

Regional Municipality of Niagara Energy Conservation & Demand Management Plan

2014 to 2018



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1 EXECUTIVE SUMMARY

The Ontario Provincial Government has committed to help public agencies better understand and manage their energy consumption. As part of this commitment, **Ontario Regulation 397/11** under the **Green Energy Act 2009** requires public agencies, including municipalities, municipal service boards, school boards, universities, colleges and hospitals to report on their energy consumption and greenhouse gas (GHG) emissions annually beginning in 2013, and to develop and implement Energy Conservation and Demand Management (ECDM) Plans starting in 2014.

The purpose of the Niagara Region Energy Conservation and Demand Management (ECDM) Plan is to develop a framework for the Regional Municipality of Niagara to understand the historical impact of its operations on GHG emissions, and to take action by setting GHG reduction targets. The main objectives of this report are:

- the development of an Energy Conservation and Demand Management Plan that addressed the facets of energy consumption in the community, for both corporate and community based assets. This included the development of a GHG emissions inventory, benchmarking the Niagara Region's existing energy intensity performance relative to other jurisdictions;
- identifying potential energy efficiency projects, and establishing an energy consumption reduction target. This strategic approach to energy management ("Energy Conservation and Demand Management Plan") supports the Niagara Region Council Business Plan 2012-2015¹.

Energy efficiency and the wise use of energy are two of the lowest cost options for meeting energy demands, while providing many other environmental, economic and social benefits, including reducing



GHG emissions, cost avoidance and savings. Along with the aforementioned benefits, energy efficiencies and the wise use of energy also promote local economic development opportunities, energy system reliability, improved energy supply security, and reduced price volatility.

There are a variety of low cost/no cost initiatives available to the Niagara Region, which can jump-start energy consumption and dollar savings. Simple actions such as turning lights and appliances off, shutting off heaters in the summer, establishing efficient usage times, efficient production requirements, and many other actions can result in energy savings. Such actions, along with energy efficient capital and operating process improvements and project implementation, are key components

¹ http://www.niagararegion.ca/government/council/cbp.aspx

that are outlined within the ECDM Plan.

This ECDM Plan is the culmination of a non-linear process involving:

- Establishing baseline performance measures,
- Setting future performance goals and objectives based on past practices,
- Continuous improvement through identification of energy conservation potential,
- Strategic alignment of measure implementation and fiscal constraints, and
- Evaluation, measurement and communication of results achieved.

This ECDM Plan contains three perspectives: historical, current and future. It looks at "what we have done", "what we are doing", and "what are we planning to do".

The main purpose of this plan is to develop an implementation strategy to allow Niagara Region to meet its conservation target of reducing its 2011 energy consumption by 5% by the end of 2019





To ensure that this goal is met, a structured Measurement and Verification Protocol will be established to allow for year-over-year comparisons for all Regional facilities. This consistent measurement and reporting ensures that savings targets for individual facilities are met and maintained and that energy conservation projects provide the energy savings expected at the time of implementation. The reductions in energy use in facilities will also serve to support Regional initiatives to meet its GHG emissions reduction goals as identified in the Corporate Climate Change Action Plan.

2 KEY COMPONENTS

The Big Picture

Sustainability is a concept that meets the needs of the present without compromising the ability of future generations to meet their own needs. This is sometimes referred to as the "triple bottom line".

- <u>Environmental Sustainability</u>: Managing the effects of human activity so that it does not permanently harm the natural environment.
- <u>Economic Sustainability:</u> Managing the financial transactions associated with human activities so that they can be sustained over the long term without incurring unacceptable human hardship.
- <u>Social/Cultural Sustainability:</u> Allowing human activity to proceed in such a way that social relationships between people and the many different cultures around the world are not adversely affected or irreversibly degraded.

An Energy Conservation and Demand Management Plan is the sum of measures planned and carried out to achieve the objective of using the minimal possible energy while maintaining comfort levels (in offices or dwellings) and production rates (in factories). It can be applied to any process or building where energy use is required. To make an efficient use of the energy and, as a consequence, to save it, the actions are focused on:

- Energy Conservation,
- Energy Recovery,
- Energy Substitution,
- Corporate Goals and Objectives, and
- Corporate Fiscal Management.

Energy Conservation and Demand Management Plans also provide the framework to allow for good financial planning related to capital projects within the Region's facilities.

Analysis and Benchmarking

It is important to recognize the value of benchmarking and comparison as a starting point. By examining Niagara Region's current energy consumption patterns and comparing them with others, a better understanding of the opportunities and the pitfalls of energy conservation and sustainability planning as experienced by other public agencies is gained. This exposure, combined with the information gleaned from the energy audits, will allow



Niagara Region to focus on strategies that have been proven successful elsewhere and can be tailored to the unique nature of the Niagara Region.

It is apparent that energy conservation is being considered and implemented in most Public Sectors across Ontario and Canada. While the Ontario government, in particular, has set guidelines for what they consider a 'Green' community to be, there are still opportunities for the Niagara Region to mold these definitions into a strategy to achieve a viable ECDM Plan. As well, the insights gained through their experiences with energy conservation can be used as a springboard to further the Niagara Region's sustainability strategies to encompass both operational and policy improvements. Many public agencies are taking their understanding of environmental issues and conservation beyond energy consumption and recycling, by addressing the more complex issues of water management, heat island effect, and light pollution, to name a few.

Regulatory Requirements

Under Ontario Regulation 397/11 (Part of the Green Energy Act, 2009), all public sector agencies must now comply with mandatory reporting requirements. All energy consumption at Niagara Region facilities was recorded and submitted to the Ministry annually beginning in 2013. In 2014, reporting requirements are more stringent to encompass measures taken to date with results, as well as a fiveyear plan, all of which are incorporated into this ECDM Plan. Niagara Region is well positioned to meet this requirement as audits have been completed at some facilities, resulting in a compiled list of energy reduction projects, some of which are already implemented. The full list is reviewed throughout this plan while the implementation program is outlined later in this report. This is meant to serve as Niagara Region's ECDM Plan and will assist Niagara Region to meet mandated reporting requirements.

Key Factors and Constraints

Internationally, corporations are beginning to embrace the notion that the earth's environment and precious resources need to be conserved. However, the necessary changes will not happen overnight. To be successful, a comprehensive energy management plan should embrace long-term thinking, taking advantage of "low hanging fruit" to achieve immediate cost savings which will be redirected to more complex projects involving higher initial costs with larger net benefits. Niagara Region has embraced this philosophy and has been involved in such a process for over 7 years.

Public agencies should realize that each of their circumstances is unique and may not lend themselves to 'boiler plate' solutions used in many private sector segments. Those who have met their goals have utilized the advantages of the unique physical and non-physical attributes of their facilities, including green power generation on large flat roofs and community gardens on their large properties. While it is

easy to be focused on the larger solutions, even seemingly small efforts can make a major long-term impact on the overall goal.

Ongoing professional development is also a key factor in the success of a ECDM Plan to ensure that staff members understand their role in the greater goal. The ECDM Plan and accompanying education should be a required part of their daily activities. A good example of this is energy awareness training that encourages staff to take simple and effective actions such as turning off lights and computers when not in use.

While realities of budget restrictions are an important consideration in any planning activity, it is possible to achieve energy savings while adhering to the financial constraints of a publicly funded system. As municipalities are generally the closest entities to the constituents, it is important to be viewed as a leader in energy conservation while ensuring that financial responsibility remains an important part of any implementation program. It is clear that new technology and ideology changes have produced continued operational cost reductions while improving indoor comfort and environmental sustainability. These cost saving projects can often fund themselves by avoiding the use of previously allocated funds. As long as the savings are reinvested, these improvements can continue for the foreseeable future, ensuring a sustainable process. Many industries have had environmental programs running for over a decade and continue to hit their intensity reduction goals without sacrificing product quality.

3 HISTORICAL ENERGY MANAGEMENT

Historically, Niagara Region has addressed energy conservation and demand management on a projectby-project or divisional basis. Capital projects were implemented based on equipment's expected useful life or in response to equipment emergency breakdowns. Utility savings, realized as a result of the implementation of these individual projects, have not historically been uniquely reported, but have been considered as a component of general operations. Thus, they have been reported through utility expenses in the Accounting System. In 2008, the Niagara Region created a dedicated energy management section that still exists, providing support to all internal departments and some of its agencies, boards and commissions. Sustainability and long-term energy reduction goals, through this ECDM Plan, will become integral components of the business reporting system.

Utility costs were viewed as a fixed overhead cost. The management of these costs relied on an exception-based investigation approach. In other words, utility costs were only reviewed if a utility bill was much higher, or lower, than typical.

In 2012, Niagara Region embarked upon a strategic energy-auditing project. The purpose of the audits was to identify and analyze potential energy conservation and demand management opportunities. These efforts have been instrumental in assisting Niagara Region in aligning the ECDM Plan with the *Niagara Region Council Business Plan 2012-2015.* A summary of the projects implemented in 2011 and 2012 is found in Appendix C, Figures 1, 2 and 3.

4 CURRENT STATE OF CORPORATE ENERGY

Energy Data Management

While Niagara Region has been tracking its energy consumption, the Ontario government has required an increase in Niagara Region's energy management practices. This has resulted in the need to enhance current practices and develop new approaches. To meet this need, Niagara Region has implemented a comprehensive program for collecting and analyzing monthly energy billing information, and ensuring staff is informed about energy consumption. This effort will produce an energy costs and consumption database that will be used for monitoring excessive variations, targeting facility follow-up evaluations, and highlighting areas that could be candidates for improved conservation. These monitoring enhancements will improve Niagara Region's understanding of the bottom line impact of energy management.

Energy Supply Management

Niagara Region has currently adopted a strategy of procuring its electricity from eight hydro Local Distribution Companies (LDC's). The Niagara Region has purchases its natural gas through Enbridge.

The Region has chosen to contract its propane through a local propane provider. This strategy is reviewed annually during the budgeting process.

Energy Use in Facilities

Niagara Region staff members have retained a great deal of data with regard to their facility's energy use. This data has been enhanced by a series of comprehensive audits completed at Niagara Region's facilities. Through the deployment of several energy management software strategies, Niagara Region staff is equipped with the information necessary to make effective energy management decisions. This will make it possible to implement an effective energy procurement process, pursue appropriate capital projects, and implement successful conservation and demand management programs.

Major energy users: Tactics to conserve energy

Water and Wastewater Treatment Plants (W&WW TP) are Niagara Region's major energy consumers due to the energy intensive type of operations they perform. From the total Niagara Region's annual utility budget, W&WW TP consume approximately 45% of the energy budget which includes electricity, natural gas, water and vehicle fuel costs.

An energy efficiency committee was instituted at W&WW TP division in order to research and put in practice feasible energy conservation measures to increase efficiency in operations and equipment. W&WW division's energy efficiency committee has been an active player in the implementation of projects focused on modern technologies that contribute to reduce our carbon footprint and dependency on fossil fuels.

Some feasibility studies focused on operation efficiency combined with energy savings have been made like the one performed to evaluate the installation of micro-turbines for power generation at Welland Water Treatment Plant. Unfortunately, the return on investment didn't support its approval at that time, but it could be re-evaluated under present conditions. In other cases, government grants and incentives have been obtained reducing payback on the investment.

Below is a chart showing a list of representative projects implemented at W&WW TP during the last seven years:

Projects	Service Territory	Арр Туре	Incentive	kw Savings
Niagara Region - Seaway Wastewater	Port Colborne	Custom-NON LIGHTING	\$88,451.76	110.57
Niagara Region - Port Colborne Water	Port Colborne	Prescriptive	\$8,385.98	10.012
Niagara Region - Fort Erie Water	Fort Erie	Custom-LIGHTING	\$2,960.00	
Niagara Region - Fort Erie Water	Fort Erie	Prescriptive	\$14,647.00	19.272
Niagara Region - Crystal Beach Wastewater	Fort Erie	Custom-LIGHTING	\$3,040.00	
Niagara Region - Crystal Beach Wastewater	Fort Erie	Prescriptive	\$12,684.00	24.103
Niagara Region-FE Wastewater	Fort Erie	Prescriptive	\$12,695.00	15.571
Niagara Region-FE Wastewater	Fort Erie	Custom-Lighting	\$1,520.00	3.8

A chart showing the 2014 Water and Waste Water energy conservation work plan is show in Appendix C, Figure 4.

Niagara Regional Housing (NRH) is identified as another big player in this scenario operating with 22% of the Niagara Region's annual utility budget.

Projects with energy conservation goals have been executed in this area in the past years:

Projects	Service Territory	Application Type	 ncentive
Gilmore Lodge	Fort Erie	Lighting	\$ 1,498.00
Niagara Regional Housing (Bowden Street)	Fort Erie	Lighting	\$ 334.00
Niagara Regional Housing (Idylewylde Street)	Fort Erie	Lighting	\$ 280.00
Niagara Regional Housing (Albany Street)	Fort Erie	Lighting	\$ 1,252.00
Niagara Regional Housing (557 Steele Street)	Port Colborne	Lighting	\$ 1,046.00
Niagara Regional Housing (561 Steele Street)	Port Colborne	Lighting	\$ 1,034.00

Energy conservation projects at Long Term Care Homes (LTCH) include:

Seniors Services (Northland Pointe) invested significant capital in 2010 in solar thermal and installed 21 hydronic solar panels to preheat the home's domestic hot water. This has reduced the energy demand for producing hot water and in turn has reduced the facility's carbon footprint.

- \$8.6 M for the redevelopment of Deer Park Villa, a 39 bed LTCH. The project was a multi-phased redevelopment project that included new construction and renovation of the facility to a LEED Silver facility.
- Scheduled \$4.7 M project budget for the replacement of the building envelope at Northland Pointe, project includes existing window replacement by energy efficient ones.
- Scheduled \$90K project budget for BAS upgrades at Rapelje Lodge.
- Scheduled \$56K project budget for building condition assessment and energy audits at 8 LTCH.

Transportation & Roads

Currently the Region owns very little roadway lighting and as such, power consumption for this lighting is low in our conservation management program. However, the plan is to expand our management of lighting on Region's roads in the next five to ten years.

At present, we are evaluating alternate technologies to the standard High Pressure Sodium street lighting fixture. We have purchased and installed over 500 LED roadway lighting fixtures. Significant power savings can be realized utilizing LED technology for roadway lighting. Additionally, we are reviewing the latest technology in remote roadway lighting management systems, which boast even further power savings.

Projects	Service Territory	Application Type	Incentive	kW Savings	Completion Date
42 Dolphin Street	Port Colborne	Energy Audit	\$ 706.00		Dec-12
369 Gorham Road	Fort Erie	Energy Audit	\$ 336.00		Dec-12
43 Hagey Avenue	Fort Erie	Energy Audit	\$ 621.00		Dec-12
487 Northland Avenue	Port Colborne	Energy Audit	\$ 377.00		Dec-12
94 Catherine Street	Fort Erie	Energy Audit	\$ 409.00		Dec-12
1200 Thompson Road	Fort Erie	Energy Audit	\$ 592.00		Dec-12
501 Fielden Avenue	Port Colborne	Energy Audit	\$ 526.00		Dec-12
Niagara Regional Police	Port Colborne	Lighting	\$ 1,679.00	4.72	May-13
Niagara Region Seaway Water (30 Prosperity)	Port Colborne	Lighting	\$ 3,182.40	7.96	Jun-13
Niagara Region HQ Chiller optimization	Thorold	Energy performance analysis	\$ 14,968.00	10.00	Sep-14

Other energy conservation projects region wide:

Equipment Efficiency



Niagara Region has pursued many measures to improve the energy efficiency of our equipment. Some of these measures include:

- Building envelope improvements,
- Electrical systems upgrade, and
 Heating, Ventilation and Air Conditioning
 (HVAC) equipment retrofits,
- The pursuit of the feasibility of solar thermal and solar photovoltaic applications.

As the understanding of corporate energy consumption improves, Niagara Region staff will be equipped with the knowledge necessary to make informed decisions. This improved understanding will also reveal how simple actions like commissioning and maintenance procedures can improve existing equipment efficiencies.

Organizational Integration

Day to day management of energy is primarily the responsibility of the managers and administrators on site; the Niagara Region Manager of Energy Management provides strategic plans to achieve those goals at corporation level. Current practices will be enhanced with future plans including:

- The creation of an interdepartmental energy management team,
- Improved energy monitoring and feedback, and
- Interactive energy training and awareness.

Staff across all departments will be given the necessary tools to address corporate energy concerns such as budgeting, procurement, conservation, and generation.

Prior to the development of the ECDM Plan, VIP Energy Services Inc. assessed Niagara Region's energy management practices. This assessment was completed by consulting with Niagara Region staff and reviewing relevant Niagara Region material. Upon completion of this review, VIP determined that Niagara Region had provided staff members with strategic directive to pursue proper energy management, and through Niagara Region staff ingenuity, Niagara Region was able to direct resources to energy management. However, VIP also noted that if Niagara Region were to achieve the Ministry's mandate, it would require the development of this ECDM Plan that will address our energy management needs.

5 CURRENT ENERGY CONCERNS

Environmental, societal, and fiscal pressures accentuate the need for a ECDM Plan.

