Oxford County

Growing stronger together

Energy Management Plan

July 2019

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PREFACE

On June 24, 2015, Oxford County Council unanimously passed the 100% renewable energy (RE) goal by 2050. Since that date, County Council has thoroughly committed itself to sustainability with the addition of the Zero Waste and Zero Poverty initiatives. This energy management plan, now in its third instalment, aims to complement these initiatives by further realizing energy savings and reducing the carbon footprint of Oxford County as an organization. With the adoption of this energy management plan (subject to annual business plan and budget approval), staff will remain dedicated to implementing the goals outlined within this plan and to further strengthen the position of sustainability within Oxford County.

1 OVERVIEW

1.1 About Oxford County

Oxford County is an upper-tier municipality located in southwestern Ontario and home to approximately 119,000 residents. The services provided by the County include, but are not limited to, engineering services, facilities, fleet, housing, libraries, planning, roads, waste management, water & wastewater collection & treatment.

1.2 Energy Management Plan – Why?

An energy management plan plays an integral role in reducing greenhouse gas (GHG) emissions and energy consumption; improving energy efficiency; establishing financial stability; and increasing renewable energy generation. All of these attributes ultimately aim at mitigating climate change. As laid out in Canada's Mid-Century Long-Term Low-Greenhouse Gas Development Strategy, one of the main pathways to limiting global temperatures to below 2°C is energy efficiency. The International Energy Agency estimates that 38% of the required global emissions reductions associated with a 2°C pathway could be met through energy efficiency improvements.

In addition to these compelling reasons, there are numerous other reasons why an energy management plan is essential to an organization as described below.

DID YOU KNOW?

Energy conservation is the least expensive option when assessing new generation. As of 2016, solar projects resulted in a cost of $0.14/kWh whereas conservation only costs $0.02/kWh! Read more about how energy conservation can play an important role in Ontario's efforts to mitigate climate change.

1.2.1 Provincial Mandate

The energy management plan was initially established in 2011 through O. Reg. 397/11 under the *Green Energy Act, 2009*. As of January 1, 2019, regulation 397/11 was revoked by the provincial government along with the repeal of the *Green Energy Act*. However, O. Reg. 397/11 has since been rebranded as O. Reg. 507/18 made under the *Electricity Act, 1998*.

Within O. Reg. 507/18, Ontario public agencies, including municipalities, are required to post on their website and report annual energy consumption and GHG emissions to the Ministry of Energy, Northern Development and Mines by July 1st of each year. In 2019, public agencies are required to report on 2017 data. In addition to annual reporting, each public agency was required to post an initial energy management plan by July 1st, 2014 followed by an updated plan every five years. Therefore, the projected updates are the following:

- July 1, 2019
- July 1, 2024
- July 1, 2029
- July 1, 2034

To maintain compliance with O. Reg. 507/18, the County must provide information on the following within each updated plan:

- Annual energy & GHG emissions
- Goals & objectives
- Review of results from past plans
- Implemented & Proposed measures
- Renewable Energy

For more information regarding O. Reg. 507/18 for the Broader Public Sector, please visit the Ontario Government website.

1.2.2 Municipal Mandate

Oxford County has demonstrated itself as a leader in identifying climate change as a key issue in today's society and has implemented numerous policies. In June 2015, County Council unanimously voted on setting a goal of 100% renewable energy by 2050, the first municipality in Ontario and second in Canada. Since the implementation of the 100% RE goal, the County has established the Zero Waste goal, which would see the current waste management site in operation until 2100, an extension of over 56 years.

Other items include the establishing of the Partners for Climate Protection Protocol (PCP), the utilization of Passive House standard on numerous new housing sites, the first powered compressed natural gas (CNG) snow plows (two) in Canada, the first hybrid-electric ambulances (four) in Canada, and the pursuit of the New Building Institute zero energy building (ZEB) verification at the Oxford County Waste Management & Education Centre (WMEC).

Lastly, here is a list of documents created by Oxford County or external documents that have significant influence on the County:

- Future Oxford
- 100% Renewable Energy Plan

- Zero Waste Plan
- Zero Poverty Plan
- Green Fleet Plan: 2015-2019
- Oxford County Feasibility Study
- Additional Environmental Documents
- Partners for Climate Protection (PCP) Protocol
- Oxford County Community Wellbeing Survey: A Comparison of Oxford Residents on Selected Aspects of their Wellbeing

DID YOU KNOW?

Oxford County is the first municipality to utilize compressed natural gas (CNG) powered snow plows and electric hybrid ambulances. You can read up on both feats here.

1.3 Relationship to Oxford County's Strategic Plan

The Energy Management Plan meets the County's initiative as set out in the following sections of the strategic plan:

3. i. ***A County that Thinks Ahead and Wisely Shapes the Future*** – Influence federal and provincial policy with implications for the County by:
    - *Advocating for federal and provincial initiatives that are appropriate to our county*

3. iii. ***A County that Thinks Ahead and Wisely Shapes the Future*** - Demonstrated commitment to sustainability by:
    - *Ensuring that all significant decisions are informed by assessing all options with regard to the community, economic and environmental implications including:*
        - *Life cycle costs and benefit/costs, including debt, tax and reserve levels and implications*
        - *Responsible environmental leadership and stewardship*

4. ii. ***A County that Informs and Engages*** - Inform the public about County programs, services and activities through planned communication that includes:
    - *A County Report Card that engages and informs our community and celebrates our successes and our history*

5. ii. ***A County that Performs and Delivers Results*** - Deliver exceptional services by:
    - *Conducting regular service reviews to ensure delivery effectiveness and efficiency*
    - *Developing and tracking key performance indicators against goals and report results*
    - *Identify best practices and appropriate benchmarking*

1.4 Scope

This plan pertains to internal matters affiliated with the County unlike other plans that encompass the County as a whole (i.e., community). With the implementation of the PCP Protocol, Oxford County is expanding the energy management plan to also include fleet and biogas emissions from landfill and wastewater treatment plants. The fleet will be included in this instalment of the plan, with biogas being implemented in the next instalment.

