County of Perth

Energy Conservation and Demand Management Plan

2014

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Introduction

In 2011, the Province of Ontario passed Regulation 397/11, made under the Green Energy Act 2009. The regulation mandates that every public agency prepare, publish, implement, and make available to the public an energy and demand management plan on or before July 1, 2014. In addition, an annual summary of the agency's annual energy consumption and greenhouse gas emissions for its operations is required. The energy and demand management plan requires a description of previous, current and proposed measures for conserving and otherwise reducing the amount of energy consumed by the agency's operations and for managing the agency's demand for energy, including a forecast of the expected results of current and proposed measures.

The County of Perth, as a municipality, is required to comply with the regulation. To this end, the County has recorded all facility related energy consumption since January of 2011, and has reported same to the Ministry of Energy as per the requirement. A copy of the latest report is included as Appendix 'A'.

In compliance with the regulation, the County has produced this report which state realistic goals for conserving and reducing energy consumption, proposed energy conservation measures including estimated costs and savings, a description of renewable energy generation facilities and the amount of energy produced, as well as how long each proposed measure will be in place.

The County of Perth has many goals and objectives for conserving or otherwise reducing energy consumption and managing our demand for energy. We are driven to improve the energy efficiency of our buildings and operations due to the rising fuel costs, energy security and environmental concerns.

The County is making an effort to spark growth in clean, renewable sources of energy, as well as focusing our energy savings efforts on electrical, water, heating and cooling consumption at our facilities to create potential savings. The County of Perth also has plans to develop more focused training programs for building operations as well as prioritizing future initiatives to be taken with respect to energy reduction targets. We are also planning on operating geothermal as well as solar energy technology in the future. Many improvements have been made to our facilities in the past to reduce greenhouse gas emissions and many more efforts are ongoing.

Serving a population of 75,000, the County provides a range of services including planning, highways, emergency medical services, and a variety of other businesses. To do so, the County owns and operates 10 facilities and leases a further 6 other locations. In 2011, a total of 256.5 tonnes of greenhouse gasses, expressed as CO_2 equivalent, were generated from County owned facilities. This resulted from the County's use of 593,000 kWh of electricity, 93,000 m^3 of natural gas, and 21,500 Litres of propane. As well, County buildings consumed 1,596,000 Litres of potable water, not including amounts from on-site wells.

The County's 2011 Energy Consumption and Greenhouse Gas Emissions as reported to the Ministry of Energy is included in this report as Appendix 'A'.

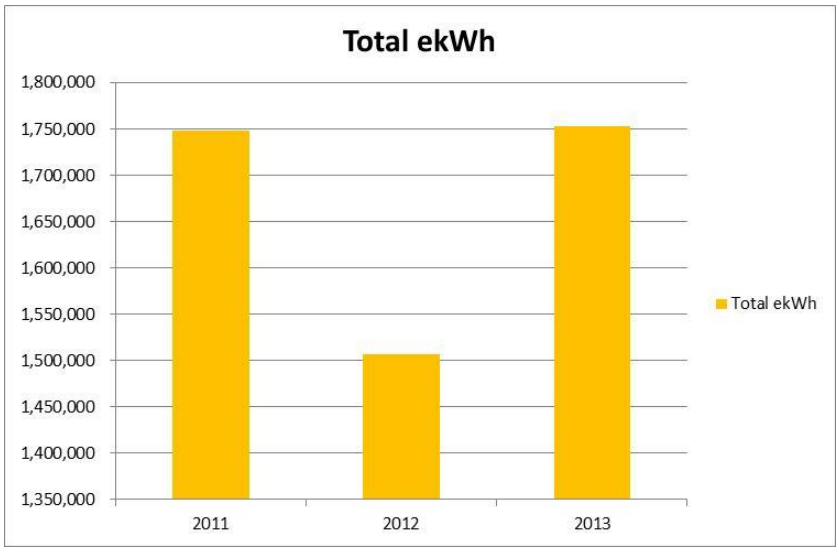

Figure 1 - Total Energy Consumption in equivalent Kilowatt Hours

Provided in this report is an overview of each facility as well as a summary of its 2011 energy consumption. Also included are the County's proposed measures for each facility to reduce energy consumption and greenhouse gas emissions, as well as timelines for each measure.

Perth County Courthouse

The historic Perth County Courthouse, located at 1 Huron Street Stratford, was constructed in 1887. It currently houses County administrative staff, as well as Superior and Provincial Offenses Court personnel. The building is 3 stories in height, and contains a gross floor area of 19,080 square feet. The facility generally operates from 8:00am to 5:00pm week days, or 45 hours weekly. The building uses a steam boiler system for heat, and a combination of ductless splits and rooftop units for cooling. Electricity is supplied by Festival Hydro.

In 2011, the total utility cost for the Courthouse was $26,994. Of this, $19,667 was for electricity and $7,327 was for natural gas. In total, the Courthouse consumed 523,736 equivalent kilowatt hours (ekWh) in 2011, which equates to an energy intensity of 27.45 ekWh/gross square foot (gsf). Because the building is used during typical office hours, 90% of electricity used is during on-peak hours, resulting in higher than average cost per kilowatt hour.

Numerous efforts have been made to increase the energy efficiency of this building over its long life. These include the installation of high efficiency windows, solar window shades, low flow washroom fixtures, energy efficient lighting, occupancy sensors, a new lower floor HVAC system, and the installation of a Building Automation System (BAS) for control of the building's steam boiler system.