Environmental

Concerns surrounding energy consumption with regard to climate change and air pollution have been well documented. Since 1990, Ontario's greenhouse gas emissions have increased 14%. The Government of Ontario estimates that 75% of Ontario's greenhouse gas emissions are associated with the consumption of fossil fuels for energy purposes. Increased smog and air pollution are also connected to the consumption of energy. Ontario's electricity generation is the Province's second largest source of sulfur dioxide and the third largest source of nitrogen oxides. These pollutants can cause irreparable harm to human health.

Societal

The 2003 Blackout heightened societal concerns surrounding the stability and security of our energy supply. Energy has been imbedded into most societal practices. If energy consumption is not managed appropriately, the frequency of energy interruption and the subsequent societal disruption could potentially increase.

Fiscal

The fossil fuels traditionally used for the generation of energy are no longer financially accessible or environmentally acceptable. This has resulted in the promotion of renewable energy generation which comes with an additional expense. Energy costs are also anticipated to increase as Ontario's existing energy infrastructure is taken off-line or refurbished. Coming off of the lows of the 2009 recession, national electricity and natural gas prices are 27% and 21% greater than they were at the start of the decade. It is not anticipated that this upward trend will be altered in the short to medium future. The Province of Ontario has recently projected an annual 3.5% to 7.9% increase in electricity costs over the next 20 years. Natural gas commodity prices are expected rise as much as 40% in the near future.

In recent years, Niagara Region has experienced a modest population growth and is projected to grow into the future. As Niagara Region grows so will the Niagara Region environmental, societal, and fiscal energy concerns. Niagara Region recognizes that proper energy management must be pursued if these concerns are to be addressed.

Niagara Region Population by Municipality, 1996-2011

Municipality	1996	2001	2006	2011
Fort Erie	27,183	28,140	29,925	29,960
Grimsby	19,585	21,295	23,937	25,325
Lincoln	18,801	20,610	21,722	22,487
Niagara Falls	76,917	78,815	82,184	82,997
Niagara-on-the-Lake	13,238	13,840	14,587	15,400
Pelham	14,393	15,275	16,155	16,598
Port Colborne	18,451	18,450	18,599	18,424
St Catharines	130,926	129,170	131,989	131,400
Thorold	17,883	18,045	18,224	17,931
Wainfleet	6,253	6,260	6,601	6,356
Welland	48,411	48,405	50,331	50,631
West Lincoln	11,513	12,265	13,167	13,837
Totals	403,554	410,574	427,421	431,346

Statistics Canada does a population census every five years.

Source: 2011 Census

(Estimate as July 1st 2013)

Municipality	2013 Population
Fort Erie	30,933
Grimsby	26,147
Lincoln	23,217
Thorold	18,513
Pelham	17,137
West Lincoln	14,286
Wainfleet	6,562
St.Catharines	135,666
Niagara Falls	85,692
Welland	52,275
Port Colborne	19,022
NOTL	15,900
Niagara Region Total	445,351

6 SCOPE OF THE ECDM PLAN

The Niagara region is located in southern Ontario, Canada, between Lake Ontario and Lake Erie. Niagara has a total area of 1,852 km2 with an estimated population of 445,351. As a municipal government, the Niagara Region is made up of 31 representatives from the 12 area municipalities. A full list of Niagara Region's owned facilities is shown as Figure 5 in Appendix C.

7 ENERGY BASELINE AND CURRENT ENERGY PERFORMANCE

Effectively managing energy requires implementing appropriate energy monitoring procedures. The establishment of an accurate energy baseline is essential in this process. It will assist with energy conservation and greenhouse gas reduction target setting, energy procurement and budgeting, bill verification, energy awareness, and the selection and assessment of potential energy projects. Niagara Region, like many local governing bodies, relies on its utility bills to establish its energy baseline.

Niagara Region is well positioned to meet this requirement as audits have been completed at some facilities, resulting in a list of energy reduction projects, some of which are already implemented. Future energy audits will consist of a detailed analysis of historical consumption and demand information, as well as a walkthrough of the facility by a qualified energy auditor. Based on the auditor's survey, detailed equipment list and an energy consumption breakdown will be created as well as the identification of a comprehensive list of potential energy conservation measures for each facility.

BASELINE PERFORMANCE (2011)

Niagara Region has elected to utilize the consumption data from 2011 to represent its baseline energy consumption performance.

In 2011, Niagara Region's total energy use, including electricity, natural gas, fuel oil and propane was 104,613,274 equivalent kilowatt hours (ekWh). This total consisted of:

2011 Energy Breakdown					
Energy Source	Annual Consumption	ekWh			
Electricity	79,585,403 kWh	79,585,403			
Natural Gas	3,287,608 m ³	23,113,705			
Fuel Oil	97,360 Litres	1,034,720			
Propane	125,089 Litres	879,445			
	Total	104,613,274			

Annual Cost				
Description	2011			
Utilities - Electricity	\$10,737,837			
Remote-Utilities-Electricity	\$1,506,376			
Utilities - Natural Gas	\$3,050,192			
Remote-Utilities-Natural Gas	\$34,761			
Utilities - Fuel Oil	\$115,410			
Remote-Utilities-Fuel Oil	\$38,438			
Utilities - Propane	\$84,326			

* A full breakdown by facility is found as Figure 6 in Appendix C.

CURRENT PERFORMANCE (2012)

It is imperative to understand the energy characteristics of each facility. By understanding these values, baselines can be established and future retrofits and improvements to the buildings can be monitored and tracked to ensure that the intended benefits are fully realized. Niagara Region's most recent energy consumption inventory was completed in 2012. This inventory took into account the electricity and natural gas consumption of Niagara Region facilities, street lights, and parks.

In 2012, Niagara Region's total energy use, including electricity, natural gas, fuel oil and propane was 103,769,761 equivalent kilowatt hours (ekWh). This total consisted of:

2012 Energy Breakdown					
Energy Source	Annual Consumption	ekWh			
Electricity	69,846,487 kWh	69,846,487			
Natural Gas	3,088,876 m ³	32,827,885			
Fuel Oil	57,296 Litres	676,411			
Propane	59,594 Litres	418,978			
	Total	103,769,761			

Annual Cost				
Description	2012			
Utilities - Electricity	\$10,292,056			
Remote-Utilities-Electricity	\$1,276,571			
Utilities - Natural Gas	\$2,364,764			
Remote-Utilities-Natural Gas	\$32,781			
Utilities - Fuel Oil	\$57,374			
Remote-Utilities-Fuel Oil	\$26,955			
Utilities - Propane	\$66,362			

* A full breakdown by facility is found as Figure 7 in Appendix C.

In all, Niagara Region has decreased its energy use intensity from 2011 to 2012 indicating an improvement in energy utilization from 1.22 GJ/m² (31 ekWh/ft²) to 1.10 GJ/m² (28 ekWh/ft²), for facilities not related to the treatment of sewage or water.

BENCHMARKING

Market Sector

Energy Use Intensity (<i>e</i> kWh/ft ²)						
Sector Minimum Average Maximum No. of Organization						
Municipal	0.0	219	56,932	410		

Niagara Region's non-water/sewage treatment facilities have an average 28 ekWh/ft² energy use intensity, which is below the industry average based on the Ministry of Energy's 2011 Public Sector Energy Consumption Data. The water/sewage treatment facilities have an average energy use intensity of 2.39 GJ/Mega Litre.

Energy use intensity is defined as energy consumption per square foot of floor space within the facility (or per litre pumped/treated for water facilities). This measure allows for easier comparison amongst buildings of different sizes to ascertain which performs better. Energy use intensity is a generally accepted method for benchmarking and targeting energy performance improvements.

A full breakdown of the energy use intensity for all Region facilities is shown as Figure 8 in Appendix C.

8 GOALS AND OBJECTIVES

The ECDM Plan has been developed to address the fiscal, societal, and environmental costs and risks associated with energy consumption. Proper energy management will allow Niagara Region to display leadership, improve the delivery of services, and enhance the overall quality of life with respect to the community.

This ECDM Plan outlines key actions that must be pursued to make this vision a reality. The completion of these actions will assist Niagara Region to meet its energy conservation targets and its GHG emission reduction commitment. Achieving these goals will assist Niagara Region in securing a strong energy management reputation and will allow for cost savings that can benefit Niagara Region, its employees, and its constituents.

Recognizing conservation impacts everyone differently, this Plan was created to address energy related concerns, while capturing innovative and relevant actions that will lead to meaningful changes. It is acknowledged that, for this vision to come to fruition, energy management at Niagara Region must become an inclusive process. This includes the need to consult and collaborate with local municipalities and public sector agencies.



This ECDM Plan will allow energy management to be incorporated into all Niagara Region activities, including organizational and human resource procedures, procurement practices, financial management and investment decisions, and facility capital, operations, and maintenance.

Overview

This ECDM Plan is designed to meet the current energy needs and obligations of Niagara Region. The intent is to guide Niagara Region in the development of an energy management foundation. This will be a living plan that will evolve as Niagara Region's energy needs are revealed and better understood.

Niagara Region's approach to energy management is three pronged. It begins with the

- Elimination of waste,
- Improving efficiencies, and
- Optimizing energy supply.

Prior to pursuing these actions, Niagara Region must be aware of the facility and staff behaviours that influence energy consumption. Once encapsulated, this knowledge must be dispersed throughout the organization, allowing for the development of a culture of sustainability.

An improved understanding of corporate energy consumption will require improvements in energy management and awareness. Energy awareness campaigns will strive to make energy a tangible asset that staff members can appreciate when it is being consumed or wasted. In addition to increasing energy awareness, this energy Plan will integrate energy efficiency into the capital and operational decision making of the organization.

It is of critical importance to improve energy efficiency and reduce our operating costs. Equally important is displaying our commitment to the environment through the reduction of greenhouse gases, while improving our air quality. It is also important that these actions are carried out without adversely impacting Niagara Region's operations. All Niagara Region staff will have an essential role in the success of this energy management plan. It will be the responsibility of the energy management team to ensure that energy management measures are properly communicated and effectively implemented. An energy mandate for Niagara Region has been developed and is an integral component of this ECDM Plan.



As mentioned, the primary objective of this plan is to improve the management of Niagara Region's energy consumption. Part of this objective is setting a conservation target that will see a reduction of our 2011 energy consumption by 5% by the end of 2019. Recognizing that Niagara Region has a modest population growth so, our energy conservation target will be energy intensity based. It is also the objective of this plan to improve Niagara Region's understanding of energy consumption that is essential for the Region to meet its corporate energy management goals.

Measurements of Success

The measurements of success will be based on a variety of indicators:

- Meeting the requirements of Ontario Regulation 397/11 and the Green Energy Act
- Reaching the ECDM Plan's energy conservation target,
- Achieving with the corporate greenhouse gas reduction target,
- Attaining the savings outlined in the plan's budget section, and
- Embedding energy management in Niagara Region's capital and operational decision making process.

Reporting Standards

The ECDM Plan will allow for the monitoring and reporting that is necessary for Niagara Region to meet the regulatory requirements of the **Green Energy Act** and Niagara Region's greenhouse gas reduction targets². Regular energy monitoring and feedback to the Ministry and Niagara Region staff will improve knowledge and make energy consumption a tangible asset, making possible appropriate behavioural changes. The intent of monitoring and reporting on energy consumption is to make energy management transparent and the consumer accountable. The Ministry will be provided with annual updates on the state of energy management at Niagara Region. Energy consumption feedback provided to staff will be embedded in Niagara Region's regular business.

2

http://www.fcm.ca/Documents/reports/PCP/Niagara_Region_2006_Corporate_GHG_Emissions_Inventory_EN.pdf http://www.fcm.ca/Documents/reports/PCP/Niagara_region_community_inventory_EN.pdf http://www.fcm.ca/Documents/reports/PCP/Niagara_Region_Corporate_Climate_Change_Action_Plan_EN.pdf

http://www.fcm.ca/Documents/reports/PCP/Niagara_Region_Community_Climate_Change_Action_Plan_EN.pdf

9 ENERGY MANAGEMENT TEAM

Historically, Niagara Region addressed energy conservation and demand management on a project-byproject basis through the activities of the building services group. Strategic directives have been provided by the Regional Council.

Currently, under the direction of the Director of Properties Management the team is led by the Manager of Energy Management and a Project Manager, Buildings.

This ECDM Plan outlines a commitment to integrate energy conservation and demand management into the operations of the Niagara Region. Within the duration of the ECDM Plan, ECDM's planned activities will become an integral component of the annual budgeting process. A collaborative effort will be undertaken to achieve this integration, involving:

- Internal staff (which may include but will not be limited to Properties Management, Finance, Water & Wastewater Energy Efficiency Committee and Purchasing),
- Advisement from the Ministry of Energy, and
- Consultations with Energy Management experts.



10 FINANCIAL ASSESSMENT

The Energy Conservation and Demand Management Plan's financial assessment philosophy is to treat fiscal resources as if they were energy assets. Therefore, financial investments follow the same three-pronged approach used for the management of energy:

- Elimination of waste,
- Improving efficiencies, and
- Optimizing energy supply.

The initial cost and saving estimates for the proposed process improvements, program implementation, and projects are broken down as follows.

A list of opportunities, annual savings, project costs and payback for the inaugural year is still being developed and some of the target areas will include:

- Heating, ventilation and air conditioning (HVAC) equipment retrofits,
- Building envelope improvements,
- Electrical systems upgrade, and

• The feasibility of solar thermal and solar photovoltaic applications.

The Region is currently developing its energy conservation measure roster for the 2015-2018 fiscal periods. The ability of the Region to implement any planned energy conservation activities is dependent on available funding.

The fiscal assessment does not take into account the economic benefits of achieving all of the corporate energy management goals. Due to the difficulty in quantifying the economic value of extended equipment longevity, improved comfort and productivity, and climate change mitigation, it should not be discounted.

11 CORPORATE ENERGY BUDGET

Prior to requesting funding for energy actions, Niagara Region will consult with utility representatives and/or energy consultants, allowing Niagara Region to schedule project launch dates in parallel with applicable incentive funding programs. The projects may be moved forward or delayed based on changes to incentive programs as well as changes to the ECDM Plan. However, Niagara Region will not make significant alterations to the plan in a quest for incentive funding. This is not a prudent approach to planning as factors such as risk, code compliance, growth impact, and sustainability must be given priority instead. Actions will be pursued only when they coincide with the Niagara Region's objectives and are appropriate to be pursued at that time.



As Niagara Region continues to evolve and its energy needs become greater, it will be essential to reassess and clarify the financial indicators that are applied to investment analysis and prioritization of proposed energy projects. Energy efficiency projects must be weighted appropriately relative to other investment needs.

12 ENERGY MANAGEMENT ACTIONS

The economic feasibility of proposed actions plays a large role in the prioritization of the processes, programs, and projects. Equally important in the prioritization exercise was the evaluation of Niagara Region's internal capacity to complete the proposed initiatives. Recognizing the need to develop Niagara Region's internal knowledge and capacity, the initial years of the plan focus heavily on processes and programs. The implementation of the recommended processes and programs will result in an improved understanding and awareness of energy consumption. This will allow for improved decision making and greater success with future energy projects. As actions are completed, the energy management team will meet to discuss monitoring results and how they can be used to enhance the Plan. The ECDM Plan is intended to be a living document. Anticipated improvements in knowledge and capacity will result in enhancement of the proposed actions.

Annual Reporting

An annual Energy Conservation and Demand Management Plan Update report will be provided that details Niagara Region's activities and results relating to this 2014-2018 energy conservation and demand management (ECDM) plan. The report will describe the related activities that have happened in the previous year and will focus on linking actions to results. In addition, the report will take a forward view of the upcoming year to lay out the roadmap and identify any changes or adjustments that should be considered based on what the current market conditions are. The overarching goal of the report is to make the five-year ECDM Plan a living document that is reviewed and updated on a yearly basis.

The annual report will also provide reference to the Region's progress towards its goal of a 5% reduction in energy intensity by 2019 (based on 2011 benchmark). This data will detail the relative success of each project undertaken in terms of the energy reductions provided within the affected facilities.

Future Energy Projects

Energy projects at Niagara Region were evaluated prior to the development of the ECDM Plan. Niagara Region staff Members have advocated for some ambitious energy initiatives that were investigated and determined to be not feasible for a variety of reasons. It is anticipated that as Niagara Region grows and energy management practices improve, these actions will be reassessed. At present, the Region has developed a list of energy savings projects that is currently being undertaken to reduce energy use in Regional facilities. This list spans the Fiscal Years of 2014 and 2015and is shown as Figure 9 in Appendix C.

The Region is currently reviewing the results of recent energy assessments as well as developing a list of future facility evaluations to build out their schedule of potential energy conservation measures for the 2016-2018 period.

Renewable Energy

Feasibility and promotion of renewable energy technologies will continue to be assessed. These technologies will be incorporated into the ECDM Plan where it makes sense to do so, strategically or fiscally.

Purchasing Practices

Traditionally, purchasing practices in the public sector were designed to favour equipment or physical retrofits at the lowest cost in order to ensure the highest possible financial return. As energy conservation best practices emerged, it was revealed that there is a major issue in doing this. Almost all wasteful energy consuming equipment is less expensive than their energy conserving counterparts. The practice in itself does not encourage energy efficiency, as most energy intensive alternatives such as standard efficiency motors are less costly than their higher efficiency counterparts. When dealing with energy intensive hardware, the initial capital cost is only a fraction (5%-10%) of the total lifecycle cost.

