

# Conservation and Demand Management (CDM) Plan

**Township of Sioux Narrows – Nestor Falls**

*June 27, 2019*



**LBE group inc.**

Engineering Services

[www.lbegroup.ca](http://www.lbegroup.ca)

## Executive Summary

The Township of Sioux Narrows Nestor Falls uses approximately 1374 GJ of energy per year from sources of electricity and propane, Energy usage will increase every year over the next five years based on expansion of facilities and services. Without the implementation of energy conservation measures the annual energy usage over the next five years will increase. Ontario Energy costs are forecast to increase over the next 5 years due to removal of Hydro rebates.

In order to maintain operation cost, the Township has the objective of decreasing energy usage by 1.5% per year over the next five years.

Energy conservation measures such as lighting upgrades, HVAC upgrades, domestic hot water upgrades, water conservation and renewable energy. In addition, organizational measures and behavioural measures will contribute to the overall energy savings and must be supported by council. Most energy conservation projects have paybacks of less than 5-7 years.

With capital investment it is possible to decrease energy usage by greater than 7% over the next five years to make up for increases in consumption and Solar Generation degradation due to age.

Energy conservation beyond those identified here are likely to be cost prohibitive until new conservation technologies are available.

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## 1. Annual Energy Consumption Summary

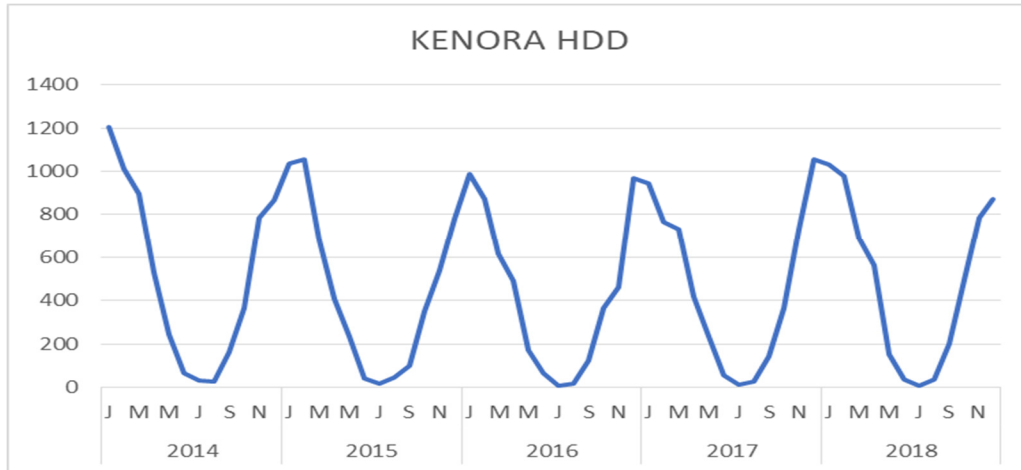
Energy usage for the Township is comprised of electricity and propane. Fuel oil was used for heating in the past but has been phased out and replaced by propane. Figure 1 gives Heating Degree Days(HDD) for the closest weather station in Kenora. High HDD values in 2014 and 2018, resulted in high energy consumption.

Electricity and propane consumption for the last 5 years has been used to determine the average annual energy.

**Table 1: Annual Energy Summary**

Year	Electricity (kWh)	Propane	Total GJ
		(L)	
2014	250,721	31,497	1703
2015	186,041	27,148	1359
2016	161,071	23,241	1170
2017	135,751	25,904	1147
2018	191,903	31,488	1491
<b>Total</b>	<b>925,488</b>	<b>139,278</b>	
<b>Est. Annual Average</b>	<b>185,098</b>	<b>27,856</b>	
<b>Est. Annual Energy (GJ)</b>	<b>666</b>	<b>708</b>	<b>1374</b>

**Figure 1 – Heating Degree Days**



A summary of Utilities Consumption are provided in Appendix A.

The Township of Sioux Narrows-Nestor Falls averaged approximately 1,374 GJ of energy per year from sources of electricity and propane over the past five years. Energy usage may increase every year based on expansion of facilities and services and is dependent upon weather conditions. Without the implementation of energy conservation measures the annual energy usage over the next five years will likely increase. With the projected increases in utility costs over the next five years, especially electricity at 30%, the cost of energy for the municipality is likely to significantly increase. With this basic information it is obvious that energy conservation is extremely important to ensure the sustainability of the Township.

