Municipality of Northern Bruce Peninsula

Energy Conservation and Demand Management Plan

June 2019 Update

Prepared by

Ontario Clean Water Agency
Agence Ontarienne Des Eaux

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Preface

This Energy Conservation and Demand Management (CDM) Plan was developed by the Project Planning & Delivery Group of the Ontario Clean Water Agency with the assistance from the staff of the Municipality of Northern Bruce Peninsula (Municipality).

The objective of the CDM Plan is to develop strategic plans and set goals such that the Municipality may have a guideline to manage its energy consumption effectively and efficiently.

This Plan will also assist the Municipality in complying with the *Electricity Act*, O.Reg. 507/18 – Broader Public Section: Energy Reporting and Conservation and Demand Management Plans.

1. Introduction & Background

The Ontario Regulation 507/18 requires public agencies (municipalities, municipal service boards, school boards, universities, colleges and hospitals) to report on their energy consumption and greenhouse gas (GHG) emissions annually beginning in 2013 and updated annually, and to develop and implement a 5-year Energy Conservation and Demand Management (CDM) Plan starting in 2014 and updated every 5 years. This CDM Plan update is the first update and it is required by July 1, 2019.

There are significant advantages to developing and implementing a CDM Plan. Reducing energy consumption translates to reducing costs to a municipality and the savings could be directed to other important works in the municipality.

The CDM Plan should be consistent with other existing planning documents that relate to energy conservation. This Plan should also document all energy conservation initiatives that the Municipality currently have and plan to implement.

1.1 Overview

The intent of the CDM Plan is to guide the Municipality of Northern Bruce Peninsula in the development of an energy management foundation. It is a living document that will evolve as the Municipality's energy needs change and develop. This updated plan is designed to address the current energy needs of the Municipality while accounting for the changes that have occurred in the last five years. The update of the CDM plan will improve understanding of energy consumption within the municipality while providing a roadmap for future improvements in energy management and awareness.

1.2 Objectives

The following objectives will be adopted to create a foundation for the Energy Conservation and Demand Management Plan.

- Allow energy management to be incorporated into all Municipal activities including organizational and human resource procedures, procurement practices, investment decisions, and facility capital, operations, and maintenance
- Create a culture of energy conservation within the Municipality to reduce greenhouse gas emissions and ensure the wise use of resources
- Demonstrate leadership within the Municipality and community as to the commitment to energy management and investigation of new and emerging technology
- Strive to reduce energy consumption through efficient use of resources while still maintaining an effective level of service
- Create a foundational program for continuous energy improvements

1.3 Strategic Plan of the Municipality of Northern Bruce Peninsula

Energy conservation and management is part of the “Strategic Plan of the Municipality of Northern Bruce Peninsula, 2015”. The Strategic Plan encourages the implementation of energy conservation practices for new developments and existing facilities in the Municipality.

Some energy conservation strategies from the Strategic Plan are listed below:

“Lead by example through energy consumption reduction at Municipal facilities and the use of Municipal vehicles, maximize waste diversion efforts, and conserving water"

“Encourage the opportunity for development, while balancing our natural environment, recognizing our community as the host to the Niagara Escarpment World Biosphere Reserve, home of two National Parks, Diving Capital of Canada and Dark Sky Community leader”

“To conserve and protect our unique natural environment while encouraging well-managed growth”

This CDM Plan complements the Strategic Plan in defining practical objectives in order to realize the goal to create an energy efficient and comfortable environment in the Municipality of Northern Bruce Peninsula. Energy conservation and management does not only deal with electricity but rather it covers a broad area that spans to water/wastewater, solid waste and environmental management for instance, as the efficient management in those areas can also lead to reduction in energy consumption.

1.4 Energy Demand and Cost

Population

The Municipality of Northern Bruce Peninsula has experienced an overall increase in population since 2001. The latest population survey showed that the Municipality's population growth rate was 6.8% from 2011 to 2016. During this time period, the population growth in Ontario was 4.6%.

The Municipality is a region populated by cottages and seasonally used homes, hence, there are considerable strain on municipal services such as water, wastewater and solid waste occurring in the summer season. The ability to handle seasonal spikes in demand is crucial for the Municipality.

Should population continue to rise, facilities would be required to be expanded to accommodate the increased demand. Subsequently, the demand for energy would also increase.

Municipality of Northern Bruce Peninsula and Ontario Population Growth

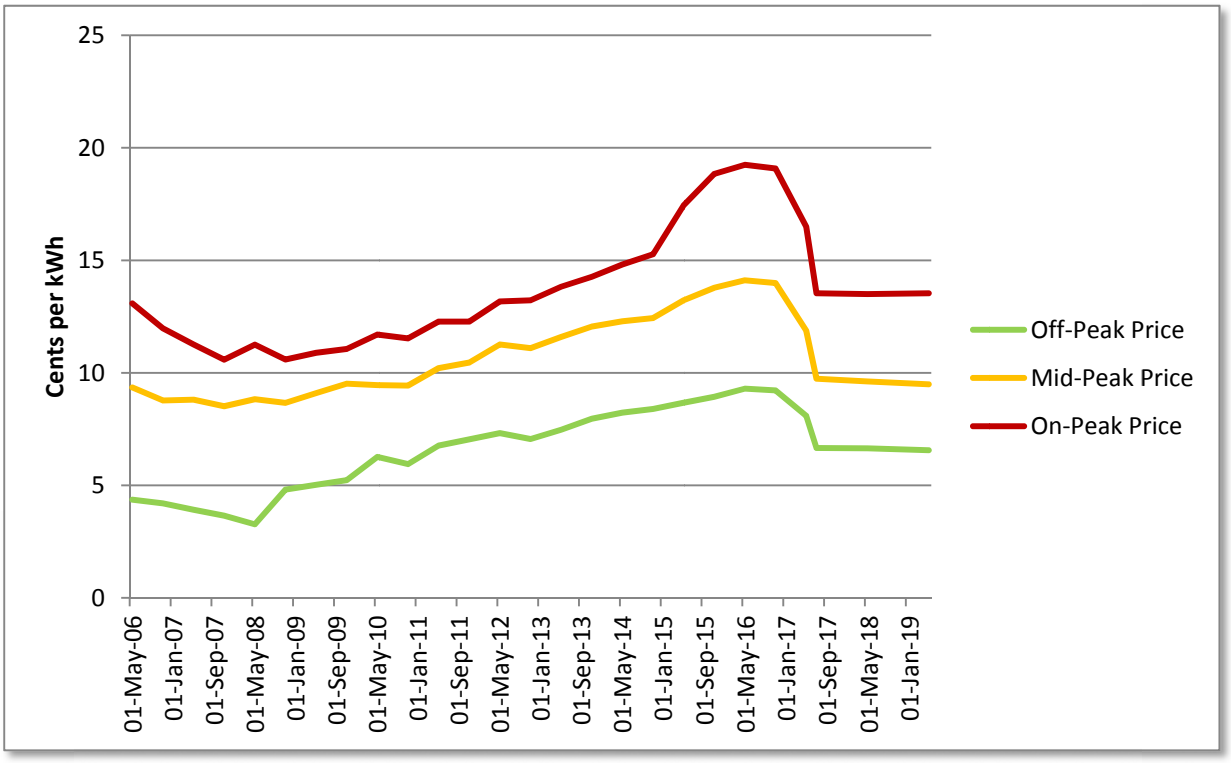
Year	Population	Population Growth in Northern Bruce Peninsula	Population Growth in Ontario
2001	3,599	7.0%	6.6%
2006	3,850	-2.8%	5.7%
2011	3,744	6.8%	4.6%
2016	3,999		

Source: Statistics Canada, www.statcan.gc.ca

Cost of Energy

The cost of energy in Ontario has been rising steadily since 2007 as shown in the chart below from the Ontario Energy Board.