1.4.1 Buildings

Oxford County's Engineering Services currently maintains approximately 305 buildings covering an approximate gross floor area (GFA) of 1,145,000 ft². The energy sources for these buildings come from four local distribution companies (LDCs) and covers 461 LDC accounts. Energy sources include electricity, natural gas, propane and oil. These buildings can be organized into sixteen different categories:

- Administration
- Communication Tower
- Flashers
- Libraries
- Long Term Care
- Multi-Residential
- Paramedic Services
- Patrol Yards
- Residential – Detached & Semi-Detached
- Sewage Pumping Station
- Streetlights
- Traffic Signals
- Vacant
- Waste Management
- Wastewater Treatment
- Water Treatment

Table 1 summarizes the County's building utility costs from 2015 to 2018. In 2016, Finance moved from coding all utilities under one account to three separate accounts (electricity, heating and water/sewage). This improvement has allowed staff now to further analyze where costs are allocated. Overall, the cost of utilities are showing a downward trend over the four year period.

Table 1: Summary of Actuals of Each Utility for Buildings

Fiscal Year	Utilities - Actuals			
	Electricity	Heating	Water/Sewage	Total
2015	-	-	-	$5,386,173
2016	$4,733,618	$595,100	$531,700	$5,860,418
2017	$4,354,872	$481,423	$468,271	$5,304,566
2018	$3,850,284	$515,630	$482,145	$4,848,059

1.4.2 Fleet

Oxford County's Corporate Fleet maintains approximately 193 assets with 48 categories. The categories range from a standard half-ton pick-up truck to tandem axle snow plows to landfill compactors. The County's Fleet is fueled by conventional fossil-fuels, CNG and electric power. The County maintains six fossil-fueling stations that store clear diesel, dyed diesel and regular gasoline. In addition, the County maintains 26 electric vehicle charging stations that provide Level II and Level III charging options. Finally, CNG is sourced from a vendor located in Woodstock, Ontario.

Table 2 summarizes the annual vehicle kilometres travelled (VKT) for the County Fleet combined. The VKT is relatively the same from year to year, hovering around 2.7 million kilometres per year.

Table 2: Summary Vehicle Kilometres Travelled Annually for the County Fleet

Fiscal Year	Vehicle Kilometres Travelled (km)
2015	2,735,997
2016	2,636,964
2017	2,667,018
2018	2,734,941

Table 3 summarizes the annual actuals of fleet fuel cost from 2015 to 2018. The cost of fuel has fluctuated significantly over the four year period, with 2018 having the highest amount. As of May 1, 2019, Oxford County has entered into a fuel supply agreement that will result in an incremental cost savings of approximately $75,000 annually for the next five years[1].

Table 3: Summary of Actuals of Fuel Consumption for Fleet from 2015 to 2018

Fiscal Year	Fleet Fuel - Actuals
2015	$792,375
2016	$699,926
2017	$800,041
2018	$960,947

1.4.3 Renewable Generation

April 29, 2011 was the first day that two microFIT projects came online and started generating renewable electricity for Oxford County. Since that day, Oxford County has expanded to twelve functioning sites with four additional sites under construction. Table 4 summarizes the capacity at each site. In addition to solar photovoltaic (PV), Oxford County operates a solar thermal system at SH - 742 Pavey - 55 Units and a geothermal system at SH - 111 Brock - 24 Units.

[1] Annually savings are based on the 2018 fuel consumption and incremental cost savings is the difference in fuel unit prices before and after the fuel supply agreement.

Table 4: Summary of Capacity of Solar PV Owned by Oxford County

Site	Solar PV Size (kW AC)	Status	Type
Southside WTF 10 kW Solar PV	10.0	O	microFIT
Tunis 10 kW Solar PV	10.0	O	microFIT
Woodstock Patrol Yard 10 kW Solar PV	10.0	O	microFIT
Oxford County Administration Building	10.0	O	microFIT
Mill St. EMS	10.0	O	microFIT
Public Works - Zenda Line	10.0	O	microFIT
161 Fyfe Ave.	9.5	O	microFIT
215 Lisgar Ave	9.7	O	microFIT
816 Alice St.	9.5	O	microFIT
George Johnson 53 kW PV Solar	53.0	O	FIT
BCSF 250 kW PV Solar	250.0	O	FIT
WMEC 120 kW NM PV Solar	120.0	O	Net-meter
Woodstock WWTP 490 kW NM PV Solar	490.0	C	Net-meter
174 Lisgar – Net-Metering - 57.6 kW	57.6	C	Net-meter
WFL-Ingersoll - Net-Metering - 99.9 kW	99.9	C	Net-meter
WFL-Tillsonburg - Net-Metering - 99.9 kW	99.9	C	Net-meter
Operational	511.7		
Construction	747.4		
Total	**1,259.1**		

O - Operational
C – Construction

1.4.4 Biogas

The County maintains numerous sites that emit biogas and contribute to Oxford County's GHG emissions. Upon completion of base lining the numbers for biogas, this will be implemented in future instalments of this plan.

2 ENERGY & GHG EMISSIONS SUMMARY

This section highlights a macro overview of Oxford County's energy consumption, energy generation and GHG emissions. There are areas where data is missing and staff plan to address these issues as noted in the 2019 Goals & Objectives section.

2.1 Buildings Summary

Table 5 summarizes all annual reports submitted by Oxford County. In 2011, only 76 locations were being captured in comparison to 159 locations in 2017. Since the release of the 2014 EMP, more resources have been allocated to energy management, which has resulted in more accurate reporting as of 2015 and onwards. As of 2017 data, Oxford County has seen a 5% reduction in overall energy and a 6.8% reduction in electricity when comparing to 2015 data.