## 2. Goals and Objectives

The Township Council has made it their mandate to conserve energy and natural resources through the implementation of conservation measures, education and environmental protection.

Over the next five years the Township will aim to decrease energy consumption by 1.5% per year to offset increasing energy costs.

### 2.1 Past Initiative Summary

Since the development of the last energy conservation and demand management measures in early 2014, the Township has implemented the following initiatives.

#### 2.1.1 Lighting Upgrades to LED

Upgrades to LED lighting have been conducted on an as needed basis when existing fixtures and bulbs require replacement. It is suspected that 10% of the lighting has been upgraded over the past five years. Policy is to continue to replace all non-led lights with led lights.

#### 2.1.2 Heating/Cooling Systems

As heating and cooling systems required replacement during the past five years, higher efficiency systems have been selected. Additionally, a fuel oil furnace in use at the Nestor Falls Community Hall was replaced by a new propane forced air furnace. It is suspected that 90% lower efficiency heating/cooling systems remain in the Township's use.

#### 2.1.3 Domestic Hot Water Systems

Any propane fueled domestic hot water systems that required replacement in the past five years were upgraded with higher efficiency models or on-demand. There is an estimated 50% propane water heaters which still require upgrading to higher efficiency models.

#### 2.1.4 Domestic Water Conservation

Efforts have been made during the past five years to convert all toilets in Township facilities to dual-flush models to improve water conservation.

#### 2.1.5 Renewable Energy

The Township operates solar energy generation equipment. During the past five years, significant repairs to the existing system has been carried out to replace all faulty inverters and maximize their generating capacity.

#### 2.1.6 Exceeding OBC Insulation Requirements

The Township has continued to improve their new and existing facilities by ensuring adequate insulation and vapor barrier is installed during construction or remodeling projects.

#### 2.1.7 Procedural Modifications

The Township has implemented procedural changes for staff dealing with the building systems. These changes include turning off lights and adjusting heating and cooling systems during periods of being unoccupied. Furthermore, lockboxes are utilized around thermostats in public spaces to prevent the unauthorized adjustment of heating or cooling.



### 3. Capital Requirements

The following Energy Conservation Measures (ECM) have been identified and are discussed in the following sections:

#### **Technical Measures**

- *Lighting upgrades to LED*
- *Heating/Cooling system upgrades to higher efficiency*
- *Occupied/Unoccupied HVAC setpoints*
- *Occupancy sensors for lighting*
- *Domestic hot water heater upgrades*
- *Water Conservation*
- *Renewable Energy*

#### **Organizational Measures**

- *All new municipal buildings to exceed OBC minimum insulation r-value requirements by 20%*
- *All municipal capital decisions to take into account energy consumption*

#### **Behavioural Measures**

- *Solicit energy savings ideas from Township staff*
- *Encourage energy saving attitude within Township*

#### 3.1 Lighting

**Existing Equipment:** The majority of remaining lighting requiring upgrading is provided by fluorescent tubes. There is some lighting by incandescent bulbs and some high-pressure sodium flood lights. Lighting run times vary from occasional use in the community centres to frequent use in the Township offices and Emergency Services buildings.

**Proposed Measure:** Light fixtures and bulbs should continue to be upgraded to LED at end of usable life to reduce electricity consumption. In addition to the energy savings the LED lamps will have a longer lifespan of 50,000 hours compared to 8,000 hours for fluorescent tubes.

**Simple Payback:** Estimated cost to purchase LED replacements for the fluorescent tubes is \$50 with an additional cost to install. LED replacements for the other bulbs are estimated to be \$30 each plus installation. Energy savings will be approximately 50% with payback ranging from 1 year to 10 years depending on operating hours per year.

### 3.2 Heating/Cooling Systems

**Existing Equipment:** There is a combination of electric heat and propane heat installed. Some of the propane appliances are mid efficiency while others are high efficiency.

**Proposed Measure:** Continue replacing existing equipment with higher efficiency models when upgrading is required. To decrease demand on the electrical grid, electric heaters could be replaced with propane models, or ground source heat pump systems could be investigated.

**Simple Payback:** The payback to upgrade all the existing furnaces to high efficiency will be in excess of 20 years, however at the time that equipment needs to be replaced it should be replaced with high efficiency models.

The replacement of electric heat with ground source heat pumps will decrease demand and consumption of the appliance by approximately 50% with substantial capital cost. Payback is expected to be in the range of 6-12 years depending on building loads and ground loop restrictions.