Although relatively efficient, there are additional measures which are proposed to be undertaken. The existing mercury vapour lights in the main courtroom will be replaced with high output LED, and additional occupancy sensors will be installed throughout the building. Although expensive at approximately $1,000 per light, each LED conversion will reduce energy consumption by approximately 570 kWh annually. Occupancy sensors are low cost solutions, and can reduce electrical consumption by up to 35% in areas where they are installed.

An important consideration will be future replacement of computer servers. The server room in the Courthouse has been found to consume 35% of the total electrical load of the building. The energy used in the server room is not just for the servers themselves, but for the associated cooling required. Servers which consume less energy will naturally generate less heat, resulting in a twofold reduction in our electrical costs.

It is also important to monitor temperature settings on air condition units. Units should not be set lower than 18C during the summer, and staff should ensure that they are turned off when leaving for the evening. In order to ensure better control of these units, they will gradually be connected to the BAS as their control technology is upgraded. As well, solar shades can be installed on windows, reducing the amount of solar heating in the summer months while leaving winter heat gain unaffected. Another measure which can be taken is to control the use of small appliances, including electric heating units that are located throughout the building. Employees need to be encouraged to unplug or otherwise turn off these appliances when they are not needed, and to strictly limit the use of electric heaters.

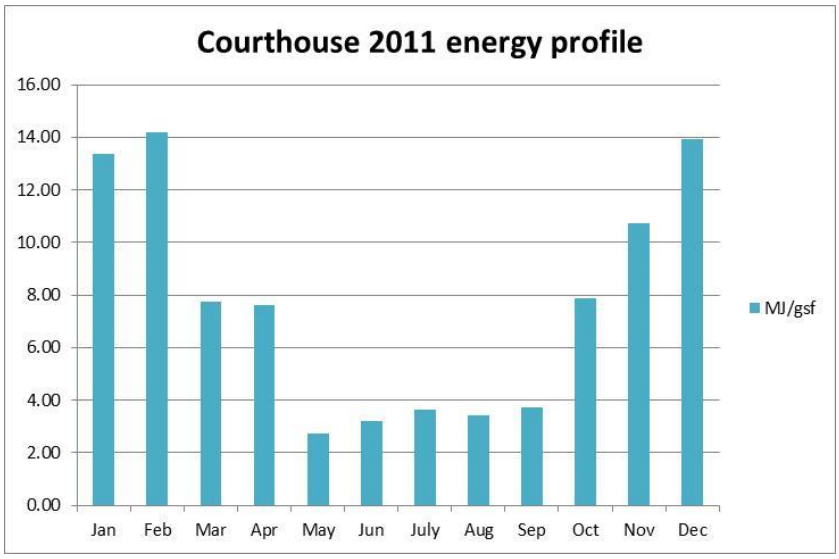

Figure 2 - Courthouse energy profile in Megajoules per square foot[1]

24 St. Andrews

The 24 St. Andrews building, currently occupied by the Stratford Perth Archives, was originally constructed in 1910. The building is single story with a basement, and has a gross floor area of 4,641 ft^2. This facility is open to the public, and operates an average of 35 hours per week. The building uses a hot water system for heat, and has window mounted air conditioners for cooling. It is supplied with electricity from Festival Hydro.

In 2011, the total utility cost for the Archives was $3,939, of which 63% was electricity. In total, the Archives consumed 80,545 ekWh in 2011, which equates to an energy intensity of 17.36 ekWh/gsf. Similar to the Courthouse, most of the electricity usage is during on-peak hours. In 2011, 57% of electricity was consumed during the higher cost on-peak times.

Some work has been done on this building to improve efficiency, such as new doors, energy efficient lighting, and an updated hot water boiler for heat. However, much of the building remains outdated and in need of improvement. Most importantly, the windows are single pane and contribute greatly to energy loss, and the washrooms contain old inefficient fixtures. Despite this, the building operates fairly efficiently due to the type of construction, with thick stone walls and a heavy wood roof structure contributing to keep the building relatively air tight.

[1] A typical 20lb propane tank contains approximately 450 Megajoules of energy

The County is currently constructing an entirely new Archives building, and as such this building is anticipated to be vacated in early 2015. As a result, a complete renovation of this building is planned in 2015 which is expected to address most if not all of the energy efficiency issues currently present. The newly renovated building will be constructed so as to be as efficient as possible within the current building envelope.