Table 5: Summary of Energy Consumption from 2011 to 2017

Year	No. of Sites	Total Floor Area (m^2)	Annual Flow (ML)	Electricity (MWh)	Natural Gas (m^3)	Propane (L)	Oil #1&2 (L)	Total (ekWh)
2011	76	18,606	26,311	14,720	591,554	27,326	0	21,199,232
2012	96	27,910	66,284	21,383	507,382	30,876	0	26,992,133
2013	87	21,394	30,983	18,593	527,365	37,466	0	24,460,856
2014	113	22,503	17,988	21,838	545,258	0	0	27,633,056
2015	170	73,848	24,948	29,380	1,414,027	53,466	4,765	44,831,111
2016	163	73,520	26,108	29,604	1,500,262	45,168	2,522	45,891,303
2017	159	73,493	24,459	27,382	1,407,479	33,746	2,784	42,605,131

2.2 Fleet Summary

Fleet data is currently scarce prior to April 2016, with only 2014 data available due to a study stemming from the Green Fleet Plan. One of the recommendations that came from the Green Fleet Plan was to overhaul the County's fuel management process. This resulted in a new fuel management system able to report fuel transactions with nearly no lag. Therefore, it is now possible to report consumption for 2017 onwards with minimal effort. Table 6 summarizes the energy consumption per fuel type and Table 7 summarizes the same data but in equivalent gasoline and kWh. Equivalent gasoline and kWh are used here since the energy content is different for a litre of gasoline versus a litre of diesel. By using equivalent units, data can be analyzed with an apples-to-apples approach.

Table 6: Summary of Fuel Consumption per Department and Type

Dept.	Type	Unit	Annual Fuel Consumption		
			2014	2017	2018
PW	Gasoline	L	238,561	269,727	268,969
PW	Clear Diesel	L	436,389	294,866	287,979
PW	Dyed Diesel	L	162,415	154,026	156,675
PW	CNG	kg	-	9,611	34,098
PW	Electricity	kWh	-	5,361	5,915
PS	Clear Diesel	L	84,762	123,192	104,426
PS	Gasoline	L	14,958	13,165	40,787

PW - Public Works
PS - Paramedic Services

Table 7: Summary of Fuel Consumption in Equivalent Energy

Dept.	Type	Annual Fuel Consumption (GLE)			Annual Fuel Consumption (ekWh)		
		2014	2017	2018	2014	2017	2018
PW	Gasoline	238,561	269,727	268,969	2,123,193	2,400,570	2,393,824
PW	Clear Diesel	386,185	260,943	254,849	3,437,046	2,322,396	2,268,153
PW	Dyed Diesel	143,730	136,306	138,650	1,279,198	1,213,125	1,233,989
PW	CNG	-	14,431	51,198	-	128,435	455,660
PW	Electricity	-	602	664	-	5,359	5,913
PS	Clear Diesel	75,011	109,019	92,412	667,595	970,273	822,467
PS	Gasoline	14,958	13,165	40,787	133,126	117,169	363,004
Total		**858,445**	**804,194**	**847,529**	**7,640,158**	**7,157,328**	**7,543,010**

GLE - Gasoline Litre Equivalent

2.3 Renewable Summary

Table 8 and Table 9 summarize the annual electricity generated from solar PV. In comparison from 2011 to 2018, electricity production has increased 2,300% and nearly reaching half of a million kWh annually.

Table 8: Renewable Energy Generation from 2011 to 2014

Site	Electricity Generation (kWh)			
	2011	2012	2013	2014
Oxford County Administration Building	-	-	-	1,268
Mill St. EMS	-	-	-	2,036
Public Works - Zenda Line	-	-	-	982
161 Fyfe Ave.	10,159	14,752	13,120	12,816
215 Lisgar Ave	-	12,324	13,581	13,646
816 Alice St.	10,711	15,291	13,811	14,028
Total	**20,869**	**42,368**	**40,512**	**44,775**

Table 9: Renewable Energy Generation from 2015 to 2018

Site	Electricity Generation (kWh)			
	2015	2016	2017	2018
Oxford County Administration Building	11,411	11,680	11,770	10,706
Mill St. EMS	11,829	9,848	10,676	10,563
Public Works - Zenda Line	12,546	12,213	11,796	10,879
161 Fyfe Ave.	13,621	14,126	13,349	12,537
215 Lisgar Ave	13,279	13,381	12,855	10,804
816 Alice St.	14,065	13,470	13,841	12,474
Southside WTF 10 kW Solar PV	-	-	8,481	11,327
Tunis 10 kW Solar PV	-	-	9,192	11,578
Woodstock Patrol Yard 10 kW Solar PV	-	-	7,999	10,731
George Johnson 53 kW PV Solar	-	67,265	68,779	66,409
BCSF 250 kW PV Solar	-	-	279,893	311,625
Total	**76,751**	**141,984**	**448,631**	**479,632**

2.4 GHG Emissions Summary

Table 10 summarizes the GHG emissions from 2011 to 2018 for buildings, fleet and biogas. The first observation is the lack of data from this table. The scope of data collection has increased since the 2014 EMP and has resulted in this data gap. The first item to address will be the lack of data in 2015 for fleet and biogas followed by 2018 data.

Table 10: Summary of the GHG Emissions from 2011 to 2018

Year	GHG Emissions (Tonne CO_2e)		
	Buildings	Fleet	Biogas
2011	1,799	-	-
2012	1,931	-	-
2013	1,859	-	-
2014	1,974	2,461	-
2015	4,044	TBD	TBD
2016	4,199	-	-
2017	3,910	2,253	TBD
2018	TBD	2,325	TBD

3 2014 EMP REVIEW

On July 1, 2014, Oxford County published its first energy management plan that outlined numerous goals, objectives and strategies to reduce energy and GHG emissions. Each main goal is reflected upon below outlining achievements.

10% overall County reduction in electricity by 2019

As of 2017 year end, Oxford County has a 6.8% reduction in electricity from 2015 and is well on its way to achieving this goal by 2019. Since we are in the current year for this projection, staff will be modifying future goals to end one year short of the planned 2024 plan update.

