



**CITY OF OWEN SOUND
ENERGY CONSERVATION AND DEMAND MANAGEMENT PLAN
2015 – 2020**

1.0 Background

- 1.1 This document has been prepared in compliance with Ontario Regulation 397/11 of the Green Energy Act. It describes the City's commitment to managing and reducing energy use where possible in keeping with the City's objectives of minimizing the environmental impact of City operations and reducing energy costs.
- 1.2 Supplies of electricity and natural gas have both been subject to significant cost increases in recent years and such increases are likely to continue in the foreseeable future. The City has made some progress in reducing energy use in the past but must increase its efforts if it is to succeed in controlling energy use and costs in the future.

2.0 Commitment

- 2.1 City Council, at its meeting held on June 23, 2014 considered the above noted matter and the following resolution R-140623-018 was adopted:

"THAT in consideration of Staff Report OP-14-037 respecting the Energy Conservation and Demand Management ("ECDM") Plan, City Council:

1. approves the ECDM Plan in principle;
2. refers the ECDM Plan to the Operations Advisory Committee to develop an implementation plan; and
3. directs that the ECDM Plan be reviewed on an annual basis."

3.0 Goal

- 3.1 To continuously improve the energy efficiency of our facilities and processes in order to reduce our operating costs, our energy consumption and the associated greenhouse gas (GHG) emissions.

4.0 Policy

- 4.1 The City will incorporate energy efficiency into all areas of our activity including our organizational and human resources management procedures, procurement practices, financial management and investment decisions, and facility operations and maintenance.

5.0 Reduction Target

- 5.1 The City will reduce the consumption of electricity and natural gas in all municipal operations by an average of 2% per year between 2015 and 2020 for a 10% reduction in energy use over five years. Approximately 4% of this reduction is expected to be achieved through the planned conversion of the streetlights to LED technology.

6.0 Strategies

- 6.1 The goal and reduction target of the Energy Conservation and Demand Management Plan can be met by the implementation of the following strategies:
 - 6.1.1 The creation of a top-down culture of energy conservation within the Corporation,
 - 6.1.2 The allocation of adequate staff and resources to effectively track energy usage at all City facilities and implement energy conservation programs,
 - 6.1.3 Requiring all managers to provide an annual accounting of energy use at their facilities similar to the annual fiscal accounting they currently provide,
 - 6.1.4 The implementation of procurement policies that favour energy-efficient technologies, products and services,
 - 6.1.5 Implementing the use of new and emerging technology where possible and practical,
 - 6.1.6 Directing additional resources to the maintenance of building envelopes and processes that directly affect energy efficiency.

- 6.2 With the implementation of the ECDMP, all City Departments will have a clear mandate to ensure that energy management is a consideration in all operations and facility-based decisions. The integration of processes, infrastructure improvements and staff awareness is critical to move the City towards the goal of reducing energy use and GHG emissions.

7.0 Energy Management

- 7.1 Energy management falls within the mandate of the Operations Department, reporting to City Council through the Operations Advisory Committee. Facility maintenance is also a function of the Operations Department while responsibility for the day to day management of the individual facilities falls to a variety of managers within the Operations Department and without. Cost containment is a mandate of the Financial Services Department reporting to City Council through the Finance Committee.

8.0 Energy Use Tracking

- 8.1 The City has made some effort to track energy use and associated costs. There are approximately 91 electricity accounts and 33 natural gas accounts. The number of accounts varies as accounts are opened and closed and current issues with the Hydro One billing system make an accurate count difficult.
- 8.2 Energy invoices are paid by the Accounts Payable department and costs allocated to the various departments and facilities. There is currently no requirement for individual managers to track the energy use at their facilities or operations. Centralized tabulation of all 124 accounts was begun in 2008 by the Environmental Division but lapsed with staffing reductions in 2011. The 38 electricity and 24 natural gas accounts for facilities with mandatory reporting under the Green Energy Act are now being tracked by the Environmental Superintendent.
- 8.3 It is recommended that the City implement a requirement for all managers to track and account for the energy used in each of their operations or facilities. This data can then be forwarded to the Environmental Superintendent to develop an overall energy use profile for the City.

