of Thunder Bay committed to reducing total energy consumption by 2% to 5% per year from the 2009 baseline year, aligning with the goal set out within the Earthcare Sustainability Plan for the Corporate target of reducing GHG emissions by 20% below 2009 levels by 2020 (Figure A-1).



*Electricity coefficient decreased from 0.00012teCO_2/kWh in 2009 to 0.00004teCO_2/kWh in 2015–2018.
**Diesel coefficients changed from 2009 to align with reporting standards of the Global Protocol for Community Scale GHG Emissions Inventories (GPC).

Figure A- 1: Corporation of the City of Thunder Bay's corporate GHG emissions target and emissions (in tonnes of CO_2e) from 2009, 2014 – 2018.

From the baseline year of 2009, corporate emissions have decreased by 26% in 2018. These reductions can be attributed to the implementation of initiatives from the 2014-2019 Corporate Energy Management Plan, as well as the reduction on the electricity coefficient as a result of non-GHG-emitting electrical generation in 2014 and the divestment of corporate facility assets including Grandview Lodge and Dawson Court Long Term Care Facilities.

ELECTRICITY

In 2009, the Corporation utilized over 66,000,000 kWh of electricity within the municipal operations. Over the last five years, the Corporation has continued to achieve year-over-year reductions in the consumption of electricity (10%), with a 22% reduction from the 2009 baseline year to the end of 2018 (Figure A- 2).

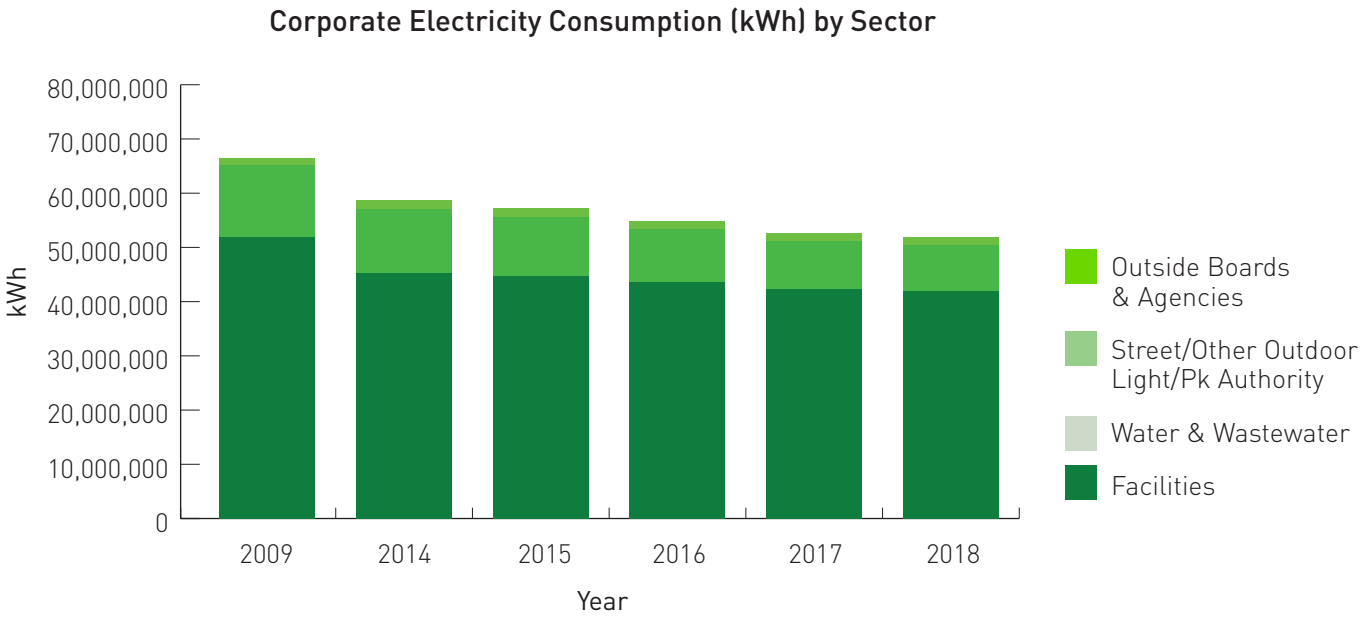


Figure A-2: The Corporation of the City of Thunder Bay electricity consumption from 2009 and 2014–2018 in kWh.