Making a specific amount of money available to include the conservation upgrades allows Niagara Region to take advantage of necessary investments in order to reduce their impact on the bottom line after the cost of purchase. This allows staff to make the right environmental decision based on this ECDM Plan.

Energy Management and Information Systems

An Energy Management and Information System (EMIS) is an important element of a comprehensive Energy Management Program (EMP), as it helps to ensure that the full benefits of other energy conservation efforts are achieved and sustained. In fact, a quality EMIS can reduce energy use and cost by at least 5%. (Ref: Office of Energy Efficiency, National Resources Canada). Current industry and international standards, such as the International Performance Measurement & Verification Protocol (IPMVP), use an average of an 8%-10% reduction in energy consumption and costs. VIP Energy Services Inc. has documented a conservation average of 17% over customers served to date. However, in order to be as conservative as possible in its financial calculations, VIP generally uses National Resources Canada (NRCan) conservative numbers (5%) to ensure objectivity in the investment matter. The savings from an EMIS result from the following measured impacts:

- Early detection of poor performance,
- Support for optimal decision making,

- Effective performance reporting,
- Auditing of historical performance,
- Identification and justification of energy projects,
- Evidence of implementation success,
- Support for energy budgeting and accounting, and
- Provision of energy data to other systems such as Building Automation Systems.

When looking at performance reports, an EMIS facilitates ensuring that upgrades or changes actually meet forecasted savings, as well as the quantification of losses or gains. However, it is important to note that placing meters to isolate individual retrofit projects determined by their scope is generally cost ineffective and typically does not allow incorporation of out-of-scope project factors that directly affect equipment performance.

A one-time, comprehensive metering solution allows for a much more cost effective view, while enabling accountability to 90% of the planned projects budgeted to date. Reporting can be the most essential part of this plan as multiple portions of the organization rely on this data to make periodic decisions. The finance team can use this information to verify billing accuracy and other potential costs, such as construction back-charges. Energy conservation managers generally look at this data for building performance, future opportunity and functional trending. Project managers rely on this information to ensure that vendors are supplying and meeting contractual obligations. Collecting the information in any EMIS program is really only the first step, as the data must then be used to instigate change and push action. This can only be done through analysis and warning systems built on baseline information. In order for an EMIS system to function properly, communication loops must also be established between departments in order for the maximum benefit to be realized. These systems can be as simple as an online Data Storage, Retrieval and Reporting System using billing data to form the basis and baselines for future comparison.

Building Re-Commissioning

Building re-commissioning, or retro-commissioning, refers to the optimization of the current automation, controls and energy consuming systems. As buildings age, both the functionality of the equipment and the functions that they serve can undergo significant changes. A re-commissioning program generally focuses on ensuring that the equipment operations are modified to include any new or deleted duties. The following is a list of common problems found in re-commissioning projects that result in increased energy costs:

• Inefficient scheduling of HVAC equipment,

- Simultaneous heating and cooling,
- Economizer sequences not optimized,
- Incorrect airflow and water balance,
- Malfunctioning sensors or incorrect calibration,
- Fan Variable Frequency Drivers (VFD) control overridden,
- Supply air static pressure set-points not optimized,
- Boiler controls not operating efficiently,
- Balancing dampers and valves not installed or installed in poor or unusable locations,
- Incorrectly piped water coils,
- Process or space classification changes (lab space to office, etc.),
- Incomplete or incorrect control component installation,
- Control sequence incorrectly implemented,
- Substituted control components,
- Incomplete installations (missing control valve, actuators, etc.), and
- Testing, adjusting, and balancing (TAB) not completed or only partially completed.

NRCan has published several guidelines for costing and expected returns from re-commissioning projects. Building re-commissioning is an increasingly important practice, not only from an energy standpoint, but also from a comfort and safety perspective as well. The more complex building controls and ventilation become, the more risk there is that one or more components will fail or deliver incorrect measurements.

Current practices in re-commissioning indicate that the cost to complete these initiatives is between \$2.90 and $$4.50/m^2$. Expected savings from the projects are typically between \$1.00 and $$4.00/m^2$, depending upon the starting efficiency of the building, thus creating very attractive paybacks in this area.

Energy and Resource Awareness (ERA) Programs

Independent studies done by organizations such as NRCan show that initiatives directed at staff and facility users, in particular ERA Programs, can lead to significant savings on their own. In fact, NRCan reports indicate that dedicated, consistent energy awareness programs are proven to be the most effective way to reduce energy usage with no capital costs and minor operational expenses. A conservative estimate of savings for an effective ERA program can be as high as 5% -7% of annual utilities spending.

An effective ERA program is designed to assist organizations to attain energy savings by promoting a fundamental shift in the personal philosophies of staff and facility users towards reducing their energy use. The program utilizes community-based social marketing to develop influential communication materials and in-house displays that are carefully designed to inform and motivate employees to effectively decrease energy consumption. In many cases, an ERA Program has proven to be the most effective way to lower energy usage without any capital costs and minimal operational expenses. A typical ERA Program would include features such as:

- A detailed ERA program written plan including a GANTT chart,
- The creation of a program email address for suggestions and concerns and access to ERA experts to answer questions,
- A customized identity and marketing program,
- Training and support for an energy efficiency committee,
- ERA displays with various relevant conservation themes, and
- Annual marketing effectiveness reports and feedback system.

A continuous and consistent ERA program is not only an effective way to lower energy use within a facility, but can also serve to be an effective marketing tool to spread the word that the Niagara Region is a community leader in energy conservation and environmental sustainability.



ENERGY CONSUMPTION

ELECTRICITY



NATURAL GAS







PROPANE


APPENDIX B

Energy Use Breakdown

ENERGY USE BREAKDOWN





APPENDIX C

Reference Materials and Charts

Figure 1: 2011 Energy Reduction Projects Summary

2012 Energy Reduction Projects Summary							
	Action Taken						
Roof Replacement Bulk Storage Facility, 250 Thorold Rd W-Roof Replacement, Welland Police Lighting Upgrades, St. Catharines Police Lighting Upgrades, Support Services HVAC Upgrades, 110 James Street HVAC Upgrades, Port Colborne Police Generator, Port Colborne Police Lighting Upgrades, Ontario Street EMS Lighting Upgrades, Welland EMS Lighting Upgrades, Campbell West HVAC Upgrades, Environmental Centre HVAC Upgrades, Niagara Falls Public Health HVAC Upgrades, Ontario Street EMS Roof	Campbell East & West HVAC Upgrades, Welland Police Roof Replacement, Welland Gun Range Electrical Upgrades, St. Catharines Police HVAC Upgrades, Niagara Falls Lighting Upgrades, Fort Erie Lighting Upgrades, Support Services Lighting Upgrades, Police Fleet Lighting Upgrades, Welland Gun Range Lighting Upgrades, Police Fleet HVAC Upgrades, Support Services HVAC Upgrades, Support Services HVAC Upgrades, NRP - Port Colborne Police Roof Replacement, Building & Energy Condition Assessments, Regional Building Energy	Building Automation Systems, Linwell EMS Roof Replacement, 250 Thorold Rd HVAC & Electrical Upgrades, Smithville EMS Roof Replacement, Environmental Centre Roof Replacement, PWSC Roof Replacement, Welland Gun Range HVAC Insulation Upgrades, Welland Police Roof Condensers, Grimsby Police BAS System, Thorold Patrol Yard Natural Gas Conversion, Campbell West VAV Box Upgrades, St. Catharines Day Care HVAC Improvements, Linwell EMS Air Conditioning Upgrade, NOTL EMS Lighting Up-Grades,					
Replacement,	Upgrades,	Public Works Service Centre Lighting Up-Grades					

Figure 2: 2012 Energy Reduction Projects Summary

Figure	3: 2012	Energy	Reduction	Projects	Summary
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2013 Energy Reduction Projects Summary								
	Action Taken							
250 Thorold Rd W-Roof Replacement, Welland Police Lighting Upgrades, Port Colborne Police Lighting Upgrades, Ontario Street EMS Lighting Upgrades, Welland EMS Lighting Upgrades, Environmental Centre HVAC Upgrades, Campbell East & West HVAC Upgrades, Welland Police Roof Replacement, Welland Gun Range Electrical Upgrades, Niagara Falls Lighting Upgrades, Fort Erie Lighting Upgrades, Support Services Lighting Upgrades, Welland Gun Range Lighting Upgrades, Welland Gun Range Lighting Upgrades,	Police Fleet HVAC Upgrades, Support Services HVAC Upgrades, NRP - Port Colborne Police Roof Replacement, Building & Energy Condition Assessments, Regional Building Energy Upgrades, Building Automation Systems, Linwell EMS Roof Replacement, 250 Thorold Rd HVAC & Electrical Upgrades, St. Catharines Health Lighting Upgrades,Smithville EMS Roof Replacement, Environmental Centre Roof Replacement, PWSC Roof Replacement, Welland Gun Range HVAC Insulation Upgrades, Welland Police Roof Condensers, Grimsby Police BAS System,	Thorold Patrol Yard Natural Gas Conversion, Campbell West VAV Box Upgrades, St. Catharines Day Care HVAC Improvements, Linwell EMS Air Conditioning Upgrade, NOTL EMS Lighting Up-Grades, Public Works Service Centre Lighting Up-Grades, Pelham Patrol Yard HVAC Improvements, Energy Upgrades, Ontario St. EMS HVAC Improvements, PWSC Roof Replacement, Police Fleet Roof Replacement, Welland Police HVAC Improvements, EMS Garage Door Upgrades, Renewable Energy Program						

Figure 4: The Energy Conservation Work Plan 2014 - Water and Wastewater

Project Description	Energy Conservation Measure	Project Cost	KW Saved	Reductions (KWh)	Savings (\$/year)	Incentive	Payback (years)
Water Wastewater Division							
Water/Wastewater Energy Efficiency Committee	Developing 3-5 year Conservation Plan						
Conservation Planning & Reporting							
	Regulatory compliance O.Reg 397/11						
	Conservation plan development						
Lighting & Controls							
Port Colborne (Seaway) WW Plant	Reduce energy use, improve lighting, cost reduction	\$30,000					
Grimsby Wastewater Plant Exterior Lighting	Replace obsolete lighting, reduce energy, improve lighting	\$121,825	24.0	125,877.00	\$13,846	\$6,618	8.3
Anger Ave WWT Plant Exterior Lighting	Replace obsolete lighting, reduce energy, improve lighting	\$145,000		82,076.00			
Welland WWT Plant Exterior Lighting	Replace obsolete lighting, reduce energy, improve lighting	\$50,000					
Decew Water Plant Interior Lighting/Controls	Reduce energy use, improve lighting	\$60,000	19.8	92,591.72	\$14,594	\$10,500	2.8
Decew Water Plant- Exterior Lighting	Replace obsolete lighting, reduce energy, improve security						
Capital Projects							
NOTL Wastewater Plant	New plant to be designed to LEED & high efficy stds						
Grimsby WTP High Lift Pp Upgrades	Incentive Applied for, Pump install Fall 2013		81.6	259,150.00	\$28,507	\$65,000	
Stevensville WTP Reservoir & Pp Station	Efficiency, optimization						
Welland WWT Plant Aeration	Energy and asset renewal study						
Pt Weller WWT - Aeration feasibility	Energy and asset renewal study						
Energy Audits and Engineering Studies							
Engineering Standards Review	Aggregated WWW Audit /Feasibility study						
Engineering Standards Review	Standards setting						
Rosehill Water Plant Energy Audit	Energy Audit and Management Plan	\$52,200					
Welland Water Plant Energy Audit	Energy Audit and Management Plan	\$86,800					
Port Dalhousie WW Plant Energy Audit	Energy Audit and Management Plan	\$82,600					
Welland Water Plant HPNC Incentive	Energy Incentive Programs For New Construction						
Pt Dalhouise RAS EE Feasibility Study	Efficiency, optimization						
Niagara Falls WTP High Lift VFD Studies							
Power Factor Correction	Efficiency, optimization						
Micro Hydro technology energy recovery	Energy recovery						
Grimsby Wastewater Plant VFD	Install VFD'S						
Pump Station Optimization (Smithville)							
Submetering& SCADA	Real time energy monitoring and control						
Biogas Utlization	Renewable Energy						
Biogas Utlization	Renewable Energy						
FIT Solar Program	Renewable Energy						
Niagara Region HQ	HVAC redesign and upgrade	\$945,000					
Niagara Region HQ	Replace obsolete lighting, reduce energy, improve lighting						
Niagara Region	Reduce energy use, improve lighting SBLIP						
Niagara Region HQ	Chiller efficiency, optimization	\$18,925				\$14,968	1.3

Figure 5: Niagara Region's Owned Facilities Included in the ECDM Plan

Regional Municipality of Niagara Facilities (Based on 2011 Energy Consumption and Greenhouse Gas Emission Report to the Ministry of Energy)							
Building Name	Operation Type	City					
	Administrative offices and related facilities,						
Regional HQ - Campbell E&W	including municipal council chambers	Thorold					
Water & Wastewater Environmental	Administrative offices and related facilities,						
Center	including municipal council chambers	Thorold					
	Administrative offices and related facilities,						
Fort Erie Public Health	including municipal council chambers	Fort Erie					
	Administrative offices and related facilities,						
Welland Community Services	including municipal council chambers	Welland					
	Administrative offices and related facilities,						
Niagara Falls Community Services	including municipal council chambers	Niagara Falls					
	Administrative offices and related facilities,						
Niagara Falls Public Health	including municipal council chambers	Niagara Falls					
	Administrative offices and related facilities,						
Welland Public Health	including municipal council chambers	Welland					
	Administrative offices and related facilities,						
St. Catharines Community Services	including municipal council chambers	St Catharines					
Niagara Falls Provincial Offences	Administrative offices and related facilities,						
Courthouse	including municipal council chambers	Niagara Falls					
	Administrative offices and related facilities,						
St Catharines Public Health	including municipal council chambers	St Catharines					
	Ambulance stations and associated offices and						
Grimsby EMS Station (10 Iroquois Trail)	facilities	Grimsby					
	Ambulance stations and associated offices and						
Pelham EMS Station (177 Hwy 20)	facilities	Pelham					
	Ambulance stations and associated offices and						
Smithville EMS Station (110 West Street)	facilities	West Lincoln					
St Catharines EMS Station (139 Ontario	Ambulance stations and associated offices and						
Street)	facilities	St Catharines					
	Ambulance stations and associated offices and	Niagara On The					
NOTLEMS Station (1/6 Wellington Street)	facilities	Lake					
Niagara Falls EMS Station (2722 St Paul	Ambulance stations and associated offices and						
Ave.)	facilities	Niagara Falls					
St Catharines EMS Station (337 Linwell	Ambulance stations and associated offices and						
Road)	facilities	St Catharines					
Dideeuro FMC Station (200 Contains Dated)	Ambulance stations and associated offices and	Faut Fuia					
Ridgeway EIVIS Station (369 Gornam Road)	Tacilities	FORTERIE					
Port Colborne EIVIS Station (42 Dolphin	Ampulance stations and associated offices and	Dout Cally and a					
Street)	Tacilities	Port Colborne					
Fort Frig ENAS Station (42 Harry Avery)	Ampulance stations and associated offices and	Fort Eric					
FOIL ERIE EIVIS Station (43 Hagey Avenue)							
Niagara Falls EMS Station (5685 North	Ambulance stations and associated offices and	Niagara Falls					

Regional Municipality of Niagara Facilities (Based on 2011 Energy Consumption and Greenhouse Gas Emission Report to the Ministry of Energy)							
Building Name	Operation Type	City					
Street)	facilities						
Welland EMS Station (580 King Street)	Ambulance stations and associated offices and facilities	Welland					
	Police stations and associated offices and						
Niagara Falls Police	facilities	Niagara Falls					
	Police stations and associated offices and	0					
St Catharines Police	facilities	St Catharines					
	Police stations and associated offices and						
Fort Erie Police	facilities	Fort Erie					
	Police stations and associated offices and						
Grimsby Police	facilities	Grimsby					
	Police stations and associated offices and						
Port Colborne Police	facilities	Port Colborne					
	Police stations and associated offices and						
Welland Police	facilities	Welland					
	Police stations and associated offices and						
Emergency Services Building		St Catharines					
Drack Inductrial Dark Dalias Facility	Police stations and associated offices and	Thorold					
Brock industrial Park Police Facility	Tacilities	Thoroid					
Police HO	facilities	St Catharings					
	Storage facilities where equipment or vehicles	St Cathannes					
Traffic Service Center	are maintained renaired or stored	Thorold					
	Storage facilities where equipment or vehicles	moroid					
Police Fleet Building	are maintained. repaired or stored	Thorold					
	Storage facilities where equipment or vehicles						
Thorold Patrol Yard	are maintained, repaired or stored	Thorold					
	Storage facilities where equipment or vehicles						
Welland Patrol Yard	are maintained, repaired or stored	Welland					
	Storage facilities where equipment or vehicles						
Smithville Patrol Yard	are maintained, repaired or stored	West Lincoln					
Niagara Falls Wastewater	Facilities related to the treatment of sewage	Niagara Falls					
		Niagara On The					
Niagara On The Lake Wastewater	Facilities related to the treatment of sewage	Lake					
		Niagara On The					
Queenston Operations Wastewater	Facilities related to the treatment of sewage	Lake					
Port Dalhousie Wastewater	Facilities related to the treatment of sewage	St Catharines					
Port Weller Wastewater	Facilities related to the treatment of sewage	St Catharines					
Welland Wastewater	Facilities related to the treatment of sewage	Welland					
Grimsby Wastewater	Facilities related to the treatment of sewage	Grimsby					
Fort Erie Wastewater	Facilities related to the treatment of sewage	Fort Erie					
Douglastown Lagoon	Facilities related to the pumping of sewage	Niagara Falls					