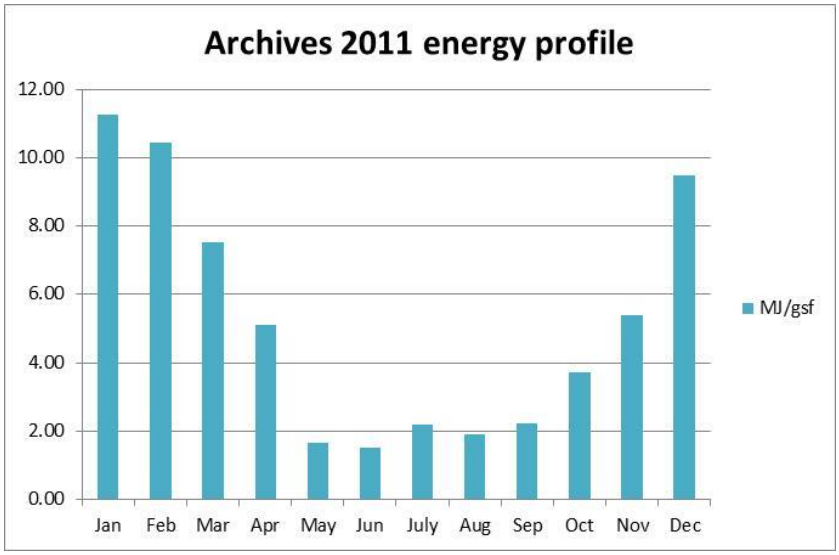

Figure 3 - Archives energy profile in MJ/gsf

5 Huron Street

5 Huron Street, otherwise known as the Registry building, was constructed in 1953. It is a single story building with an unfinished basement. Total gross floor area is 8,700 square feet. The basement section is used for storage, and the main floor is open to the public during regular business hours. The main floor is entirely leased to the Province of Ontario, and houses Service Ontario, the Land Registry Office, and the Victim/Witness Assistance Program. The building operates approximately 42.5 hours per week. The building has gas fired forced air rooftop units for heating, and rooftop air conditions for cooling. Electricity supply is from Festival Hydro.

The total utility cost for 2011 was $10,349 of which 74% was electricity. 5 Huron consumed 188,000 ekWh in 2011, which equates to an energy intensity of 21.63 ekWh/gsf. Like most office buildings, most of the electricity usage is during on-peak hours. In 2011, 76% of electricity was consumed during the higher cost on-peak times.

Measures taken to increase the efficiency of 5 Huron to date include conversion of all lighting on the main floor to T8 type fluorescent, and all lighting in the basement has been converted to LED. All windows on the main floor have been replaced with new, however the basement

windows remain single pane steel frame type. These windows will be replaced with proper insulated windows during the 2017 fiscal year.

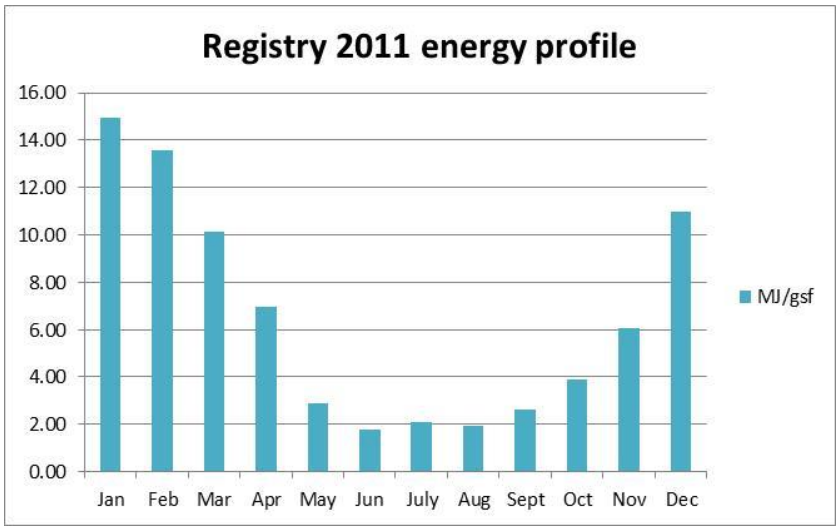

Figure 4 - Registry energy profile in MJ/gsf

Listowel EMS Base

Constructed in 1990, the Listowel EMS base is a 2 story facility of 3,500 gross square feet. The building comprises crew quarters/general office space and garage space for 2 ambulances. As an ambulance base, this building operates 24 a day. Heating is provided by a hot water system on the main floor, and a combination of hot water and electrical heating on the upper floor. Cooling is provided by window mounted air conditioning units. Electricity is supplied by Hydro One.

The total utility cost for 2011 was $5,285 of which 74% was electricity. Listowel EMS consumed 80,500 ekWh in 2011, which equates to an energy intensity of 22.99 ekWh/gsf. As a 24 hour a day operation, electricity usage for this building is generally evenly distributed between on-peak, mid-peak and off-peak hours. In 2011, only 21% of electricity was consumed during the higher cost on-peak times.

This facility has had new low-flow toilets installed, all lighting changed to T8 florescent and LED, and some of the windows have been replaced. In 2014, the remainder of the windows in this facility will be changed to high efficiency units. In future, changes to the HVAC system should be considered to do away with the window mounted cooling units, and expansion of the hot water heating system to encompass the entire building.

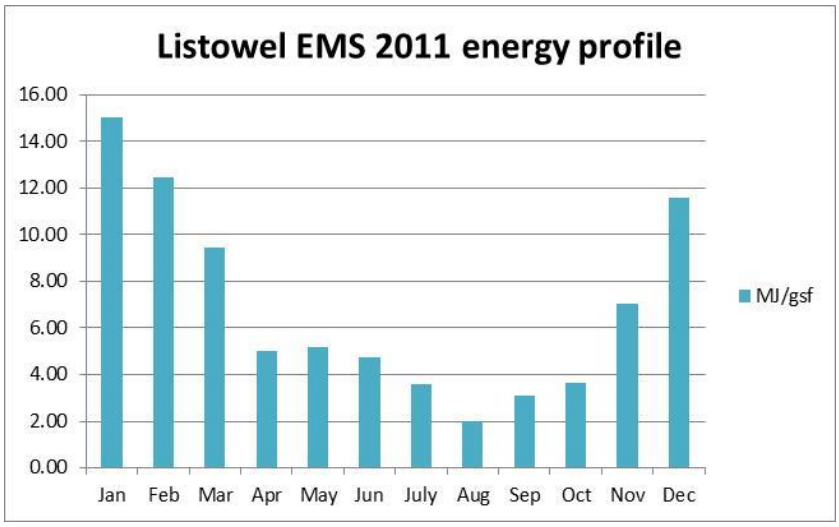

Figure 5 - Listowel EMS energy profile in MJ/gsf

St. Mary's EMS Base

The St. Mary's EMS Base, located at 241 Queen Street West, was built in 2007. This ambulance base is a single story building of 3,488 gross square feet. The building comprises crew quarters/general office space and garage space for 2 ambulances. As an ambulance base, this building operates 24 a day. Heating is provided by a forced air gas furnace. Heat in the garage bays is provided by a forced air gas tube heater. Cooling is provided by a pad mounted air conditioning unit. Electricity is supplied by Festival Hydro.