10% reduction in carbon emissions by 2019

As of 2017 year end, Oxford County has a 3.3% reduction in carbon emissions for buildings from 2015 and a reduction of 8.5% for fleet from 2014. The current projection has buildings falling just shy of the 10% mark but well on its way to exceeding the 10% mark for fleet. Since we are in the current year for this projection, staff will be modifying future goals to end one year short of the planned 2024 plan update.

Replace all exterior lighting to LED lighting by 2019

As of July 1, 2019, the majority of buildings have had their exterior lights converted to LED lamps. There still remains a small inventory of non-LED lamps and they are scheduled to be replaced by 2019 year end.

Develop a green energy plan for fleet by Q4 2015

This goal has been accomplished and as of 2017 year end, Oxford County's fleet is at an 8.5% reduction in GHG emissions and well on its way to achieving the 10% reduction goal by the end of 2019 as outlined in the Green Fleet Plan.

Domestic Hot Water Demand systems (where applicable) installed by 2019

The new Oxford County Waste Management & Education Centre currently utilizes an on-demand hot water system. However, this goal has not been entirely met as water heaters have been replaced as they reach the end of their life.

Building conditions and energy audit report for all Municipal owned buildings – 2015

Building condition assessments are fully complete for all buildings older than ten years and have helped shape the capital replacement budget of facilities significantly. In addition, eight Level II official energy audits have been completed across eight building categories. By applying the energy audits to different categories, staff can then identify the same measures in similar facilities. The results of the energy audits showed great promise and will be continued to be utilized over the next five years.

Develop construction and renovation standards with energy efficiency as the driver

Oxford County has prioritized energy efficiency when completing new construction or major renovation projects. Projects have ranged from aiming for Passive House

Standard at Blossom Park in Woodstock, to New Building Institute's Zero Energy Buildings (ZEB) verification at WMEC.

DID YOU KNOW?

It only takes 10 tea lights or the body heat of 4 people to keep a 20 m² Passive House room warm in the middle of winter. Read more about Passive House here.

4 2019 GOALS & OBJECTIVES

The 2014 goals were set based on energy knowledge at the time while a set of long-term goals and objectives were still in development. Since the first instalment of this plan, Oxford County has established the 100% renewable energy goal by 2050 and has undergone an analysis of what is required to achieve this goal as a community. From an internal perspective, the County will align itself with the 100% RE goal by 2050 and outline the targets required to achieve that in this section. Furthermore, the short-term targets will be highlighted along with qualitative goals to be achieved by 2024.

4.1 Long Term Goals

Smart Energy Oxford, in consultation with WalterFedy, have developed a roadmap of how the 100% renewable energy by 2050 goal can be reached for the community as a whole. Given the establishment of the goal in 2015, with the scarcity of data in prior years and the intensive data mining requirements, 2015 was set as the baseline. The roadmap then outlines the targets every five years until 2050.

Table 11 highlights the incremental targets and the ultimate end goals for energy and GHG emissions reductions. Based on the current projection targets, a **54% reduction of energy and a 69% reduction of GHG emissions by 2050** are required to meet the 100% renewable target.

Table 11: Oxford County's Energy & GHG Emissions Reduction Targets from 2015 to 2050

Year	Total Reduction from 2015 baseline	
	Energy	GHG Emissions
2015	-	-
2020	1.7%	3.2%
2025	10.5%	14.1%
2030	19.3%	25.0%
2035	28.1%	36.0%
2040	36.8%	46.9%
2045	45.6%	57.8%
2050	54.4%	68.7%

Table 12 summarizes the energy mix required in order to reach the 100% renewable energy goal along with five year incremental targets. A major assumption is that the Ontario grid will be able to supply approximately 20% of its energy through renewable sources. Therefore, Oxford County is aiming to close that gap by establishing a target of **80% renewable energy generated within Oxford County by 2050**.

Table 12: Energy Mix Targets from 2015 to 2050

Year	Energy Mix		
	Non-Renewable	Renewable - Grid	Renewable - Oxford County
2015	-	-	-
2020	88.6%	6.1%	5.3%
2025	81.0%	7.3%	11.7%
2030	71.9%	8.7%	19.5%
2035	60.5%	10.4%	29.1%
2040	45.9%	12.7%	41.4%
2045	26.6%	15.6%	57.8%
2050	0.0%	19.7%	80.3%

4.2 Short Term Quantitative Goals

Oxford County, as an organization, will align its short and long-term goals to reflect Table 11 and Table 12, respectively. Given that the energy management plan requires updates every five years from 2014 onwards, all short-term goals will be interpolated for in-between years. Additionally, this plan's short-term goals will be adjusted to 2023 in order to have a more comprehensive reflection of this instalment's plan in 2024. Table 13 highlights the short-term goals set by the County.

Table 13: Summary of Short-Term Goals for Energy Reduction, GHG Emissions Reduction, and Renewable Energy Mix by 2023

Description	Target	Amount	Date	Equivalency
Energy Reduction from 2015	**7.0%**	3,133,000 ekWh	Dec. 31, 2023	• 3,133,000 kWh of electricity • 293,467 m³ of natural gas • Annual electricity consumption of the Woodstock WWTP
GHG Emissions Reduction from 2015	**9.7%**	632 Tonnes CO_2e		• 75.7 homes' energy use for one year • 1,464 barrels of oil consumed
Renewable Energy Mix	**9.2%**	3,816,000 ekWh		• 3.2 MW of solar photovoltaic

DID YOU KNOW?

The average passenger vehicle emits 4.71 tonnes CO_2e per year. You can calculate your carbon footprint on the U.S. E.P.A.'s GHG equivalencies calculator here.

4.3 Short Term Qualitative Goals

In addition to the short-term quantitative goals, there are also qualitative goals that will indirectly assist in achieving the overall quantitative goals. Table 14 summarizes the thirteen qualitative goals along with projected annual budgets until 2024. Each goal is detailed below along with the total implementation budget over the five year period and target completion year. Some goals, such as the Solar PV maintenance contract, will have ongoing operational costs.

