

THE REGIONAL MUNICIPALITY OF DURHAM
ENERGY CONSERVATION AND DEMAND MANAGEMENT PLAN
2014 TO 2019



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1.0 Introduction

Consistent with the theme of the Durham Region Strategic Plan 2009-2014 to “*protect and enhance our environment for today and tomorrow through stewardship of our natural resources*”, the Regional Municipality of Durham is committed to reducing energy consumption and being conscious of energy usage within its facilities and operations. Given the cost impacts and greenhouse gas (GHG) emissions associated with energy consumption, there are notable benefits to improving energy efficiency across Regional facilities and operations.

The vision for Durham’s energy management, as aligned with the Durham Region Strategic Plan, is to attain continuous improvement in energy conservation and awareness throughout all Regional sectors. Key goals consist of reductions in energy waste and GHG emissions and cost avoidance, particularly given rising energy costs. Further, investigation and implementation of renewable energy generation and energy harvesting opportunities are considered where feasible.

VISION

“Continuous improvement in energy conservation and awareness throughout all Regional sectors.”

The Region’s Energy Conservation and Demand Management Plan (‘CDM Plan’) will serve as a tool to guide and improving energy efficiency and conservation. The Plan is a ‘living document’ and will continue to evolve as the Region’s requirements are further scoped and the various proposed strategic actions, which have been identified through the Plan development process, are assessed and implemented throughout the long-term business planning period.

The CDM Plan is a corporate-wide plan that will set the context for the 2015 Business Planning and Budget cycle and five-year economic and financial forecast (2015 to 2019) in terms of energy

conservation and demand management planning and funding across all Regional program areas¹.

Completed or ongoing energy efficiency and conservation measures are described herein, as it is the Region’s previous successes and challenges which will set a strong foundation for improvement, including the establishment of 2015 to 2019 energy conservation and demand management goals, objectives and strategic actions, to be approved through annual business planning and budget cycles.

2.0 Council Direction Regarding Energy Planning and Conservation

Energy planning and conservation is not new to the Regional Municipality of Durham and staff across program areas have worked to improve corporate energy planning and conservation while also seeking co-benefits from associated GHG emission reductions.



Durham Regional Headquarters, 605 Rossland Rd. E., Town of Whitby

Since 2007, energy usage, related costs and GHG emissions have been tracked and reported. Even prior to 2004, when the Region’s formalized Corporate Asset Management Program was established, Regional staff from across program areas have worked to improve energy efficiency as part of the ongoing processes of service delivery and infrastructure renewal.

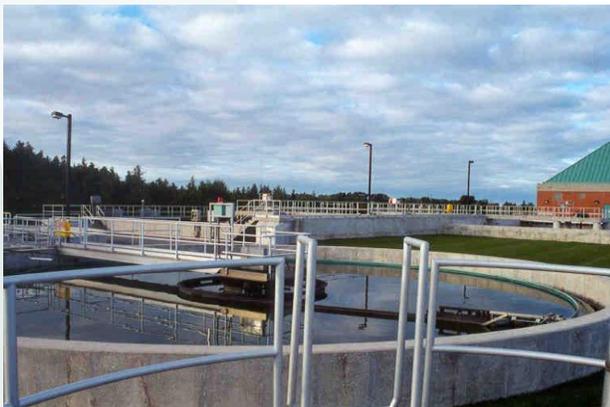
¹ The Region’s capital planning period was extended in 2013 to a 10-year forecast of requirements and financing (2015-2024).

In June, 2012, Regional Council endorsed the continuing efforts of staff and the ongoing process of integrating energy efficiency and conservation initiatives into existing corporate business planning, risk and asset management programs, through the established multi-departmental Climate Change Staff Working Group and Energy Advisory Sub-committee.

Consistent with the Region's business planning cycle and annual studies and reporting processes, which are based upon five-year operational plans and 10-year capital plans, the Region will also report progress through its CDM Plan commencing with this report, and consistent with provincial reporting requirements of *Ontario Regulation 397/11*.

3.0 Collaborative Approach to Energy Management

Based on past successes, staff coordination across programs and multi-departmental business management teams is seen as a key element to ensuring the maximization of energy efficiency and conservation opportunities, while minimizing costs and avoiding duplication of efforts.



Lake Simcoe WPCP, 885 Concession 5, Beaverton

The Region's corporate-wide approach is supported by the Corporate Climate Change Staff Working Group, established by Department Heads. The Energy Advisory Sub-committee, formed by the working group and chaired by the Works Department, connects energy management across operational areas with a focus on:

- Raising awareness;
- Guiding energy efficiency initiatives;
- Monitoring progress and reviewing achievements;
- Maximizing knowledge of external funding opportunities; and
- Supporting linkages to other Regional business strategies and staff teams.