The total utility cost for 2011 was $5,553 of which 75% was electricity. Listowel EMS consumed 93,500 ekWh in 2011, which equates to an energy intensity of 26.81 ekWh/gsf. As a 24 hour a day operation, electricity usage for this building is generally evenly distributed between on-peak, mid-peak and off-peak hours. However, this facility did not receive a time of use meter until late 2011, and as a result 68% of electricity was billed out at the higher cost on-peak rate. This changed drastically in 2012 and beyond as time of use billing was implemented in St. Mary's.

The building was constructed to a high efficiency standard, with T8 fluorescent lighting, occupancy sensors, and R40 ceiling insulation. To date, the only changes that have been made to this building are updates to the outdoor lighting, with the original mercury vapour lights changed to LED. The ceiling insulation should be further upgraded to an R50 standard in the near future to better insulate the building envelop.

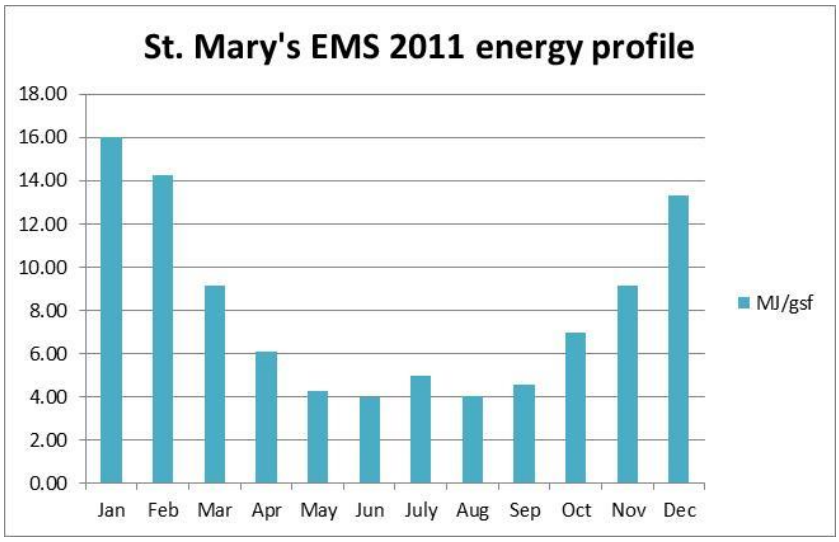

Figure 6 - St. Mary's EMS energy profile in MJ/gsf

Mitchell EMS Base

The Mitchell EMS Base, located at 16 Napier Street, was built in 2010. This ambulance base is a single story building of 3,595 gross square feet. The building comprises crew quarters/general office space and garage space for 2 ambulances. As an ambulance base, this building operates 24 a day. Heating is provided by hot water heat in-floor, as well as a forced air furnace in the garage area. Cooling is provided by a pad mounted air conditioning unit. Electricity is supplied by Erie Thames Hydro.

The total utility cost for 2011 was $4,255 of which 77% was electricity. Mitchell EMS consumed 63,500 ekWh in 2011, which equates to an energy intensity of 17.68 ekWh/gsf. As a 24 hour a day operation, electricity usage for this building is generally evenly distributed between on-peak, mid-peak and off-peak hours. However, like St. Mary's this facility did not receive a time of use meter until late September of 2011, and as a result 50% of electricity was billed out at the higher cost on-peak rate. This changed drastically in 2012 and beyond as time of use billing was implemented in Mitchell.

As a new building, the Mitchell EMS base was purposefully constructed to a very energy efficient standard. The building has high efficiency in-floor heating, LED and T5 lighting, low flow water fixtures, and R50 insulation in the ceiling. With the exception of 24 St. Andrews, this building is the most energy efficient facility owned by the County.

This building is already highly efficient and has little current room for improvement. One notable exception to this is the outside lighting, which is currently mercury vapour and will be changed to LED as funds permit.