NATURAL GAS

In 2009, the Corporation utilized over 6,000,000 m^3 of natural gas within municipal operations. Natural gas consumption is significantly dependent on temperature. The anomalous increase in 2014 was a result of the year being 9% colder on average in Thunder Bay than it has been in the past 30 years based on data from Environment Canada. Energy efficient technology and awareness initiatives have been implemented to reduce and/or mitigate the consumption of natural gas over the last five years. However, with natural gas' dependence on weather, sustained consumption reductions remains a challenge. Over the last five years, the Corporation achieved an overall 17% reduction in natural gas, with a 6% reduction from the 2009 baseline year to the end of 2018 (Figure A-3).

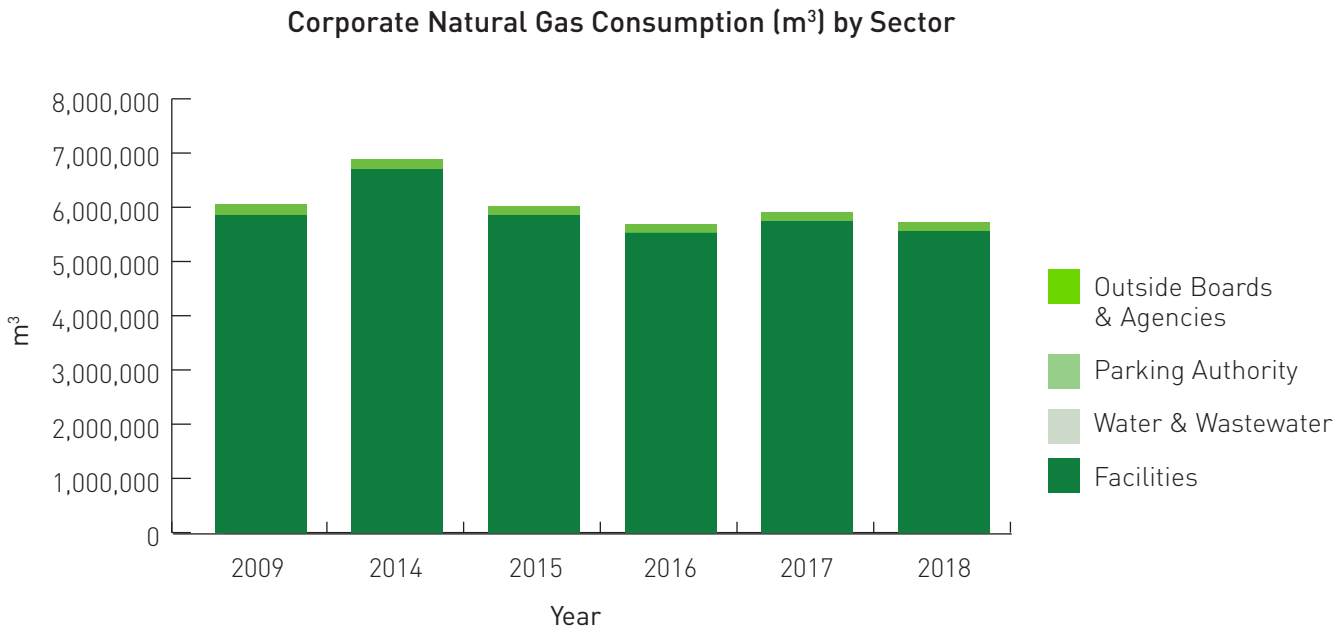


Figure A-3: Corporation of the City of Thunder Bay natural gas consumption from 2009, 2014- 2018 in m^3.

FUEL

In 2009, the Corporation utilized over 4,000,000 L of diesel and gasoline within municipal operations. Diesel and gasoline are significantly dependent on temperature and precipitation. In addition to 2014 being 9% colder, 2014 also experienced significant weather events in comparison to the last 10 years. Continued investments in energy efficient fleet technologies and driver optimization has decreased consumption over the last two years; however increases to service areas has increased consumption from 2009 to present. Over the last four years there has also been a shift in fuel types from diesel to gasoline, thereby increasing gasoline consumption while reducing diesel consumption. Over the last five years the Corporation has continued to decrease consumption from 2014 by 6%, however compared to the 2009 baseline year, there has been a 3% increase in fuel consumption to the end of 2018 (Figure A-4).