Regional Municipality of Niagara Facilities (Based on 2011 Energy Consumption and Greenhouse Gas Emission Report to the Ministry of Energy)							
Building Name	City						
Seaway Wastewater	Facilities related to the treatment of sewage	Port Colborne					
Niagara Falls Water	Facilities related to the treatment of water	Niagara Falls					
Rosehill Water	Facilities related to the treatment of water	Fort Erie					
Welland Water	Facilities related to the treatment of water	Welland					
Port Colborne Water	Facilities related to the treatment of water	Port Colborne					
DeCew Falls Water	Facilities related to the treatment of water	St Catharines					
Grimsby Water	Facilities related to the treatment of water	Grimsby					
Garner Roads Biosolids	Facilities related to the treatment of sewage	Niagara Falls					
	Administrative offices and related facilities,						
Water & Wastewater Central Maintenance	including municipal council chambers	Welland					

We will continue to expand the GHG emissions report during the course of this plan to include the following sites:

Long Term Care Homes (LTCH)							
LTCH Deer Park Villa	Long Term Care Home	Grimsby					
LTCH Northland Pointe	Long Term Care Home	Port Colborne					
LTCH Upper Canada Lodge	Long Term Care Home	NOTL					
LTCH Rapelje Lodge	Long Term Care Home	Welland					
LTCH Linhaven	Long Term Care Home	St. Catharines					
LTCH Gilmore Lodge	Long Term Care Home	Fort Erie					
LTCH The Meadows of Dorchester	Long Term Care Home	Niagara Falls					
LTCH Woodlands of Sunset	Long Term Care Home	Welland					

Figure 6: Niagara Region's 2011 Energy and GHG Emissions Breakdown

Regional Municipality of Niagara Facilities - 2011 Energy									
		Total Electricity	Total Natural Gas	Total Fuel Oil	Total Propane	GHG	Energy	Energy	
	Annual Flow	Consumption	Consumption	Consumption	Consumption	Emissions	Intensity	Intensity	Energy Intensity
Building Name	(Mega Litres)	(kWh)	(m³)	(Litres)	(Litres)	(kg)	(ekWh/ft ²)	(GJ/m²)	(GJ/Mega Litre)
Regional HQ - Campbell E&W		2,858,153	169,841			549,758	24	0.93	
Environmental Center		408,316	73,586			171,789	63	2.43	
Fort Erie Health		70,908	803			7,191	17	0.65	
Welland Community Services		289,048	44,430			107,124	29	1.14	
SAEO Office		220,081	5,138			27,321	13	0.49	
Niagara Falls Public Health		184,188	1,924			18,373	26	1.01	
Welland Public Health		156,716	17,835			46,257	19	0.74	
SAEO Office		274,732	26,336			71,770	19	0.73	
Queen Street Courthouse		67,600	31,946			65,806	58	2.25	
St Catharines Public Health		44,891	21,965			45,119	49	1.89	
Grimsby EMS Station		64,937	4,962			14,576	35	1.36	
Pelham EMS Station		24,392	5,801			12,919	26	0.99	
Smithville EMS Station		18,942	8,755			18,068	32	1.25	
St Catharines EMS Station		129,727	15,055			38,842	31	1.19	
NOTL EMS Station		13,892	5,863			12,196	35	1.35	
Niagara Falls EMS Station		20,168	5,918			12,802	85	3.30	
St Catharines EMS Station		39,334	4,399			11,464	41	1.59	
Ridgeway EMS Station		20,200	6,434			13,780	26	1.02	
Port Colborne EMS Station		45,027	13,468			29,065	27	1.03	
Fort Erie EMS Station		22,685				1,815	14	0.53	
Niagara Falls EMS Station		126,365				10,109	21	0.82	
Welland EMS Station		92,334	15,118			35,969	37	1.44	
Niagara Falls Police		374,721	13,890			56,238	27	1.04	
St Catharines Police		1,987,690	121,343			388,430	44	1.69	
Fort Erie Police		75,750	4,960			15,438	22	0.84	
Grimsby Police		141,037	17,353			44,091	40	1.54	
Port Colborne Police		91,980	3,307			13,611	24	0.94	
Welland Police		599,819	46,497			135,894	42	1.63	
Emergency Services Building		234,031	15,308			47,664	22	0.84	
Brock Ind Park Police Facility		80,430	4,109			14,203	17	0.67	
Police HQ		963,589	86,242			240,139	40	1.54	
Traffic Service Center		435,265			82,177	161,701	22	0.86	
Police Fleet Building		208,805			26,822	58,117	21	0.81	
Thorold Patrol Yard		108,816			16,090	33,548	37	1.45	
Welland Patrol Yard		228,324	31,200			77,253	32	1.22	
Pelham Patrol Yard		91,714	12,516			31,000	54	2.10	
Smithville Patrol Yard		95,764	28,497			61,538	39	1.51	
Niagara Falls Wastewater	16588	10,205,802	459,980			1,686,115			3.28
Niagara On The Lake Wastewater	1932	1,768,034	1,568			144,407			3.33
Queenston Operations Wastewater	112	208,423				16,674			6.72
Port Dalhousie Wastewater	14030	5,362,431	84,184			588,155			1.61
Port Weller Wastewater	15806	5,567,902	120,084			672,466			1.56
Welland Wastewater	15221	6,426,264	140,765			/80,235			1.87
Grimsby Wastewater	8/20	5,161,704	413,942			1,195,546			3.95
Fort Erie Wastewater	5316	3,221,982	145,085			532,060			3.23
Crystal Beach Wastewater	2304	1,446,841	99,146			303,195			3.91
Douglastown Lagoon	560	403,465	220.200			32,277			2.59
Seaway Wastewater	4967	3,705,902	238,268			/46,948			4.52
Niagara Falls Water	19059	8,1/9,286	189,234			1,012,114			1.92
Rusenill Water	4661	2,253,888	100,550			370,414			2.57
weilang water	8088	3,213,201	92,619			432,164			1.87
Port Colborne Water	2987	1,240,456	/0,18/	07.000		231,934			2.39
Crimehy Water	19404	4,815,530	120	97,360		691,670		1	0.89
Grinisby Water	5154	4,137,828	168,434			649,472			4.14
Garrier Koads Biosolids		1,196,000	53,605			197,027	25	0.07	
Central Maintenance	144.000	160,095	45,038	07.300	125.000	97,957	25	0.97	2.05
	144,908	/9,565,403	3,287,608	97,360	125,089	13,001,608	31	1.22	2.85

Figure 7: Niagara Region's 2012 Energy and GHG Emissions

Regional Municipality of Niagara Facilities - 2012 Energy									
		Total Electricity	Total Natural Gas	Total Fuel Oil	Total Propane	GHG	Energy	Energy	
	Annual Flow	Consumption	Consumption	Consumption	Consumption	Emissions	Intensity	Intensity	Energy Intensity
Building Name	(Mega Litres)	(kWh)	(m ³)	(Litres)	(Litres)	(kg)	(ekWh/ft ²)	(GJ/m ²)	(GJ/Mega Litre)
Regional HQ - Campbell E&W	-	2,708,656	125,969	-	-	454,852.87	21	0.80	
Environmental Center	-	395,710	56,326	-	-	138,148	52	2.03	
Fort Erie Health	-	70,176	5,876	-	-	16,723	28	1.08	
Welland Community Services	-	277,583	77,335	-	-	168,418	43	1.65	
SAEO Office	-	205,033	21,490	-	-	57,032	20	0.77	
Niagara Falls Public Health	-	107,627	11,957	-	-	31,216	30	1.15	
Welland Public Health	-	139,100	13,568	-	-	36,780	16	0.61	
SAEO Office	-	284,735	23,667	-	-	67,524	18	0.70	
Queen Street Courthouse	-	64,626	20,412	-	-	43,762	40	1.55	
St Catharines Public Health	-	62,098	14,669	-	-	32,701	38	1.48	
Grimsby EMS Station	-	247,962	3,310	-	-	26,095	84	3.27	
Pelham EMS Station	-	3,734	-	-	-	299	1	0.04	
Smithville EMS Station	-	29,214	6,160	-	-	13,983	27	1.06	
St Catharines EMS Station	-	105,877	11,555	-	-	30,316	24	0.94	
NOTL EMS Station	-	14,601	3,975	-	-	8,683	26	1.01	
Niagara Falls EMS Station	-	16,526	4,422	-	-	9,682	65	2.52	
St Catharines EMS Station	-	34,442	3,265	-	-	8,928	33	1.28	
Ridgeway EMS Station	-	18,968	4,856	-	-	10,698	21	0.81	
Port Colborne EMS Station	-	46,726	8,650	-	-	20,092	20	0.76	
Fort Erie EMS Station	-	70,176	5,876	-	-	16,723	80	3.12	
Niagara Falls EMS Station	-	98,672	-	-	-	7,894	16	0.64	
Welland EMS Station	-	81,231	14,510	-	-	33,932	35	1.34	
Niagara Falls Police	-	383,708	10,422	-	-	50,401	25	0.99	
St Catharines Police	-	1,977,635	105,036	-	-	356,795	41	1.59	
Fort Erie Police	-	53,065	3,487	-	-	10,838	15	0.59	
Grimsby Police	-	145,245	13,013	-	-	36,222	35	1.34	
Port Colborne Police	-	88,678	2,794	-	-	12,377	23	0.87	
Welland Police	-	510,259	46,914	-	-	129,518	39	1.50	
Emergency Services Building	-	254,863	16,969	-	-	52,471	24	0.92	
Brock Ind Park Police Facility	-	107,818	3,439	-	-	15,127	20	0.77	
Police HQ	-	896,952	70,726	-	-	205,473	35	1.35	
Traffic Service Center	-	413,883	-	-	35,820	88,417	15	0.56	
Police Fleet Building	-	200,655	-	-	14,517	38,466	16	0.62	
Thorold Patrol Yard	-	103,471	-	-	9,257	22,570	28	1.10	
Welland Patrol Yard	-	252,515	26,164	-	-	69,668	30	1.16	
Pelham Patrol Yard	-	121,020	18,556	-	-	44,764	77	2.98	
Smithville Patrol Yard	-	86,263	20,943	-	-	46,496	30	1.17	
Niagara Falls Wastewater	14485	8,392,388	286,809	-	-	1,213,640			2.84
Niagara On The Lake Wastewater	1561	2,031,417	1,529	-	-	165,404			4.72
Queenston Operations Wastewater	93	206,790	-	-	-	16,543			8.04
Port Dalhousie Wastewater	11708	5,405,063	77,045	-	-	578,068			1.91
Port Weller Wastewater	12400	4,999,655	49,236			493,059			1.60
Welland Wastewater	12998	5,470,069	361,502			1,121,071			2.58
Baker Wastewater	6887	4,947,600	268,349	-	-	903,156			4.08
Anger Wastewater	4024	2,798,259	114,914	-	-	441,120			3.60
Crystal Beach Wastewater	1707	1,413,945	113,947			328,547			5.54
Douglastown Lagoon	411	365,363	-	-	-	29,229			3.20
Seaway Wastewater	3878	3,608,981	320,450			894,570			6.51
Niagara Falls Water	19422	6,880,151	195,946			920,873			1.66
Rosehill Water	4694	2,340,787	95,591	-	-	367,990			2.57
Welland Water	8918	3,253,311	77,351	-	-	406,507			1.65
Port Colborne Water	2901	1,235,256	52,425	-	-	197,937			2.22
DeCew Falls Water	19277	5,693,646	38,640	57,296	-	708,744			1.27
Grimsby Water	5274	3,954,530	178,822	-	-	654,448			4.00
Garner Roads Biosolids		1,179,720	42,334	-	-	174,415			
Central Maintenance	0	232,028	37,675	-	-	89,792	25	0.97	
	130,639	75,088,463	3,088,876	57,296	59,594	12,119,199	28	1.10	2.39



Figure 8: 2011 and 2012 Energy Use Intensity Breakdowns



	Niagara Region Energy Conservation Measures									
ECM #	Location	Address	City	Project	Project Cost					
01	Welland Gun Range	300 Woodland Road	Welland	Electrical Upgrades	\$125,000					
02	Support Services	2 Cushman Road	St. Catharines	Lighting Upgrades	\$50,000					
03	Support Services	2 Cushman Road	St. Catharines	HVAC Upgrades	\$70,000					
04	Regional Buildings	Regional Buildings		Energy Upgrades	\$350,000					
05	Regional Buildings	Regional Buildings		BAS Upgrades	\$250,000					
06	250 Thorold Rd	250 Thorold Rd	Welland	HVAC & Electrical Upgrades	\$800,000					
07	Pelham Patrol Yard	Pelham Patrol Yard	Thorold	HVAC Upgrades	\$50,000					
08	Regional Buildings	Regional Buildings		Energy Upgrades	\$350,000					
09	Ontario St. EMS	Ontario St. EMS	St. Catharines	HVAC Upgrades	\$50,000					
10	PWSC (Service Centre)	PWSC (Service Centre)	Thorold	Roof Replacement	\$475,000					
11	Police Fleet	Police Fleet	Thorold	Roof Replacement	\$300,000					
12	EMS Garage	EMS Garage	Niagara Falls	Garage Door Upgrades	\$75,000					
13	Regional Buildings	Regional Buildings		Renewable Energy Program	\$1,000,000					
14	PWSC (Service Centre)	PWSC (Service Centre)	Thorold	Overhead Door Upgrades	\$50,000					
15	Welland Patrol Yard	Welland Patrol Yard	Welland	Roof Replacement	\$45,000					
16	Campbell West	Campbell West	Thorold	Window Replacement	\$250,000					
17	Welland Gun Range	Welland Gun Range	Welland	HVAC Upgrades	\$125,000					
18	Thorold Patrol Yard	Thorold Patrol Yard	Thorold	HVAC Upgrades	\$20,000					
19	Linwell EMS	Linwell EMS	St. Catharines	HVAC Upgrades	\$10,000					
20	Smithville Ems	Smithville Ems	Smithville	HVAC Upgrades	\$10,000					

Figure 9: Planned Regional Energy Conservation Initiatives

Niagara Region Energy Conservation Measures						
ECM #	Facility	Measure	Anticipated Results			
21	Rosehill Water Treatment Plant	Reuse sample water as grey water (purple pipe system)	996 Litres per week water savings			
22	Rosehill Water Treatment Plant	Upgrade LLP1 and LLP4	108,500 kWh/yr., 31kW, 10,000 \$/yr. electrical savings			
23	Rosehill Water Treatment Plant	Upgrade LLP3	35,500 kWh/yr., 42kW, 3,000 \$/yr. electrical savings			
24	Rosehill Water Treatment Plant	Friction head reduction	14,000 kWh/yr., 5,000 \$/yr. electrical savings			
25	Rosehill Water Treatment Plant	Facility heating and cooling (and no new elevator)	5,000 \$/yr. electrical savings			
26	Rosehill Water Treatment Plant	Night pump (75 hp) replacing HLP4 for low flows	80,000 kWh/yr., 56kW, 5,000 \$/yr. electrical savings			
27	Rosehill Water Treatment Plant	Upgrade Backwash Pump 2	5,500 kWh/yr., 28kW, 600 \$/yr. electrical savings			
28	Rosehill Water Treatment Plant	Utilize elevated tank for water distribution	4,000 \$/yr. electrical savings			
29	Port Dalhousie Wastewater Treatment Plant	Resize / Reconfigure Pumps on Secondary Clarifier #5	45,454 kWh/yr. electrical savings and 33,148 Litres/yr. water savings			
30	Port Dalhousie Wastewater Treatment Plant	Install Diffused Air Technology	665,760 kWh/yr. electrical savings and 73,234 Litres/yr. water savings			
31	DeCew Water Treatment Plant	Replace 427 fluorescent fixtures, T12 to T5	95,592 kWh/yr., 14,594 \$/yr. electrical savings, cost \$59,000			
32	Fort Erie Wastewater Treatment Plant	Replace 53 exterior fixtures, upgrade to LED	Cost \$145,000			
33	Grimsby Wastewater Treatment Plant	Replace 131 exterior fixtures with induction fixtures	Cost \$121,825 125,872 kWh/yr., 13,847 \$/yr. electrical savings			

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1 EXECUTIVE SUMMARY

The Ontario Provincial Government has committed to help public agencies better understand and manage their energy consumption. As part of this commitment, **Ontario Regulation 397/11** under the **Green Energy Act 2009** requires public agencies, including municipalities, municipal service boards, school boards, universities, colleges and hospitals to report on their energy consumption and greenhouse gas (GHG) emissions annually beginning in 2013, and to develop and implement Energy Conservation and Demand Management (ECDM) Plans starting in 2014.