More recently, an Energy Management Working Group, formed from members of the Energy Advisory Sub-committee and comprised of staff from Works and Finance, was established to steer the development of the Region's first CDM Plan in compliance with provincial regulations, and in consultation with senior management and other program stakeholders, including front-line staff.

Strategic workshop consultations undertaken by the Working Group across all operational areas assisted with the development of energy plan goals and objectives.



EMS Headquarters, 4040 Anderson St., Town of Whitby

4.0 Building on Success

This section highlights past successes and ongoing initiatives at the Region related to corporate energy conservation and demand management. The summary provides an overview of the breadth of the study and effort that has already gone into the area of energy efficiency.

Although not exhaustive in scope, Appendix A of the CDM Plan provides an overview of several notable initiatives undertaken, or in the process of implementation. These span operational improvements and enhancements to monitoring, equipment upgrades and lighting, to name a few. The 2014 approved budget also includes several other initiatives that are being implemented and that are identified separately.

4.1 The Regional 'New Build' Energy Standard

Regional facilities are based upon the design standards of the American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) 90.1, 2007 Energy Standard and has been adopted by the Ontario Building Code (OBC).



DRPS Operations Training Centre (ASHRAE Standard 90.1-2007), 4060 Taunton Rd., Town of Whitby

Furthermore, the Region's analysis for new build design and approvals includes consideration of ASHRAE Standard 189.1-2009 on a case-by-case basis. The ASHRAE standards ensure a sustainable and consistent performance through a buildings life-cycle, rather than focusing solely on construction.

The approach has led to several Regional buildings being designed based upon the ASHRAE 189.1-2009 standard, including the new Fairview Lodge Long-term Care (LTC) Home, Oshawa North Emergency Medical Services (EMS) Station and the DRPS Clarington Complex Phase 1 (East Division Building and Forensic Investigation Facility). Furthermore, the Fairview Lodge LTC Home and

DRPS Complex Phase 1 facilities will be LEED Silver Certified.

For example, the DRPS Clarington Complex is proposed to include pedestrian connections, south facing building orientation, sustainable building massing, natural ventilation and site lighting. Renewable energy options may also be considered.

Additionally, the new Fairview LTC Home, scheduled for occupancy in late-2014, will include increased HVAC and appliance efficiencies; sub-metering capability; enhanced duct sealing and will be capable of accommodating rooftop solar photovoltaic (PV).

- The new Durham – York Energy Centre, energy from waste facility (EFW) anticipated to commence operations in 2014, will process 140,000 tonnes of municipal non-hazardous and post-diversion solid waste collected by Durham Region (110,000 tonnes) and York Region (30,000 tonnes). The facility will produce enough energy in-house to accommodate all of its day-to-day electricity and heating requirements. Purchased energy will be negligible and temporary, required mainly for facility start-up and shut-down.

The EFW will provide base load electricity to the Ontario power grid equivalent to the power requirements of approximately 10,000 households. Electricity revenues will in turn offset the solid waste facility operational costs. Other features of the EFW include energy efficient white roofing applied to all administrative buildings and a zero discharge water system. No wastewater is discharged from the EFW process and instead the facility will progressively re-use process water for internal systems until it finally becomes quench water for ash residue at the end of the process. A portion of the solid waste fuel processed within the facility is biogenic, and could also be considered renewable.

Where possible, newly constructed facilities will consider program incentives and technical resources including the saveONenergy High Performance New Construction Program (HPNC) and Enbridge Savings by Design programs, where both provide incentives for implementing energy efficient features into building design.

4.2 Energy Performance Monitoring

The Region's Works Department has established consistent and effective energy reporting tools for all Regional facilities in order to manage energy usage and promote conservation. Annual Energy Usage Reports, Energy Report Cards and other internal energy tools are available for use by all Regional departments.



Boilers at Newcastle WPCP, 1000 Toronto Ave., Newcastle

The Region has also established a comprehensive and robust reporting framework and methodology for reporting energy usage and associated GHGs, based on recognized measurement protocols.

4.2.1 Annual Energy Usage Reports and Energy Report Cards

Since 2006, the Technical Support Division of the Works Department has produced Annual Energy Usage Reports to assist program areas in energy management and to assist in the planning and prioritization of energy conservation and demand management initiatives. The reports present overall energy consumption and cost totals. Summaries by operational service area are also provided which include historical energy consumption, cost trends, benchmark levels, energy use intensities and corresponding GHG emissions.

The Energy Efficiency Report Cards represent another internal tool for monitoring energy usage and benchmarking annual trends. These are available to staff through the Region's internal website, and allow online viewing of electricity and natural gas billing data.