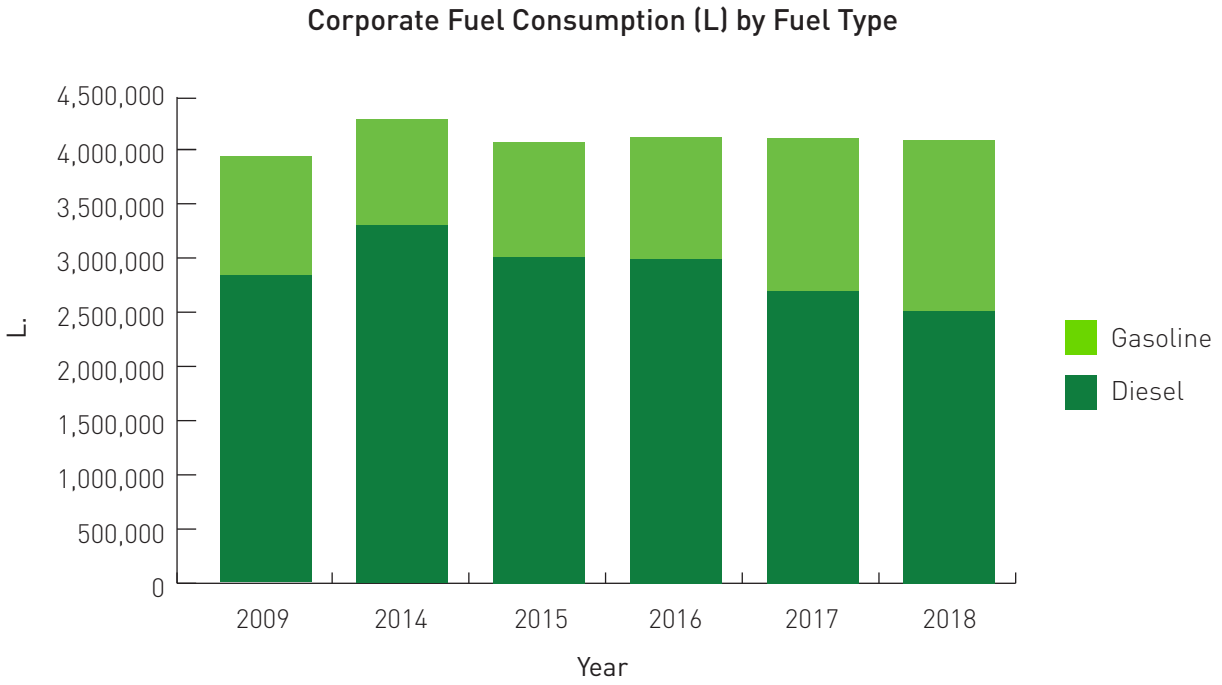


Figure A-4: The Corporation of the City of Thunder Bay fuel consumption from 2009 and 2014–2018 in L.

The following is a sample of a variety of successful energy management initiatives undertaken within the Corporation from 2014 to 2019:

Energy Data Management

- Implementation of AMERESCO Energy and Sustainability Software to monitor and track Corporate electricity and natural gas consumption
- Process implemented to review monthly consumption and cost to monitor for excessive variations
- Review use of Powerview application from Thunder Bay Hydro for viewing interval data at the Atlantic Ave Water Pollution Control Plant (WPCP) and Bare Point Water Treatment Plant (WTP)
- Reviewed initiative for the installation of interval meters within new Corporate facilities with a demand greater than 50kW, however determined that it is not a requirement for Corporate facilities with the exception of the Atlantic Ave WPCP and Bare Point WTP. Each plant has implemented comprehensive software to monitor energy usage within the main operation and stations

Energy Supply Management

- Developed framework and application process for use of Energy Management Reserve Fund for innovative energy initiatives that align with the strategies in the Corporate Energy Management Plan
- Established quarterly meeting with Energy Management Financial Committee for energy budget and variance review, commodity hedge purchases and load profile changes
- Evaluation of the Ontario Demand Response Program for potential participation opportunity. Program cancelled in 2014, continue to review for opportunities in new programming
- Participation in the Industrial Conservation Initiative (ICI) with Bare Point WTP and the Atlantic Ave WPCP
- Developed monthly reporting documentation with Supply Management and Energy Procurement specialists for natural gas purchases
- Reviewed electricity hedge opportunities and contracts with Supply Management and Energy Procurement specialists
- Transitioned to Corporation of the City of Thunder Bay supplier contracts for electricity procurement

Energy Consumption

- Annual submission of the Corporation of the City of Thunder Bay's energy data for prescribed facilities as required under the *Green Energy Act, 2009*. All documents are made available to the public through City Clerk's office and on the City of Thunder Bay's website.
- Comprehensive energy audits conducted at Pioneer Ridge Long Term Care Facility, Community Services Administration Facility (formally Pool 6), Front St. Administration Facility, Parks North, Current River Arena and the Canada Games Complex
- Continued use of biodiesel within Corporate fleet (B5 winter and B20 summer)
- Conducted pilot project to evaluate the use of propane as a fuel source verses gasoline
- Adjusted boiler operations to maximize efficiencies at Solid Waste and Recycling Facility
- Review of operational requirements resulted in the relocation of resources into centralized location for winter season at Chippewa Park
- Conducted an evaluation for use of compressed natural gas (CNG) options available for Transit buses and waste packers