The purpose of the Niagara Region Energy Conservation and Demand Management (ECDM) Plan is to develop a framework for the Regional Municipality of Niagara to understand the historical impact of its operations on GHG emissions, and to take action by setting GHG reduction targets. The main objectives of this report are:

- the development of an Energy Conservation and Demand Management Plan that addressed the facets of energy consumption in the community, for both corporate and community based assets. This included the development of a GHG emissions inventory, benchmarking the Niagara Region's existing energy intensity performance relative to other jurisdictions;
- identifying potential energy efficiency projects, and establishing an energy consumption reduction target. This strategic approach to energy management ("Energy Conservation and Demand Management Plan") supports the Niagara Region Council Business Plan 2012-2015¹.

Energy efficiency and the wise use of energy are two of the lowest cost options for meeting energy demands, while providing many other environmental, economic and social benefits, including reducing



GHG emissions, cost avoidance and savings. Along with the aforementioned benefits, energy efficiencies and the wise use of energy also promote local economic development opportunities, energy system reliability, improved energy supply security, and reduced price volatility.

There are a variety of low cost/no cost initiatives available to the Niagara Region, which can jump-start energy consumption and dollar savings. Simple actions such as turning lights and appliances off, shutting off heaters in the summer, establishing efficient usage times, efficient production requirements, and many other actions can result in energy savings. Such actions, along with energy efficient capital and operating process improvements and project implementation, are key components

¹ http://www.niagararegion.ca/government/council/cbp.aspx

that are outlined within the ECDM Plan.

This ECDM Plan is the culmination of a non-linear process involving:

- Establishing baseline performance measures,
- Setting future performance goals and objectives based on past practices,
- Continuous improvement through identification of energy conservation potential,
- Strategic alignment of measure implementation and fiscal constraints, and
- Evaluation, measurement and communication of results achieved.

This ECDM Plan contains three perspectives: historical, current and future. It looks at "what we have done", "what we are doing", and "what are we planning to do".

The main purpose of this plan is to develop an implementation strategy to allow Niagara Region to meet its conservation target of reducing its 2011 energy consumption by 5% by the end of 2019





To ensure that this goal is met, a structured Measurement and Verification Protocol will be established to allow for year-over-year comparisons for all Regional facilities. This consistent measurement and reporting ensures that savings targets for individual facilities are met and maintained and that energy conservation projects provide the energy savings expected at the time of implementation. The reductions in energy use in facilities will also serve to support Regional initiatives to meet its GHG emissions reduction goals as identified in the Corporate Climate Change Action Plan.

2 KEY COMPONENTS

The Big Picture

Sustainability is a concept that meets the needs of the present without compromising the ability of future generations to meet their own needs. This is sometimes referred to as the "triple bottom line".

- <u>Environmental Sustainability</u>: Managing the effects of human activity so that it does not permanently harm the natural environment.
- <u>Economic Sustainability:</u> Managing the financial transactions associated with human activities so that they can be sustained over the long term without incurring unacceptable human hardship.
- <u>Social/Cultural Sustainability:</u> Allowing human activity to proceed in such a way that social relationships between people and the many different cultures around the world are not adversely affected or irreversibly degraded.

An Energy Conservation and Demand Management Plan is the sum of measures planned and carried out to achieve the objective of using the minimal possible energy while maintaining comfort levels (in offices or dwellings) and production rates (in factories). It can be applied to any process or building where energy use is required. To make an efficient use of the energy and, as a consequence, to save it, the actions are focused on:

- Energy Conservation,
- Energy Recovery,
- Energy Substitution,
- Corporate Goals and Objectives, and
- Corporate Fiscal Management.

Energy Conservation and Demand Management Plans also provide the framework to allow for good financial planning related to capital projects within the Region's facilities.

Analysis and Benchmarking

It is important to recognize the value of benchmarking and comparison as a starting point. By examining Niagara Region's current energy consumption patterns and comparing them with others, a better understanding of the opportunities and the pitfalls of energy conservation and sustainability planning as experienced by other public agencies is gained. This exposure, combined with the information gleaned from the energy audits, will allow



Niagara Region to focus on strategies that have been proven successful elsewhere and can be tailored to the unique nature of the Niagara Region.

It is apparent that energy conservation is being considered and implemented in most Public Sectors across Ontario and Canada. While the Ontario government, in particular, has set guidelines for what they consider a 'Green' community to be, there are still opportunities for the Niagara Region to mold these definitions into a strategy to achieve a viable ECDM Plan. As well, the insights gained through their experiences with energy conservation can be used as a springboard to further the Niagara Region's sustainability strategies to encompass both operational and policy improvements. Many public agencies are taking their understanding of environmental issues and conservation beyond energy consumption and recycling, by addressing the more complex issues of water management, heat island effect, and light pollution, to name a few.

Regulatory Requirements

Under Ontario Regulation 397/11 (Part of the Green Energy Act, 2009), all public sector agencies must now comply with mandatory reporting requirements. All energy consumption at Niagara Region facilities was recorded and submitted to the Ministry annually beginning in 2013. In 2014, reporting requirements are more stringent to encompass measures taken to date with results, as well as a fiveyear plan, all of which are incorporated into this ECDM Plan. Niagara Region is well positioned to meet this requirement as audits have been completed at some facilities, resulting in a compiled list of energy reduction projects, some of which are already implemented. The full list is reviewed throughout this plan while the implementation program is outlined later in this report. This is meant to serve as Niagara Region's ECDM Plan and will assist Niagara Region to meet mandated reporting requirements.

Key Factors and Constraints

Internationally, corporations are beginning to embrace the notion that the earth's environment and precious resources need to be conserved. However, the necessary changes will not happen overnight. To be successful, a comprehensive energy management plan should embrace long-term thinking, taking advantage of "low hanging fruit" to achieve immediate cost savings which will be redirected to more complex projects involving higher initial costs with larger net benefits. Niagara Region has embraced this philosophy and has been involved in such a process for over 7 years.

Public agencies should realize that each of their circumstances is unique and may not lend themselves to 'boiler plate' solutions used in many private sector segments. Those who have met their goals have utilized the advantages of the unique physical and non-physical attributes of their facilities, including green power generation on large flat roofs and community gardens on their large properties. While it is

easy to be focused on the larger solutions, even seemingly small efforts can make a major long-term impact on the overall goal.

Ongoing professional development is also a key factor in the success of a ECDM Plan to ensure that staff members understand their role in the greater goal. The ECDM Plan and accompanying education should be a required part of their daily activities. A good example of this is energy awareness training that encourages staff to take simple and effective actions such as turning off lights and computers when not in use.

While realities of budget restrictions are an important consideration in any planning activity, it is possible to achieve energy savings while adhering to the financial constraints of a publicly funded system. As municipalities are generally the closest entities to the constituents, it is important to be viewed as a leader in energy conservation while ensuring that financial responsibility remains an important part of any implementation program. It is clear that new technology and ideology changes have produced continued operational cost reductions while improving indoor comfort and environmental sustainability. These cost saving projects can often fund themselves by avoiding the use of previously allocated funds. As long as the savings are reinvested, these improvements can continue for the foreseeable future, ensuring a sustainable process. Many industries have had environmental programs running for over a decade and continue to hit their intensity reduction goals without sacrificing product quality.

3 HISTORICAL ENERGY MANAGEMENT

Historically, Niagara Region has addressed energy conservation and demand management on a projectby-project or divisional basis. Capital projects were implemented based on equipment's expected useful life or in response to equipment emergency breakdowns. Utility savings, realized as a result of the implementation of these individual projects, have not historically been uniquely reported, but have been considered as a component of general operations. Thus, they have been reported through utility expenses in the Accounting System. In 2008, the Niagara Region created a dedicated energy management section that still exists, providing support to all internal departments and some of its agencies, boards and commissions. Sustainability and long-term energy reduction goals, through this ECDM Plan, will become integral components of the business reporting system.

Utility costs were viewed as a fixed overhead cost. The management of these costs relied on an exception-based investigation approach. In other words, utility costs were only reviewed if a utility bill was much higher, or lower, than typical.

In 2012, Niagara Region embarked upon a strategic energy-auditing project. The purpose of the audits was to identify and analyze potential energy conservation and demand management opportunities. These efforts have been instrumental in assisting Niagara Region in aligning the ECDM Plan with the *Niagara Region Council Business Plan 2012-2015.* A summary of the projects implemented in 2011 and 2012 is found in Appendix C, Figures 1, 2 and 3.

4 CURRENT STATE OF CORPORATE ENERGY

Energy Data Management

While Niagara Region has been tracking its energy consumption, the Ontario government has required an increase in Niagara Region's energy management practices. This has resulted in the need to enhance current practices and develop new approaches. To meet this need, Niagara Region has implemented a comprehensive program for collecting and analyzing monthly energy billing information, and ensuring staff is informed about energy consumption. This effort will produce an energy costs and consumption database that will be used for monitoring excessive variations, targeting facility follow-up evaluations, and highlighting areas that could be candidates for improved conservation. These monitoring enhancements will improve Niagara Region's understanding of the bottom line impact of energy management.

Energy Supply Management

Niagara Region has currently adopted a strategy of procuring its electricity from eight hydro Local Distribution Companies (LDC's). The Niagara Region has purchases its natural gas through Enbridge.

The Region has chosen to contract its propane through a local propane provider. This strategy is reviewed annually during the budgeting process.

Energy Use in Facilities

Niagara Region staff members have retained a great deal of data with regard to their facility's energy use. This data has been enhanced by a series of comprehensive audits completed at Niagara Region's facilities. Through the deployment of several energy management software strategies, Niagara Region staff is equipped with the information necessary to make effective energy management decisions. This will make it possible to implement an effective energy procurement process, pursue appropriate capital projects, and implement successful conservation and demand management programs.

Major energy users: Tactics to conserve energy

Water and Wastewater Treatment Plants (W&WW TP) are Niagara Region's major energy consumers due to the energy intensive type of operations they perform. From the total Niagara Region's annual utility budget, W&WW TP consume approximately 45% of the energy budget which includes electricity, natural gas, water and vehicle fuel costs.

An energy efficiency committee was instituted at W&WW TP division in order to research and put in practice feasible energy conservation measures to increase efficiency in operations and equipment. W&WW division's energy efficiency committee has been an active player in the implementation of projects focused on modern technologies that contribute to reduce our carbon footprint and dependency on fossil fuels.

Some feasibility studies focused on operation efficiency combined with energy savings have been made like the one performed to evaluate the installation of micro-turbines for power generation at Welland Water Treatment Plant. Unfortunately, the return on investment didn't support its approval at that time, but it could be re-evaluated under present conditions. In other cases, government grants and incentives have been obtained reducing payback on the investment.

Below is a chart showing a list of representative projects implemented at W&WW TP during the last seven years:

Projects	Service Territory	Арр Туре	Incentive	kw Savings
Niagara Region - Seaway Wastewater	Port Colborne	Custom-NON LIGHTING	\$88,451.76	110.57
Niagara Region - Port Colborne Water	Port Colborne	Prescriptive	\$8,385.98	10.012
Niagara Region - Fort Erie Water	Fort Erie	Custom-LIGHTING	\$2,960.00	
Niagara Region - Fort Erie Water	Fort Erie	Prescriptive	\$14,647.00	19.272
Niagara Region - Crystal Beach Wastewater	Fort Erie	Custom-LIGHTING	\$3,040.00	
Niagara Region - Crystal Beach Wastewater	Fort Erie	Prescriptive	\$12,684.00	24.103
Niagara Region-FE Wastewater	Fort Erie	Prescriptive	\$12,695.00	15.571
Niagara Region-FE Wastewater	Fort Erie	Custom-Lighting	\$1,520.00	3.8

A chart showing the 2014 Water and Waste Water energy conservation work plan is show in Appendix C, Figure 4.

Niagara Regional Housing (NRH) is identified as another big player in this scenario operating with 22% of the Niagara Region's annual utility budget.

Projects with energy conservation goals have been executed in this area in the past years:

Projects	Service Territory	Application Type	ncentive
Gilmore Lodge	Fort Erie	Lighting	\$ 1,498.00
Niagara Regional Housing (Bowden Street)	Fort Erie	Lighting	\$ 334.00
Niagara Regional Housing (Idylewylde Street)	Fort Erie	Lighting	\$ 280.00
Niagara Regional Housing (Albany Street)	Fort Erie	Lighting	\$ 1,252.00
Niagara Regional Housing (557 Steele Street)	Port Colborne	Lighting	\$ 1,046.00
Niagara Regional Housing (561 Steele Street)	Port Colborne	Lighting	\$ 1,034.00

Energy conservation projects at Long Term Care Homes (LTCH) include:

Seniors Services (Northland Pointe) invested significant capital in 2010 in solar thermal and installed 21 hydronic solar panels to preheat the home's domestic hot water. This has reduced the energy demand for producing hot water and in turn has reduced the facility's carbon footprint.

\$8.6 M for the redevelopment of Deer Park Villa, a 39 bed LTCH. The project was a multi-phased redevelopment project that included new construction and renovation of the facility to a LEED Silver facility.

- Scheduled \$4.7 M project budget for the replacement of the building envelope at Northland Pointe, project includes existing window replacement by energy efficient ones.
- Scheduled \$90K project budget for BAS upgrades at Rapelje Lodge.
- Scheduled \$56K project budget for building condition assessment and energy audits at 8 LTCH.

Transportation & Roads

Currently the Region owns very little roadway lighting and as such, power consumption for this lighting is low in our conservation management program. However, the plan is to expand our management of lighting on Region's roads in the next five to ten years.

At present, we are evaluating alternate technologies to the standard High Pressure Sodium street lighting fixture. We have purchased and installed over 500 LED roadway lighting fixtures. Significant power savings can be realized utilizing LED technology for roadway lighting. Additionally, we are reviewing the latest technology in remote roadway lighting management systems, which boast even further power savings.

Projects	Service Territory	Application Type	Incentive	kW Savings	Completion Date
42 Dolphin Street	Port Colborne	Energy Audit	\$ 706.00		Dec-12
369 Gorham Road	Fort Erie	Energy Audit	\$ 336.00		Dec-12
43 Hagey Avenue	Fort Erie	Energy Audit	\$ 621.00		Dec-12
487 Northland Avenue	Port Colborne	Energy Audit	\$ 377.00		Dec-12
94 Catherine Street	Fort Erie	Energy Audit	\$ 409.00		Dec-12
1200 Thompson Road	Fort Erie	Energy Audit	\$ 592.00		Dec-12
501 Fielden Avenue	Port Colborne	Energy Audit	\$ 526.00		Dec-12
Niagara Regional Police	Port Colborne	Lighting	\$ 1,679.00	4.72	May-13
Niagara Region Seaway Water (30 Prosperity)	Port Colborne	Lighting	\$ 3,182.40	7.96	Jun-13
Niagara Region HQ Chiller optimization	Thorold	Energy performance analysis	\$ 14,968.00	10.00	Sep-14

Other energy conservation projects region wide:

Equipment Efficiency



Niagara Region has pursued many measures to improve the energy efficiency of our equipment. Some of these measures include:

- Building envelope improvements,
- Electrical systems upgrade, and
 Heating, Ventilation and Air Conditioning
 (HVAC) equipment retrofits,
- The pursuit of the feasibility of solar thermal and solar photovoltaic applications.

As the understanding of corporate energy consumption improves, Niagara Region staff will be equipped with the knowledge necessary to make informed decisions. This improved understanding will also reveal how simple actions like commissioning and maintenance procedures can improve existing equipment efficiencies.

Organizational Integration

Day to day management of energy is primarily the responsibility of the managers and administrators on site; the Niagara Region Manager of Energy Management provides strategic plans to achieve those goals at corporation level. Current practices will be enhanced with future plans including:

- The creation of an interdepartmental energy management team,
- Improved energy monitoring and feedback, and
- Interactive energy training and awareness.

Staff across all departments will be given the necessary tools to address corporate energy concerns such as budgeting, procurement, conservation, and generation.

Prior to the development of the ECDM Plan, VIP Energy Services Inc. assessed Niagara Region's energy management practices. This assessment was completed by consulting with Niagara Region staff and reviewing relevant Niagara Region material. Upon completion of this review, VIP determined that Niagara Region had provided staff members with strategic directive to pursue proper energy management, and through Niagara Region staff ingenuity, Niagara Region was able to direct resources to energy management. However, VIP also noted that if Niagara Region were to achieve the Ministry's mandate, it would require the development of this ECDM Plan that will address our energy management needs.

5 CURRENT ENERGY CONCERNS

Environmental, societal, and fiscal pressures accentuate the need for a ECDM Plan.

Environmental

Concerns surrounding energy consumption with regard to climate change and air pollution have been well documented. Since 1990, Ontario's greenhouse gas emissions have increased 14%. The Government of Ontario estimates that 75% of Ontario's greenhouse gas emissions are associated with the consumption of fossil fuels for energy purposes. Increased smog and air pollution are also connected to the consumption of energy. Ontario's electricity generation is the Province's second largest source of sulfur dioxide and the third largest source of nitrogen oxides. These pollutants can cause irreparable harm to human health.

Societal

The 2003 Blackout heightened societal concerns surrounding the stability and security of our energy supply. Energy has been imbedded into most societal practices. If energy consumption is not managed appropriately, the frequency of energy interruption and the subsequent societal disruption could potentially increase.