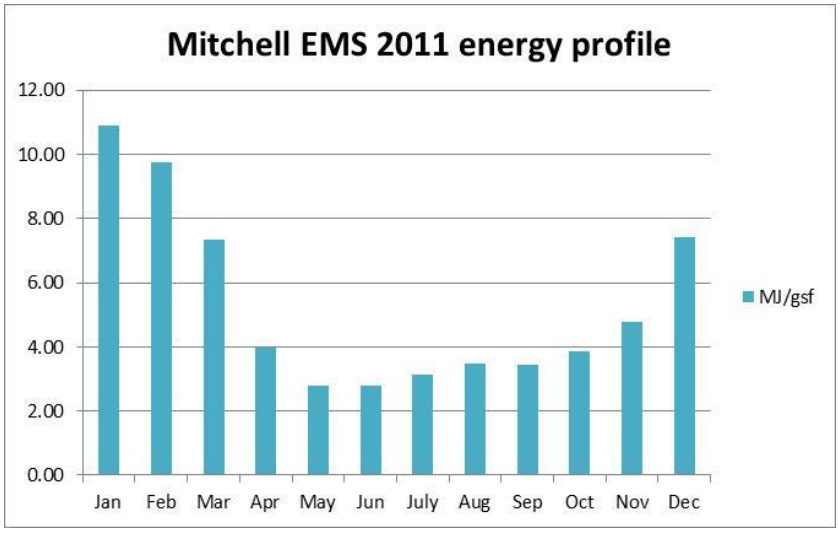

Figure 7 - Mitchell EMS energy profile in MJ/gsf

Milverton EMS Base

Located at 22 Mill Street, the Milverton EMS Base was built in 2004. Similar to Mitchell EMS, this base is a single story building of 3,413 gross square feet. The building comprises crew quarters/general office space and garage space for 2 ambulances. As an ambulance base, this building operates 24 a day. Heating is provided by a forced air propane furnace, as well as a propane fired tube heater in the garage area. Cooling is provided by a pad mounted air conditioning unit. Electricity is supplied by Hydro One.

The total utility cost for 2011 was $10,274 of which 52% was electricity. Milverton EMS consumed 125,900 ekWh in 2011, which equates to an energy intensity of 36.89 ekWh/gsf. As a 24 hour a day operation, electricity usage for this building is generally evenly distributed between on-peak, mid-peak and off-peak hours. In 2011, only 40% of electricity was consumed during the higher cost on-peak times.

One of the primary reasons why Milverton EMS has such high energy intensity is the use of propane. Conventional propane furnaces and tube heaters do not convert the fuel to heat as efficiently as their natural gas equivalents. As well, the cost of propane is more than twice that of natural gas for the same energy content. Newer technology can alleviate most of the difference in fuel conversion, but can do nothing for the cost differential.

Similar to other facilities, we are planning on changing the outdoor mercury vapour lamps to LED. Long term, this facility should be switched to natural gas heat should it become available, or geothermal should it not. Additionally, solar heat should be considered for hot water use. While geothermal and solar are expensive options initially, they will be produce considerable annual savings versus propane and will provide a good return on investment.

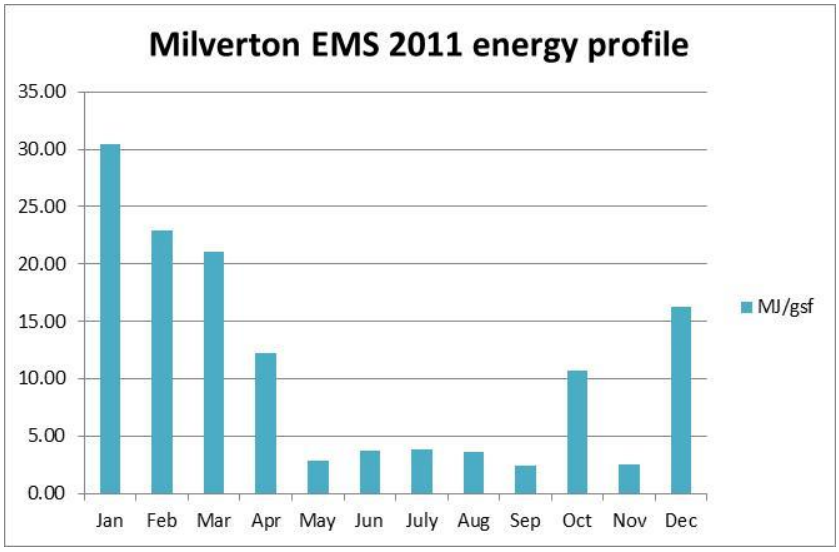

Figure 8 - Milverton EMS energy profile in MJ/gsf

Milverton Public Works

The Milverton Public Works Yard was built in 1987 at #6372 Perth Road 131. This yard is mostly used for winter operations and is largely vacant during the summer months. The single story building contains a small office area, and garage space for 3 snowplows. Total floor area is 2,900 square feet. Heat is provided by a combination of a propane fired furnace and propane tube heaters in the garage area. The building does not have cooling. Water is supplied from an on-site drilled well. Electricity is supplied by Hydro One.

The total utility cost for 2011 was $8,231 of which only 33% was electricity. Milverton Public Works consumed 102,300 ekWh in 2011, which equates to an energy intensity of 35.27 ekWh/gsf. In 2011, only 18% of electricity was consumed during the higher cost on-peak times.

Similar to Milverton EMS, one of the primary reasons why Milverton Public Works has such high energy intensity is the use of propane. Conventional propane furnaces and tube heaters do not convert the fuel to heat as efficiently as their natural gas equivalents. As well, the cost of propane is more than twice that of natural gas for the same energy content. Newer technology

can alleviate most of the difference in fuel conversion, but can do nothing for the cost differential. In order to help address the high cost of heat, lockable thermostats were installed in the garage area and were pre-set to a lower temperature.

Due to the type of building and the way it is used, this facility is inherently inefficient. The vast majority of the floor space is garage, which has high heat loss during the winter months as the large bay doors are opened and closed. Also, the insulation value of the building envelope is below optimal. A proposed energy saving measure for this facility will be to blow in additional insulation into the ceiling to improve heat retention. Further, additional translucent panels should be considered for the bay doors to increase radiated heat gain and lessen the requirement for lighting.

Similar to Milverton EMS, the heating for this facility should be converted to natural gas if it becomes available, or geothermal if it does not.