- Conducted a review of fuel alternative options for ice resurfacers including compressed natural gas (CNG) and electric
- Facility rationalization of City departments to maximize underutilized facility space
- Member of Canadian Urban Transit Research and Innovation Consortium (CUTRIC) to participate in study and analysis of the potential of integration of electric transit fleet on one or more higher volume conventional routes
- Feasibility Study was completed for the installation and implementation of a combined heat and power (CHP) plant at the Canada Games Complex
- Implementation of acrylic window pilot at Front St. Administration facility
- Implementing radiant heater panel exchange program
- Began review of standardization of office temperatures throughout Corporate facilities where applicable and will be incorporated into 2019 Corporate Energy Management Plan
- Reprogramming and optimization of building heat and ventilation schedules for Atlantic Ave WPCP – screen and grit and biological aerated filter (BAF) building

Equipment Efficiency

- Ongoing preventative maintenance programs at all Corporate facilities
- Purchase of ENERGY STAR® rated equipment within Corporate facilities
- Installation of programmable thermostats at Fire Stations with reduced day and night setbacks
- Installation of new garage loops in overhead garage doors at Front St. Administration building and Mountdale garage
- Installation of on-demand hot water heaters at Delaney Arena
- Installation of time and solenoid system to control run time and hot water at Delaney Arena
- Continued replacement of kitchen equipment at Community Centres with ENERGY STAR® equipment
- Continued retrofit to LED lighting in all Corporate facilities
- Completion of the residential LED streetlight retrofit project (2014 – 2017)
- Continuation of the arterial LED streetlight retrofit project
- Parks Trail Lighting Master Plan continued implementation of LED lights along trail system
- Various outdoor rinks implemented LED lights over outdoor ice surface (Northwood Park, Tarbutt Park and West Thunder)
- Pump automation controls at Harbourview Expressway stormwater pumping station, Memorial Ave Stormwater pumping station and Hazelwood reservoir
- Energy efficiency design standards used for retrofits at Fort William Road Transit, new construction of the Frederica Fire Station and Mapleward Fire Station, retrofits at Current River, Oliver Road and West Arthur Community Centres, Mountdale Administration Building, Thunder Bay Community Auditorium, North Central Fire Station, Pioneer Ridge Long Term Care Facility, Fort William Gardens and Canada Games Complex
- Superior North EMS Headquarters achieve LEED®-NC Gold certification
- Heating, Ventilation and Air Conditioning (HVAC) upgrades and rebalancing in various Corporate facilities

- Installation of new air handling units at the Whalen Building
- Exterior building envelope upgrades including weather stripping, caulking, new windows and doors at various Corporate facilities
- New boiler system at Waverley Resource Library
- Installation of five new higher efficient turbo blowers and main pumps at the Atlantic Ave WPCP
- Roof replacement with increased insulation at the Thunder Bay Community Auditorium
- Installation of occupancy sensors at various Corporate facilities
- Installation of electric fan cooling systems on new buses in lieu of belt powered mechanical fan systems to improve bus fuel efficiency by up to 6.5%
- Replacement of aged vehicles reducing harmful GHG emissions by 90% with newer vehicles
- Replacement of 75% of heavy truck and bus tires with retread tires which reduces overall production energy per tire by 70%
- Upgrades to diesel fuel filtration system at fuel dispensing pumps in 3 City yards to remove over 90% dirt and particulates increasing engine longevity and efficiency
- Aligned operational controls and processes at the Canada Games Complex natatorium to coincide with facility and programming requirements
- Installation of separated switches for radiant heating at Current River and Grandview Arenas to allow for sectional heating
- Installation of automated digital ice controller at Delaney Arena
- Installation of new electronic control values for perimeter heating at City Hall
- Installation of high speed bay doors at Fort William Road Transit
- Retrofit of high efficiency motors at various Corporate facilities
- Replacement of multiple uninterrupted power supply (UPS) units with one energy efficient unit at Bare Point WTP
- Retrofit hot water tanks at various Corporate facilities to increase energy efficiencies
- Installation of two new heating and ventilation systems at the Atlantic Ave WPCP including variable speed drives and building automation system to increase energy efficiency of units
- Installation of variable frequency drives (VFD) at various Corporate facilities to maximize energy efficiency of equipment
- Installation of new heat recovery ventilation unit at Hodder Ave Fire Station
- Installation of two new make-up air handling units and two new exhaust fans at North Central Fire Station
- Installation of high efficiency hot water tank at Front St Administration Facility
- Programming and wiring on process boilers were modified at Bare Point WTP to reduce energy consumption and maximize usage of circulation pumps
- Optimization of cogeneration heat recovery system to include new controls and program logic at Atlantic Ave WPCP
- Relamping to a more energy efficient bulb in the disinfection system at Atlantic Ave WPCP
- LED lighting retrofit at the Canada Games Complex natatorium