4.3 Energy Procurement

Energy efficiency is currently a consideration in the Region's purchase of goods and services. In 2012 Regional Council directed that the Region's Purchasing By-law 68-2000 (as amended) include the following clause within its "Section 2: Policies:"

"Departments will review potential for, and where appropriate include, specifications in bid solicitations that provide for: energy efficient products; durable and re-useable products; products that contain the maximum level of post-consumer waste and/or recyclable content; products that are compostable or bio-degradable; and products that include the least toxins and packaging, without significantly affecting intended usage or life-cycle or impacting conformance to compliance standards. It is understood that cost analysis will be utilized as appropriate to ensure products continue to be affordable and competitively priced and to ensure consideration of a life-cycle approach."

The Region also contracts electricity and natural gas procurement and consulting services to assist in the management of an extensive energy portfolio totaling approximately \$25 million. Energy supply management includes supplier evaluations, based on quality and reliability. Continuous monitoring and assessment of supply and market fundamentals is also key to assessing account risk factors.

4.4 Energy Performance Audits

The Energy Advisory Sub-Committee has guided the Region's energy audit process to assess energy performance and identify go-forward energy and water saving opportunities. Water efficiency works in synergy with energy efficiency given that reductions in water usage result in energy cost savings and delay water supply infrastructure expansions.

Goals and Objectives of energy performance audits include:

- Establishment of an energy baseline and relevant performance indicators, including Energy Use Intensity (EUI) and Energy Cost Index (ECI) indicators;
- Development of energy load distribution and water consumption inventories;
- Identification of demand reduction opportunities within plant operations;
- Improvements to maintenance and building control systems;
- Analysis of energy retrofit and upgrade projects;
- Life-cycle assessment and business cases for potential energy conservation measures (ECM) and water efficiency measures (WEM);
- Maximization of saveONenergy, Enbridge or other program funding opportunities; and
- Increased awareness among staff and residents/tenants and empowerment of stakeholders in energy conservation.

The performance audit includes a list of potential energy conservation measures (ECMs) and water efficiency measures (WEMs), including low-cost and no-cost opportunities suitable for immediate implementation. The auditing team also provides continuous support throughout the project implementation stages for approved projects. The utilization of in-house resources and internal expertise allows for closer collaboration amongst all stakeholders.



Grandview South WPS, 1090 St. Andrews Ct., City of Oshawa

The Region has adopted best practice approaches to conduct in-house audits processes, including comprehensive internal reporting tools. Audits are built upon data sources from Building Condition Assessments (BCA) and Maintenance Management Systems. For example, an audit at DRPS West Division in Pickering utilized BCA information to identify ECMs and WEMs.

Since 2012, several comprehensive energy performance audits have been completed outside the BCA process including: Ajax Water Supply Plant (WSP); Grandview South Water Pumping Station (WPS); Lake Simcoe Water Pollution Control Plant (WPCP); Courtice WPCP; Newcastle WPCP; and DRPS West Division. Further, an audit strategy in 2014 is focused on Duffin Creek WPCP, the single largest energy consuming facility in Durham Region, responsible for 41% of the Region's total facility energy usage.

To supplement the in-house auditing process, the Region also leverages funding opportunities and available technical resources to assess facilities through consultant-based energy audit studies and site assessments administered through the Region's local distribution companies (LDCs). This auditing approach was utilized for the Region's 23 Durham Region Local Housing Corporation (DRLHC) properties, DRPS and EMS facilities, Works maintenance depots and various offices and other Regional facilities.

5.0 Renewable Energy and Forward Looking Studies

The Region has been active in investigating and implementing various renewable energy and alternative generating opportunities through multi-disciplinary strategic and technical feasibility assessments. Following is an overview of the initiatives undertaken by the Region:

- The Region has installed and operate four rooftop solar photovoltaic (PV) applications, each with 20-year micro Feed-in-Tariff (microFIT) contracts. Senior government funding has assisted with the implementation of systems at the following DRLHC locations:
 - 850 Green St., Whitby (2011);
 - 155 King St. E, Oshawa (2013);
 - 439 Dean Ave., Oshawa (2013); and
 - 315 Colborne St., Whitby (2013).

It is estimated that the projects generate a combined \$40,000 per annum in contract revenues.² The solar projects are monitored and analyzed by Regional staff and results will assist in the strategic assessment of potential future projects.