Cost of Energy (kWh) in Ontario (Adjusted for Inflation, 2019 dollars)



Source: Ontario Energy Board, www.oeb.ca

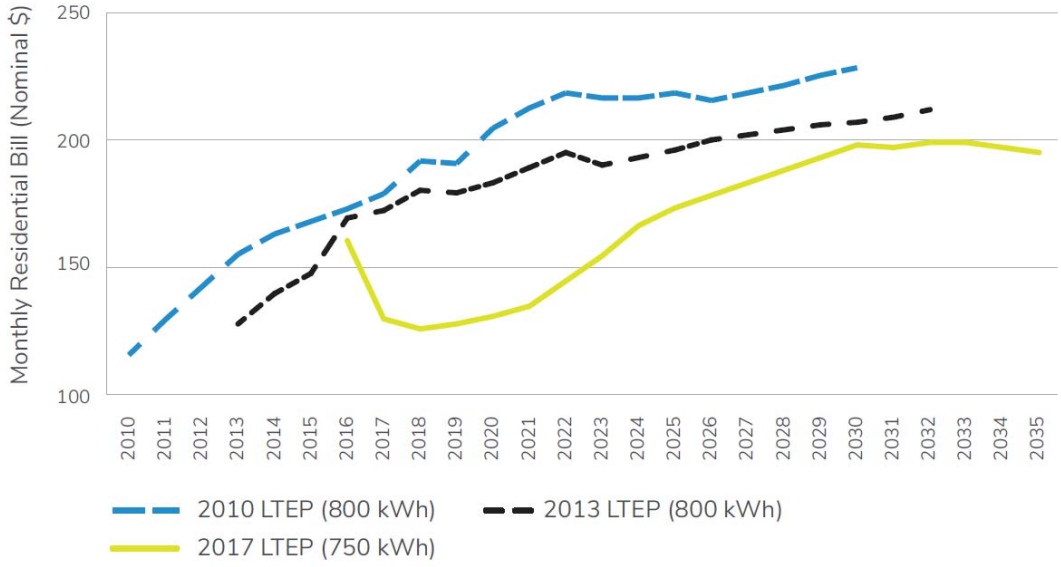
Using the Mid-peak cost line as an average and accounting for inflation, the cost of energy increased approximately 66% from the low in 2007 to the high in 2016. Electricity costs have since regressed to costs similar to those 2011. This dramatic decrease in electricity pricing can be attributed to the *Fair Hydro Act*, which came into effect on June 1, 2017. The Act puts in place the framework for giving effect to the Fair Hydro Plan initiatives that the government has stated will:

- lower electricity bills by 25% on average for all residential customers and as many as half a million small businesses and farms;
- hold increases to the rate of inflation for four years;
- provide additional bill relief for residential customers in rural or remote areas of the province and for on-reserve First Nations residential customers; and
- remove the cost of certain electricity-related relief programs from electricity bills, and instead fund those programs through taxes.

The *Fair Hydro Act, 2017* will affect different parts of an electricity bill in different ways for different customers. Through refinancing, the province will lower electricity bills and hold rate increases to the rate of inflation.

According to *Ontario's Long Term Energy Plan* published by the Ministry of Energy in 2017, the cost of energy will be subsidised to a rate 25% below the status-quo rate[1] until 2021, at which time it will gradually increase while remaining in a deficit until 2027. From 2028-2045, the rates will exceed the status-quo rate by 4% to account for the incurred financing. The chart below shows the electricity bill forecasts for a typical residential household.

Ontario Electricity Bill Forecasts (2010, 2013, 2017)



Source: Ontario's Long Term Energy Plan, 2017, www.energy.gov.on.ca

With the cost of energy projected to reach heights greater than seen in 2016 by 2024, energy conservation and management should be made a priority in every municipality. This is the very reason that the Ministry of Energy created the O.Reg. 397/11 (amended to O.Reg. 507/18) requiring public agencies to develop an Energy Conservation and Demand Management Plan.

[1] Status-Quo Rate: Electricity rate that is unsubsidised by the provincial government.

2. Baseline

The establishment of an energy consumption baseline is essential for energy management and to monitor the effectiveness of energy efficiency projects.

It can also assist with target setting, bill verification, energy awareness and the selection and assessment of potential energy projects.

The Municipality of Northern Bruce Peninsula uses its electricity utility bills to establish its energy consumption baseline for the reportable municipal buildings.

The Municipality began collecting energy consumption data in 2011, and has continued with this practice. As stated in the 2014 CDM plan, 2012 data will be used as a baseline for data comparison against the 2017 data. 2012 and 2017 energy data were collected as a requirement of the Part 1 of the O.Reg. 507/18 under the *Electricity Act* in which energy consumption and greenhouse gas (GHG) emissions data have to be reported annually.

The table below summarizes energy consumption data from 2012 to 2017 for the reportable facilities. Water and wastewater production data in megalitres (ML) for the facilities are also provided for comparison.

	Electrical Energy (kWh) Consumption			Fuel Oil (L) Consumption			Propane (L) Consumption			Water/Wastewater Flow (ML)		
Facility	2012	Difference From 2012 to 2017	2017	2012	Difference From 2012 to 2017	2017	2012	Difference From 2012 to 2017	2017	2012	Difference From 2012 to 2017	2017
Admin Municipal Office	43,074	-6,333	36,741	2,902	-2,902	0	751	5,858	6,609			
Lion's Head Community Centre	74,159	-19,328	54,831	13,259	-562	12697						
Lion's Head Arena	283,668	-29,988	253,680									
Eastnor Public Works Shed	21,483	458	21,941	4,062	-4,062	0	3,897	10,059	13,956			
Lindsay Storage Shed	2,697	-2,267	430									
Lindsay Public Works Storage Shed/Garage	10,730	-2,098	8,632				11,778	3,948	15,726			
Lion's Head Fire Hall and Offices	21,532	-1,851	19,681	4,249	-4,249	0	0	4,291	4,291			
Lion's Head Public Library	14,514	906	15,420									
Lion's Head Public Works Shed	6,430	-3,692	2,738				1,521	859	2,380			
Lion's Head Water Low Lift Pump Station	59,755	-16,675	43,080							119.80	4.11	123.907
Lion's Head Water Treatment Plant	216,630	-90,870	125,760				3,730	8,060	11,790	113.02	2.77	115.8
Tobermory Museum	2,435	1,268	3,703	1,036	-1,036	0						
Lion's Head Rotary Hall	16,299	-3,454	12,845	3,295	-3,295	0	0	3,569	3,569			
Tobermory Community Centre & Small Water System	120,956	-7,356	113,600							1.03	1.21	2.236
Tobermory Fire Hall	26,458	-16,994	9,464	4,358	-4,358	0	0	6,184	6,184			
Tobermory Sewer Pump Lift Station	69,711	-23,108	46,603							41.81	41.52	83.324
Tobermory Public Library	32,786	-1,459	31,327									
Tobermory Sewer Aerator Building	106,534	63,806	170,340							41.80	41.52	83.324
Tobermory Pubic Works Shed	17,027	-5,778	11,249	2,401	2,598	4999						
Tobermory Meeting Place	57,492	-5,385	52,107									
Tobermory Water Treatment Plant Little Tub	29,940	17,340	47,280							3.37	-0.62	2.745
Total	**1,234,310**	**-152,858**	**1,081,452**	**35,561**	**-17,865**	**17,696**	**21,677**	**42,828**	**64,505**	**321**	**91**	**411**

The 2012 energy consumption data is used as the baseline for this CDM Plan.

2.1 Trends in Energy Consumption

It is important to examine the trends of energy consumption for each facility. It could provide an overall picture of the behaviour of the facilities and a forecast of future consumption. Actions could be planned accordingly should there be distinctive trends that need attention.