- Bare Point WTP installed an electrical metering system at the storm water, pumping station and main plant to ensure systems and processes are operating efficiently and provide alerts should processes deviate from optimum performance
- Installation of new 7.5 HP motor and variable frequency drive at Front St Administration Facility
- Upgrade to the domestic hot water system at the Fort William Gardens
- Installation of a new high efficiency condensing boiler plant system at the Thunder Bay Community Auditorium
- Installation of new energy efficient condensing hot water system and heat recovery ventilation (HRV) unit at Pioneer Ridge Long Term Care Facility
- Installation of higher energy efficient hot water tank at Front St Administration Building
- Upgrading of four higher energy efficient chemical pumps at Bare Point WTP
- Upgrades and additional insulation to the roof of the influent Pump Station at Atlantic Ave WPCP
- Main sewage pump repairs and wet well maintenance to optimize pumping usage at Atlantic Ave WPCP
- Installation of new energy efficient air conditioner at Oliver Rd Community Centre
- Installation of new energy efficient condensing boiler plant system and new energy efficient domestic hot water heating system at North Central Fire Station
- Conversion of heating system for drying room at North Central Fire Station from electric duct heating to hot water

Corporate Energy Integration

- Developed and continue to deliver the CONSERVE. *a little goes a long way* employee awareness and engagement workshop
- Thunder Bay Community Auditorium promote energy conservation in all aspects of its operations
- Fire Services continue to promote energy conservation with staff
- Continued partnership with Thunder Bay Hydro and Union Gas representatives for funding opportunities and participation in awareness workshop
- Participated in various Thunder Bay Hydro saveONenergy and Union Gas Energy Efficiency incentive programs
- Parking Authority worked with Parkade users to ensure lighting levels meet needs without overlighting
- Continued fleet training and enhanced training programs to include additional and more frequent training opportunities that improve operator driving habits
- Commercial properties working with tenants to ensure energy operational requirements are met while minimizing energy waste
- Successful applicant for the Municipal GHG Challenge Fund for Facility Energy Efficiency Retrofit through the Ministry of Energy, however funding program cancelled

Renewable Energy

The Corporation of the City of Thunder Bay is participating in a number of renewable energy projects within current operations as well as partnership with Synergy North's Sustainable Electric Energy Development (SEED) initiative.

Landfill Gas:

Thunder Bay Hydro Renewable Power Incorporated (an affiliate of SYNERGY NORTH Corporation) owns and operates a renewable energy project to generate electricity from local landfill gas.

The 3.2 megawatt power generation plant is located on a section of land leased from the City of Thunder Bay at their Solid Waste and Recycling Facility. Through an agreement with the City, the generating plant draws methane gas to fuel two engine-driven generator sets and is designed to generate enough electricity to power 2,000 houses.

The project annually converts 263 million cubic feet of methane gas that would have otherwise been released into the environment.

However, due to confidential requirements, the total electricity generated and generation revenue cannot be disclosed.

Atlantic Ave Water Pollution Control Plant:

At the Atlantic Ave Water Pollution Control Plant, the anaerobic digesters retain the primary and thickened waste secondary sludge for approximately 28 days. The content of the digesters is mixed and heated to a temperature of approximately 35°C to support the breakdown of the sludge by the anaerobic bacteria.

Digester gas, which contains methane, is produced during the anaerobic digestion process and is partially re-circulated in the digesters to provide mixing. The excess digester gas is piped to a 600kW cogeneration engine to produce electricity and heat for the plant (Table A-1). If the engine is not utilizing the digester gas, the gas can be burned in any of the four dual-fuel plant boilers, supplying heat for the digestion process and plant buildings.

	Size (kW)	kWh Generated				
		2014	2015	2016	2017	2018
Atlantic Ave WPCP Cogeneration	600	2,216,776	2,039,920	1,985,704	2,768,064	2,850,008

Table A-1 Atlantic Ave Water Pollution Control Plant Cogeneration annual kWh generation 2014 – 2018.

Solar Photovoltaic (PV) Generation:

The Corporation of the City of Thunder Bay owns two facilities at Prince Arthur's Landing housing rooftop solar photovoltaic (PV) installations. The Baggage Building solar PV installation operates 36 – 230W panels and the Water Garden Pavilion installation operates 26 – 230W panels (Table A-2).

Synergy North Electricity Distribution Inc. is the exclusive solar photovoltaic (Solar PV) developer to the Corporation of the City of Thunder Bay and has preferred access to City-owned buildings (rooftops) and property for the installation of Solar PV panels.