9.0 Current energy use and GHG production

City of Owen Sound
Energy Consumption and GHG Emissions for those Facilities reporting
under Regulation 397/11

Year to Year *

YEAR	ENERGY eMWh's	COST \$	GHG CO2e/TONNES
2011	17,656.9	\$1,444,818.00	2,309.8
2012	19,737.6	\$1,684,548.00	2,546.8

*Includes Streetlights and the Library for both 2011 and 2012.

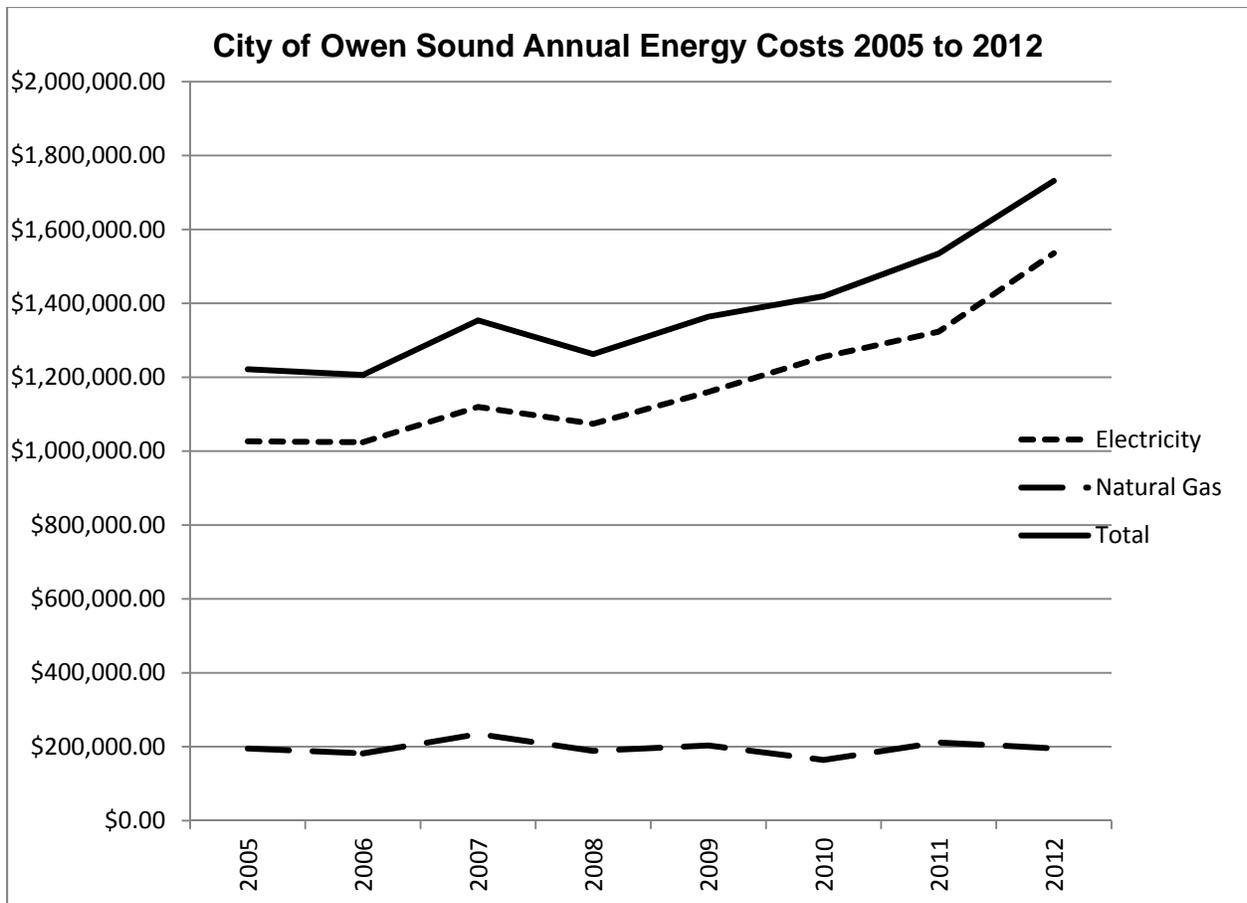
- 9.1 The energy use and reduction targets in the ECDMP are based on the facility types and locations reported to the Ministry of Energy under the Green Energy Act. The City began voluntarily including the main streetlight account in the Ministry of Energy reports beginning with the 2012 reporting year. Including streetlights, these 38 accounts consume most of the electricity used by the City. There are however approximately 53 small Hydro One accounts that are not included in this exercise due to limitations in time and staff. These include many small streetlight accounts and other outdoor activities not included in the Regulation 397/11 reporting requirements.
- 9.2 The total annual energy consumption for the 38 municipal operations reported under Regulation 397/11 was 19,737 eMWh in 2012 at a cost of \$1,685,000 and GHG emission of 2,546 tonnes/year eCO₂. Energy use increased significantly from 2011 to 2012 mostly due to the opening of the JMRRC with two ice pads and two swimming pools. Staff anticipate a further increase in energy use for 2013 which will be the first full year of operation for the JMRRC. This may make it more difficult to meet the 10% energy reduction target over five years. Tables of 2011 and 2012 energy use are attached to this report.