Table 14: Summary of Short Term Qualitative Goals along with Target Year and Estimated Annual Budgets

Goal	Target Completion	Proposed Budget				
		2020	2021	2022	2023	2024
Solar PV maintenance contract	2019	$15,000	$20,900	$29,000	$32,000	$35,000
Long Term Renewable Energy Plan	2020	-	-	-	-	-
Examine alternative fuels for fleet	2020	ST	ST	ST	ST	ST
Adjust energy baseline of 2015 to align with PCP Protocol and record all necessary forms of energy and relevant data from 2017 onwards	2020	ST	ST	ST	ST	ST
Form an energy committee	2020	ST	ST	ST	ST	ST
Annual group of energy assessments	2020	$15,000	$15,000	$15,000	$15,000	$15,000
Benchmarking all buildings	2020	ST	ST	ST	ST	ST
Reduce energy & GHG emissions reporting gap from two years to one fiscal quarter	2021	ST	ST	-	-	-
Improve software monitoring of all building meters from 80% of the County's consumption to 95%	2021	$25,000	-	-	-	-
Create an annual energy campaign	2023	-	-	-	$5,000	$5,000
Develop baseline models of top ten sites	2023	-	-	-	$1,000	$1,000
Annual progress reports to County Council	2023	-	-	-	ST	ST
Increase number of sub-metered buildings to ten	2024	$25,000	$25,000	$22,000	$15,000	$15,000

ST – Staff Time

Solar PV maintenance contract
Target Completion: 2019
Total Implementation Budget: $131,900
Priority: Medium
Oxford County is projected to have over 1.2 MW of solar PV installed by the end of 2019 and will require periodical maintenance. The objective is to form a service agreement with a solar PV contractor to perform annual site inspections and servicing for any necessary repairs that come about.
This goal will be deemed accomplished if all fully operational solar PV systems outside warranty period are included in a service agreement.

Long Term Renewable Energy Plan
Target Completion: 2020
Total Implementation Budget: $0 ($50,000 in 2019 Budget)
Priority: High
Oxford County is dedicated to achieving its 100% Renewable Energy goal. Given the magnitude of such an undertaking, a renewable energy plan will be developed in conjunction with the energy management plan. This plan will highlight potential sites owned by Oxford County for implementing renewable strategies, including but not limited to, solar PV, solar thermal, geothermal, wind and bioenergy. Other highlights of the plan will set out project requirements, such as budgeting and permits required.
This goal will be deemed accomplished if the plan encompasses a multi-year plan that highlights a general roadmap for where renewable energy funds will be allocated and receives County Council’s approval.

Examine alternative fuels for fleet
Target Completion: 2020
Total Implementation Budget: Staff Time
Priority: High
For future procurement years, staff will review alternative fuel options (e.g. compressed natural gas, hydrogen and electricity) for fleet assets requiring replacement. This approach will allow staff to annually review market trends and to examine if an alternatively-fuelled asset is a viable option for the County. In addition, options to utilize renewable diesel or seasonal bio-diesel for examining assets will be reviewed.
This goal will be deemed accomplished if staff have a formal process of evaluating fleet assets for alternative options.

Adjust energy baseline of 2015 to align with PCP Protocol and record all necessary forms of energy and relevant data from 2017 onwards
Target Completion: 2020
Total Implementation Budget: Staff Time
Priority: High
Data is missing for fleet and biogas in 2015 based on the scope of the PCP Protocol. Staff will need to review paper utilities as some of this information is no longer available online or was recorded in paper entirely.
This goal will be deemed accomplished if staff complete the inventory of GHG emissions for 2015 and become compliant with the PCP Protocol.

Form an energy committee

Target Completion: 2020

Total Implementation Budget: Staff Time

Priority: Medium

Employee engagement is another significant variable that contributes to a successful energy management plan. An energy committee is a great way to act as that cornerstone. The aim will be to set up meetings for two to four times per year and to target representatives who have major influences on the County's energy consumption or interested employees. The main objectives of the meetings would be to discuss existing projects that can have significant influence on energy, propose new energy initiatives and to educate committee members of their influence on energy consumption.

This goal will be deemed accomplished if an energy committee meets at a minimum frequency of two times per year from 2020 to 2024.

Annual group of energy assessments

Target Completion: 2020

Total Implementation Budget: $75,000

Priority: Medium

Energy assessments can assist staff in identifying Energy Efficiency Measures/Energy Conservation Measures (EEMs/ECMs) and providing key attributes that can determine if the project is viable (e.g. energy savings, budget and financial analysis). In addition, it provides all the information necessary to form a proper budget which needs to be done upwards of year in advance.

This goal will be deemed accomplished if a minimum of three sites per year are assessed.

Benchmarking all buildings

Target Completion: 2020

Total Implementation Budget: Staff Time

Priority: High

Benchmarking is an effective tool to identify buildings with the most potential for energy savings. The typical approach is calculating a building's energy use intensity (EUI) by taking the annual equivalent energy consumption and dividing by the gross floor area. However, this approach is not always appropriate where buildings are more driven by other metrics (e.g. effluent of a wastewater treatment plant). Other items to potentially examine are the GHG Emissions intensity of buildings. By implementing this goal, staff will be able to focus resources more appropriately and assist in closing any potential gaps in the County's short-term quantitative goals.

This goal will be deemed accomplished if the all buildings are appropriately benchmarked.

Reduce energy & GHG emissions reporting gap from two years to one fiscal quarter

Target Completion: 2021

Total Implementation Budget: Staff Time

Priority: High

The County currently reports energy and GHG emissions data as per O. Reg. 507/18 which lags by two years. From 2014, staff have gone from having only paper invoices as source material to online access for a majority of LDC accounts in 2019. Staff will collaborate on ways to shorten the gap from two years to three months by implementing routine download times, examining automation methods and incorporating enhanced recordkeeping when processing utility invoices.