Installations have been completed at the following City of Thunder Bay locations:

Superior North EMS

Victoriaville Parkade

Thunder Bay Transit

Mountdale Maintenance Garage

Tbaytel Work Centre

Port Arthur Arena

However, due to confidential requirements, the total electricity generated and generation revenue cannot be disclosed for the above six locations.

Solar Panel Location	Size (kW)	kWh Generated				
		2014	2015	2016	2017	2018
Baggage Building	8.28	8,080	9,001	9,052	8,334	8,944
Water Garden Pavilion	5.98	5,552	6,537	6,313	5,976	6,409

Table A-2: Solar PV annual kWh generation 2014 to 2018 for the Baggage Building and Water Garden Pavilion.

APPENDIX B:

Corporate Energy Management Plan Committee Membership and Roles and Responsibilities

The membership of the committee and roles and responsibilities include:

Membership	Responsibility
Director – Asset Management Chair of Energy Committee	Overall Corporate Energy and Liaison with EMT
Manager – Facilities Services	Management of Corporate Facilities
Supervisor – Construction Services	Construction & Renovations of Corporate Facilities
Director – Environment Division	Management of Water and Wastewater Facilities
Manager – Supply Management	Procurement of Energy
Manager – Roads Division	Management of traffic control and Streetlighting
Supervisor – Parking Authority	Management of Parking Facilities and Lots
Manager – Parks & Open Spaces Section	Management of Operations for Parks and associated facilities
Director – Recreation, Culture & Municipal Child Care	Management of Operations for Arenas, Community Aquatics, Community Centres, Older Adults Centre, & Day Cares
Superintendent – Administrative Services SNEMS	Preparation of budgets for SNEMS
Division Chief – Fire Administration	Management Operations for Fire/Rescue Halls
Manager – Fleet Services	Management of Corporate Fleet and Fuels
Manager – Transit Services	Management of Transit fleet
Manager – Corporate Information Technology	Management of Corporate IT systems
Manager – Central Support (Community Services)	Management of Budgeting of Corporate Energy
Sustainability Coordinator	Coordination of the Earthcare Sustainability Plan
Thunder Bay Community Auditorium – Building Systems Supervisor	Management of Building systems at Thunder Bay Community Auditorium
Thunder Bay Public Libraries – Accounting Supervisor	Management of budget for Thunder Bay Public Library and liaison for building operations
Thunder Bay Police Services – Finance and Support Services Manager	Management of budget for Thunder Bay Police Services and internal liaison
Energy Analyst	Monitoring and Verification of Energy Consumption Energy Budgets, Energy Plan implementation Grant funding opportunities, Committee resource

Corporate Energy Management Plan Committee Terms of Reference

GOAL:

To work collaboratively towards the continued implementation of energy management opportunities and promote employee engagement through the wise use of energy, employee engagement and awareness, and alignment with Asset Management Plans to continue to transition to a carbon neutral future while maintaining Council approved service levels.

The breakdown of Corporate energy by category in the Energy Management Plan is as follows:

1. Facilities
2. Water and Wastewater
3. Traffic Control, Street and Other Outdoor Lighting, Parking Authority
4. Fleet

OBJECTIVES:

- Work collaboratively to implement energy efficient actions within daily operations to reduce consumption;
- Promote employee engagement and awareness towards energy management initiatives and opportunities;
- Integrate best practices into daily operations, and where feasible reduce energy consumption;
- Provide a forum for discussion on energy management strategies that may benefit all divisions;
- Actively participate in the implementation of initiatives and documentation as it pertains to members' respective operations and energy management initiatives;
- Increase corporate awareness of the consumption of energy within each department; and
- Provide information for the Energy Management Plan Annual Report.

MEMBERSHIP:

The committee will be made of a cross functional team from Corporate Stakeholders who have responsibility for planning and authorizing Corporate Capital and Operating expenditures related to the categories outlined above and are key to the successful implemention of the Energy Management Plan.

MEETING SCHEDULE:

3 times per year

APPENDIX C

Summary of Corporate Strategic Direction and Alignment with Other Plans

City of Thunder Bay Environmental Policy: (2005)

In 2005, City Council adopted an Environmental Policy statement to fulfill a goal under the 2004 City of Thunder Bay's New Foundation Living Strategic Plan to "foster and promote qualities of a healthy community and to grow greener by promoting sustainability and by being a leader in environmental stewardship." Strategic Action No. 14 of the plan specifically called for the development and recommendation of an Environmental Policy for the City of Thunder Bay.