10.0 Energy Conservation vs. Demand Management

- 10.1 Electricity generators, distributors and the Province are concerned not just about the amount of electricity that municipalities use but also the rate at which they use it. The higher the rate of use or demand, the higher the generation and distribution capacity that must be readily available. For this reason Regulation 397/11 requires that municipalities reduce both their electricity use and their electricity demand.
- 10.2 Facilities that use large amounts of electricity are charged both for the volume of electricity they use and the peak monthly demand. The Kilowatt (kW) or Kilovolt Ampere (kVA) demand is used to calculate the Delivery Charges for demand customers. The number of kW's or kVA's are multiplied by \$14.58 (2014 figure supplied by Hydro One) to determine the delivery charge. Every additional kW in demand therefore adds \$14.58 to the monthly electricity bill. For example in 2012 the Bayshore CC had an average monthly demand of 321 kVA and a peak monthly demand of 409 kVA in March-April 2012.
- 10.3 Electric motors that drive pumps for cooling systems such as the ice-making plant at the Bayshore CC or moving water at the Water Treatment Plant and Sewage Treatment Plant often drive up the peak demand as they are started up. Ways to minimize the peak demand are to install devices that 'soft-start' the pump motors or to phase in the start-up cycles of multiple pumps over a longer period of time. Many of these soft-start devices are already in use in City facilities.

11.0 Energy Costs

- 11.1 The table below illustrates the dramatic increase in City energy costs from 2005 to 2012, driven mostly by increased electricity use and cost. These figures include the 1.76% HST paid by municipalities.
- 11.2 The City paid \$1,221,600 in energy costs in 2005 and \$1,731,500 in 2012 an increase of \$509,900 which represents a 41.7% increase over 2005 costs. The 2012 costs exclude the electricity and natural gas costs attributed to the YMCA portion of the JMRRRC. The costs for 2013 were not included as staff are not able to provide reliable numbers due to ongoing Hydro One billing issues.



11.3 As energy costs are estimated to continue their upwards trend in the future any energy savings realized today will pay back far more down the road.

11.4 One of the greatest challenges faced by Owen Sound and many other municipalities is finding the funds to invest in energy conservation measures. However as illustrated by the graph of energy costs from 2005 to 2012 the City has little choice but to either pay now or pay more later.

12.0 Energy Upgrades and Audits Conducted to Date

12.1 Harry Lumley Bayshore Community Centre

- 12.1.1 The City hired Agviro Incorporated of Guelph, Ontario to conduct an energy audit of the Harry Lumley Bayshore Community Centre in 2008 and the completed report was presented in May 2009. The report contained a number of recommendations and included implementation cost estimates as well as estimates of energy savings and cost savings for each recommendation where possible. Some of the notable recommendations were:
- 12.1.2 Install a desuperheater to recover waste heat from the refrigeration plant to preheat the water used by the space-heating boilers.
- 12.1.3 Replace the aging space-heating boiler with a pair of high efficiency condensing boilers. Both the desuperheater and condensing boilers were installed in 2010-2011 with some of the cost covered by grants from Union Gas.
- 12.1.4 Install doors to separate the east and west lobby stairs from the arena area. Warm air in the lobby rises up the staircases and warms up the air in the arena requiring additional energy to maintain the ice surface. This has not yet been implemented.
- 12.1.5 Reduce the number of pop machines which each consume an estimated \$400 of electricity per year. At the very least the energy cost should be included in the negotiations with the supplier if this is not already the case.
- 12.1.6 Other upgrades have also been made at the Bayshore CC; The incandescent scoreboard has since been replaced with an LED scoreboard and the cooling system for the compressors upgraded to glycol from water. Fluorescent fixtures are being replaced with more efficient ones as budget permits.