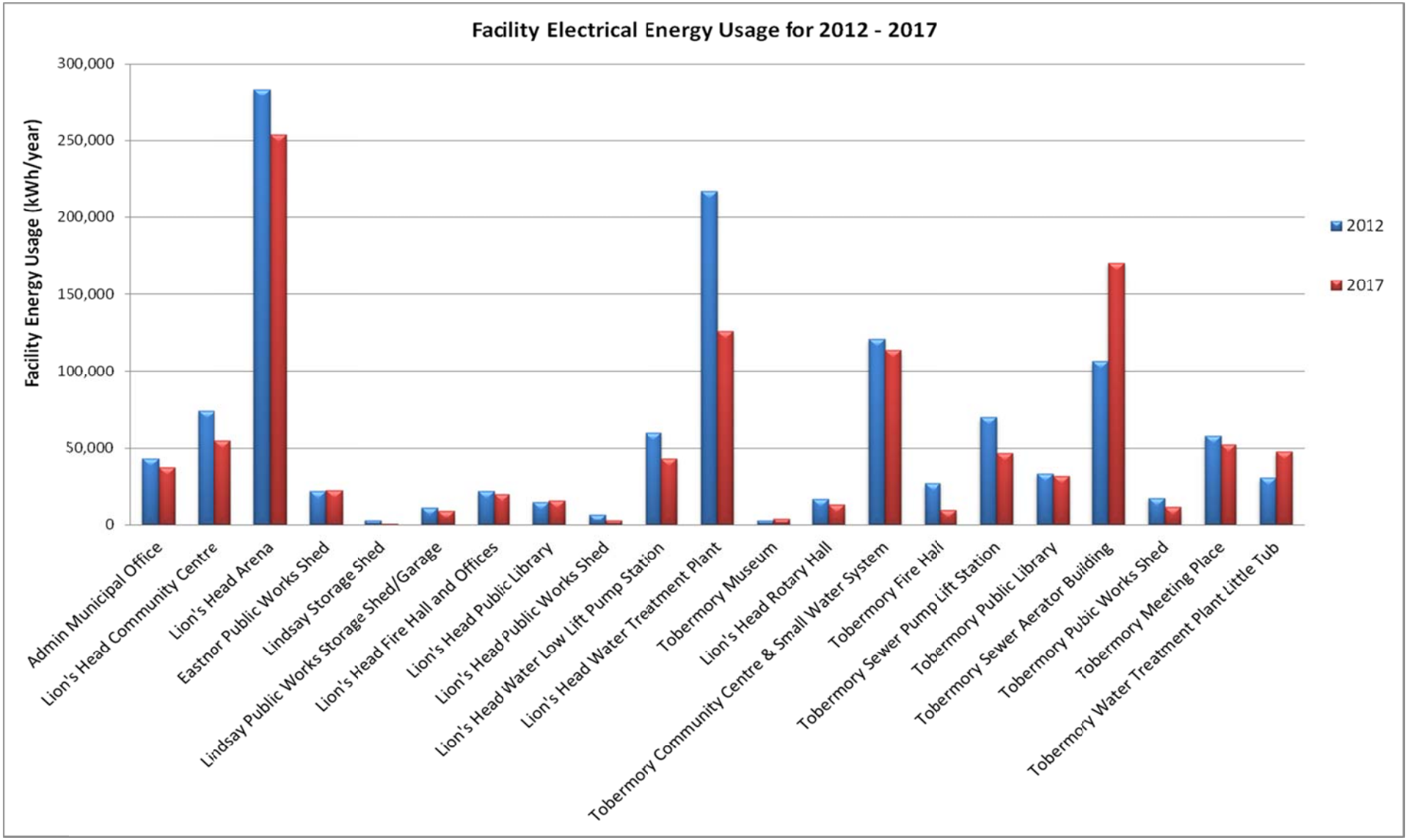
Electrical Energy Consumption Trend

There is a trend in the electrical energy consumption of the facilities in the table above. There was an overall decrease of approximately 152,858 kWh (12.4%) of energy consumption from 2012 to 2017.

The most significant changes in electrical use was the decrease at the Lion's Head Water Treatment Plant and an electrical use increase at the Tobermory Sewer Aerator Building. This is expected as larger facilities tend to have more opportunities and issues that affect electrical usage.

There was also a general across the board decrease in electrical usage at 16 of the remaining 19 facilities. It is more difficult to reduce energy consumption in smaller facilities as there is a minimum requirement for essential energy usage. However, most of the smaller facilities had a relatively large percent reduction in energy consumption. Energy conservation has been and will continue to be an on-going process in the Municipality. There have been various initiatives in the Municipality that contributed to the decrease in energy usage.

The chart below provides a perspective of the amount of energy usage from 2012 to 2017 for each municipal facility.


Facility Electrical Energy Usage for 2012 - 2017
Facility Energy Usage (kWh/year)
300,000
250,000
200,000
150,000
100,000
50,000
0
2012
2017
Admin Municipal Office
Lion's Head Community Centre
Lion's Head Arena
Eastnor Public Works Shed
Lindsay Storage Shed
Lindsay Public Works Storage Shed/Garage
Lion's Head Fire Hall and Offices
Lion's Head Public Library
Lion's Head Public Works Shed
Lion's Head Water Low Lift Pump Station
Lion's Head Water Treatment Plant
Tobermory Museum
Lion's Head Rotary Hall
Tobermory Community Centre & Small Water System
Tobermory Fire Hall
Tobermory Sewer Pump Lift Station
Tobermory Public Library
Tobermory Sewer Aerator Building
Tobermory Pubic Works Shed
Tobermory Meeting Place
Tobermory Water Treatment Plant Little Tub

Fuel Oil Consumption Trend

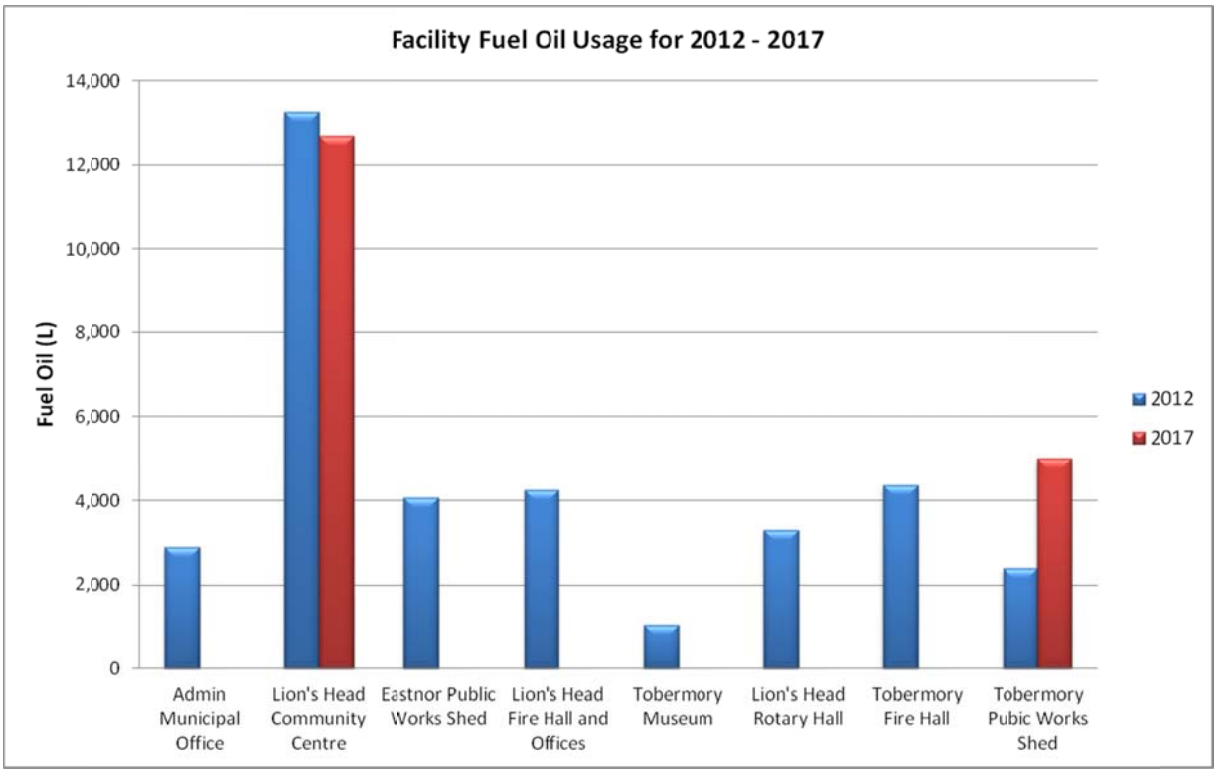
There is a decreasing trend in the fuel oil consumption of the Municipality's facilities. There was a large decrease of approximately 17,865 L (50.2%) from 2012 to 2017.

Fuel oil is used for heating purposes and the amount of heating required is highly dependent on winter temperatures. Should there be many cold days in a winter, the oil usage would likewise be higher. However, there are energy conservation measures that can reduce heating requirement, including lowering the thermostat temperature while maintaining a comfortable environment, and using less hot water.

The large decrease in fuel oil usage was mostly as a result of the conversion from fuel oil heating to propane heating in the Admin Municipal Office, Eastnor Public Works Shed, Lion's Head Fire Hall and Offices, Tobermory Museum, Lion's Head Rotary Hall, and Tobermory Fire Hall.

Propane is more environmentally friendly and cost effective than heating oil. The Municipality has plans to convert the Tobermory Public Works Shed and to investigate the feasibility of converting Lion's Head Community Centre from fuel oil heating to propane heating.

The chart below provides a perspective on the amount of fuel oil usage by the facilities that use fuel oil.