Bowling Green Towers, 850 Green St., Town of Whitby

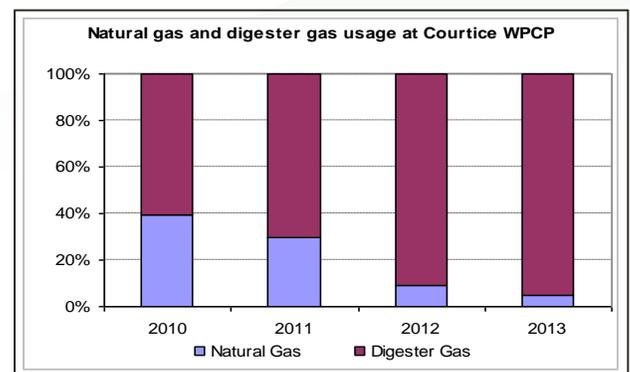
Based upon detailed assessments undertaken by Works and Finance staff, several candidate sites were examined for solar application viability. Structural enhancements are included in the new Fairview Lodge LTC home rebuild to

provide rooftop solar PV capability for the future. Consideration will also be given for solar potential at the new Clarington Police Complex facilities and Durham Region Transit (DRT) Raleigh facility in Oshawa.

Solar options and related technologies are assessed on a case-by-case basis as part of new build design, including technical and financial considerations and available FIT and microFIT program opportunities by the Ontario Power Authority (OPA).

- Also a renewable resource, digester gas is a by-product of the anaerobic digestion process at secondary wastewater treatment facilities. It is utilized in dual-fuelled boilers for process and internal heating purposes at several Regional plants. The utilization of the digester gas at Duffin Creek WPCP, Corbett Creek WPCP, Harmony Creek WPCP and Courtice WPCP has significantly displaced natural gas usage, decreasing flaring requirements and reducing energy costs.

New operating practices are meant to maximize the utilization of the digester gas. At Courtice WPCP, the innovative operational improvements by plant staff resulted in enhanced biogas production and consistent gas pressure for the boiler system. In turn, the plant's operational improvements have set an example for other Regional WPCPs, and digester gas usage will be expanded across facilities as treatment processes permit.



Historical regression of natural gas usage for dual fuel boilers due to utilization of digester gas at Courtice WPCP.

² 850 Green St, Whitby receives revenues at \$0.802/kWh while the three other DRLHC locations receive \$0.549/kWh.

Potential for biogas utilization for cogeneration, heat exchange based technologies, and/or generation of bio-fuel and/or bio-methane is being assessed. Staff are currently engaged in a feasibility study and technical, commercial and risk assessment work in developing a scope of work to review energy recovery options for Courtice WPCP for consideration in the Business Planning process.



Courtice WPCP, 100 Osborne Rd., Courtice

- In 2011, Regional staff retained a consultant to conduct pre-feasibility analysis of options to implement anaerobic digestion technology to recover energy from organic materials. In 2013, staff began to explore potential partnership options. Staff will report back in 2015 regarding options, technical and financial analysis and recommendations.
- Wind energy potential was investigated at Courtice WPCP but was deemed more suitable for large developments beyond the scope and mandate of the Region. Similarly, energy recovery potential at Brock Township landfill, the Region's largest landfill, was investigated and dismissed given insufficient gas to feasibly implement a landfill gas collection system.
- The Region continues to examine renewable energy options that provide value-added benefits, including environmental, technical, regulatory and financial considerations.

6.0 Energy Baseline

Consistent with the annual energy reporting required by public agencies for the 2014 reporting year under the regulation, 2012 is used as the energy baseline for the Region's CDM Plan. Energy management and conservation begins with a detailed assessment of the state of energy consumption across operations areas. More specifically, data is to be provided by facility and by energy type (i.e. electricity, natural gas, fuel) to facilitate development of concrete measures and targets to ensure an ability to track success as the Plan moves forward³.

2012 Energy Consumption by Fuel Source

Annual Energy Consumption and Cost	Value (000's)	Unit	Converted to GJ (000's)	\$ (000's)	GHG Emissions (tonnes CO ₂ e)
Electricity	178,837	kWh	643.8	\$ 20,290	17,168
Natural Gas	9,942	m ³	381.0	\$ 2,789	18,797
Diesel	173	L	6.6	\$ 165	482
Furnace Oil	1,262	L	49.0	\$ 1,253	3,453
Propane	18	L	0.5	\$ 12	28
Totals			1,080.9	\$ 24,510	39,929