12.2 Billy Bishop Home & Museum and Tourism Office

- 12.2.1 The City contracted I.B. Storey of Maryhill, Ontario to conduct energy audits of both the Billy Bishop Museum and the Tourism Office in 2010.

- 12.2.2 Recommendations for the Tourism Office included the replacement of the old boiler with an energy efficient one, replacing individual radiator controls with room thermostats and using the new boiler to heat the domestic hot water. No energy upgrades have been completed as it was not clear that the City would be retaining this building.
- 12.2.3 Recommendations for the Billy Bishop Home and Museum included sealing the unused fire places, replacing leaky windows, installing a setback thermostat and ventilation controls. The fireplaces were subsequently sealed and a setback thermostat installed. Some of the attic windows were replaced but the other windows cannot be replaced due to the heritage designation.

12.3 Richard Neath Water Treatment Plant

- 12.3.1 The City hired VIP Energy Services of Waterloo, Ontario to conduct an energy audit of the Richard Neath Water Treatment Plant in 2010, with the final report being submitted in March 2011.
- 12.3.2 The most significant recommendation was to convert WTP heating system from electricity to natural gas. This not strictly speaking an energy conservation measure as it involves a change of fuel but it will result in considerable cost savings. The conversion will also save energy as older electrical heaters are replaced by more efficient natural gas heaters. This changeover was completed in March 2014.
- 12.3.3 The consultant also recommended the installation of Variable Frequency Drives (VFD's) on major pumps in the plant where these were not already in use. A new VFD was installed on the Lowlift pump in March 2014. Installation of VFD's on the municipal pumps is still outstanding.
- 12.3.4 Also recommended were several upgrades to the building envelope such as replacing some windows and doors. These recommendations have yet to be implemented.

12.4 Murray McDonald Public Works & Engineering Facility

- 12.4.1 The City had a subsidized energy audit of the Public Works building conducted by the Local Authority Services (LAS) branch of the Association of Municipalities of Ontario (AMO) in 2012. Recommendations included replacing Metal Halide lighting in the garage area with banks of T5 fluorescent lamps, lowering the temperature in the four-wall storage building and put a locking cover over the thermostat, installing setback thermostats in all office areas and insulating the Domestic Hot Water piping. None of the recommendations have been implemented to date.

12.5 City Hall

- 12.5.1 LAS also conducted a subsidized energy audit of City Hall in late 2012 at no cost to the City. Recommendations of that audit included replacing the boiler with a more efficient condensing boiler, preheating ventilation make-up air, replacing the chiller and insulating the overhang around the edge of the roof. It also recommends replacing the windows but acknowledges that this would be costly and would depend on the future plans for the building.
- 12.5.2 It also recommended that staff look at installing a vestibule or an air curtain for the back doors to prevent the loss of heated air every time the doors are opened in the winter. None of these recommendations have been implemented to date, in part due to the uncertainty about the future of the building.
- 12.5.3 The Council Chambers was upgraded to LED lighting with the ceiling replacement and subsequent remodeling in 2013.

13.0 Past and Current Initiatives

13.1 Traffic Light Conversion to LED Lamps

- 13.1.1 All City traffic lights were converted from incandescent lamps to LED's in 2006. This saves the City 260,000 kWh of electricity a year at an average cost of approximately \$0.12/kWh since 2006 for an annual savings of \$31,200. The capital cost of this initiative was \$135,000 in 2006 providing a payback period of just over four years.

13.2 Hydro One Lighting Blitz

- 13.2.1 The City participated in the 2009 Hydro One Power Savings Blitz – replacing T12 fluorescent lamps with more efficient T8 lamps and electronic ballasts in thirteen City buildings including City Hall, the Fire Hall and Airport. Hydro One contributed 24% of the overall cost of this program.

13.3 Street Light Conversion to LED Technology

- 13.3.1 The City is embarking on a wholesale conversion of the City streetlights to LED fixtures through LAS and RealTerm Energy. All of the City streetlights will be converted to LED's with the exception of the downtown decorative fixtures as the replacement cost of those fixtures is too high relative to the cost savings.
- 13.3.2 The cost of the streetlight conversion is estimated \$1.23 million (pending a detailed inventory of streetlights) and is projected to save \$250,000 a year in energy costs and reduced maintenance for a payback period of approximately five years. The project will reduce GHG emissions by and estimated 115.7 tonnes per year and provide the City with more reliable streetlights.