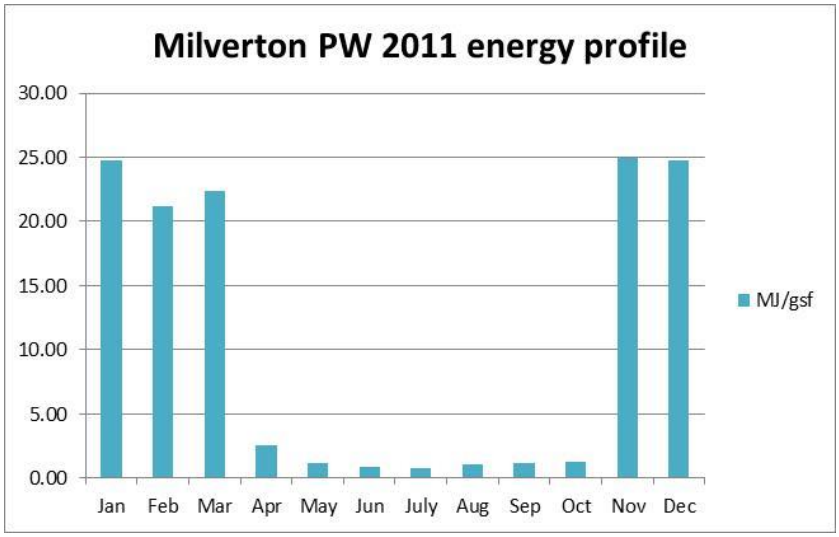

Figure 9 - Milverton PW energy profile in MJ/gsf

Mitchell Public Works

The Mitchell Public Works Yard, located at 4 Napier Street, was built in 1972. As this is the main location for Perth County Public Works, the yard is used year round. This single story building contains small offices, lunch room, storage areas, and 5 truck bays for both vehicle storage and repair facilities. There is also a large heated storage shed with 2 truck bays, which is primarily used for winter storage of snowplows. Total floor area of all occupied buildings is 13,768 square feet. Heat is provided by natural gas fired unit heaters. Building cooling is limited to the

small upstairs office area, and is provided by a ductless split type air conditioning unit. Electricity is supplied by Erie Thames Hydro.

The total utility cost for 2011 was $17,131 of which 73% was electricity. Mitchell Public Works consumed 313,200 ekWh in 2011, which equates to an energy intensity of 22.75 ekWh/gsf. This facility did not receive a time of use meter until September of 2011, and as a result 71% of electricity was billed out at the higher cost on-peak rate. This changed drastically in 2012 and beyond as time of use billing was implemented in Mitchell.

The construction of this building is typical for the time period it was built, with concrete block walls and steel truss flat roof. Neither of these construction methods are particularly energy efficient. The building is able to achieve a respectable energy intensity value due to the fact that it is not cooled in the summer months. As well, the unit heaters were replaced in 2011 with high efficiency units which resulted in natural gas savings. The building does have high heat loss as a result of the frequent opening and closing of the bay doors. Additional translucent panels should be considered for the bay doors to increase radiant heat gain and lessen the requirement for lighting.

All lighting in this facility was updated in 2010 to high efficiency T5 fluorescent fixtures, and occupancy sensors were installed in key locations to minimize electricity usage.

On December 27, 2013 this building suffered a fire. The building is now vacant, and its future is yet to be determined.

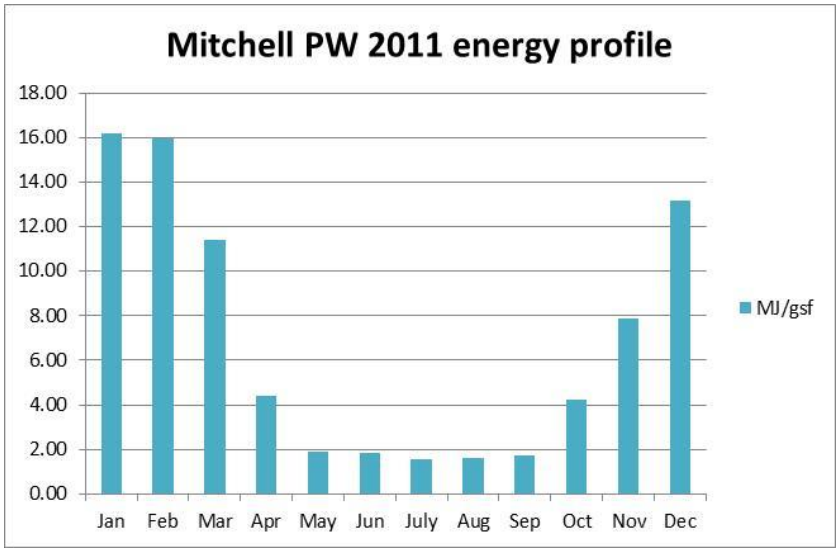

Figure 10 - Mitchell PW energy profile in MJ/gsf

Stratford Public Works

Built in 2009 at #4312 Perth Road 119, the Stratford Public Works Yard is a single story equipment garage and sand storage facility. This building is primarily used in the winter, and is largely vacant during the summer months. The building contains a small office and 5 truck bays for vehicle storage. Total floor area of the occupied portion is 7,200 square feet. Heat is provided by natural gas fired unit heaters. The building does not have cooling. Water is supplied from an on-site drilled well. Electricity is supplied by Hydro One.