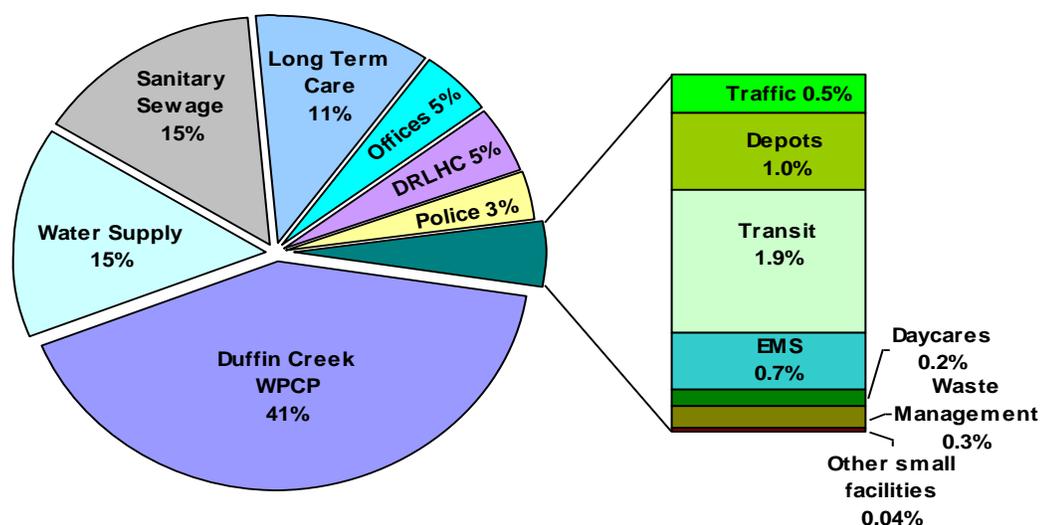
Notes: Gigajoules (GJ) is a metric term for measuring energy use. For CO₂e, GHGs are calculated based on tonnes of CO₂ needed to produce a similar warming effect and is a product of the amount of gas and its associated Global Warming Potential (GWP).

³ Totals are for energy usage for Regional facilities and operations and are not inclusive of fleet energy consumption (i.e. police services, transit, EMS, depot operations). DRLHC properties include seniors multi-residential locations but do not include energy consumption for family unit properties in the City of Oshawa.

2012 Energy Usage by Operational Sector

Total energy costs for Regional facilities were approximately \$25 million for 2012, with almost 83% attributed to electricity consumption. The operational sector using the most energy is Water Supply and Sanitary Sewerage, which accounts for just over 71% of total Regional energy usage for facilities and operations (as measured by total GJs). Water Supply and Sanitary Sewerage uses over 76% of the Region's total electricity consumption.⁴

2012 Energy Usage by Operational Sector



6.1 Baseline Performance Measures

2012 Sector Baseline Performance Measures

Benchmark Performances	Number of Systems	Quantity ML or ft ²	Unit	Sector EUI	Rate per Unit \$/ML or \$/ft ²
Benchmark Performances by Sector					
- Energy Use Intensity (EUI) of Water	13	64,752	GJ/ML	2.50	\$77.00
- Energy Use Intensity (EUI) of Wastewater	11	54,171	GJ/ML	2.64	\$70.63
- Energy Use Intensity (EUI) of Duffin Cr WPCP	1	119,179	GJ/ML	3.89	\$80.06
- Energy Use Intensity (EUI) of Traffic	386 Accounts		GJ/Account	14.70	\$552.18
Normalized Benchmark Performance					
- Energy Use Intensity (EUI) of RHQ	1	358,950	GJ/HDD/ft ²	0.140	\$2.99
- Energy Use Intensity (EUI) of other offices	6	72,300	GJ/HDD/ft ²	0.095	\$2.15
- Energy Use Intensity (EUI) of DRLHC	18	603,552	GJ/HDD/ft ²	0.094	\$1.72
- Energy Use Intensity (EUI) of LTC	4	677,228	GJ/HDD/ft ²	0.206	\$3.15
- Energy Use Intensity (EUI) of Police	10	192,763	GJ/HDD/ft ²	0.205	\$3.93
- Energy Use Intensity (EUI) of Works Depots	6	99,251	GJ/HDD/ft ²	0.126	\$2.18
- Energy Use Intensity (EUI) of Transit	4	130,286	GJ/HDD/ft ²	0.177	\$2.16
- Energy Use Intensity (EUI) of EMS	10	62,390	GJ/HDD/ft ²	0.146	\$2.52
- Energy Use Intensity (EUI) of Daycares	6	25,508	GJ/HDD/ft ²	0.104	\$2.10

⁴ Duffin Creek WPCP is jointly owned by Region of Durham and York Region. Consistent with the Annual Energy Reporting as required for Ontario Regulation 397/11, the Region of Durham reports for Duffin Creek WPCP usage and costs in its entirety, including York's share.

The Energy Use Intensity (EUI) measure serves as a facility benchmark and parameter to assist with the prioritization of energy audits. Further, in representing a facility or operation and its energy usage relative to its size, the sector-specific EUI measure considers the uniqueness of the facility and operations by sector while recognizing the growth in the Region which includes, in some instances, expansions to operations or additional facilities which may impact absolute energy consumption.

Additional details for energy usage and performance measures across operational sectors are provided in Appendix C. Additional terminology and conversion methodology information are detailed in Appendix D.

7.0 The Region's CDM Plan: Moving Forward

The CDM Plan is a tool to guide the Region in attaining continuous improvement in energy conservation and awareness throughout all Regional sectors and operations.