14.0 Renewable Energy Development

14.1 Existing Ground Mount Solar Installations

- 14.1.1 The City of Owen Sound installed two 10 kW ground mount photovoltaic solar panels arrays in 2011. These were purchased as turn-key installations from Essex Energy and LAS. The installations feed energy into the Hydro One distribution network and the City receives monthly cheques under the Ontario Power Authority (OPA) MicroFIT program.

- 14.1.2 One installation is located at the Kiwanis Soccer Complex and the second at the Owen Sound Public Works facility. These panels are on racking that is manually adjusted twice per year to allow the panels to face the sun's track across the sky. The panels are producing all the energy promised by the proponent and have an estimated payback period of just less than 10 years.

14.2 Potential MicroFIT Solar Installations

- 14.2.1 The City issued an RFP in 2013 for two more ground mount solar installations but ran into difficulty finding suitable locations that did not conflict with OPA rules. The City is presently negotiating with the selected contractor to install a solar array at the East Hill Booster Station on 8th Avenue East. Depending on the outcome of the Provincial election the OPA may not be offering further MicroFIT contracts and the City will have to review the options for installing new solar capacity.
- 14.2.2 The City issued an RFP in 2014 to install 10 kW MicroFIT solar panel installations on the roof of the Animal Shelter and the Greenwood Cemetery workshop. The City received five submissions that met the RFP requirements and these are currently under review. This contract will not be awarded unless the MicroFIT program remains in place.

14.3 Potential FIT Projects

- 14.3.1 200 kW Bayshore CC Rooftop Photovoltaic Project
 - 14.3.1.1 The City signed a contract with Horizon Energy to lease the roof of the Bayshore CC for a 20-year period to install a 200 kW solar generating facility. Horizon Energy was not awarded an OPA contract under the FIT 2.0 offering and the City is currently awaiting word if they will be offered a contract under FIT 3.0. The continuation of the OPA Solar FIT program may also be decided by the June 2014 Provincial election.
- 14.3.2 250 to 500 kW Ground Mount Photovoltaic Projects

- 14.3.2.1 The City has contracts with Biidaske Corporation to lease up to six City properties for the installation of 250 to 500 kW ground mount solar generating facilities. These projects are also pending the award of OPA generation contracts.

15.0 Energy Management Going Forward

15.1 Responsibility

- 15.1.1 The administration and implementation of this plan will be responsibility of the Environmental Superintendent reporting to Director of Operations and the Operations Advisory Committee.

15.2 How will the City Reduce Energy Use?

- 15.2.1 Energy conservation measures generally fall into two categories; firstly employing more efficient technology or new energy controls and secondly encouraging behavioural change in the energy user.

15.2.2 Technology Upgrades and Add-ons

- 15.2.2.1 The first category involves introducing new technology to facilities and operations that still achieve the purpose of the energy use (for instance providing appropriate lighting) while using less energy than the technology that it replaces. Replacing high pressure sodium streetlights with LED streetlights is a good example of this. Another way to reduce energy use is to replace energy controls with more efficient options. An example would be installing motion sensors to replace conventional light switches in areas that are infrequently occupied.
- 15.2.2.2 Installing Variable Frequency Drives for pumps and motors also reduces energy use without sacrificing the delivery of the services. VFD's vary the motor speed according to demand.
- 15.2.2.3 Technological changes generally have a greater initial cost but also have a better track record of achieving the objective of long-term reductions in energy use.

15.2.2.4 Another component of an energy management program is the re-commissioning of facilities. System controls can fall out of sync with each other over time and reduce efficiency or even create energy-wasting conflicts. Mechanical distribution or building controls instrumentation is sometimes over-looked when renovations take place. Re-commissioning a building involves examining the original mechanical design and operating specification against any building renovations and recalibrates the settings to suit today's energy efficient standards. It also ensures that mechanical operating practices are current and appropriate to maximize building system efficiencies.

15.2.3 Changing Behaviour

15.2.3.1 The second energy conservation approach involves encouraging the energy user (whether staff or the public) to change behaviours that waste energy, such as leaving the lights on when they leave a room or turning up the heat in an entire building rather than putting on a sweater.