The total utility cost for 2011 was $8,467 of which 65% was electricity. Stratford Public Works consumed 176,000 ekWh in 2011, which equates to an energy intensity of 24.45 ekWh/gsf. This facility received time of use metering early in 2011, and as a result only 25% of electricity was billed out at the higher cost on-peak rate. The building does have some energy measures already installed. There are occupancy sensors throughout, timers on lights in the sand storage bay and fuel pumps, and lockable thermostats for the garage area.

While the building was constructed to a relatively efficient standard, the frequent opening and closing of bay doors during the winter creates high heat loss. Additional translucent panels should be considered for the bay doors to increase radiated heat gain and lessen the requirement for lighting. As well, the existing outdoor mercury vapour lamps will be changed to LED as funds permit.

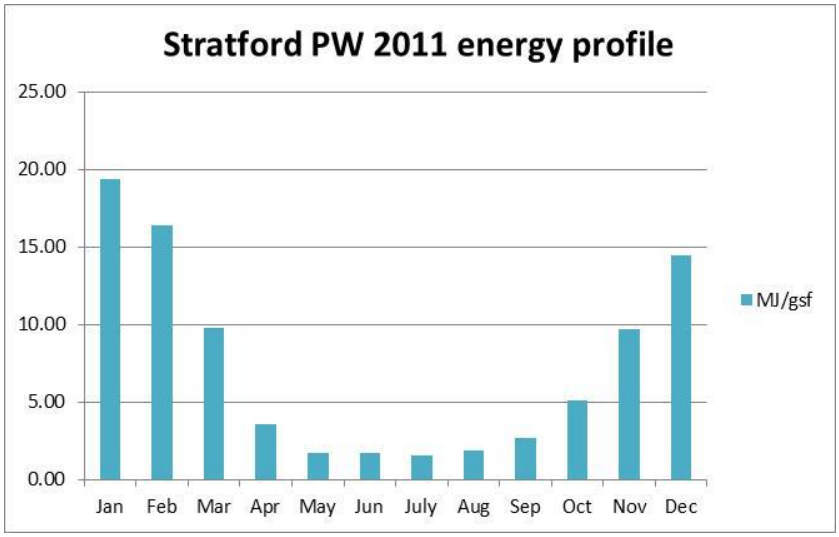

Figure 11 - Stratford PW energy profile in MJ/gsf

Other Measures

In June of 2011 the County constructed a ground mounted 10kW solar panel on property in Mitchell. The panel was constructed as part of the MicroFIT program, and is connected to the local grid. In calendar year 2012, the first full year of operation, this panel generated 19,132 kWh of electricity. The green energy produced by the County's solar panel offsets 1.93 tonnes of greenhouse gases annually.

In addition, the County has undertaken a tree planting program since 2009. The County donates $15,000 annually, through its lower-tier municipalities, for tree planting programs. In addition, the County has planted over 500 trees in the past two years, and plans to continue to do so in the future.

Summary

The preceding sections showed energy intensity for all County facilities on the basis of Megajoules per gross square foot. This is a good way to compare facilities against each other. However, it does not provide a good way of examining the performance of any one facility from year to year, as annual variations in temperatures and hours of sunshine will have a large impact on energy usage. A better method is to incorporate the theory of "degree days" into the calculation. A degree day is defined as the number of days where the average temperature is above or below a certain value, multiplied by the number of degrees it is above or below that value. For example, on a day where the average daily temperature is 5C, which is 11 degrees below the heating value of 16C, that day would result in 11 heating degree days. The concept works similarly for cooling degree days. For reference sake, 2011 had 3,397 heating degree days, 2012 had 3,016, and 2013 resulted in 3,510. Higher numbers indicate colder winters.

Using this concept, it is possible to determine the energy usage of all facilities based on equivalent Watt Hours per Degree Day per Square Foot (eWHrs/dd/gsf). Both electricity and heating fuel can be expressed as equivalent Watt Hours. Using this, we can examine the performance of buildings on a year to year basis, and determine which ones are improving over time, and which are not. Those that show an increase in cold years likely indicate a lack of building insulation or other building envelope problems.