Fiscal

The fossil fuels traditionally used for the generation of energy are no longer financially accessible or environmentally acceptable. This has resulted in the promotion of renewable energy generation which comes with an additional expense. Energy costs are also anticipated to increase as Ontario's existing energy infrastructure is taken off-line or refurbished. Coming off of the lows of the 2009 recession, national electricity and natural gas prices are 27% and 21% greater than they were at the start of the decade. It is not anticipated that this upward trend will be altered in the short to medium future. The Province of Ontario has recently projected an annual 3.5% to 7.9% increase in electricity costs over the next 20 years. Natural gas commodity prices are expected rise as much as 40% in the near future.

In recent years, Niagara Region has experienced a modest population growth and is projected to grow into the future. As Niagara Region grows so will the Niagara Region environmental, societal, and fiscal energy concerns. Niagara Region recognizes that proper energy management must be pursued if these concerns are to be addressed.

Niagara Region Population by Municipality, 1996-2011

Municipality	1996	2001	2006	2011
Fort Erie	27,183	28,140	29,925	29,960
Grimsby	19,585	21,295	23,937	25,325
Lincoln	18,801	20,610	21,722	22,487
Niagara Falls	76,917	78,815	82,184	82,997
Niagara-on-the-Lake	13,238	13,840	14,587	15,400
Pelham	14,393	15,275	16,155	16,598
Port Colborne	18,451	18,450	18,599	18,424
St Catharines	130,926	129,170	131,989	131,400
Thorold	17,883	18,045	18,224	17,931
Wainfleet	6,253	6,260	6,601	6,356
Welland	48,411	48,405	50,331	50,631
West Lincoln	11,513	12,265	13,167	13,837
Totals	403,554	410,574	427,421	431,346

Statistics Canada does a population census every five years.

Source: 2011 Census

(Estimate as July 1st 2013)

Municipality	2013 Population
Fort Erie	30,933
Grimsby	26,147
Lincoln	23,217
Thorold	18,513
Pelham	17,137
West Lincoln	14,286
Wainfleet	6,562
St.Catharines	135,666
Niagara Falls	85,692
Welland	52,275
Port Colborne	19,022
NOTL	15,900
Niagara Region Total	445,351

6 SCOPE OF THE ECDM PLAN

The Niagara region is located in southern Ontario, Canada, between Lake Ontario and Lake Erie. Niagara has a total area of 1,852 km2 with an estimated population of 445,351. As a municipal government, the Niagara Region is made up of 31 representatives from the 12 area municipalities. A full list of Niagara Region's owned facilities is shown as Figure 5 in Appendix C.

7 ENERGY BASELINE AND CURRENT ENERGY PERFORMANCE

Effectively managing energy requires implementing appropriate energy monitoring procedures. The establishment of an accurate energy baseline is essential in this process. It will assist with energy conservation and greenhouse gas reduction target setting, energy procurement and budgeting, bill verification, energy awareness, and the selection and assessment of potential energy projects. Niagara Region, like many local governing bodies, relies on its utility bills to establish its energy baseline.

Niagara Region is well positioned to meet this requirement as audits have been completed at some facilities, resulting in a list of energy reduction projects, some of which are already implemented. Future energy audits will consist of a detailed analysis of historical consumption and demand information, as well as a walkthrough of the facility by a qualified energy auditor. Based on the auditor's survey, detailed equipment list and an energy consumption breakdown will be created as well as the identification of a comprehensive list of potential energy conservation measures for each facility.

BASELINE PERFORMANCE (2011)

Niagara Region has elected to utilize the consumption data from 2011 to represent its baseline energy consumption performance.

In 2011, Niagara Region's total energy use, including electricity, natural gas, fuel oil and propane was 104,613,274 equivalent kilowatt hours (ekWh). This total consisted of:

2011 Energy Breakdown				
Energy Source	Annual Consumption	ekWh		
Electricity	79,585,403 kWh	79,585,403		
Natural Gas	3,287,608 m ³	23,113,705		
Fuel Oil	97,360 Litres	1,034,720		
Propane	125,089 Litres	879,445		
	Total	104,613,274		

Annual Cost				
Description	2011			
Utilities - Electricity	\$10,737,837			
Remote-Utilities-Electricity	\$1,506,376			
Utilities - Natural Gas	\$3,050,192			
Remote-Utilities-Natural Gas	\$34,761			
Utilities - Fuel Oil	\$115,410			
Remote-Utilities-Fuel Oil	\$38,438			
Utilities - Propane	\$84,326			

* A full breakdown by facility is found as Figure 6 in Appendix C.

CURRENT PERFORMANCE (2012)

It is imperative to understand the energy characteristics of each facility. By understanding these values, baselines can be established and future retrofits and improvements to the buildings can be monitored and tracked to ensure that the intended benefits are fully realized. Niagara Region's most recent energy consumption inventory was completed in 2012. This inventory took into account the electricity and natural gas consumption of Niagara Region facilities, street lights, and parks.

In 2012, Niagara Region's total energy use, including electricity, natural gas, fuel oil and propane was 103,769,761 equivalent kilowatt hours (ekWh). This total consisted of:

2012 Energy Breakdown				
Energy Source	Annual Consumption	ekWh		
Electricity	69,846,487 kWh	69,846,487		
Natural Gas	3,088,876 m ³	32,827,885		
Fuel Oil	57,296 Litres	676,411		
Propane	59,594 Litres	418,978		
	Total	103,769,761		

Annual Cost				
Description	2012			
Utilities - Electricity	\$10,292,056			
Remote-Utilities-Electricity	\$1,276,571			
Utilities - Natural Gas	\$2,364,764			
Remote-Utilities-Natural Gas	\$32,781			
Utilities - Fuel Oil	\$57,374			
Remote-Utilities-Fuel Oil	\$26,955			
Utilities - Propane	\$66,362			

* A full breakdown by facility is found as Figure 7 in Appendix C.

In all, Niagara Region has decreased its energy use intensity from 2011 to 2012 indicating an improvement in energy utilization from 1.22 GJ/m² (31 ekWh/ft²) to 1.10 GJ/m² (28 ekWh/ft²), for facilities not related to the treatment of sewage or water.

BENCHMARKING

Market Sector

Energy Use Intensity (<i>e</i> kWh/ft ²)						
Sector Minimum Average Maximum No. of Organizatio						
Municipal	0.0	219	56,932	410		

Niagara Region's non-water/sewage treatment facilities have an average 28 ekWh/ft² energy use intensity, which is below the industry average based on the Ministry of Energy's 2011 Public Sector Energy Consumption Data. The water/sewage treatment facilities have an average energy use intensity of 2.39 GJ/Mega Litre.

Energy use intensity is defined as energy consumption per square foot of floor space within the facility (or per litre pumped/treated for water facilities). This measure allows for easier comparison amongst buildings of different sizes to ascertain which performs better. Energy use intensity is a generally accepted method for benchmarking and targeting energy performance improvements.

A full breakdown of the energy use intensity for all Region facilities is shown as Figure 8 in Appendix C.

8 GOALS AND OBJECTIVES

The ECDM Plan has been developed to address the fiscal, societal, and environmental costs and risks associated with energy consumption. Proper energy management will allow Niagara Region to display leadership, improve the delivery of services, and enhance the overall quality of life with respect to the community.

This ECDM Plan outlines key actions that must be pursued to make this vision a reality. The completion of these actions will assist Niagara Region to meet its energy conservation targets and its GHG emission reduction commitment. Achieving these goals will assist Niagara Region in securing a strong energy management reputation and will allow for cost savings that can benefit Niagara Region, its employees, and its constituents.

Recognizing conservation impacts everyone differently, this Plan was created to address energy related concerns, while capturing innovative and relevant actions that will lead to meaningful changes. It is acknowledged that, for this vision to come to fruition, energy management at Niagara Region must become an inclusive process. This includes the need to consult and collaborate with local municipalities and public sector agencies.



This ECDM Plan will allow energy management to be incorporated into all Niagara Region activities, including organizational and human resource procedures, procurement practices, financial management and investment decisions, and facility capital, operations, and maintenance.

Overview

This ECDM Plan is designed to meet the current energy needs and obligations of Niagara Region. The intent is to guide Niagara Region in the development of an energy management foundation. This will be a living plan that will evolve as Niagara Region's energy needs are revealed and better understood.

Niagara Region's approach to energy management is three pronged. It begins with the

- Elimination of waste,
- Improving efficiencies, and
- Optimizing energy supply.
Prior to pursuing these actions, Niagara Region must be aware of the facility and staff behaviours that influence energy consumption. Once encapsulated, this knowledge must be dispersed throughout the organization, allowing for the development of a culture of sustainability.

An improved understanding of corporate energy consumption will require improvements in energy management and awareness. Energy awareness campaigns will strive to make energy a tangible asset that staff members can appreciate when it is being consumed or wasted. In addition to increasing energy awareness, this energy Plan will integrate energy efficiency into the capital and operational decision making of the organization.

It is of critical importance to improve energy efficiency and reduce our operating costs. Equally important is displaying our commitment to the environment through the reduction of greenhouse gases, while improving our air quality. It is also important that these actions are carried out without adversely impacting Niagara Region's operations. All Niagara Region staff will have an essential role in the success of this energy management plan. It will be the responsibility of the energy management team to ensure that energy management measures are properly communicated and effectively implemented. An energy mandate for Niagara Region has been developed and is an integral component of this ECDM Plan.



As mentioned, the primary objective of this plan is to improve the management of Niagara Region's energy consumption. Part of this objective is setting a conservation target that will see a reduction of our 2011 energy consumption by 5% by the end of 2019. Recognizing that Niagara Region has a modest population growth so, our energy conservation target will be energy intensity based. It is also the objective of this plan to improve Niagara Region's understanding of energy consumption that is essential for the Region to meet its corporate energy management goals.

Measurements of Success

The measurements of success will be based on a variety of indicators:

- Meeting the requirements of Ontario Regulation 397/11 and the Green Energy Act
- Reaching the ECDM Plan's energy conservation target,
- Achieving with the corporate greenhouse gas reduction target,
- Attaining the savings outlined in the plan's budget section, and
- Embedding energy management in Niagara Region's capital and operational decision making process.

Reporting Standards

The ECDM Plan will allow for the monitoring and reporting that is necessary for Niagara Region to meet the regulatory requirements of the **Green Energy Act** and Niagara Region's greenhouse gas reduction targets². Regular energy monitoring and feedback to the Ministry and Niagara Region staff will improve knowledge and make energy consumption a tangible asset, making possible appropriate behavioural changes. The intent of monitoring and reporting on energy consumption is to make energy management transparent and the consumer accountable. The Ministry will be provided with annual updates on the state of energy management at Niagara Region. Energy consumption feedback provided to staff will be embedded in Niagara Region's regular business.

2

http://www.fcm.ca/Documents/reports/PCP/Niagara_Region_2006_Corporate_GHG_Emissions_Inventory_EN.pdf http://www.fcm.ca/Documents/reports/PCP/Niagara_region_community_inventory_EN.pdf http://www.fcm.ca/Documents/reports/PCP/Niagara_Region_Corporate_Climate_Change_Action_Plan_EN.pdf

http://www.fcm.ca/Documents/reports/PCP/Niagara_Region_Community_Climate_Change_Action_Plan_EN.pdf

9 ENERGY MANAGEMENT TEAM

Historically, Niagara Region addressed energy conservation and demand management on a project-byproject basis through the activities of the building services group. Strategic directives have been provided by the Regional Council.

Currently, under the direction of the Director of Properties Management the team is led by the Manager of Energy Management and a Project Manager, Buildings.

This ECDM Plan outlines a commitment to integrate energy conservation and demand management into the operations of the Niagara Region. Within the duration of the ECDM Plan, ECDM's planned activities will become an integral component of the annual budgeting process. A collaborative effort will be undertaken to achieve this integration, involving:

- Internal staff (which may include but will not be limited to Properties Management, Finance, Water & Wastewater Energy Efficiency Committee and Purchasing),
- Advisement from the Ministry of Energy, and
- Consultations with Energy Management experts.



10 FINANCIAL ASSESSMENT

The Energy Conservation and Demand Management Plan's financial assessment philosophy is to treat fiscal resources as if they were energy assets. Therefore, financial investments follow the same three-pronged approach used for the management of energy:

- Elimination of waste,
- Improving efficiencies, and
- Optimizing energy supply.

The initial cost and saving estimates for the proposed process improvements, program implementation, and projects are broken down as follows.

A list of opportunities, annual savings, project costs and payback for the inaugural year is still being developed and some of the target areas will include:

- Heating, ventilation and air conditioning (HVAC) equipment retrofits,
- Building envelope improvements,
- Electrical systems upgrade, and
- The feasibility of solar thermal and solar photovoltaic applications.

The Region is currently developing its energy conservation measure roster for the 2015-2018 fiscal periods. The ability of the Region to implement any planned energy conservation activities is dependent on available funding.

The fiscal assessment does not take into account the economic benefits of achieving all of the corporate energy management goals. Due to the difficulty in quantifying the economic value of extended equipment longevity, improved comfort and productivity, and climate change mitigation, it should not be discounted.

11 CORPORATE ENERGY BUDGET

Prior to requesting funding for energy actions, Niagara Region will consult with utility representatives and/or energy consultants, allowing Niagara Region to schedule project launch dates in parallel with applicable incentive funding programs. The projects may be moved forward or delayed based on changes to incentive programs as well as changes to the ECDM Plan. However, Niagara Region will not make significant alterations to the plan in a quest for incentive funding. This is not a prudent approach to planning as factors such as risk, code compliance, growth impact, and sustainability must be given priority instead. Actions will be pursued only when they coincide with the Niagara Region's objectives and are appropriate to be pursued at that time.



As Niagara Region continues to evolve and its energy needs become greater, it will be essential to reassess and clarify the financial indicators that are applied to investment analysis and prioritization of proposed energy projects. Energy efficiency projects must be weighted appropriately relative to other investment needs.

12 ENERGY MANAGEMENT ACTIONS

The economic feasibility of proposed actions plays a large role in the prioritization of the processes, programs, and projects. Equally important in the prioritization exercise was the evaluation of Niagara Region's internal capacity to complete the proposed initiatives. Recognizing the need to develop Niagara Region's internal knowledge and capacity, the initial years of the plan focus heavily on processes and programs. The implementation of the recommended processes and programs will result in an improved understanding and awareness of energy consumption. This will allow for improved decision making and greater success with future energy projects. As actions are completed, the energy management team will meet to discuss monitoring results and how they can be used to enhance the Plan. The ECDM Plan is intended to be a living document. Anticipated improvements in knowledge and capacity will result in enhancement of the proposed actions.

Annual Reporting

An annual Energy Conservation and Demand Management Plan Update report will be provided that details Niagara Region's activities and results relating to this 2014-2018 energy conservation and demand management (ECDM) plan. The report will describe the related activities that have happened in the previous year and will focus on linking actions to results. In addition, the report will take a forward view of the upcoming year to lay out the roadmap and identify any changes or adjustments that should be considered based on what the current market conditions are. The overarching goal of the report is to make the five-year ECDM Plan a living document that is reviewed and updated on a yearly basis.

The annual report will also provide reference to the Region's progress towards its goal of a 5% reduction in energy intensity by 2019 (based on 2011 benchmark). This data will detail the relative success of each project undertaken in terms of the energy reductions provided within the affected facilities.

Future Energy Projects

Energy projects at Niagara Region were evaluated prior to the development of the ECDM Plan. Niagara Region staff Members have advocated for some ambitious energy initiatives that were investigated and determined to be not feasible for a variety of reasons. It is anticipated that as Niagara Region grows and energy management practices improve, these actions will be reassessed. At present, the Region has developed a list of energy savings projects that is currently being undertaken to reduce energy use in Regional facilities. This list spans the Fiscal Years of 2014 and 2015and is shown as Figure 9 in Appendix C.

The Region is currently reviewing the results of recent energy assessments as well as developing a list of future facility evaluations to build out their schedule of potential energy conservation measures for the 2016-2018 period.

Renewable Energy

Feasibility and promotion of renewable energy technologies will continue to be assessed. These technologies will be incorporated into the ECDM Plan where it makes sense to do so, strategically or fiscally.

Purchasing Practices

Traditionally, purchasing practices in the public sector were designed to favour equipment or physical retrofits at the lowest cost in order to ensure the highest possible financial return. As energy conservation best practices emerged, it was revealed that there is a major issue in doing this. Almost all wasteful energy consuming equipment is less expensive than their energy conserving counterparts. The practice in itself does not encourage energy efficiency, as most energy intensive alternatives such as standard efficiency motors are less costly than their higher efficiency counterparts. When dealing with energy intensive hardware, the initial capital cost is only a fraction (5%-10%) of the total lifecycle cost.

Making a specific amount of money available to include the conservation upgrades allows Niagara Region to take advantage of necessary investments in order to reduce their impact on the bottom line after the cost of purchase. This allows staff to make the right environmental decision based on this ECDM Plan.