### 3.3 Occupancy Setpoints

**Existing Equipment:** Presently there are no occupancy controls on the HVAC equipment or lighting.

**Proposed Measure:** Though the Township has procedural methods in place to address non-occupancy of their facilities, it is still recommended to install controls or implement operational procedures that decrease HVAC and lighting

loads during times when buildings are unoccupied. This will include ensuring that lighting is turned off when not in use and decreasing heat set-point when the building is unoccupied.

**Simple Payback:** According to a Natural Resources Canada study, night setback of heating can save from 6-12%.

### 3.4 Domestic Hot Water Systems

**Existing Equipment:** There is a combination of electric and propane hot water installed. The propane appliances are mid efficiency.

**Proposed Measure:** The electric hot water systems will not create any savings in energy by replacement unless they are changed to on demand tank-less type heaters. The capital cost to upgrade does not make sense until the existing equipment fails. Upgrading the propane appliances to higher efficiency does not show a good payback until the existing equipment must be replaced due to failure. Typical hot water demand is mostly limited to wash rooms.

**Simple Payback:** The use of on demand, tank-less type, water heaters is documented to save 30-40% of hot water costs when buildings are using less than 40 gallons per day of hot water. Most of the buildings owned by the Township have very low water usage. The actual energy savings will be less when the building is heated with electric heat since the storage tank losses are contributing to building heat. Payback is anticipated to be in the range of 5 to 7 years for buildings with low water usage.

### 3.5 Domestic Water Conservation

**Existing Equipment:** There is a combination of standard and low flow fixtures installed. Many of the faucets are equipped with aerators. All toilets have been upgraded to dual-flush models to provide water conservation.

**Proposed Measure:** Continue upgrading fixtures (including faucets and showerheads) with low flow versions to decrease demand on the water and sewage systems upon end of usable life for the fixtures.

**Simple Payback:** There will be very little energy savings from these upgrades but there will be other benefits such as decreased maintenance on the water treatment systems and increased septic system life.

### 3.6 Renewable Energy

**Existing Equipment:** The Township has invested in solar photovoltaics, totalling 30 kW installed capacity.

**Proposed Measure:** The Township will consider renewables such as solar PV, solar hot water, solar air heating and geothermal on an individual project basis as opportunities arise. Maintenance on existing renewable energy systems should be kept up to date to maximize electrical generation or offset.

**Simple Payback:** The capital cost associated with renewable energy sources often doesn't present a good payback unless there are incentives. Payback without incentives could be expected to be in the range of 6 to 15 years, maybe longer depending on the individual project. Equipment life is typically 20-25 years.

## 4. Renewable Energy Generation

The Township has invested in three 10 kW solar photovoltaic systems to generate renewable electricity. All three solar systems are tied into the Hydro One power distribution grid and in 2013 generated a total of 33,956 kWh of renewable energy.

The Township has considered water source heat pump system at the Northern Ontario Fishing Centre, but the capital cost is great and will consider the technology for future renovation and/or construction projects. Geographic conditions in the area are beneficial in some areas and detrimental in others and therefore heat pump installations would be considered on a specific project basis.

The Township does not have any installed solar thermal air or solar thermal water systems, but these technologies will be considered for future installation.

## 5. Conservation and Demand Management Plan

The Township of Sioux Narrows Nestor Falls used an average of 1,374 GJ of energy over the past 5 years. The Council have identified the importance of energy savings and will aim to decrease energy usage by 1.5% per year over the next five years.

Implementation of the energy conservation measures outlined in this document will make it possible to decrease energy usage by greater than 6% over the next five years. This will require capital investment in measures such as lighting upgrades, HVAC upgrades, domestic hot water upgrades, water conservation and renewable energy. In addition, organizational measures and behavioural measures will contribute to the overall energy savings and must be supported by council.

Table 2 below summarizes the baseline energy usage and shows the effect of implementing the energy conservation measures. As can be seen, the annual net energy is still increasing over time, even with energy conservation measures, due to an increase in energy load every year based on expansion of facilities and services.

Energy conservation beyond the 7% identified here is likely to be cost prohibitive until new conservation technologies are available.