Pump operator at Ajax WSP, 75 Lake Driveway, Town of Ajax

Through the Region's Business Planning and Budget process, a number of energy efficiency initiatives are included in the forecast period. Where energy efficiency can be achieved, staff also works collaboratively with LDCs through participation in various energy efficiency programs and incentives. The Region has thus far been successful in leveraging numerous incentive programs for projects related to new construction, retrofits, energy audits, technical assessments and related resources.

Continued progress by the Region in the area of energy efficiency will further its position as a steward for corporate energy and environmental sustainability, while reducing exposure to rising energy costs. Given this, from the goals and objectives outlined herein, more concrete actions have been brought forward for implementation over the planning period (2015 to 2019).



Beaverton WSP, 35 Simcoe St., Beaverton

Development of the CDM Plan through multi-disciplinary strategic consultations has identified further areas for improvement to ensure energy efficiency and conservation remain a corporate-wide priority. Further, heightening energy awareness among operational and facility occupants will assist the Region in fostering a 'culture of conservation' into the future.

7.1 Specific Energy Conservation Measures (2014 to 2019)

Measures targeting energy efficiency can consist of organizational (e.g. policy, procedural), behavioral (e.g. awareness, engagement) and technological (e.g. equipment) initiatives. As the following goals, objectives and actions primarily target behavioral and organizational elements, Appendix B provides a summary of technological and related energy conservation measures (ECMs). These will be considered through the annual Business Planning and Budget process. As proposed, initiatives continue to be assessed and refined, and cost estimates and implementation timelines are subject to change. The CDM Plan is a living document for which Regional staff will report to Regional Council at least annually, as required.

7.2 Goals, Objectives and Actions

Goal 1: Enhance Corporate Energy Awareness, Communications, Engagement and Information Sharing

OBJECTIVES:

- *To engage staff and enhance educational opportunities for staff and tenants and foster a 'culture of conservation.'*
- *To enhance staff empowerment regarding energy management.*
- *To provide effective forums for recognition of energy conservation successes.*
- *To determine areas where improved information sharing is possible and facilitate interaction across operational areas regarding ECMs, experiences and results.*

Ensuring the greatest possible communication across operational sectors will assist in promoting effective information exchange and feedback around success stories and knowledge. The following actions are proposed to enhance energy awareness:

ACTIONS (2014-2015)

- **A Corporate Energy Awareness Strategy:** The Region's Energy Advisory Sub-Committee, working in collaboration with key Regional divisions (e.g. Corporate Communications, Information Services, etc.) and senior management, will develop an Energy Awareness Strategy to heighten staff awareness and foster communication including ECMs, experiences and results.
- **Energy Forums:** To assist in furthering corporate energy efficiency goals and objectives, staff forums will be established including working groups and web-based linkages etc. These forums will enhance networking across operational sectors while providing educational opportunities for all staff. Forums will be facilitated by staff knowledgeable in energy management best practice who are willing to share information to enhance the knowledge of others. This approach to enhancing educational opportunities for staff allows expert staff, proactive in approach and initiative, to share innovative solutions and promote energy efficiency and conservation across the organization. It is not only a method to empower staff, but utilizes a collaborative approach to help foster a culture of conservation across the organization.

Goal 2:

Investigate Existing and Potential for New Standards Related to Energy Efficiency

OBJECTIVES:

- *Ensure where possible, a consistent approach to operations, maintenance, asset management and procurement as related to energy efficiency.*
- *Consider energy efficiency criterion at the earliest stages of a project.*

Between 2014 and 2016, staff will investigate Regional energy-related standards and consider areas where energy management standardization can be further implemented or improved, including consideration of potential synergies with compliance standards and/or other service and infrastructure requirements. Proposed actions include:

ACTIONS (2014-2016)

- **Establish Standardization Committees:** Staff Committees will be established to review, analyze, develop and provide recommendations regarding standard processes, documentation, technical specifications and implications related to energy conservation and demand management.
- **Review Energy and Water Audit Processes:** A review and assessment of energy and water efficiency audit procedures and resources will be conducted by staff to support an audit implementation strategy, in consultation with senior management, by 2016.