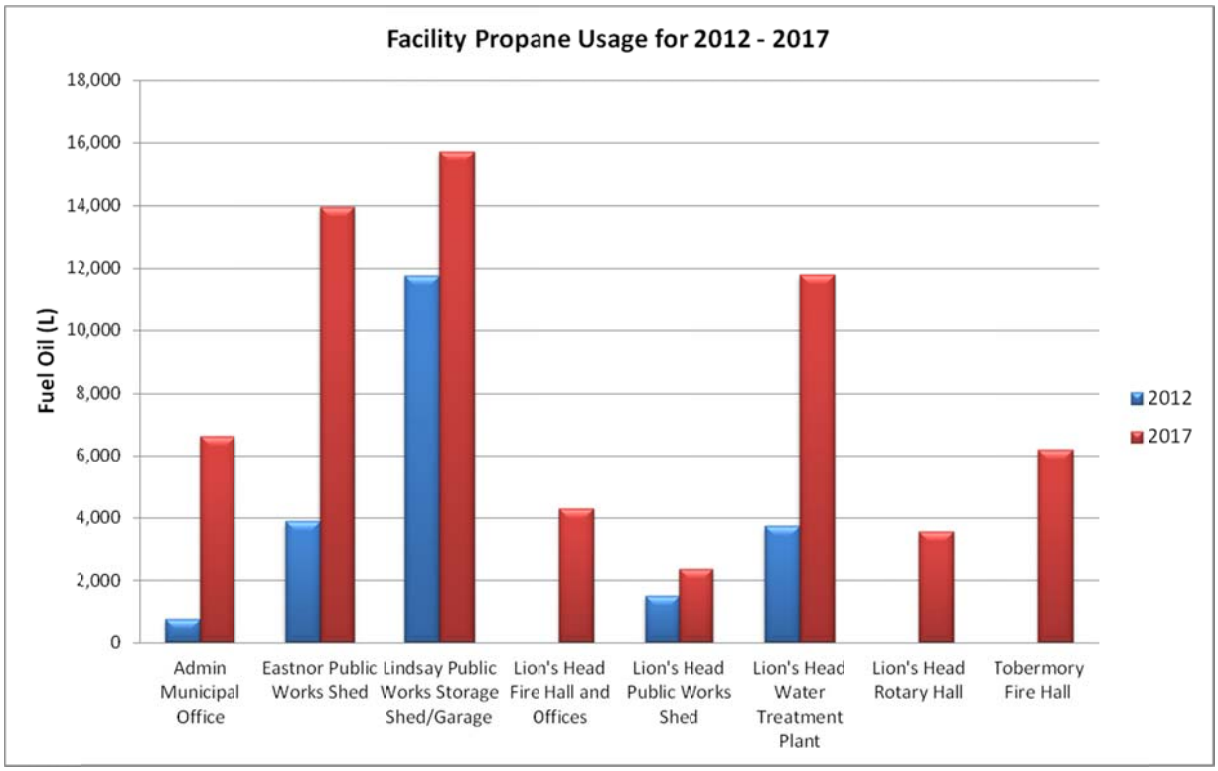


Propane Consumption Trend

There is an increasing trend in the propane consumption of the Municipality's facilities. There was an increase usage of 42,828L (197%) from 2012 to 2017. As discussed above, this increase is mostly due to the conversion from fuel oil heating to propane heating, which adds new sources of propane usage from 2012.

Propane is used for heating purposes and the amount of heating required is highly dependent on winter temperatures. Should there be many cold days in a winter, the propane usage would likewise be high. However, there are energy conservation measures that can reduce heating requirement, including lowering the thermostat temperature while maintaining a comfortable environment, using less hot water, and improving building insulation.

The chart below provides a perspective on the amount of propane usage by the facilities that use propane.



There is no propane usage data for the Lion's Head Fire Hall and Offices, Lion's Head Rotary Hall, and the Tobermory Fire Hall in 2012 as these facilities were converted to propane heating between 2012-2017.

3. Current State of Energy Usage

The Municipality of Northern Bruce Peninsula is aware that energy conservation and management is imperative to creating a sustainable environment and reducing on-going operations/energy costs. There have been various works in the Municipality in recent years that contributed to a reduction in energy consumption.

Energy conservation and management does not include only electricity usage reduction in buildings. Water conservation and solid waste management also play a direct role in the overall target for efficient energy management. The lower the amount of water and waste produced the less energy required for treatment and disposal.

3.1 Energy Conservation in Buildings

Energy conservation has been an on-going process in all municipal buildings. As per the Strategic Plan of the Municipality of Northern Bruce Peninsula, a major point is “to conserve and protect our unique natural environment while encouraging well-managed growth”. Under this goal, the focus is to lead by example through energy consumption reduction at Municipal facilities and the use of Municipal vehicles. New developments and redevelopments including replacement/retrofit works are encouraged to be built and sustained in a manner that minimizes energy consumption. Electrical equipment replacement works over the years have been evaluated against energy efficiencies criteria, and the most cost-effective option at that time was chosen.

3.2 Dark Sky Community

The Municipality of Northern Bruce Peninsula has proclaimed in 2004 to be a “Dark-Sky Community”. The International Dark-Sky Association’s (“IDA”) mission is to preserve and protect the night time environment and our heritage of dark skies through quality outdoor lighting and goals intended to stop the adverse effects of light pollution. To accomplish this, the Association along with Dark-Sky Communities raise awareness about light pollution, its adverse effects and its solutions in order to educate about the values of quality outdoor lighting. A complete copy of the Municipality’s proclamation is available on the website or at the Municipal Office. In addition, the Bruce Peninsula Biosphere Association has a dark sky lighting catalogue available on its website.

The catalogue for dark sky friendly lighting actions recommends scarce use of lights and only leaving lights on while they are needed for a task. The use of blinds on building windows keeps indoor light from protruding into the darkness outside. Instead of incandescent light bulbs for outdoor fixtures, yellow, low wattage Compact Fluorescent Light (CFL) bulbs can be used to improve energy efficiency and reduce harsh bright lights. To ensure outdoor lights are only on when necessary, a timer or motion detector can be installed. As well, lighting should be directed downwards and fitted with a light shield to keep light only directed towards a task and not out in every direction.

This initiative has had significant positive effect on the amount of energy consumption in the Municipality.

3.3 Water Conservation

The Municipality of Northern Bruce Peninsula started installation of water meters in Lion's Head in 2005 and since then billings have been based on water usage.

Installation of water meters have multiple benefits:

Immediate water usage reduction

Historical statistics have shown that buildings reduce water consumption immediately following the installation of water meters.

Ability to detect water loss/leaks

The summation of all water meter readings over a period of time can be compared to the amount of water output at the water wells over the same period of time to see how much of the wells output actually gets consumed. This verification check could provide an indication of water loss or watermain leaks should the consumption be much lower than the water output.

These two parameters should be compared on an annual basis for a meaningful analysis. Should the gap between them increases, it is likely that watermain leaks are worsening and an investigation may be warranted.

Increase capacity of Water and Wastewater Systems

All water and wastewater systems have a rated capacity or maximum output that they can produce. Should output be near the rated capacity (~80% of rated capacity) as demand increases, studies should be initiated to increase the capacity which would typically involve major upgrades to the systems.

Reducing water consumption has a direct effect on reducing output of the water and wastewater systems and could avoid costly capital upgrades.

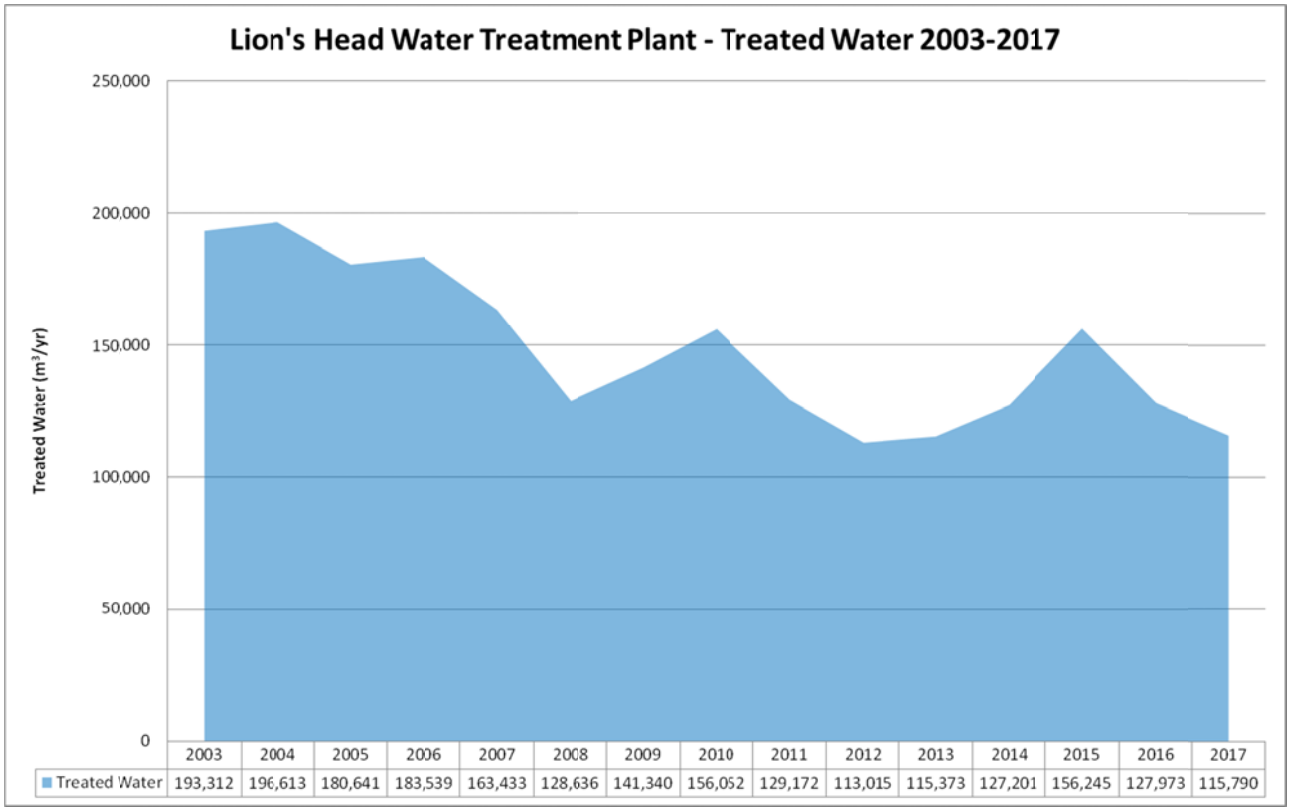
The amount of wastewater produced is also directly related to the amount of water consumed as a majority of the water consumed is released to the sewer system, hence, reducing water consumption has the effect of "increasing capacity of both water and wastewater systems" in the community. This is in turn beneficial from the municipal planning perspective as there would be capacity to accommodate new housing or commercial developments.