15.2.3.2 While behavioural changes may be promoted at relatively little cost compared to technological upgrades, it is notoriously difficult to convince people to change habits that do not result in an immediate and obvious benefit to the individual. Even after some initial gains are made people tend to revert back to their old habits unless continually motivated.

15.2.3.3 An integrated approach is recommended that involves both technological upgrades as well as an effort to create a culture of energy conservation within the City.

15.2.3.4 The methodology for conserving energy can be summed up as follows:

- Implement outstanding recommendations from past energy audits,
- Conduct new energy audits and act on their recommendations in a timely manner,
- Make managers responsible for the energy use in their facilities and operations,
- Put a greater emphasis on the facets of facility maintenance that affect energy usage,
- Make a greater effort to educate staff on how to conserve energy and reduce peak demand.

15.2.4 How will the City Reduce Peak Demand?

- 15.2.4.1 Peak demand may be reduced by installing soft-start controls on any pumps and motors that do not already have them installed. Reducing peak demand, also called peak shaving can often be accomplished by revising operational practices to limit demand. Pumps and motors without soft-start controls will usually pull the most power right at start-up. Peak demand can be reduced by phasing pump start-up in multi-pump operations such as the ice plant at the Bayshore.
- 15.2.4.2 Peak demand can also be reduced by timing operations to avoid running multiple systems at once. For example the ice plant at the Bayshore is generally started in August to create ice for preseason tryout and skills camps. Starting the ice plant in the evening when there is less demand from the air conditioning units would help to limit peak demand.
- 15.2.4.3 Another example would be to backwash the filters at the Water Treatment Plant when there is less demand on the pumps supplying drinking water.

15.2.5 Demand Response Programs:

- 15.2.5.1 There are many companies that will offer the City an annual or monthly payment for the promise to reduce a fixed amount of electricity from large energy consumers whenever the Provincial electrical distribution operator declares a peak demand event. These usually coincide with high air conditioning demand on hot, humid summer days. The JMRRC may be able to accommodate such an energy reduction without sacrificing user comfort or functionality. This initiative should be investigated further.

15.3 Specific Projects to Pursue

15.3.1 City Hall

- 15.3.1.1 If the building is to be retained then the City should hire an energy consultant to evaluate the recommendations from the LAS preliminary energy audit and put cost and savings estimates to the recommended upgrades. It is estimated that producing such a report would cost between \$2,000 and \$4,000.

15.3.2 Harry Lumley Bayshore Community Centre

- 15.3.2.1 The City should investigate the cost and potential energy savings of retrofitting the lobby or upper concourse to prevent warm lobby air from entering the arena. This may take the form of physical doors or air curtains.
- 15.3.2.3 The contract for refreshment machines should be reviewed and the cost for energy controls included in the next contract.
- 15.3.2.3 An operational review should be conducted to investigate the opportunity for reducing peak electricity demand.

15.3.3 Tourism Office

- 15.3.3.1 The City should investigate upgrading the boiler and temperature controls at the building and use the new boiler to supply domestic hot water. This was estimated to cost approximately \$22,000 in 2010 and save \$1,600 per year for a payback period of 13.75 years.

15.3.4 Public Works

- 15.3.4.1 The City should obtain prices for replacing the Metal Halide bay lights with banks of T5 fluorescent lamps. Set back thermostats should be installed in those areas that do not already have them and the thermostat in the storage building should be set and a locking cover put in place.

15.3.5 Further Energy Audits

- 15.3.5.1 The Sewage Treatment Plant is not considered a candidate for an energy audit as it is being upgraded to secondary treatment and much of the equipment will be replaced during this process. Energy efficiency is one of the factors being considered in the new equipment recommendations.
- 15.3.5.2 The Police Services building is a large user of energy and would benefit from a detailed energy audit. Other facilities to be considered for future energy audits include Fire Services, the Library and the Tom Thomson Art Gallery.

15.3.6 Monitoring and Reporting

- 15.3.6.1 Regular monitoring and reporting will be conducted to track consumption and dollar savings and/or avoidance as the result of implemented initiatives.
- 15.3.6.2 The Environmental Superintendent will be responsible for providing an annual progress report with energy consumption data and initiatives undertaken within the calendar year through the Operations Advisory Committee to Council.
- 15.3.6.3 Achieving all the objectives of the ECDMP will either require additional staff in the Environmental Division or having energy management tasks delegated to staff in each department. These tasks would include energy tracking, energy auditing and the implementation of recommendations.