Energy Management Standardization: Areas for Consideration

Areas for review include, but are not limited to:

- *Commissioning and re-commissioning;*
- *Equipment selection;*
- *Energy monitoring;*
- *Tender/Request-for-Proposal (RFP) specifications;*
- *Facility and performance measurement;*
- *Measurement and verification;*
- *Asset maintenance (e.g. upgrades);*
- *Standard operating procedures; and,*
- *The energy and water performance audit process.*

Goal 3: Enhance Energy Related Performance Measurements

OBJECTIVES:

- *Improve the quality of data to better understand variations in consumption and performance over time.*
- *Continue to implement Council direction to incorporate energy specific performance measures into individual business plans and budget documentation to enhance the long term energy conservation and demand management planning process.*

Further development and implementation of effective performance measures, both internal and external, and their consideration within the Business Planning and Budget process will assist in identifying where funding and resources should be prioritized to promote energy efficiency. Key elements of the proposed strategy include the following:

ACTIONS (2014-2015)

- ***Improve and Monitor Baseline Measures:*** Staff will work to improve baseline measures for facilities, through the use of energy audit information, BCAs and billing analysis, with additional reviews to identify additional monitoring requirements.
- ***Establish Quantitative Energy Management and Performance Targets for Regional Facilities:*** In collaboration with operational areas and senior management, staff will establish quantitative performance targets across operational sectors, using the EUI metric (Section 6.1) and additional measures, as appropriate.
- ***Review Industry Benchmarks:*** In consultation with operational areas, staff will review external industry benchmarking methods and programs and provide recommendations as appropriate, for methodological improvements and/or recommendations for potential participation in additional organizational/collaborative initiatives.⁵
- ***Investigate Potential for Enhancing the Current Data Collection, Monitoring and Reporting Processes:*** Work with operational areas and provide analysis, recommendations and implications.

⁵ The Region is already a participant in several performance measurement initiatives. In addition to internal performance measurement within annual Business Plans and Budgets, the Region is a participant in the Ontario Municipal Benchmarking Initiative (OMBI), National Water and Wastewater Benchmarking Initiative (NWWBI) and the mandatory Ontario Municipal Performance Measurement Program (MPMP).

Goal 4:

Continue Integration of Energy Conservation into Existing Asset Management and Business Planning Processes

OBJECTIVES:

- *Investigate and provide options, analysis and information for decision making and business case analysis.*
- *Further integrate energy efficiency considerations and continue to leverage external grant funding opportunities and programs.*

Per existing Regional Council direction, staff continue to integrate energy efficiency considerations and initiatives into the annual business planning and asset management processes across program areas.

ACTIONS (2014-2019)

- **Energy Efficiency is a Priority:** Staff continue to increase awareness of energy efficiency as a standard criterion for evaluation in undertaking maintenance practices, capital upgrades and/or related projects. A recent focus is ensuring appropriate and reliable performance measurement as discussed herein. With increasing awareness of energy efficiency, associated savings and other identified benefits over the longer-term/life-cycle of a project or initiative, the benefits of integration are reinforced. Further, opportunities for expert staff to support and present business cases for energy efficiency will be facilitated.
- **Better Identify Opportunities:** Detailed information from technical reviews/BCAs will continue to be used to assist in identifying and further examining energy efficiency measures at the earliest stages of planning.
- **Align Planning and External Funding Opportunities with Program Resources:** Collaboration with Durham's LDCs at the earliest stages of a project will remain key to determining whether external grant funding is available and/or value-added investments should be incorporated into project design.
- **Leverage Program Incentive Funding or Additional Funding Opportunities:** Additional ECMs will be considered as funding is identified as available. Staff will continuously monitor external funding opportunities.
- **Multi-Disciplinary Analysis:** Decisions will consider life-cycle analysis, compliance standards, best-available technologies, environmental benefits and technical and financial sustainability at the earliest stages of a project (e.g. conceptual and pre-design stages).

Goal 5:

Develop a Corporate-wide Five-Year Lighting Retrofit Strategy

OBJECTIVES:

- *Investigate and establish a lighting inventory for the Region's 300+ facilities.*
- *Works and Finance staff strategically analyze options and conduct business case analysis to determine and recommend a sustainable and technically and financially feasible five-year plan to upgrade the Region's lighting inventory.*

The Region's 300+ facilities include a wide variety of lighting technologies. Staff believe that considerable energy savings would result with a corporate plan to upgrade the Region's lighting in conjunction with other project priorities.

ACTIONS (2014-2019)

- **Develop Corporate Lighting Inventory:** *Staff, in consultation with the Energy Advisory Sub-Committee, will compile an inventory of existing lighting at the Region's 300+ facilities, including technology, number of units, energy usage estimates and costs and replacement cost estimates.*
- **Recommend Five-year Lighting Retrofit Strategy:** *Strategic assessments of options will be conducted in consultation with the asset management teams, including business case analysis, to recommend through a Joint Committee of Regional Council a financially and technically feasible comprehensive lighting retrofit strategy over the 2015 to 2019 timeframe.*

Goal 6:

Assess 2014/15 Embedded Energy Manager (EEM) Program for Potential Application at Other Sites/Programs

OBJECTIVES:

- *Repeat program successes, where appropriate and beneficial.*
- *Share successes and challenges with other areas to enhance awareness and knowledge across program areas.*
- *Determine opportunities and constraints during implementation of EEM at Duffin Creek and consider future implementation and implications for other sites/programs.*

The Region is currently participating in the OPA's Embedded Energy Manager (EEM) program for Duffin Creek WPCP, which involves a dedicated temporary staffing resource for energy management with a mandate to achieve target demand and consumption reductions. As part of the CDM Plan, it is proposed that the EEM be used as a model for evaluating and implementing dedicated energy management resources for other Regional programs, where appropriate.