This goal will be deemed accomplished if all energy & GHG emissions are within one fiscal quarter as of December 31, 2021.

Improve software monitoring of all utility meters from 80% of the County's consumption to 95%

Target Completion: 2021

Total Implementation Budget: $25,000

Priority: High

Monitoring is fundamentally imperative to ensuring an energy management plan has any success of achieving its goals and objectives. Staff have implemented software monitoring for 112 energy meters in 2019 which represents approximately 80% of the County's annual energy consumption for buildings. However, the last 20% represents 345 meters or the last 5% represents 99 meters.

It is not necessarily beneficial to monitor every single meter nor financially viable with software (e.g. microFIT load side meters or streetlights). Therefore, staff will review meters in further detail and provide an appropriate solution to achieving this goal (e.g. grouping meters into one virtual meter).

This goal will be deemed accomplished if 95% of all building meters are monitored by December 22, 2022 and is dependent on the success of the reporting gap goal.

Create an annual energy campaign

Target Completion: 2023

Total Implementation Budget: $10,000

Priority: Medium

Oxford County has numerous events dedicated to a wide range of topics to engage employees. The idea is to create a challenge amongst employees by monitoring energy consumption during a time period and then comparing it to what was expected to be consumed during that time period respectively. This approach can be scalable from departments to whole buildings. The plan would be to host a campaign once a year.

This goal will be deemed accomplished if a pilot campaign is launched by 2023.

Develop baseline model of ten buildings

Target Completion: 2023

Total Implementation Budget: $2,000

Priority: Low

The objective is to create energy models of ten buildings through software, such as RETScreen Expert. By developing models, it can aid in identifying energy savings and also energy avoidance. Other uses are predicting energy consumption which can complement projects, such as the energy campaign. The ten buildings will be the top energy consumers owned by the County.

This goal will be deemed accomplished if ten buildings are modeled by 2023.

Annual progress reports to County Council

Target Completion: 2023

Total Implementation Budget: Staff Time

Priority: High

Staff historically have intermittently submitted progress reports to County Council regarding the status of fleet and energy. Moving forward, an established annual report highlighting the previous year's energy data, GHG emissions and renewable energy will be summarized along with all major projects that were completed. This approach will keep County Council informed and allow goals to be updated based on current priorities and financial opportunities and pressures.

This goal will be deemed accomplished if an annual progress report is submitted to County Council every year starting in Q2 of 2023.

Increase number of sub-metered buildings to ten
Target Completion: 2024
Total Implementation Budget: $102,000
Priority: Low
Oxford County currently has two sub-metered buildings (WMEC and Oxford County Administration Building). The goal will be to implement approximately two sub-metering projects per year. Sub-metering can further assist energy staff in identifying energy savings and load shifting. In addition, it can be used for employee engagement through contests and simply displaying the information at a central location (e.g. dashboard in lobby).
This goal will be deemed accomplished if ten buildings have sub-metering by 2024.

5 MEASURES

This section will summarize the overall results of the measures implemented and proposed. For a detailed summary of each measure, please refer to Appendix A: Summary of Implemented Measures and Appendix B: Summary of Proposed Measures.

5.1 Implemented Measures

As of 2019, the annual energy savings noted is at 870,504 ekWh (798,063 kWh of electricity and 6,786 m^3 of natural gas). The biggest energy savings comes from an operational adjustment at Woodstock WWTP with savings of nearly 400,000 ekWh and only costing approximately $15,500 to implement. A total of 19 projects over 52 locations contributed to these annual savings. For a detailed summary of each measure, please refer to Appendix A: Summary of Implemented Measures.

5.2 Proposed Measures

The current outlook for the next five years are well on track to meet the proposed short-term targets. Currently, the list of measure in Appendix B: Summary of Proposed Measures for energy reduction is projected at 6% and GHG emissions is projected at 5.9%. Achieving the qualitative goals listed within this plan will uncover more measures that will surely push the reduction numbers near the 7.0% and 9.7% for energy and GHG emissions, respectively.

The fleet will play an instrumental role in the GHG emissions column as more vehicles become available for CNG conversion and the County's CNG supplier explores the potential of switching to renewable natural gas (RNG). Other factors from fleet include the transition to other alternative fuels, such as electricity or hydrogen.

Benchmarking and modeling facilities will allow staff to focus their efforts on the "energy hogs" and direct energy assessments towards these buildings. This approach will result in capturing more "low-hanging fruit" and smaller payback projects while identifying potentially future projects as technology improves.

Overall, Oxford County is in a great position to meet its short-term goals and continue its path to 100% renewable energy by 2050.

6 FINANICAL

As of 2019, Oxford County has $150,000 annually dedicated to green initiatives through 2024[2]. In order to meet the requirements within this plan, Oxford County will require a spending increase of $976,600 over the five year period. Table 15 summarizes the annual budget requirements along with the projected deficit per year. Staff will attempt to mitigate these costs by obtaining incentives and/or grants where available. The goal will be to only implement projects that are financially viable and to maintain a positive net present value for all projects combined.

Table 15: Financial Summary to Implement the 2019 EDM Plan

Budget Year	Green Initiatives	Estimated Project Costs	Deficit
2020	$150,000	$409,700	$259,700
2021	$150,000	$418,400	$268,400
2022	$150,000	$414,000	$264,000
2023	$150,000	$282,500	$132,500
2024	$150,000	$202,000	$52,000
Total	**$750,000**	**$1,726,600**	**$976,600**

[2] In the approved 2019 Business Plan & Budget Highlights, the Public Works' Long Term Capital Plan Report shows expected expenditures of $150,000 from 2020 through 2028 for 911006 Green Initiatives Facilities

7 APPROVAL

The implementation of this plan is subject to annual budget and business plan approval.

To be updated pending Council approval.