Energy Management and Information Systems

An Energy Management and Information System (EMIS) is an important element of a comprehensive Energy Management Program (EMP), as it helps to ensure that the full benefits of other energy conservation efforts are achieved and sustained. In fact, a quality EMIS can reduce energy use and cost by at least 5%. (Ref: Office of Energy Efficiency, National Resources Canada). Current industry and international standards, such as the International Performance Measurement & Verification Protocol (IPMVP), use an average of an 8%-10% reduction in energy consumption and costs. VIP Energy Services Inc. has documented a conservation average of 17% over customers served to date. However, in order to be as conservative as possible in its financial calculations, VIP generally uses National Resources Canada (NRCan) conservative numbers (5%) to ensure objectivity in the investment matter. The savings from an EMIS result from the following measured impacts:

- Early detection of poor performance,
- Support for optimal decision making,

- Effective performance reporting,
- Auditing of historical performance,
- Identification and justification of energy projects,
- Evidence of implementation success,
- Support for energy budgeting and accounting, and
- Provision of energy data to other systems such as Building Automation Systems.

When looking at performance reports, an EMIS facilitates ensuring that upgrades or changes actually meet forecasted savings, as well as the quantification of losses or gains. However, it is important to note that placing meters to isolate individual retrofit projects determined by their scope is generally cost ineffective and typically does not allow incorporation of out-of-scope project factors that directly affect equipment performance.

A one-time, comprehensive metering solution allows for a much more cost effective view, while enabling accountability to 90% of the planned projects budgeted to date. Reporting can be the most essential part of this plan as multiple portions of the organization rely on this data to make periodic decisions. The finance team can use this information to verify billing accuracy and other potential costs, such as construction back-charges. Energy conservation managers generally look at this data for building performance, future opportunity and functional trending. Project managers rely on this information to ensure that vendors are supplying and meeting contractual obligations. Collecting the information in any EMIS program is really only the first step, as the data must then be used to instigate change and push action. This can only be done through analysis and warning systems built on baseline information. In order for an EMIS system to function properly, communication loops must also be established between departments in order for the maximum benefit to be realized. These systems can be as simple as an online Data Storage, Retrieval and Reporting System using billing data to form the basis and baselines for future comparison.

Building Re-Commissioning

Building re-commissioning, or retro-commissioning, refers to the optimization of the current automation, controls and energy consuming systems. As buildings age, both the functionality of the equipment and the functions that they serve can undergo significant changes. A re-commissioning program generally focuses on ensuring that the equipment operations are modified to include any new or deleted duties. The following is a list of common problems found in re-commissioning projects that result in increased energy costs:

• Inefficient scheduling of HVAC equipment,

- Simultaneous heating and cooling,
- Economizer sequences not optimized,
- Incorrect airflow and water balance,
- Malfunctioning sensors or incorrect calibration,
- Fan Variable Frequency Drivers (VFD) control overridden,
- Supply air static pressure set-points not optimized,
- Boiler controls not operating efficiently,
- Balancing dampers and valves not installed or installed in poor or unusable locations,
- Incorrectly piped water coils,
- Process or space classification changes (lab space to office, etc.),
- Incomplete or incorrect control component installation,
- Control sequence incorrectly implemented,
- Substituted control components,
- Incomplete installations (missing control valve, actuators, etc.), and
- Testing, adjusting, and balancing (TAB) not completed or only partially completed.

NRCan has published several guidelines for costing and expected returns from re-commissioning projects. Building re-commissioning is an increasingly important practice, not only from an energy standpoint, but also from a comfort and safety perspective as well. The more complex building controls and ventilation become, the more risk there is that one or more components will fail or deliver incorrect measurements.

Current practices in re-commissioning indicate that the cost to complete these initiatives is between \$2.90 and $$4.50/m^2$. Expected savings from the projects are typically between \$1.00 and $$4.00/m^2$, depending upon the starting efficiency of the building, thus creating very attractive paybacks in this area.

Energy and Resource Awareness (ERA) Programs

Independent studies done by organizations such as NRCan show that initiatives directed at staff and facility users, in particular ERA Programs, can lead to significant savings on their own. In fact, NRCan reports indicate that dedicated, consistent energy awareness programs are proven to be the most effective way to reduce energy usage with no capital costs and minor operational expenses. A conservative estimate of savings for an effective ERA program can be as high as 5% -7% of annual utilities spending.

An effective ERA program is designed to assist organizations to attain energy savings by promoting a fundamental shift in the personal philosophies of staff and facility users towards reducing their energy use. The program utilizes community-based social marketing to develop influential communication materials and in-house displays that are carefully designed to inform and motivate employees to effectively decrease energy consumption. In many cases, an ERA Program has proven to be the most effective way to lower energy usage without any capital costs and minimal operational expenses. A typical ERA Program would include features such as:

- A detailed ERA program written plan including a GANTT chart,
- The creation of a program email address for suggestions and concerns and access to ERA experts to answer questions,
- A customized identity and marketing program,
- Training and support for an energy efficiency committee,
- ERA displays with various relevant conservation themes, and
- Annual marketing effectiveness reports and feedback system.

A continuous and consistent ERA program is not only an effective way to lower energy use within a facility, but can also serve to be an effective marketing tool to spread the word that the Niagara Region is a community leader in energy conservation and environmental sustainability.



ENERGY CONSUMPTION

ELECTRICITY



NATURAL GAS







PROPANE



APPENDIX B

Energy Use Breakdown

ENERGY USE BREAKDOWN





APPENDIX C

Reference Materials and Charts

2011 Energy Reduction Projects Summary					
	Actions Taken				
Roof Replacement Bulk Storage Facility, Service Centre Lighting Upgrades, Roof Replacement Branscombe Daycare, 250 Thorold Rd W-Roof Replacement, Vaccine Room HVAC Upgrades, Campbell Wort Boof	Port Colborne Police Lighting Upgrades, Port Colborne EMS Roof Replacement, PW Service Centre HVAC Upgrades, Port Colborne EMS HVAC Upgrades, Campbell West HVAC	Campbell East & West HVAC Upgrades Port Colborne Police HVAC Upgrades, Welland Police Roof Replacement, Niagara Falls Police Lighting Upgrades, Welland Gun Range Electrical			
Replacement, LEED Pilot Project, Energy Mgmt Prgm-Regional Facilities, Welland Police Lighting Upgrades, St. Catharines Police Lighting Upgrades, Support Services HVAC Upgrades, 110 James Street HVAC Upgrades, Port Colborne Police Generator,	Fort Erie Police HVAC Upgrades, Environmental Centre HVAC Upgrades, Niagara Falls Public Health HVAC Upgrades, Niagara Falls Police Building Lighting Retrofit, Fort Erie Police Roof Replacement, Ontario Street EMS Roof Replacement,	St. Catharines Police HVAC Upgrades, NF Police Exterior Brick Repairs, Building & Energy Condition Assessments, Regional Building Energy Upgrades, Building Automation Systems (BAS), Linwell EMS Roof Replacement, Smithville EMS Roof Replacement			

Figure 1: 2011 Energy Reduction Projects Summary

2012 Energy Reduction Projects Summary						
	Action Taken					
Roof Replacement Bulk Storage Facility, 250 Thorold Rd W-Roof Replacement, Welland Police Lighting Upgrades, St. Catharines Police Lighting Upgrades, Support Services HVAC Upgrades, 110 James Street HVAC Upgrades, Port Colborne Police Generator, Port Colborne Police Lighting Upgrades, Ontario Street EMS Lighting Upgrades, Welland EMS Lighting Upgrades, Campbell West HVAC Upgrades, Environmental Centre HVAC Upgrades, Niagara Falls Public Health HVAC Upgrades, Ontario Street EMS Roof	Campbell East & West HVAC Upgrades, Welland Police Roof Replacement, Welland Gun Range Electrical Upgrades, St. Catharines Police HVAC Upgrades, Niagara Falls Lighting Upgrades, Fort Erie Lighting Upgrades, Support Services Lighting Upgrades, Police Fleet Lighting Upgrades, Welland Gun Range Lighting Upgrades, Police Fleet HVAC Upgrades, Support Services HVAC Upgrades, Support Services HVAC Upgrades, NRP - Port Colborne Police Roof Replacement, Building & Energy Condition Assessments, Regional Building Energy	Building Automation Systems, Linwell EMS Roof Replacement, 250 Thorold Rd HVAC & Electrical Upgrades, Smithville EMS Roof Replacement, Environmental Centre Roof Replacement, PWSC Roof Replacement, Welland Gun Range HVAC Insulation Upgrades, Welland Police Roof Condensers, Grimsby Police BAS System, Thorold Patrol Yard Natural Gas Conversion, Campbell West VAV Box Upgrades, St. Catharines Day Care HVAC Improvements, Linwell EMS Air Conditioning Upgrade, NOTL EMS Lighting Un-Grades				
Replacement,	Upgrades,	Public Works Service Centre Lighting Up-Grades				

Figure 2: 2012 Energy Reduction Projects Summary

Figure 3: 2012 Energy Reduction Projects Summary

2013 Energy Reduction Projects Summary								
	Action Taken							
 250 Thorold Rd W-Roof Replacement, Welland Police Lighting Upgrades, Port Colborne Police Lighting Upgrades, Ontario Street EMS Lighting Upgrades, Welland EMS Lighting Upgrades, Environmental Centre HVAC Upgrades, Campbell East & West HVAC Upgrades, Welland Police Roof Replacement, Welland Gun Range Electrical Upgrades, Niagara Falls Lighting Upgrades, Fort Erie Lighting Upgrades, Support Services Lighting Upgrades, Police Fleet Lighting Upgrades, Welland Gun Range Lighting Upgrades, 	Police Fleet HVAC Upgrades, Support Services HVAC Upgrades, NRP - Port Colborne Police Roof Replacement, Building & Energy Condition Assessments, Regional Building Energy Upgrades, Building Automation Systems, Linwell EMS Roof Replacement, 250 Thorold Rd HVAC & Electrical Upgrades, St. Catharines Health Lighting Upgrades,Smithville EMS Roof Replacement, Environmental Centre Roof Replacement, PWSC Roof Replacement, Welland Gun Range HVAC Insulation Upgrades, Welland Police Roof Condensers, Grimsby Police BAS System,	Thorold Patrol Yard Natural Gas Conversion, Campbell West VAV Box Upgrades, St. Catharines Day Care HVAC Improvements, Linwell EMS Air Conditioning Upgrade, NOTL EMS Lighting Up-Grades, Public Works Service Centre Lighting Up-Grades, Pelham Patrol Yard HVAC Improvements, Energy Upgrades, Ontario St. EMS HVAC Improvements, PWSC Roof Replacement, Welland Police HVAC Improvements, EMS Garage Door Upgrades, Renewable Energy Program						

Figure 4: The Energy Conservation Work Plan 2014 - Water and Wastewater

Project Description	Energy Conservation Measure	Project Cost	KW Saved	Reductions (KWh)	Savings (\$/year)	Incentive	Payback (years)
Water Wastewater Division							
Water/Wastewater Energy Efficiency Committee	Developing 3-5 year Conservation Plan						
Conservation Planning & Reporting							
	Regulatory compliance O.Reg 397/11						
	Conservation plan development						
Lighting & Controls							
Port Colborne (Seaway) WW Plant	Reduce energy use, improve lighting, cost reduction	\$30,000					
Grimsby Wastewater Plant Exterior Lighting	Replace obsolete lighting, reduce energy, improve lighting	\$121,825	24.0	125,877.00	\$13,846	\$6,618	8.3
Anger Ave WWT Plant Exterior Lighting	Replace obsolete lighting, reduce energy, improve lighting	\$145,000		82,076.00			
Welland WWT Plant Exterior Lighting	Replace obsolete lighting, reduce energy, improve lighting	\$50,000					
Decew Water Plant Interior Lighting/Controls	Reduce energy use, improve lighting	\$60,000	19.8	92,591.72	\$14,594	\$10,500	2.8
Decew Water Plant- Exterior Lighting	Replace obsolete lighting, reduce energy, improve security						
Capital Projects		•					
NOTL Wastewater Plant	New plant to be designed to LEED & high efficy stds						
Grimsby WTP High Lift Pp Upgrades	Incentive Applied for, Pump install Fall 2013		81.6	259,150.00	\$28,507	\$65,000	
Stevensville WTP Reservoir & Pp Station	Efficiency, optimization						
Welland WWT Plant Aeration	Energy and asset renewal study						
Pt Weller WWT - Aeration feasibility	Energy and asset renewal study						
Energy Audits and Engineering Studies			•				
Engineering Standards Review	Aggregated WWW Audit /Feasibility study						
Engineering Standards Review	Standards setting						
Rosehill Water Plant Energy Audit	Energy Audit and Management Plan	\$52,200					
Welland Water Plant Energy Audit	Energy Audit and Management Plan	\$86,800					
Port Dalhousie WW Plant Energy Audit	Energy Audit and Management Plan	\$82,600					
Welland Water Plant HPNC Incentive	Energy Incentive Programs For New Construction						
Pt Dalhouise RAS EE Feasibility Study	Efficiency, optimization						
Niagara Falls WTP High Lift VFD Studies							
Power Factor Correction	Efficiency, optimization						
Micro Hydro technology energy recovery	Energy recovery						
Grimsby Wastewater Plant VFD	Install VFD'S						
Pump Station Optimization (Smithville)							
Submetering& SCADA	Real time energy monitoring and control						
Biogas Utlization	Renewable Energy						
Biogas Utlization	Renewable Energy						
EIT Solar Program	Benewable Energy						
	1						
	1						
Niagara Region HQ	HVAC redesign and upgrade	\$945.000					
Niagara Region HQ	Replace obsolete lighting, reduce energy, improve lighting	÷: .5,000					
Niagara Region	Reduce energy use, improve lighting SBLIP						
Niagara Region HO	Chiller efficiency, optimization	\$18 925				\$14,968	1 3
		÷_3,523				÷= .,500	1.5

Figure 5: Niagara Region's Owned Facilities Included in the ECDM Plan

Regional Municipality of Niagara Facilities (Based on 2011 Energy Consumption and Greenhouse Gas Emission Report to the Ministry of Energy)					
Building Name	Operation Type	City			
	Administrative offices and related facilities,				
Regional HQ - Campbell E&W	including municipal council chambers	Thorold			
Water & Wastewater Environmental	Administrative offices and related facilities,				
Center	including municipal council chambers	Thorold			
	Administrative offices and related facilities,				
Fort Erie Public Health	including municipal council chambers	Fort Erie			
	Administrative offices and related facilities,				
Welland Community Services	including municipal council chambers	Welland			
	Administrative offices and related facilities,				
Niagara Falls Community Services	including municipal council chambers	Niagara Falls			
	Administrative offices and related facilities,				
Niagara Falls Public Health	including municipal council chambers	Niagara Falls			
	Administrative offices and related facilities,				
Welland Public Health	including municipal council chambers	Welland			
	Administrative offices and related facilities,				
St. Catharines Community Services	including municipal council chambers	St Catharines			
Niagara Falls Provincial Offences	Administrative offices and related facilities,				
Courthouse	including municipal council chambers	Niagara Falls			
	Administrative offices and related facilities,				
St Catharines Public Health	including municipal council chambers	St Catharines			
	Ambulance stations and associated offices and				
Grimsby EMS Station (10 Iroquois Trail)	facilities	Grimsby			
	Ambulance stations and associated offices and				
Pelham EMS Station (177 Hwy 20)	facilities	Pelham			
	Ambulance stations and associated offices and				
Smithville EMS Station (110 West Street)	facilities	West Lincoln			
St Catharines EMS Station (139 Ontario	Ambulance stations and associated offices and				
Street)	facilities	St Catharines			
	Ambulance stations and associated offices and	Niagara On The			
NOTL EMS Station (176 Wellington Street)	facilities	Lake			
Niagara Falls EMS Station (2722 St Paul	Ambulance stations and associated offices and				
Ave.)	facilities	Niagara Falls			
St Catharines EMS Station (337 Linwell	Ambulance stations and associated offices and				
Road)	facilities	St Catharines			
	Ambulance stations and associated offices and				
Ridgeway EMS Station (369 Gorham Road)	facilities	Fort Erie			
Port Colborne EMS Station (42 Dolphin	Ambulance stations and associated offices and				
Street)	facilities	Port Colborne			
	Ambulance stations and associated offices and				
Fort Erie EMS Station (43 Hagey Avenue)	facilities	Fort Erie			
Niagara Falls EMS Station (5685 North	Ambulance stations and associated offices and	Niagara Falls			