Decrease energy consumption of Water and Wastewater Systems

Water and Wastewater systems are costly to operate, in fact, combined they are the single largest energy consumer in the Municipality. The treatment and pumping of water and wastewater are very energy and chemically

intensive. Reducing output from these systems directly decreases energy use and chemical cost.

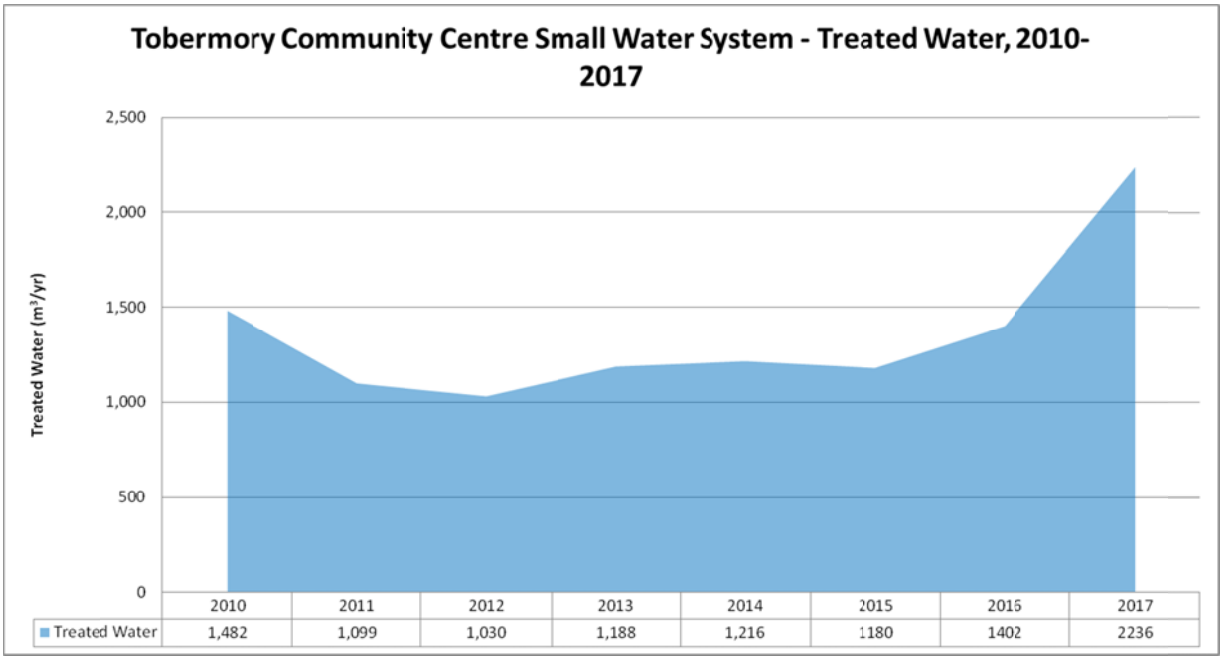
The decrease in water usage was indeed immediate following the implementation of the water meters. It takes time for consumers to adjust their water usage habits realizing the amount of water usage is reflected in the amount on the water bill. The chart below shows the yearly amount of water treated at the Lion's Head Water Treatment Plant.



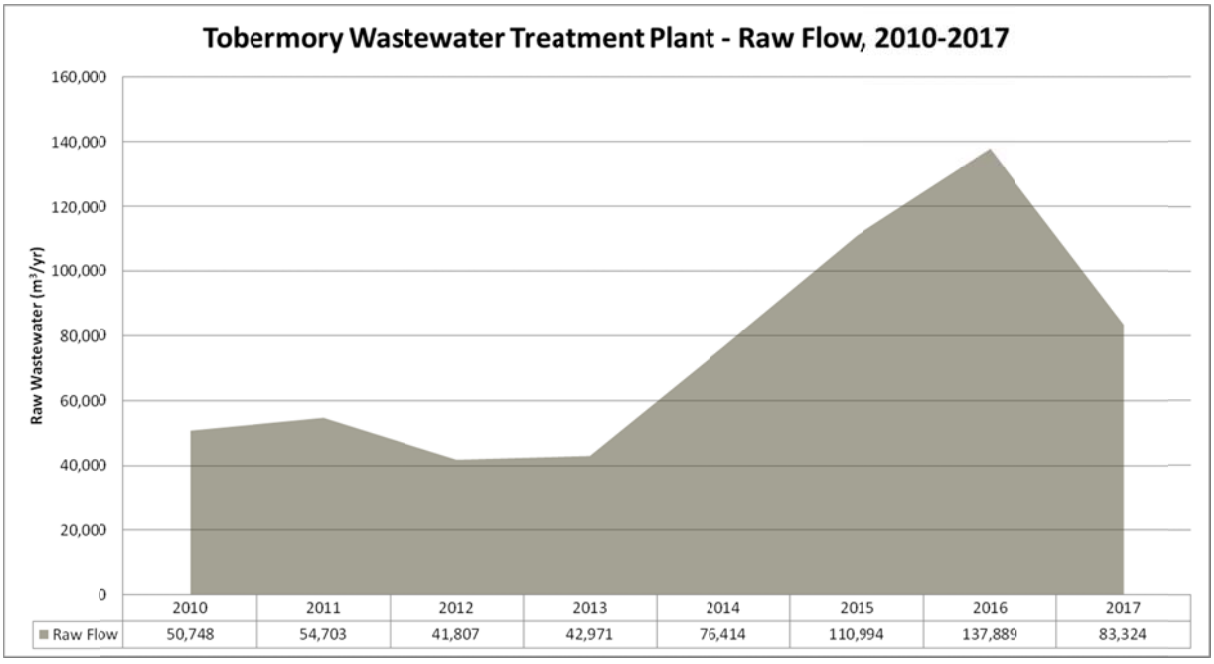
The average water output from 2003 to 2005 was 190,000 m^3/year. In comparison the average water output in the last five years (2013-2017) was 129,000 m^3/year. This 32% decrease is eleven percent greater than the decrease reported in the previous CDM report in 2014. The decreasing trend from 2005 to 2012 has since stabilized and present use will likely remain between the range of 115,000-150,000 m^3/year.

Future trends of water use are likely to be proportional to population growth in the area. As described in section 1.4, the population has increased at a rate 6.8% over 5 years based on the most recent census. Treated water demand can be expected to follow the rate of population increase. This may be mitigated as consumers further adjust their water use habits and replace old appliances with new and more water efficient appliances.

The Municipality has a by-law for regulating the supply of water in Lion's Head which also provides for conservation measures.



Eight complete years (2010 to 2017) of data were obtained for the Tobermory Community Centre Small Water System. Water demand has been relatively consistent for the seven years between 2010-2016, at an average of 1,200 m^3/year. As of 2017, water demand started to increase to due to greater demand at the Community Centre. The average usage of 1,200 m^3/year is relative low hence it could fluctuate greatly depending on demand on a particular year.



Eight complete years (2010 to 2017) of data were obtained for the Tobermory Wastewater Treatment Plant. There was a significant increase in raw flow to the plant after 2014. Flows increased from an average of 48,000 m^3/year to a peak in

2016 at 138,000 m^3/year. This increase is due to a source of major water infiltration that started between 2014-2015. The infiltration was identified and mitigated in 2017. It is expected that raw flows into the plant will return to levels before 2014.

It should be noted that raw flow can very substantially from year to year due to inflow and infiltration of rain and snowmelt.

There are no water meters installed in Tobermory. The Municipality will investigate the viability of installing water meters in Tobermory and other locations within the Municipality as the opportunity arises.