APPENDIX A: SUMMARY OF IMPLEMENTED MEASURES

Project Description	Location	Year Implemented	Annual Projected Savings			Projected Demand Reduction (kW)	GHG Emissions Reduction	Estimated Financial				Estimated Life Span (Yr)
			Electricity (kWh)	Natural Gas (m^3)	Cost			Capital Cost	Incentive	Net Cost	Simple Payback Period (Yr)	
Exterior Lighting Replacement	SH - 82 Finkle - 40 Units	2016	4,174	-	$501	0.0	0.2	$4,637	$579	$4,058	8.1	16.4
Exterior Lighting Replacement	SH - 738 Parkinson - 36 Units	2016	3,167	-	$380	0.0	0.1	$1,116	$158	$958	2.5	13.7
Thamesford Blower Replacement	Thamesford WWTP	2016	157,000	-	$18,840	23.0	6.8	N/A	N/A	N/A	N/A	15.0
Aeration Optimization	Woodstock WWTP	2017	394,366	-	$47,324	60.0	17.0	$15,500	$0	$15,500	0.3	20.0
BAS Installation	SH - 816 Alice - 40 Units	2017	110,255	-	$13,231	-	4.7	$59,021	$10,453	$48,567	3.7	15.0
Home Assistance Program	SH - 135 Carroll - 35 Units	2017	1,094	-	$161	-	0.0	$0	-	-	0.0	10.0
Home Assistance Program	SH - 161 Fyfe - 56 Units	2017	4,468	-	$657	-	0.2	$0	-	-	0.0	10.0
Home Assistance Program	SH - 70 Maria - 27 Units	2017	2,215	-	$326	-	0.1	$0	-	-	0.0	10.0
Home Assistance Program	SH - 738 Parkinson - 36 Units	2017	6,763	-	$994	-	0.3	$0	-	-	0.0	10.0
Lobby Lights Replacement	Oxford County Administration Building	2019	8,069	-	$968	1.5	0.3	$1,600	$0	$1,600	1.7	8.6
Lobby Lights Replacement	Woodingford Lodge - Woodstock	2019	2,050	-	$246	0.2	0.1	$1,719	$0	$1,719	7.0	3.0
Lighting Retrofit - 911006	Various (35 locations)	2017	98,401		$11,808	0.0	4.2	$108,346	$15,922	$92,424	7.8	13.0
Courtroom#1 Lighting Replacement	Oxford County Court House	2018	816	-	$135	0.4	0.0	$655	$0	$655	4.9	25.0
Sub-metering of whole building	Oxford County Administration Building	2019	-	-	-	-	0.0	-	-	-	-	20
Sub-metering of whole building	Oxford County Waste Management Facility	2018	-	-	-	-	0.0	-	-	-	-	20
Beacon Light Replacement	COIN - Bower Hill	2016	5,225	-	$627	-	0.2	$17,027	$0	$17,027	27.2	20.0
Roof Insulation Upgrade	Springford Patrol Yard	2015	-	3,368	$876	-	6.4	N/A	N/A	N/A	N/A	20.0
Roof Insulation Upgrade	Drumbo Patrol Yard	2015	-	3,418	$889	-	6.5	N/A	N/A	N/A	N/A	20.0
Fuel Procurement	N/A	2019	-	-	$79,607		0.0	$0	$0	$0	0.0	5.0
Total			**798,063**	**6,786**	**$177,568**	**85**	**47.2**	**$209,620**	**$27,112**	**$182,508**	**1.0**	