**Table 2: Projected Energy Usage**

	Annual Energy (GJ)					
	2018	2019	2020	2021	2022	2023
Baseline Electricity *	691	696	701	706	711	716
Baseline Propane *	800	806	812	818	823	829
Baseline Solar Generation **	-122	-119.6	-117.2	-114.8	-112.5	-110.3
Lighting upgrades to LED		8.64	8.70	8.76	8.83	8.89
HVAC Upgrades		10.00	10.07	10.15	10.22	10.29
Occupancy Setpoints				1	1	
Domestic hot water			4.06			4.15
Water Conservation			1		1	
Renewable Energy (other than existing solar)						
Organizational Measures			3.75	3.78	3.81	
Behavioural Measures			1		1	
<b>Total Baseline (Consumption minus generation)</b>	<b>1369</b>	<b>1382.25</b>	<b>1395.53</b>	<b>1408.84</b>	<b>1422.18</b>	<b>1435.56</b>
<b>Savings from Conservation Current Year (GJ)</b>		<b>18.64</b>	<b>28.59</b>	<b>23.69</b>	<b>25.85</b>	<b>23.33</b>
<b>Savings (%)</b>		<b>1.35%</b>	<b>2.05%</b>	<b>1.68%</b>	<b>1.82%</b>	<b>1.63%</b>
<b>Annual Net Energy (GJ)</b>	<b>1369</b>	<b>1364</b>	<b>1367</b>	<b>1385</b>	<b>1396</b>	<b>1412</b>

\* includes 2% increase in base load each year based on expansion of facilities/services.

\*\* includes 2% decrease in output each year due to degradation of panels

## 6. Closure

This study was performed by Andrew Brookes, P.Eng., CMVP and Keith Loucks, P.Eng., MSc (M.E.), CEM, CDSM.

Sincerely,



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## 7. Company Information



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# Appendix A

Utility Consumption

## Hydro Electricity

<b>Sioux Narrows Ambulance Base</b>		
Year	kWh	Total
2014	51,367.00	320,303.74
2015	77,760.00	
2016	71,919.40	
2017	51,726.98	
2018	67,530.36	

<b>Nestor Falls Community Club</b>		
Year	kWh	Total
2014	60,118.00	126,606.26
2015	26,588.00	
2016	21,135.89	
2017	7,937.37	
2018	10,827.00	

<b>Sioux Narrows Municipal Office/Fire Hall</b>		
Year	kWh	Total
2014	22,067.00	153,193.83
2015	36,355.00	
2016	29,723.05	
2017	32,163.51	
2018	32,885.27	

<b>Nestor Falls Multi-Use Building/Fire Hall</b>		
Year	kWh	Total
2014	20,767.00	107,152.68
2015	12,538.00	
2016	12,690.35	
2017	13,536.46	
2018	47,620.87	

<b>Sioux Narrows Community Hall/Maintenance Garage</b>		
Year	kWh	Total
2014	96,402.00	218,231.16
2015	32,800.00	
2016	25,602.45	
2017	30,386.77	
2018	33,039.94	

<b>Overall Electricity Totals</b>		
Year	kWh	Total
2014	250,721.00	925,487.67
2015	186,041.00	
2016	161,071.14	
2017	135,751.09	
2018	191,903.44	

## Propane

<b>Nestor Falls Community Hall</b>		
<b>Year</b>	<b>Litres</b>	<b>Total</b>
2014	3,230.80	19,794.93
2015	3,101.70	
2016	3,744.30	
2017	5,206.70	
2018	4,511.43	

<b>Sioux Narrows Municipal Office/Fire Hall</b>		
<b>Year</b>	<b>Litres</b>	<b>Total</b>
2014	16,765.60	67,437.80
2015	10,592.30	
2016	7,225.50	
2017	10,763.10	
2018	22,091.30	

<b>Nestor Falls Multi-Use Building/Fire Hall</b>		
<b>Year</b>	<b>Litres</b>	<b>Total</b>
2014	6,016.40	25,852.40
2015	6,415.30	
2016	7,030.10	
2017	6,390.60	
2018	0.00	

<b>Sioux Narrows Community Hall/Maintenance Garage</b>		
<b>Year</b>	<b>Litres</b>	<b>Total</b>
2014	5,484.00	26,193.20
2015	7,039.00	
2016	5,241.10	
2017	3,543.90	
2018	4,885.20	

<b>Overall Propane Totals</b>		
<b>Year</b>	<b>Litres</b>	<b>Total</b>
2014	31,496.80	139,278.33
2015	27,148.30	
2016	23,241.00	
2017	25,904.30	
2018	31,487.93	