3.4 Solid Waste Management

Solid waste management services are provided by the Municipality (landfills / recycling facilities) and curbside waste collection/waste disposal bin services are provided by a private contractor.

In general, the volume of material being recycled has increased over the years and the residual going to the landfill has fallen.

The Municipality has developed a “Long-Term Waste Management Plan” in 2012 to effectively manage its waste. This plan is still in use as of 2019.

The Municipality will continue to monitor the program and make improvements to the plan where applicable.

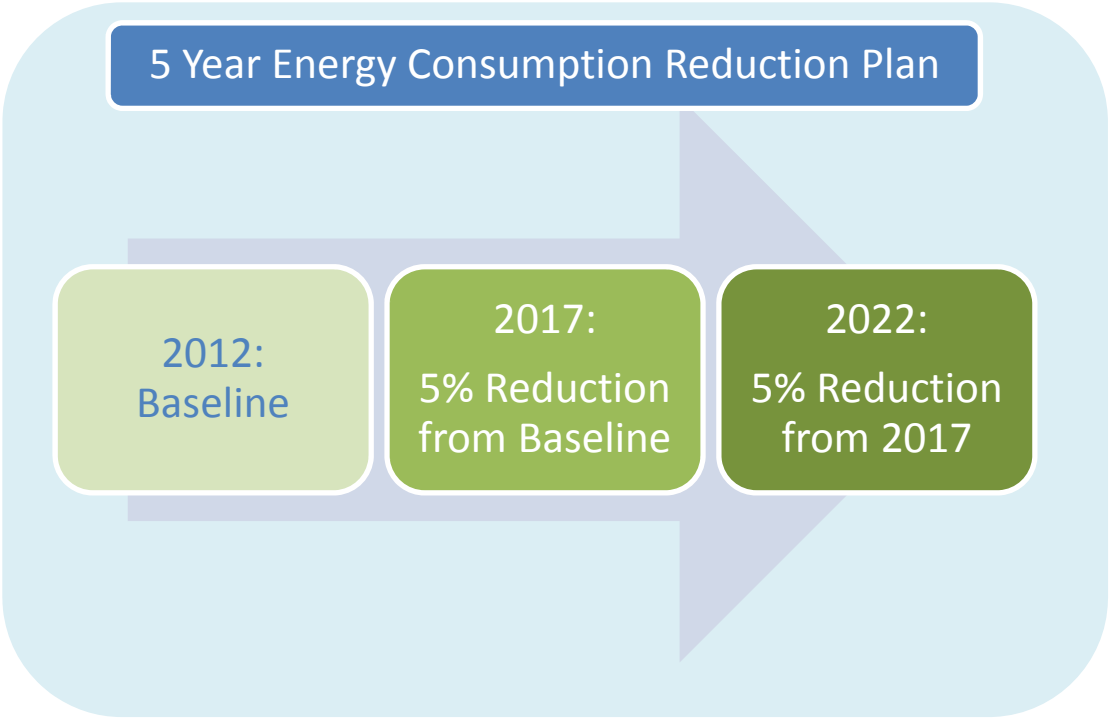
Information and tips on solid waste management and recycling can be found on the Municipality’s website and the Bruce County website.

4. Preferred State of Energy Usage

The municipal buildings of the Municipality of Northern Bruce Peninsula have gone through continuous upgrades and improvements over the years.

However, there are more opportunities for improvement and the Municipality is committed to continuously monitor energy consumption and implement energy efficient practices where applicable.

As a target for this 5 year Energy Conservation and Demand Management (CDM) Plan, the Municipality will strive to reduce energy (electricity, fuel oil and propane) consumption in each building by 5% every 5 years.



The preferred state of energy usage in the Municipality of Northern Bruce Peninsula is to continue to comply with the guidelines as set out in its Strategic Plan and to always seek improvement to its energy conservation and management practices where applicable.

5. Energy Conservation Measures & Implementation

In order to reach the preferred state of energy usage as identified in Section 4, energy conservation measures and an implementation plan is required to be developed.

5.1 Energy Conservation Planning Measures

A planning framework acts as an overall guideline to ensuring energy conservation will be realized. Three planning measures are identified: structure planning, resource planning, and procurement planning.

Structure Planning

Consideration of Energy Efficiency for All Projects: incorporate environmental life cycle cost into the design procedures for all capital projects as well as procurement decisions for equipment and other municipal assets. Environmental life cycle cost analysis is a technique to assess environmental impacts associated with all the stages of a product's life from-cradle-to-grave. It can avoid a narrow outlook on environmental concerns by: 1) compiling an inventory of relevant energy and material inputs and environmental releases; 2) evaluating the potential impacts associated with identified inputs and releases; 3) interpreting the results to help make a more informed decision.

Resource Planning

Energy Team: all municipal staff have a responsibility to contribute to overall municipal energy management objectives. Technology alone will not achieve energy conservation and demand management objectives. The Municipality will benefit when staff realizes how everyday actions can reduce energy waste and decrease operating costs. Simple actions such as turning off lights, computers and printers, ensuring that filters on heating and cooling coils are clean and dust-free, etc., all contribute to reduced energy use and energy costs in municipal buildings.

Energy Skills Training: provide skills training for operators and employees that have hands-on involvement with energy consuming systems to enhance their capacity to achieve energy efficiency improvements. Training will help lower operating costs, reduce greenhouse gas emissions, increase operational efficiency, and create a better work environment.

Procurement Planning

Energy Purchasing: investigate utilizing purchasing groups and/or cooperatives to procure fuel oil, propane, and electricity. The investigation will include the analysis of cost considerations, available energy services, energy quality, and other performance factors. The goal is to obtain the optimal rates while achieving an appropriate level of cost certainty.

Consideration of Energy Efficiency of Acquired Equipment: incorporate energy efficiency and environmental life cycle costing into the criteria for selection and evaluation of materials and equipment.

5.2 Best Practices

Nearly all buildings have lighting and heating, ventilation and air conditioning (HVAC) components, and they typically account for nearly all of the energy consumption in non-industrial buildings. Lighting and HVAC along with the building envelope upgrades are the major works that could lead to energy savings. Best practice measures of the three components are provided below; however, this does not mean all buildings should implement the measures below as each project is different and various factors (i.e. life cycle cost, long term use of the equipment/building, etc.) need to be considered.

Lighting Retrofits

There have been significant improvements in the area of lighting technology in recent years. Energy savings can be achieved by replacing older incandescent, T12 fluorescent, and metal halide lamps with T8 fluorescent, T5 fluorescent, compact fluorescent (CFL), and LED (light-emitting diode) lamps. Newer technology can produce the same amount of light for half or less of the input power, thereby reducing half or more energy consumption. At the same time, lighting levels should be optimized to meet needs - if a 100W and a 80W light bulb both can produce sufficient lighting level for the location, consider installing the 80W light bulb.

Lighting motion sensors could be a beneficial add-on for areas of infrequent occupancy, as most people do not turn off lights when they leave the area. This would ensure the light is automatically turned off when the area is not occupied.

Heating, Ventilation and Air Conditioning (HVAC) System Upgrades

HVAC system improvements offer the greatest potential for energy savings in most buildings. The first step for reducing HVAC operating costs in large buildings is to reduce HVAC loads. "Greening" an existing building may also include replacing equipment with more efficient models, improving controls and operating procedures, and retrofitting existing equipment to operate more efficiently. It must be realized, however, that HVAC systems contain many interrelated components, and upgrading them takes careful planning, professional engineering design, and careful implementation. Properly designed, installed and maintained HVAC systems are efficient, provide comfort to the occupants, and inhibit the growth of moulds and fungi.

Buildings usually operate under less than full-load heating and cooling conditions. Therefore, the greatest overall efficiency improvements will result from giving special consideration to part-load conditions and selecting equipment accordingly. Chiller manufacturers now provide a standard rating for part-load efficiency, reflecting the fact that chillers operate at less than full load 99% of the time. Staging multiple chillers or boilers to meet varying demand also greatly improves efficiencies at low and moderate building loads. Pairing different-sized chillers or boilers in parallel offers greater flexibility. Units should be staged with microprocessor controls to optimize system performance.

The fan motors in packaged units typically run at constant speeds. Variable frequency drives (VFDs) can be installed on the motors to match the fan output to

the required airflow. Energy savings vary depending on the specific system characteristics, but in certain cases can be 50% or higher.

Programmable thermostats should be utilized where possible. It can be used to specify an automatic reduction in temperature overnight. Typical savings are 2% of the heating bill for every 1°C that the temperature is reduced overnight.

Building Envelope Upgrades

Reducing a building's energy consumption often revolves around changes to its mechanical and electrical operations or system. However, a building's roof and walls may also provide significant energy savings.