APPENDIX B: SUMMARY OF PROPOSED MEASURES

Project Description	Location	Year Proposed	Annual Projected Savings			Projected Demand Reduction (kW)	GHG Emissions Reduction (Tonne CO2e)	Financial Estimates				Estimated Life Span (Yr.)
			Electricity (kWh)	Natural Gas (m^3)	Cost			Capital Cost	Incentive	Planned Estimated Cost	Simple Payback Period (Yr.)	
Interior Lighting Retrofit	Oxford County Administration Building	2019	102,300	-	$18,155	27.4	4.4	$102,300	$10,960	$91,340	5.0	12.0
Emergency Light Scheduling	Oxford County Administration Building	2019	28,850	-	$3,981	-	1.2	$17,200	$2,885	$14,315	3.6	20.0
LED Lighting Upgrade	Various Locations (water sites)	2019	15,000	-	$1,800	15.0	0.6	15,000	$1,500	$13,500	7.5	15.0
Interior Lighting Control Improvements	Oxford County Administration Building	2019	3,639	-	$646	-	0.2	$2,700	$364	$2,336	3.6	12.0
Ingersoll CNG station	Water Operations Centre	2020	-	-	-	-	-	$240,000	-	$240,000	-	20.0
LED Lighting Upgrade	Woodstock WWTP	2020	65,645	-	$9,559	27.0	2.8	$65,600	$10,800	$54,800	5.7	15.0
Energy Monitoring Enhancements	N/A	2020	-	-	-	-	-	$25,000	$0	$25,000	-	10.0
Sub-metering	Woodstock WWTP	2020	-	-	-	-	-	$15,000	-	$15,000	-	20.0
Energy Assessments	TBD - 3 Locations	2020	-	-	-	-	-	$15,000	-	$15,000	-	-
Solar PV Maintenance	Operational Solar PV Arrays	2020	-	-	-	-	-	$15,000	-	$15,000	-	-
Sub-metering	SH - 742 Pavey - 55 Units	2020	-	-	-	-	-	$10,000	-	$10,000	-	20.0
Lighting Controls	Woodstock WWTP	2020	26,021	-	$3,789	-	1.1	$10,000	$2,602	$7,398	2.0	15.0
LED Lighting Upgrade	EMS Station 3 - Tillsonburg	2020	11,646	-	$2,329	3.0	0.5	$8,100	$1,200	$6,900	3.0	12.0
Cogeneration Investigation	Woodingford Lodge - Woodstock	2020	-	-	-	-	0.0	$5,000	$0	$5,000	-	-
Vacancy Sensors	EMS Station 3 - Tillsonburg	2020	1,831	-	$366	-	0.1	$1,000	$183	$817	2.2	12.0
Cogeneration/Biogas Utilization	Woodstock WWTP	2021	-	171,755	$41,603	-	326.2	$150,000	$25,000	$125,000	3.0	20.0
CNG conversions - Ingersoll Vehicles	9 Trucks	2021	-	-	-	-	-	$110,000	-	$110,000	-	12.0
Idling reduction technology	5 Snow Plows	2021	-	-	-	-	-	$37,500	-	$37,500	-	9.0
Sub-metering	Woodingford Lodge - Woodstock	2021	-	-	-	-	-	$15,000	-	$31,000	-	20.0
Sub-metering	SH - 161 Fyfe - 56 Units	2021	-	-	-	-	-	$10,000	-	$31,000	-	20.0
Power factor correction	Woodingford Lodge - Woodstock	2021	0	-	$5,000	50	0.0	$30,000	0.0	$30,000	6.0	20.0
Solar PV Maintenance	Operational Solar PV Arrays	2021	-	-	-	-	-	$20,900	-	$20,900	-	-
Free Cooling IT Room	Oxford County Administration Building	2021	32,964	-	$5,850	8	1.4	$20,000	0.0	$20,000	3.4	15.0
Energy Assessments	TBD - 3 Locations	2021	-	-	-	-	-	$15,000	-	$15,000	-	-
Demand Control Ventilation	Oxford County Administration Building	2021	6,205	1,811	$1,590	-	3.7	$10,000	0.0	$10,000	6.3	15.0
LED Lighting Upgrade	Woodingford Lodge - Woodstock	2022	228,962	-	$36,634	60	9.8	$230,000	$23,840	$206,160	5.6	12.0
Idling reduction technology	5 Snow Plows	2022	-	-	-	-	-	$31,000	-	$31,000	-	9.0
LED Lighting Upgrade	Tillsonburg WWTP	2022	-	-	-	-	-	$30,000	-	$30,000	-	20.0
LED Lighting Upgrade	Ingersoll WWTP	2022	-	-	-	-	-	$30,000	-	$30,000	-	20.0
Solar PV Maintenance	Operational Solar PV Arrays	2022	-	-	-	-	-	$29,000	-	$29,000	-	-
Demand controlled kitchen ventilation	Woodingford Lodge - Woodstock	2022	16,863	15,000	$6,331	-	29.2	$20,000	$3,200	$16,800	2.7	15.0
Energy Assessments	TBD - 3 Locations	2022	-	-	-	-	-	$15,000	-	$15,000	-	-
Sub-metering	Woodingford Lodge - Tillsonburg	2022	-	-	-	-	-	$15,000	-	$15,000	-	20.0
Sub-metering	Woodstock Patrol Yard	2022	-	-	-	-	-	$7,000	-	$7,000	-	20.0
Air Curtain Pilot Project	Woodstock Patrol Yard	2022	-	-	-	-	-	$5,000	-	$5,000	-	15.0
ERV Control Optimization	Oxford County Court House	2022	3,984	623	$775	2.5	1.4	$2,000	$0	$2,000	2.6	15.0

Project Description	Location	Year Proposed	Annual Projected Savings			Projected Demand Reduction (kW)	GHG Emissions Reduction (Tonne CO2e)	Financial Estimates				Estimated Life Span (Yr.)
			Electricity (kWh)	Natural Gas (m³)	Cost			Capital Cost	Incentive	Planned Estimated Cost	Simple Payback Period (Yr.)	
Hallway Lighting at all multi-residential sites	Various (14 sites)	2023	130,000	-	$15,600	20.0	5.6	$133,500	$8,000	$125,500	8.0	12.0
Retro-commissioning	Oxford County Administration Building	2023	40,039	1,837	$5,282	-	-	50,000	$0	$50,000	9.5	10.0
Solar PV Maintenance	Operational Solar PV Arrays	2023	-	-	-	-	-	$32,000	-	$32,000	-	-
Idling reduction technology	5 Snow Plows	2023	-	-	-	-	-	$31,000	-	$31,000	-	9.0
Energy Assessments	TBD - 3 Locations	2023	-	-	-	-	-	$15,000	-	$15,000	-	-
Sub-metering	Woodingford Lodge - Ingersoll	2023	-	-	-	-	-	$15,000	-	$15,000	-	20.0
Energy Campaign	TBD	2023	-	-	-	-	-	$5,000	-	$5,000	-	-
Baseline Modeling	TBD - 5 Buildings	2023	-	-	-	-	-	$1,000	-	$1,000	-	-
Retro-commissioning	Woodingford Lodge - Woodstock	2024	108,048	23,195	$18,997	-	-	100,000	$0	$100,000	5.3	10.0
Solar PV Maintenance	Operational Solar PV Arrays	2024	-	-	-	-	-	$35,000	-	$35,000	-	-
Idling reduction technology	5 Snow Plows	2024	-	-	-	-	-	$31,000	-	$31,000	-	9.0
Energy Assessments	TBD - 3 Locations	2024	-	-	-	-	-	$15,000	-	$15,000	-	-
Sub-metering	Ingersoll WWTP	2024	-	-	-	-	-	$15,000	-	$15,000	-	20.0
Energy Campaign	TBD	2024	-	-	-	-	-	$5,000	-	$5,000	-	-
Baseline Modeling	TBD - 5 Buildings	2024	-	-	-	-	-	$1,000	-	$1,000	-	-
Total			**821,997**	**214,222**	**178,287**	**213**	**388**	**$1,863,800**	**$90,534**	**$1,773,266**	**-**	**-**

APPENDIX C: PLAN REVISIONS

Revisions	Instalment	Date
• Released for compliance with O. Reg. 507/18 • Revamped layout of plan • Added new goals and targets for the next five years • Listed all current and proposed measures	3	July 1, 2019
• Added ECMs table • Update to summary of energy & GHG Emissions • Summarized renewable energy	2	October 31, 2017
• Original plan	1	July 1, 2014

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