Policy Statement:

It is the policy of the Corporation of the City of Thunder Bay to provide leadership and continual improvement in environmental management and performance. In all activities the City will seek to identify and monitor issues, and minimize our impact on the environment to further our goal of community sustainability.

Statement of Environmental Principles:

The Corporation of the City of Thunder Bay will demonstrate leadership and continual improvement in the practice of environmental management and performance. To this end, we will:

1) Ensure that environmental considerations and energy conservation are fully integrated into all decisions respecting community planning, service delivery, and operations.

2) Strive to achieve a level of performance that meets or exceeds all applicable environmental legislation and regulations.

3) Use the best available technology economically achievable consistent with the current knowledge of environmental protection and innovation.

4) Promote the sustainable use and re-use of resources and work to reduce the consumption of non-renewables.

5) Communicate openly and in a timely manner with community, business, stakeholders, and our employees, on our environmental policies and programs, and make these commitments readily available to all interested parties.

6) Increase public awareness of environmental issues and actions people can take by promoting environmental education and training, and participating in projects that promote water and energy conservation, waste reduction, pollution prevention and urban green-spaces.

7) Participate in community initiatives to protect and improve the quality of the environment for future generations.

8) Contribute to the preparation and implementation of the Community Environmental Action Plan (CEAP) with the knowledge and assistance of community partners.

9) Use the precautionary principle where there exists the possibility of significant harmful effects on health or the environment.

10) Strengthen green procurement commitments by employing environmental criteria when evaluating all potential purchases.

Clean, Green and Beautiful Policy: (2007)

In 2007, City Council approved the Clean, Green and Beautiful Policy, with a vision to foster and promote our quality of life, which is directly linked to establishing and nurturing a healthy community that is environmentally sustainable. The vision for improving our quality of life is centered on the creation and maintenance of a city that celebrates its culture and history through the arts and architecture, protects and enhances its natural systems, and provides a clean and healthy environment for its citizens – it is quite simply, clean, green and beautiful.

The City shall ensure that its own projects and partnership projects are evaluated based on the following Performance Criteria and review which criteria are appropriate to each project. For each City project, Council will require project managers to report the extent to which their projects meet the diamond performance standard for clean, green and beautiful.

The performance criteria include references to energy management through:

Clean: Conserving Energy

Use of Alternative Energy

Reducing Greenhouse Gas Emissions

Green: Protecting Biological Diversity

Protecting Ecological Integrity

Partners for Climate Protection: (2014)

In March 2003, the City of Thunder Bay passed a resolution to participate in the Partners for Climate Protection (PCP) program. This resolution makes a commitment to work towards reducing greenhouse gas emissions in municipal operations by 20% below 1990 levels, and at least 6% reductions throughout our municipal area.

In accordance with the Federation of Canadian Municipalities (FCM) Climate Protection program, the City of Thunder Bay has completed the five performance milestones (Table C-1) and continues to implement, monitor and report progress of the goals outlined in the Earthcare Sustainability Plan (Local Action Plan). The milestone framework was established to help guide our municipal efforts to reduce greenhouse gas emissions. It provides a method to better understand how municipal decisions and planning effect energy use, and how we can work to mitigate global climate change while improving our community's quality of life. The five milestone process is a sequential process that includes the following:

MILESTONE	OBJECTIVE	TIMELINE
1	Create a Baseline emissions inventory and forecast	Completed 2008
2	Set emission reduction targets	Completed 2008
3	Develop a Local Action Plan	Completed 2008
4	Implement the Local Action Plan	Ongoing
5	Monitor Progress and Report Results	Ongoing

Table C-1: Summary of PCP milestones and City of Thunder Bay progress.

Earthcare Thunder Bay Sustainability Plan: (2014-2020)

In 2008, the Earthwise® Community Environmental Action Plan was approved by City Council and met the intent of previous council resolutions to develop a community energy plan and a sustainable energy policy to reduce greenhouse gas (GHG) emissions. The plan took an integrated approach to promoting a more sustainable community recognizing that environment, economy, society and culture are linked around issues such as active transportation, air, community greening, food, energy, green building, land use, pesticides, waste and water.

In 2014, the new Earthcare Thunder Bay Sustainability Plan (formerly known as Earthwise® Community Environmental Action Plan) provided an updated framework of vision and priorities for Thunder Bay by outlining a clear path to deliver positive and tangible changes within the community and Corporation. The Sustainability Plan focuses on greenhouse gas reduction and mitigation initiatives but also introducing a shift toward adaptation strategies for our changing climate.

Under the Earthcare Sustainability Plan:

Sustainable Development: Energy Goal

To promote the wise use of energy and transition to a carbon neutral future. By 2020, the community of Thunder Bay will reduce greenhouse gas emissions by 20% below 2009 levels.