Adding/improving insulation to the roof and walls reduces the amount of heat lost to the environment in the winter and also reduces the heat coming into the building in the summer. Sealing doors and windows properly to prevent inflow/outflow of air can significantly reduce required heating requirements. Furthermore, windows can be double or triple paned to reduce heat loss through conduction and tinted to prevent an increase in heat from sunlight.

By implementing this measure, studies have shown a building could reduce the heating and cooling load substantially. This is generally a high cost measure for existing buildings since the roof and walls essentially need to be rebuilt. The most effective strategy is to coordinate the work with a roof or wall replacement.

5.3 Renewable Energy

The Provincial government has been promoting renewable energy throughout the province for over a decade. The Municipality is encouraged to seek and apply for incentives where available for renewable energy projects.

The Municipality currently has three small solar pre-heat systems, one each operating at the Ferndale Information Centre, the Lion's Head Harbour Masters Office and the Tobermory Harbour Public Washroom/Showers. Installation of solar panels at more municipal facilities would reduce electrical usage and saves cost in the long-term.

5.4 New Construction / Redevelopment of Existing Buildings

Energy efficiency measures should be implemented during the construction phase for maximum potential benefit when the measures have been evaluated, planned and designed.

The Municipality of Northern Bruce Peninsula will consider employing sustainable/energy efficient building principles for new or redevelopment of municipal buildings. This practice can be carried out through the pursuit of LEED (Leadership In Energy and Environmental Design) certified projects as an example.

LEED is a set of rating systems for the design, construction, operation, and maintenance of green buildings. Developed by the United States Green Building Council (USGBC) and adopted by Canada Green Building Council (CaGBC), LEED is intended to help building owners and operators be environmentally responsible and use resources efficiently.

Buildings with LEED certification means they have employed sustainable and energy efficient practices into their design and construction.

LEED certification is becoming more popular in Canada as its benefits are becoming more apparent. It also serves as a reminder to occupants that energy conservation and management is a priority and everyone's responsibility.

5.5 Energy Conservation Implementation - Buildings

Building equipment tend to lose their efficiency as they approach the end of their useful life. A plan should be developed to replace the equipment by evaluating the life cycle cost of the replacement options. The chart below presents the energy conservation measures and implementation plan for each municipal building.

As discussed previously, the Municipality has been continuously improving equipment and their energy efficiency. Many energy conservation measures have already been implemented. The table on the next page shows proposed measures for the next 5 years, actions in the last five, and the effects in energy use that these measures have had.

It should be noted that the Behavioural Measures in Section 5.6 are by default to be implemented in all buildings.

It is the goal of the Municipality to reduce energy consumption by continuing to improve awareness of energy efficiency practices and to replace equipment with more energy efficient units as maintenance issues arise. These actions are being implemented across all municipal buildings with an expected across-the-board reduction in energy use by 5% over 5 years.

Municipal Building	2012 →2017 Electrical Energy Consumption (kWh) / Baseline	2012→2017 Fuel Oil Consumption (L) / Baseline	2012→2017 Propane Consumption (L) / Baseline	Recent Energy Conservation Measures Implemented (July 2012 to June 2019)	Proposed Energy Conservation Measures In The Next 5 Years (July 2019 to June 2024)	Year of Implementation	Estimated Cost ($)	Estimated Energy Savings per Year
Administration Municipal Office	43,074 → 36,741	2,901.5 → 0	751.2 → 6,609	Replaced oil fired furnaces with propane units (2013). Replace T-12 fluorescent fixtures with T-8 bulbs. Replaced shingle roof and windows in council chambers (2015).	Install wind break wall at main entrance on North side of doors. Reduction in heating costs by 5%	2019	$3,000	330 L/year (Propane)
Lion's Head Community Centre	74,159 → 54,831	13,259 → 12,697	-	Replaced exterior entrance doors (2016). Replaced three existing oil tanks (2019)	Investigate installation of propane furnace (1) and propane water heaters (2) to replace oil fired units.	2020	-	5% in 5 years
Lion's Head Arena	283,668 → 253,680	-	-	Replaced compressors and pumps with more energy efficient units and soft starts (2014). Replaced ice temperature control and adjusted optimal temperature (2014). Continued compressor upgrade (2016).	2019 - Replace door closures and weather stripping on mechanical room doors $2,000 & retain heat loss by 10% in that room.	2019	$2,000	500-1000 kWh/year
Eastnor Public Works Shed	21,483 → 21,941	4,061.8 → 0	3,896.6 → 13,956	Switched to high efficiency lights in office. Replaced old refrigerator with new efficient model.	Replace all windows and man doors. Fix the trim around the large bay doors. Replace outdoor security lights and incandescent bulbs with LED bulbs. Installing motion sensor switches in low use areas. The estimated upgrades should be around $20,000. Plan is to reduce consumption by 5% by 2024.	2019-2024	$20,000	1,097 kWh/year
Lindsay Storage Shed	2,697 → 430	-	-	Replaced interior lights with efficient fluorescents bulbs	Reseal bay door to reduce drafts. Replace outdoor security lights and incandescent bulbs with LED bulbs.	2019	$500	5% in 5 years

Municipal Building	2012 →2017 Electrical Energy Consumption (kWh) / Baseline	2012→2017 Fuel Oil Consumption (L) / Baseline	2012→2017 Propane Consumption (L) / Baseline	Recent Energy Conservation Measures Implemented (July 2012 to June 2019)	Proposed Energy Conservation Measures In The Next 5 Years (July 2019 to June 2024)	Year of Implementation	Estimated Cost ($)	Estimated Energy Savings per Year
					Installing motion sensor switches for low use areas.			
Lindsay Public Works Storage Shed	10,730 → 8,632	-	11,778 → 15,726	Resealed large bay doors (3) to reduce heating costs. Replaced some interior lights with low energy fluorescent lights.	Replace seals around Bay Doors. Replace outdoor security lights and incandescent bulbs with LED bulbs. Installing motion sensor switches for low use areas.	2019	$2,000	431 kWh/year
Lion's Head Fire Hall and Offices	21,532 → 19,681	4,248.6 → 0	0 → 4,291	Replaced windows in fire truck bay, installed efficient lighting and baseboard heating, upgraded truck bay doors, replaced oil furnace with propane unit (2016)	Continue to strive to reduce consumption by 5 % over the next 5 years by replacing equipment with more energy efficient units as maintenance issues arise. Staff and firefighters to become more educated in reducing energy consumption.	-	-	5% in 5 years
Lion's Head Public Library	14,514 → 15,420	-	-	Replaced windows & installed new weather stripping to doors (2015)	Replace aging electric heaters with new energy efficient units when maintenance issues arise.	2020	-	5% in 5 years
Lion's Head Public Works Shed	6,430 → 2,738	-	1,521 → 2,380	Replaced seals around large bay doors to reduce heat loss. Replaced old oil furnace with propane unit (2017)	Replace outdoor security lights and incandescent bulbs with LED bulbs. Also will be installing motion sensor switches for low use areas. The estimated upgrades should be around $1000.00. Plan is to reduce consumption by 5% by 2024.	2019-2024	$1,000	322 kWh/year
Lion's Head Water Low Lift Pump Station	59,755 → 43,080	-	-	-	Continue to strive to reduce consumption by 5 % over the next 5 years by replacing equipment with more energy efficient units as maintenance issues arise. Staff to become more	2019-2024	-	5% in 5 years

Municipal Building	2012 →2017 Electrical Energy Consumption (kWh) / Baseline	2012→2017 Fuel Oil Consumption (L) / Baseline	2012→2017 Propane Consumption (L) / Baseline	Recent Energy Conservation Measures Implemented (July 2012 to June 2019)	Proposed Energy Conservation Measures In The Next 5 Years (July 2019 to June 2024)	Year of Implementation	Estimated Cost ($)	Estimated Energy Savings per Year
					educated in reducing energy consumption.			
Lion's Head Water Treatment Plant	216,630 → 125,760	-	3,730 → 11,790	-	Continue to strive to reduce consumption by 5 % over the next 5 years by replacing equipment with more energy efficient units as maintenance issues arise. Staff to become more educated in reducing energy consumption.	2019-2024	-	5% in 5 years
Tobermory Museum	2,435 → 3,703	1,036.3 → 0	-	Replace T-12 fluorescent fixtures with T-8 units. Weather stripping and crack sealing where needed (2015). Replace oil furnace with electric unit, new electric panel, well, submersible pump, and electric hot water heater (2018)	Continue to strive to reduce consumption by 5 % over the next 5 years by replacing equipment with more energy efficient units as maintenance issues arise. Staff and users to become more educated in reducing energy consumption.	2019-2024	-	5% in 5 years
Lion's Head Rotary Hall	16,299 → 12,845	3,295.4 → 0	0 → 3,569	Replace oil furnaces with propane unit and oil fired water heater with electric unit (2016)	Continue to strive to reduce consumption by 5 % over the next 5 years by replacing equipment with more energy efficient units as maintenance issues arise. Exterior basement door replacement by fall 2019.	2019	-	5% in 5 years
Tobermory Community Centre & Small Water System	120,956 → 113,600	-	-	Replaced dishwasher with new Hobart unit (2014). Replaced old baseboard heaters with new convection baseboard units (2015).	Continue to strive to reduce consumption by 5 % over the next 5 years by replacing equipment with more energy efficient units as maintenance issues arise. Staff and users to become more educated in reducing energy	2019-2024	-	5% in 5 years