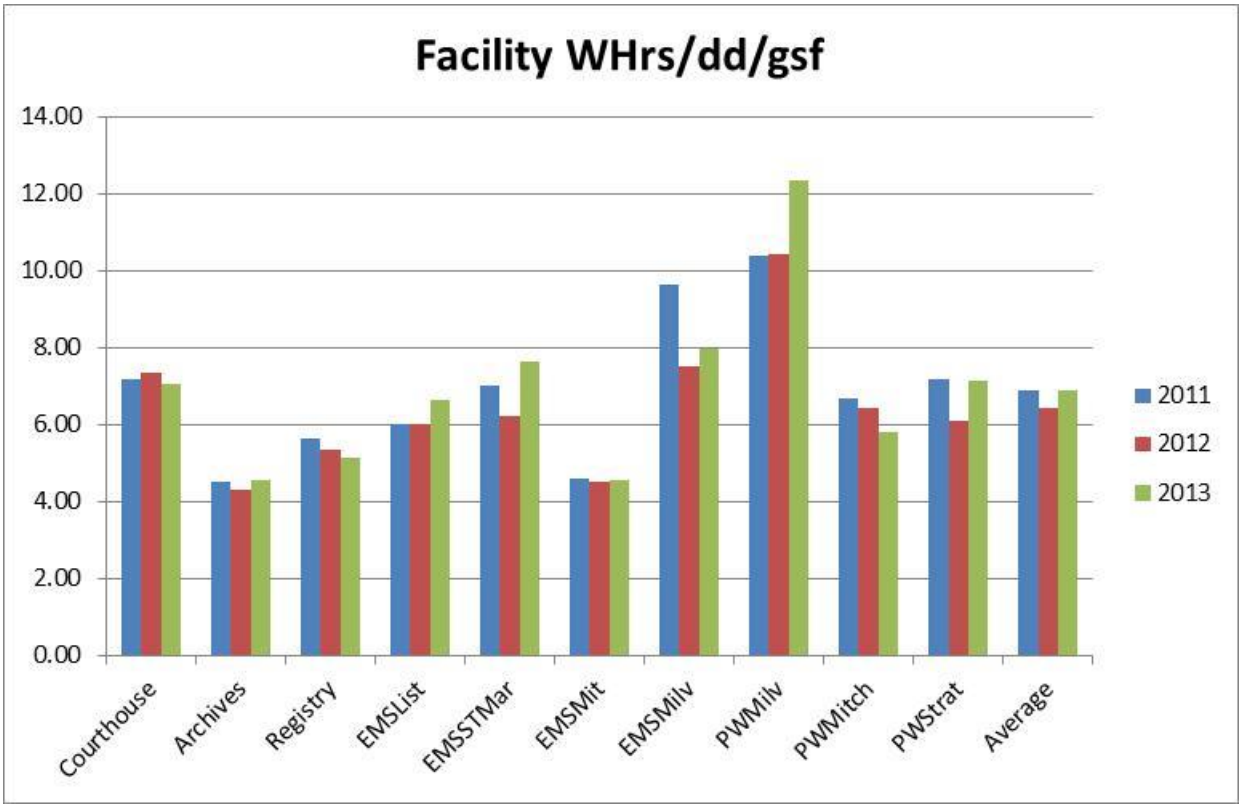

Figure 12 - 2011-2013 Facility Performance

5 Year Energy Plan

The following table lists proposed energy savings measures, their anticipated implementation, and their estimated costs and annualized savings.

Facility	Measure	Implementation	Estimated Cost	Annualized Savings
Courthouse	Occupancy Sensors	2014	$1,000	$150
Courthouse	LED Lights in Main Courtroom	2018	$22,000	$1,000
Courthouse	Replace rooftop units with High Efficiency units	2017	$15,000	$1,000
Courthouse	AC units controlled by Building Automation System	2017-2019	n/a. Only occurs when unit is replaced.	$250/unit

Facility	Measure	Implementation	Estimated Cost	Annualized Savings
Courthouse	Solar windows blinds	2015	$1,000 per office	$100 per office
Courthouse	Insulation Improvements	2017	$7,000	$300
24 St. Andrews	Renovations for better efficiency	2015	n/a. Part of larger renovation project	n/a
5 Huron	Replace basement windows	2017	$3,800	$180
Listowel EMS	Upgrade HVAC System	2018	$20,000	$1,300
Listowel EMS	Light Timer in Garage	2015	$150	$75
Listowel EMS	Insulation Improvements	2017	$2,500	$120
St. Mary's EMS	Insulation Improvement	2017	$5,000	$300
St. Mary's EMS	Light Timer in Garage	2015	$150	$75
Mitchell EMS	Replace outdoor lighting with LED	2015	$1,000	$150
Mitchell EMS	Light Timer in Garage	2015	$150	$75
Milverton EMS	Replace outdoor lighting with LED	2015	$1,000	$150
Milverton EMS	Install Geothermal Heating	2016	$20,000	$2,000
Milverton EMS	Install solar water heating	2015	$5,000	$500
Milverton EMS	Light Timer in Garage	2015	$150	$75
Milverton PW	Insulation Improvement	2015	$5,000	$600
Milverton PW	Translucent Bay Door panels	2017	$7,500	$500
Milverton PW	Install Geothermal Heating	2016	$20,000	$2,000
Stratford PW	Translucent Bay Door panels	2017	$10,000	$650

Facility	Measure	Implementation	Estimated Cost	Annualized Savings
Stratford PW	Replace outdoor lighting with LED	2015	$1,000	$150
All Facilities	Replace water heaters with smaller units, or on-demand units	2016-2019	$1,000 ea.	$100

Appendix 'A' – 2011 Energy Consumption and Greenhouse Gas Emissions

Operation Name	Total Floor Area (ft2)	Avg Hrs/week	Annual Flow (m3)	Electricity (kWh)	Natural Gas (m3)	Propane (L)	GHG Emissions (Kg)	Energy Intensity (ekWh/sqft)
County Courthouse	19,080.00	35	695.0	181,568	32,156.3		75,321	27.4
Stratford-Perth Archives	5,000.00	35	103.0	22,195	5,484.3		12,144	16.1
Perth County Registry Building	8,700.00	40	92.0	70,608	11,050.5		26,541	21.6
Listowel EMS	3,500.00	168	139.0	27,197	5,006.6		11,641	23.0
St. Mary's EMS	3,488.00	168	104.0	39,165	5,106.0		12,787	26.8
Mitchell EMS	3,595.00	168	88.0	28,104	3,330.5		8,545	17.7
Milverton EMS	3,413.00	168	29.1	41,855		10,004.8	18,796	32.9
Milverton Public Works	2,900.00	55		20,892		11,564.2	19,526	35.2
Mitchell Public Works	13,768.00	80	34.6	115,985	18,533.8		44,319	22.7
Stratford Public Works	7,200.00	55		45,238	12,293.3		26,861	24.4