Regional Municipality of Niagara Facilities (Based on 2011 Energy Consumption and Greenhouse Gas Emission Report to the Ministry of Energy)					
Building Name	Operation Type	City			
Street)	facilities				
	Ambulance stations and associated offices and				
Welland EMS Station (580 King Street)	facilities	Welland			
	Police stations and associated offices and				
Niagara Falls Police	facilities	Niagara Falls			
	Police stations and associated offices and				
St Catharines Police	facilities	St Catharines			
	Police stations and associated offices and				
Fort Erie Police	facilities	Fort Erie			
	Police stations and associated offices and				
Grimsby Police	Tacilities	Grimsby			
Port Colhorno Polico	facilities	Port Colhorno			
	Police stations and associated offices and	Port Colborne			
Welland Police	facilities	Welland			
	Police stations and associated offices and	Wendha			
Emergency Services Building	facilities	St Catharines			
	Police stations and associated offices and				
Brock Industrial Park Police Facility	facilities	Thorold			
· · · · · · · · · · · · · · · · · · ·	Police stations and associated offices and				
Police HQ	facilities	St Catharines			
	Storage facilities where equipment or vehicles				
Traffic Service Center	are maintained, repaired or stored	Thorold			
	Storage facilities where equipment or vehicles				
Police Fleet Building	are maintained, repaired or stored	Thorold			
	Storage facilities where equipment or vehicles				
I horold Patrol Yard	are maintained, repaired or stored	Thorold			
Wolland Patrol Vard	Storage facilities where equipment or vehicles	Wolland			
	Storage facilities where equipment or vehicles	weilallu			
Smithville Patrol Yard	are maintained repaired or stored	West Lincoln			
Niagara Falls Wastewater	Eacilities related to the treatment of sewage	Niagara Falls			
		Niagara On The			
Niagara On The Lake Wastewater	Facilities related to the treatment of sewage	Lake			
		Niagara On The			
Queenston Operations Wastewater	Facilities related to the treatment of sewage	Lake			
Port Dalhousie Wastewater	Facilities related to the treatment of sewage	St Catharines			
Port Weller Wastewater	Facilities related to the treatment of sewage	St Catharines			
Welland Wastewater	Facilities related to the treatment of sewage	Welland			
Grimshy Wastewater	Facilities related to the treatment of sewage	Grimshy			
Fort Frie Wastewater	Facilities related to the treatment of sewage	Fort Frie			
	Facilities related to the numping of courses				
Douglastown Lagoon	racinities related to the pumping of sewage	iviagara Falls			

Regional Municipality of Niagara Facilities (Based on 2011 Energy Consumption and Greenhouse Gas Emission Report to the Ministry of Energy)					
Building Name	Operation Type	City			
Seaway Wastewater	Facilities related to the treatment of sewage	Port Colborne			
Niagara Falls Water	Facilities related to the treatment of water	Niagara Falls			
Rosehill Water	Facilities related to the treatment of water	Fort Erie			
Welland Water	Facilities related to the treatment of water	Welland			
Port Colborne Water	Facilities related to the treatment of water	Port Colborne			
DeCew Falls Water	Facilities related to the treatment of water	St Catharines			
Grimsby Water	Facilities related to the treatment of water	Grimsby			
Garner Roads Biosolids	Facilities related to the treatment of sewage	Niagara Falls			
	Administrative offices and related facilities,				
Water & Wastewater Central Maintenance	including municipal council chambers	Welland			

We will continue to expand the GHG emissions report during the course of this plan to include the following sites:

	Long Term Care Homes (LTCH)	
LTCH Deer Park Villa	Long Term Care Home	Grimsby
LTCH Northland Pointe	Long Term Care Home	Port Colborne
LTCH Upper Canada Lodge	Long Term Care Home	NOTL
LTCH Rapelje Lodge	Long Term Care Home	Welland
LTCH Linhaven	Long Term Care Home	St. Catharines
LTCH Gilmore Lodge	Long Term Care Home	Fort Erie
LTCH The Meadows of Dorchester	Long Term Care Home	Niagara Falls
LTCH Woodlands of Sunset	Long Term Care Home	Welland

Figure 6: Niagara Region's 2011 Energy and GHG Emissions Breakdown

Regional Municipality of	f Niagara I	Facilities - 20	11 Energy						
		Total Electricity	Total Natural Gas	Total Fuel Oil	Total Propane	GHG	Energy	Energy	
	Annual Flow	Consumption	Consumption	Consumption	Consumption	Emissions	Intensity	Intensity	Energy Intensity
Building Name	(Mega Litres)	(kWh)	(m³)	(Litres)	(Litres)	(kg)	(ekWh/ft²)	(GJ/m²)	(GJ/Mega Litre)
Regional HQ - Campbell E&W		2,858,153	169,841			549,758	24	0.93	
Environmental Center		408,316	73,586			171,789	63	2.43	
Fort Erie Health		70,908	803			7,191	17	0.65	
Welland Community Services		289,048	44,430			107,124	29	1.14	
SAEO Office		220,081	5,138			27,321	13	0.49	
Niagara Falls Public Health		184,188	1,924			18,373	26	1.01	
Welland Public Health		156,716	17,835			46,257	19	0.74	
SAEO Office		274,732	26,336			71,770	19	0.73	
Queen Street Courthouse		67,600	31,946			65,806	58	2.25	
St Catharines Public Health		44,891	21,965			45,119	49	1.89	
Grimsby EMS Station		64,937	4,962			14,576	35	1.36	
Pelham EMS Station		24,392	5,801			12,919	26	0.99	
Smithville EMS Station		18,942	8,755			18,068	32	1.25	
St Catharines EMS Station		129,727	15,055			38,842	31	1.19	
NOTL EMS Station		13,892	5,863			12,196	35	1.35	
Niagara Falls EMS Station		20,168	5,918			12,802	85	3.30	
St Catharines EMS Station		39,334	4,399			11,464	41	1.59	
Ridgeway EMS Station		20,200	6,434			13,780	26	1.02	
Port Colborne EMS Station		45,027	13,468			29,065	27	1.03	
Fort Erie EMS Station		22,685				1,815	14	0.53	
Niagara Falls EMS Station		126,365	45.440			10,109	21	0.82	
Welland EMS Station		92,334	15,118			35,969	3/	1.44	
Niagara Falis Police		3/4,/21	13,890			56,238	27	1.04	
St Catharines Police		1,987,690	121,343			388,430	44	1.69	
Fort Erie Police		/5,/50	4,960			15,438	22	0.84	
Grimsby Police		141,037	17,353			44,091	40	1.54	
Nolland Delian		91,980	3,307			13,011	24	0.94	
Emorganey Canvings Duilding		224,021	46,497			135,694	42	1.03	
Emergency Services Building		234,031	15,508			47,004	17	0.84	
		062 590	4,103			240 120	17	0.07	
Traffic Service Center		435 265	00,242		82 177	161 701	40	0.86	
Police Elect Building		208 805			26 822	58 117	22	0.80	
Thorold Patrol Vard		108 816			16 090	33,117	21	1.45	
Welland Patrol Vard		228 324	31 200		10,050	77 253	37	1.43	
Pelham Patrol Vard		91 714	12 516			31,000	54	2 10	
Smithville Patrol Yard		95 764	28 497			61 538	39	1 51	
Niagara Falls Wastewater	16588	10 205 802	459 980			1 686 115	55	1.01	3.28
Niagara On The Lake Wastewater	1932	1 768 034	1 568			144 407			3 33
Queenston Operations Wastewater	112	208.423	2,500			16.674			6.72
Port Dalhousie Wastewater	14030	5.362.431	84,184			588,155			1.61
Port Weller Wastewater	15806	5,567,902	120.084			672,466			1.56
Welland Wastewater	15221	6,426,264	140.765			780.235			1.87
Grimsby Wastewater	8720	5.161.704	413,942			1.195.546			3.95
Fort Erie Wastewater	5316	3,221,982	145,085			532,060			3.23
Crystal Beach Wastewater	2304	1,446,841	99,146			303,195			3.91
Douglastown Lagoon	560	403,465				32,277			2.59
Seaway Wastewater	4967	3,705,902	238,268			746,948			4.52
Niagara Falls Water	19059	8,179,286	189,234			1,012,114			1.92
Rosehill Water	4661	2,253,888	100,550			370,414			2.57
Welland Water	8088	3,213,201	92,619			432,164			1.87
Port Colborne Water	2987	1,240,456	70,187			231,934			2.39
DeCew Falls Water	19404	4,815,530	120	97,360		691,670			0.89
Grimsby Water	5154	4,137,828	168,434			649,472			4.14
Garner Roads Biosolids		1,196,000	53,605			197,027			
Central Maintenance		160,095	45,038			97,957	25	0.97	
	144,908	79,585,403	3,287,608	97,360	125,089	13,081,808	31	1.22	2.85

Figure 7: Niagara Region's 2012 Energy and GHG Emissions

Regional Municipality of	Niagara F	acilities - 201	L2 Energy						
		Total Electricity	Total Natural Gas	Total Fuel Oil	Total Propane	GHG	Energy	Energy	
	Annual Flow	Consumption	Consumption	Consumption	Consumption	Emissions	Intensity	Intensity	Energy Intensity
Building Name	(Mega Litres)	(kWh)	(m ³)	(Litres)	(Litres)	(kg)	(ekWh/ft ²)	(GJ/m²)	(GJ/Mega Litre)
Regional HQ - Campbell E&W	-	2,708,656	125,969	-	-	454,852.87	21	0.80	
Environmental Center	-	395,710	56,326	-	-	138,148	52	2.03	
Fort Erie Health	-	70,176	5,876	-	-	16,723	28	1.08	
Welland Community Services	-	277,583	77,335	-	-	168,418	43	1.65	
SAEO Office	-	205,033	21,490	-	-	57,032	20	0.77	
Niagara Falls Public Health	-	107,627	11,957	-	-	31,216	30	1.15	
Welland Public Health	-	139,100	13,568	-	-	36,780	16	0.61	
SAEO Office	-	284,735	23,667	-	-	67,524	18	0.70	
Queen Street Courthouse	-	64,626	20,412	-	-	43,762	40	1.55	
St Catharines Public Health	-	62,098	14,669	-	-	32,701	38	1.48	
Grimsby EMS Station	-	247,962	3,310	-	-	26,095	84	3.27	
Pelham EMS Station	-	3,734	-	-	-	299	1	0.04	
Smithville EMS Station	-	29,214	6,160	-	-	13,983	27	1.06	
St Catharines EMS Station	-	105,877	11,555	-	-	30,316	24	0.94	
NOTL EMS Station	-	14,601	3,975	-	-	8,683	26	1.01	
Niagara Falls EMS Station	-	16,526	4,422	-	-	9,682	65	2.52	
St Catharines EMS Station	-	34,442	3,265	-	-	8,928	33	1.28	
Ridgeway EMS Station	-	18,968	4,856	-	-	10,698	21	0.81	
Port Colborne EMS Station	-	46,726	8,650	-	-	20,092	20	0.76	
Fort Erie EMS Station	-	70,176	5,876	-	-	16,723	80	3.12	
Niagara Falls EMS Station	-	98,672	-	-	-	7,894	16	0.64	
Welland EMS Station	-	81,231	14,510	-	-	33,932	35	1.34	
Niagara Falls Police	-	383,708	10,422	-	-	50,401	25	0.99	
St Catharines Police	-	1,977,635	105,036	-	-	356,795	41	1.59	
Fort Erie Police	-	53,065	3,487	-	-	10,838	15	0.59	
Grimsby Police	-	145,245	13,013	-	-	36,222	35	1.34	
Port Colborne Police	-	88,678	2,794	-	-	12,377	23	0.87	
Welland Police	-	510,259	46,914	-	-	129,518	39	1.50	
Emergency Services Building	-	254,863	16,969	-	-	52,471	24	0.92	
Brock Ind Park Police Facility	-	107,818	3,439	-	-	15,127	20	0.77	
Police HQ	-	896,952	/0,/26	-	-	205,473	35	1.35	
Traffic Service Center	-	413,883	-	-	35,820	88,417	15	0.56	
Police Fleet Building	-	200,655	-	-	14,517	38,466	16	0.62	
Malland Patrol Yard	-	103,471	-	-	9,257	22,570	28	1.10	
Weiland Patrol Yard	-	252,515	20,104	-	-	09,008	30	1.10	
Pelnam Patrol Yard	-	121,020	18,550	-	-	44,764	20	2.98	
Niagara Falls Wastewater	- 14495	9 202 299	20,945	-	-	1 212 640	50	1.17	2.84
Niagara On The Lake Wastewater	14465	0,392,500	1 520	-	-	1,215,040			2.04
Queenston Operations Wastewater	1301	2,031,417	1,525			16 5 4 2			4.72
Port Dalbousie Wastewater	11708	5 405 063	77.045			578.068			1 91
Port Weller Wastewater	12400	4 999 655	/9.236			493.059			1.51
Welland Wastewater	12908	5 470 069	361 502			1 121 071			2.58
Baker Wastewater	6887	4 947 600	268 349			903 156			4.08
Anger Wastewater	4024	2 798 259	114 914	-	-	441 120			3.60
Crystal Beach Wastewater	1707	1,413,945	113,947	-	-	328,547			5.54
Douglastown Lagoon	411	365,363	-	-	-	29,229			3.20
Seaway Wastewater	3878	3,608,981	320.450	-	-	894,570			6.51
Niagara Falls Water	19422	6.880.151	195.946	-	-	920.873			1.66
Rosehill Water	4694	2,340,787	95,591	-	-	367,990			2.57
Welland Water	8918	3,253,311	77,351	-	-	406,507			1.65
Port Colborne Water	2901	1,235,256	52,425	-	-	197,937			2.22
DeCew Falls Water	19277	5,693,646	38,640	57,296	-	708,744			1.27
Grimsby Water	5274	3,954,530	178,822		-	654,448			4.00
Garner Roads Biosolids		1,179,720	42,334	-	-	174,415			
Central Maintenance	0	232,028	37,675	-	-	89,792	25	0.97	
	130,639	75,088,463	3,088,876	57,296	59,594	12,119,199	28	1.10	2.39



Figure 8: 2011 and 2012 Energy Use Intensity Breakdowns



Figure 9: Planned Regional Energy Conservation Initiatives

ECM #	Location	Address	City	Project	Project Cost
01	Welland Gun Range	300 Woodland Road	Welland	Electrical Upgrades	\$125,000
02	Support Services	2 Cushman Road	St. Catharines	Lighting Upgrades	\$50,000
03	Support Services	2 Cushman Road	St. Catharines	HVAC Upgrades	\$70,000
04	Regional Buildings	Regional Buildings		Energy Upgrades	\$350,000
05	Regional Buildings	Regional Buildings		BAS Upgrades	\$250,000
06	250 Thorold Rd	250 Thorold Rd	Welland	HVAC & Electrical Upgrades	\$800,000
07	Pelham Patrol Yard	Pelham Patrol Yard	Thorold	HVAC Upgrades	\$50,000
08	Regional Buildings	Regional Buildings		Energy Upgrades	\$350,000
09	Ontario St. EMS	Ontario St. EMS	St. Catharines	HVAC Upgrades	\$50,000
10	PWSC (Service Centre)	PWSC (Service Centre)	Thorold	Roof Replacement	\$475,000
11	Police Fleet	Police Fleet	Thorold	Roof Replacement	\$300,000
12	EMS Garage	EMS Garage	Niagara Falls	Garage Door Upgrades	\$75,000
13	Regional Buildings	Regional Buildings		Renewable Energy Program	\$1,000,000
14	PWSC (Service Centre)	PWSC (Service Centre)	Thorold	Overhead Door Upgrades	\$50,000
15	Welland Patrol Yard	Welland Patrol Yard	Welland	Roof Replacement	\$45,000
16	Campbell West	Campbell West	Thorold	Window Replacement	\$250,000
17	Welland Gun Range	Welland Gun Range	Welland	HVAC Upgrades	\$125,000
18	Thorold Patrol Yard	Thorold Patrol Yard	Thorold	HVAC Upgrades	\$20,000
19	Linwell EMS	Linwell EMS	St. Catharines	HVAC Upgrades	\$10,000
20	Smithville Ems	Smithville Ems	Smithville	HVAC Upgrades	\$10,000

Niagara Region Energy Conservation Measures

ECM #	Facility	Measure	Anticipated Results
21	Rosehill Water Treatment Plant	Reuse sample water as grey water (purple pipe system)	996 Litres per week water savings
22	Rosehill Water Treatment Plant	Upgrade LLP1 and LLP4	108,500 kWh/yr., 31kW, 10,000 \$/yr. electrical savings
23	Rosehill Water Treatment Plant	Upgrade LLP3	35,500 kWh/yr., 42kW, 3,000 \$/yr. electrical savings
24	Rosehill Water Treatment Plant	Friction head reduction	14,000 kWh/yr., 5,000 \$/yr. electrical savings
25	Rosehill Water Treatment Plant	Facility heating and cooling (and no new elevator)	5,000 \$/yr. electrical savings
26	Rosehill Water Treatment Plant	Night pump (75 hp) replacing HLP4 for low flows	80,000 kWh/yr., 56kW, 5,000 \$/yr. electrical savings
27	Rosehill Water Treatment Plant	Upgrade Backwash Pump 2	5,500 kWh/yr., 28kW, 600 \$/yr. electrical savings
28	Rosehill Water Treatment Plant	Utilize elevated tank for water distribution	4,000 \$/yr. electrical savings
29	Port Dalhousie Wastewater Treatment Plant	Resize / Reconfigure Pumps on Secondary Clarifier #5	45,454 kWh/yr. electrical savings and 33,148 Litres/yr. water savings
30	Port Dalhousie Wastewater Treatment Plant	Install Diffused Air Technology	665,760 kWh/yr. electrical savings and 73,234 Litres/yr. water savings
31	DeCew Water Treatment Plant	Replace 427 fluorescent fixtures, T12 to T5	95,592 kWh/yr., 14,594 \$/yr. electrical savings, cost \$59,000
32	Fort Erie Wastewater Treatment Plant	Replace 53 exterior fixtures, upgrade to LED	Cost \$145,000
33	Grimsby Wastewater Treatment Plant	Replace 131 exterior fixtures with induction fixtures	Cost \$121,825 125,872 kWh/yr., 13,847 \$/yr. electrical savings

Niagara Region Energy Conservation Measures