Municipal Building	2012 →2017 Electrical Energy Consumption (kWh) / Baseline	2012→2017 Fuel Oil Consumption (L) / Baseline	2012→2017 Propane Consumption (L) / Baseline	Recent Energy Conservation Measures Implemented (July 2012 to June 2019)	Proposed Energy Conservation Measures In The Next 5 Years (July 2019 to June 2024)	Year of Implementation	Estimated Cost ($)	Estimated Energy Savings per Year
					consumption.			
Tobermory Fire Hall	26,458 → 9,464	4,357.9 → 0	0 → 6,184	Installed new propane furnace in truck bay (2015). Replacement of all exterior doors, seals, north side windows, and foam gasket under eaves (2016).	Continue to strive to reduce consumption by 5 % over the next 5 years by replacing equipment with more energy efficient units as maintenance issues arise. Staff and firefighters to become more educated in reducing energy consumption.	2019-2024	-	5% in 5 years
Tobermory Sewer Pump Lift Station	69,711 → 46,603	-	-	-	Continue to strive to reduce consumption by 5 % over the next 5 years by replacing equipment with more energy efficient units as maintenance issues arise. Staff and users to become more educated in reducing energy consumption.	2019-2024	-	5% in 5 years
Tobermory Public Library	32,786 → 31,327	-	-	Repair/seal cracks and paint exterior (2017). Installed new electric heaters (2018).	Continue to strive to reduce consumption by 5 % over the next 5 years by replacing equipment with more energy efficient units as maintenance issues arise. Staff and users to become more educated in reducing energy consumption.	2019-2024	-	5% in 5 years
Tobermory Sewer Aerator Building	106,534 → 170,340	-	-	-	Continue to strive to reduce consumption by 5 % over the next 5 years by replacing equipment with more energy efficient units as maintenance issues arise. Staff and users to become	2019-2024	-	5% in 5 years

Municipal Building	2012 →2017 Electrical Energy Consumption (kWh) / Baseline	2012→2017 Fuel Oil Consumption (L) / Baseline	2012→2017 Propane Consumption (L) / Baseline	Recent Energy Conservation Measures Implemented (July 2012 to June 2019)	Proposed Energy Conservation Measures In The Next 5 Years (July 2019 to June 2024)	Year of Implementation	Estimated Cost ($)	Estimated Energy Savings per Year
					more educated in reducing energy consumption.			
Tobermory Public Works Shed	17,027 → 11,249	2,401 → 4,999	-	Resealed windows and replaced latches. Decommissioned second hot water tank.	2019 - Install insulation under subfloor of office. 2020 - Replace outdoor security lights and incandescent bulbs with LED bulbs. Install motion sensors switches to reduce energy use in low use areas. 2019-2024 – Replace oil furnace with propane unit	2019-2024	$11,000	500 kWh/year
Meeting Place	57,492 → 52,107	-	-	Replaced all 24 windows, replacement of T-12 fluorescent fixtures with T-8 units (2014). Seal all windows and doors; repaint exterior (2017).	Continue to strive to reduce consumption by 5 % over the next 5 years by replacing equipment with more energy efficient units as maintenance issues arise. Staff and users to become more educated in reducing energy consumption.	2019-2024	-	500 kWh/year
Tobermory Water Treatment Plant Little Tub	29,940 → 47,280	-	-	-	Continue to strive to reduce consumption by 5 % over the next 5 years by replacing equipment with more energy efficient units as maintenance issues arise. Staff and users to become more educated in reducing energy consumption.	2019-2024	-	5% in 5 years

5.6 Energy Conservation Implementation - Behavioural

Currently, Ontario's electricity system has a capacity of approximately 37,000 megawatt (MW) of power and the Ontario Power Authority forecasts that more than 11,000 MW will need to be renewed, replaced or added by 2030. To help meet the increasing demand for energy, as outlined with *Ontario's Long Term Energy Plan*, conservation has become an integral part of the future to help meet the ever increasing demand for energy.

Studies have stressed the importance of engaging the people working within the facility along with technological changes to achieve meaningful and lasting energy consumption savings. This has been shown to result in much higher energy savings than just implementing energy technology or engaging people alone.

The chart below presents some behavioural measures that the Municipality could implement without major cost or effort. There is no cost to adjusting behaviours on day-to-day activities so the payback is immediate.

Behavioural Measures	Year of Implementation
Promote limited water use in municipal kitchens and bathrooms where appropriate	On-going
Promote energy conservation with the turning off of lights and electronics (e.g. computers) when not in use	
Continue to ensure the temperature of facilities/rooms meets the needs of the users	
Install programmable thermostats and implement programmed setback temperatures where appropriate	
Utilize day light where possible by opening blinds instead of using electric lighting	
Effective roof insulation can result in heating/cooling savings of up to 20%	

6. Monitoring & Evaluation

To ensure the Municipality of Northern Bruce Peninsula meets its goals in energy consumption reduction, it is critical that there is regular monitoring and evaluation of its progress.

6.1 2012-2017 Evaluation

The Energy Consumption and Greenhouse Gas (GHG) Emission template shows the detailed energy usage results and if the 5% energy reduction goal was achieved.

As stated in Section 4, it was the goal of the Municipality to reduce energy usage in the municipality by 5% over the five years (from 2012 to 2017). The following table summarizes the change in energy usage over the 2012-2017 period.

Energy Source	2012 (L)	2012 (kWh)	2017 (L)	2017 (kWh)	Change
Total Electrical Usage		1,234,310 kWh		1,081,452 kWh	-12.4%
Total Heating Oil Usage	35,561 L	385,841[2] kWh	17,696 L	192,002 kWh	-50.2%
Total Propane Usage	21,677 L	154,188[3] kWh	64,505 L	458,824 kWh	+197%
Total Energy Use		**1,774,339 kWh**		**1,732,278 kWh**	**-2.4%**

From the table above the energy usage in the Municipality is totalled for all buildings and energy sources. Heating fuels are converted to energy use and compiled into one overall energy use total. This total energy use value is compared between 2012 data to 2017 data to show a decrease in total energy use of 2.4%. This decrease is less than the 5% decrease that was the proposed goal in the 2014 CDM plan.

It should be noted that there is an expectation of increased energy usage as the Municipality's population increases, which it has by 4.6%. The change in Total Energy Use does account for the increase in population. Should population be the same as in 2012, the 2.4% decrease in energy usage would likely be higher.

[2] Propane was converted to kW using the calorific value of 7.113 kWh/L
[3] Heating oil was converted to kW using the calorific value of 10.85 kWh/L for Gas Oil

6.2 2018-2022 CDM Plan Update

After a five year period the CDM plan will again be updated.

An interim evaluation is proposed to be held at the end of 2020. As shown in section 5.5, most of the proposed upgrades that are being considered are for the short term (2019-2020). The evaluation would allow for a review of the status of the planned short-term upgrades, as well as planning for more upgrades for the following three years. This interim evaluation would also allow for an opportunity to check energy usage to compare against 2017 values to insure that the Municipality is still on target to meet long-term energy use reduction targets (5% reduction from 2017 values).

As proposed upgrades are implemented and shown to be successful. Future plans could be developed to further implement the successful measures for other facilities.

The Municipality long-term goal is to reduce 10% in energy consumption over the next five years from the 2012 value.

As with this update, the next 2018-2022 CDM Plan update will include the following items:

- The Energy Consumption and Greenhouse Gas Emissions Template for 2017 data
- A description of current and proposed measures for conserving and otherwise reducing energy consumption and managing demand for energy
- A revised forecast of the expected results of the current and proposed measures
- A report of the actual results achieved
- A description of any proposed changes to be made to assist the public agency in reaching any targets it has established or forecasts it has made

6.3 2023 & Beyond

The Energy Conservation and Demand Management Plan is intended to be a living document and flexible roadmap that will provide guidance and encourage the Municipality of Northern Bruce Peninsula to incorporate energy management into their daily and future decisions. The successful implementation of energy management practices and the installation of energy efficiency upgrades will provide the foundation for the CDM plan in future years. Experienced staff will apply and pass on their knowledge in identifying and investigating energy efficiency initiatives as the energy management field continues to thrive and evolve.

END OF DOCUMENT