Objectives and Recommended Actions:

A. By 2020, total municipal operations energy consumption is 20% below 2009 levels and total community energy consumption is 20% below 2009 levels.

Actions for the Corporation:

a) Adopt higher energy efficiency standards for new buildings and renovations that minimize the environmental impact of the capital projects and energy demands of city facilities.

b) Continue to implement the Strategic Approach to Corporate Energy Management Plan

c) Develop a Local Improvement Incentive (LIC) program to facilitate energy efficiency upgrades to private property

d) Update and revise the Green Fleet Plan to meet new goals and best practices

e) Create processes to track staff travel claims and work to reduce mileage and flights

B. Renewable energy is increasingly used to meet local demand.

Actions for the Corporation:

a) Continue to implement renewable energy projects such as rooftop/land-mount solar projects

b) Pursue opportunities to increase generation capacity to renewable energy sources

City of Thunder Bay Facility Design Standards Policy: (2014)

In 2014, City Council approved the Facility Design Standards to demonstrate a commitment to environmental, social and economic improvements and to provide leadership and support in the application and development of sustainable building practices for Corporate facilities.

This policy is intended to:

- Align the planning and development of new municipal facilities with the Council endorsed internal design influences;
- Achieve long-term cost savings through reduced operating costs by way of energy and water efficiency;
- Enhance indoor and outdoor environments to promote a healthy and productive workplace for all city employees and visitors;
- Reduce demolition and construction waste being sent to the landfill by mandating recycling; and
- Demonstrate community leadership by committing to the sustainable design and development of municipal facilities.

The City shall ensure that its own facility projects are designed to meet the performance criteria appropriate to the category type outlined within the policy using a tiered standard based on category and size for all new municipal facilities, targeting at the highest level a Gold score from the Leadership in Energy and Environmental Design (LEED®) green building rating system.

Global Covenant of Mayors for Climate and Energy:

In 2015, the City of Thunder Bay joined the Compact of Mayors which was a global coalition of mayors and city officials pledging to reduce local greenhouse gas emissions, enhance resiliency to climate change and track and monitor progress of these initiatives transparently.

In 2016, the Covenant of Mayors for Climate Change and the Compact of Mayors merged to form the Global Covenant of Mayors for Climate Change and Energy. This international alliance of cities and local governments share a long term vision of promoting and supporting voluntary actions to combat climate change and move to a low emission, resilient society.

Under the commitment made under the Compact of Mayors, the City of Thunder Bay has made a commitment to set greenhouse gas emission reduction/low emission development targets that strive to be at least as ambitious, and preferably more ambitious, than Canada's Nationally Determined Contribution (NDC) under the Paris Agreement, and commit to climate adaptation and resilience as well as to ensure access to affordable and clean energy, develop a strategy to meet them, and measure and report on progress over time. Transparent reporting is required every two years.

Earthcare Sustainability Plan: 2014-2020, City of Thunder Bay Adaptation Plan and the Corporate Energy Management Plan align to form the framework set out in the Compact of Mayors commitment.

City of Thunder Bay Asset Management Plan (AMP): (2016)

The City of Thunder Bay Asset Management Plan provides a high level overview of the state of the Corporate infrastructure as well as management and financial strategies to maintain the infrastructure. The AMP includes the following asset categories: roads network, sidewalk network, bridges and culverts, water distribution network, sanitary sewer network, storm sewer network, facilities, fleet, land improvements, machinery and equipment.

Through the implementation of a comprehensive Asset Management Plan, the Corporation of the City of Thunder Bay can meet new demands in a fiscally responsible and environmentally sustainable framework while preserving our quality of life. To optimize opportunities within the AMP, it is essential that synergies be explored to not only optimize operations and maintenance but also align energy management opportunities to reduce/avoid energy consumption and cost where feasible.

City of Thunder Bay Strategic Asset Management Policy: (2019)

In 2019, City Council approved the City of Thunder Bay Strategic Asset Management Policy, with a commitment to developing and implementing a corporate wide asset management program to promote informed infrastructure investment decisions based on sound asset management practices that will include social, environmental and economic considerations. The plan also complies with Ontario Regulation 588/17- Asset Management Planning for Municipal Infrastructure.

The policy is intended to guide the consistent use of asset management across the Corporation, to facilitate logical and evidence-based decision making for the management of municipal infrastructure assets and to support the delivery of sustainable community services now and in the future.

CITY OF THUNDER BAY
ASSET MANAGEMENT DIVISION
155 FRONT STREET
P.O. BOX 800
THUNDER BAY ON P7C 5K4
TEL: 807.684.2510

INFORMATION IS ALSO AVAILABLE AT:
THUNDERBAY.CA

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