ACTIONS (2015-2019)

- ***Evaluate the Success of the 2014/15 EEM Program:*** Based on consideration of quarterly assessment reports, overall performance and success in identifying ECMs, Regional staff will assess the results of the 12 month initiative in the spring/summer of 2015, and assess potential to extend or expand the program.
- ***Evaluate Opportunities for Other Program Areas:*** Regional staff will collaboratively evaluate energy efficiency opportunities across other Regional operational areas (outside Duffin Creek WPCP system), to assess the viability and functionality of dedicating resources specifically to energy management, including the EEM program. Recommendations for considering such resources and additional program participation would be considered through future Business Planning and Budget processes.

7.3 Regional Planning Process: Implementation of Strategic Actions

Energy initiatives will continue to be prioritized within the Region's established business practices. These processes provide a strong foundation to support implementation of the most cost effective and value-added energy and conservation strategies over the forecast period and beyond. Sustainable decision making must consider the balance of social, environmental, technical, financial, economic, operational and regulatory considerations.

The Region's focus to-date has been on the enhancement of energy efficiency initiatives, including green construction and maintenance practices and standards; electrical and mechanical system retrofits; and, improvements and maximization of external grant funding available for energy efficiency initiatives.

Numerous energy saving initiatives have been completed, are underway or are under evaluation for possible future implementation (Appendix B). Where possible, staff continue to leverage the multitude of available programs to further the Region's corporate energy conservation goals and objectives. Regional staff work in collaboration with electricity and natural gas local distribution companies (LDCs) to leverage numerous programs, funding opportunities and technical resources, including saveONenergy programs offered by the OPA and Enbridge Gas, which have assisted with project identification and implementation.

The Region looks to ensure that energy conservation remains central to the organization's culture and best-practice decision-making, reporting and approvals processes going forward. CDM plan costs, benefits, and risks will be considered annually, and monitored and reported within the broader long-term planning and management process with the goal of continuous improvement.

Durham Annual Business Planning Cycle



Through the Region's annual business planning cycle, objectives are achieved through: strategic planning; research/analysis; the five-year economic and financial forecast; longer-term servicing and financing studies for major program areas; business case evaluations; asset and risk management; annual detailed business plans and implementation approvals; and, performance measurement and monitoring.

The Region will continue to employ a multi-disciplinary corporate approach to energy planning to ensure the maximization of benefits. It is recognized that energy planning is not specific to any one program area, and a concerted effort across program areas and staff is necessary to maximize results.

This Strategic Planning Goal guides the corporate program, consistent with Regional Council direction. Each year during the business planning process, all Regional program areas highlight and consider potential energy efficiency and GHG reduction measures, including potential energy and cost savings, implementation steps, timeframes, required resources, and potential performance measures to evaluate success.

8.0 Conclusion: Looking Forward

The Region's Energy Conservation and Demand Management Plan ('CDM Plan') will serve as a tool to guide and improve the energy efficiency of the Regional corporation while reducing GHG emissions in support of climate change mitigation. The Plan is a living document that will evolve as the Region's requirements are further scoped and the various proposed strategic actions, are assessed and implemented throughout the operational planning period (2015 to 2019).

The CDM Plan is a corporate-wide plan that will set the context for the 2015 Business Planning and Budget cycle and five-year economic and financial forecast (2015 to 2019) in terms of energy conservation and demand management planning and funding across all Regional program areas.

The implementation plan includes the following six goals, as detailed with associated objectives and strategic actions within Section 7 of the Region's CDM Plan:

1. Enhance corporate energy awareness, communications, engagement and information sharing, including educational opportunities for staff to foster a 'culture of conservation' (2014 – 2015);
2. Investigate existing standards and potential for new energy-related standards to ensure an effective and consistent approach to operations, maintenance, asset management and procurement (2014 – 2016);
3. Per previous Council direction, continue to enhance energy related performance measurement, to better understand energy usage variations and incorporate specific performance measures into individual business planning and budget documentation (2014-2015);
4. Further integrate energy conservation into existing business planning and asset management analysis, including strategic assessments of specific corporate options for 2015 to 2024 Business Planning and the leveraging of external grant funding opportunities (2014 – 2019);
5. Develop a corporate-wide five-year lighting retrofit strategy for consideration, including Works and Finance staff consolidation of the existing lighting inventory, options analysis, business case analysis and comprehensive reporting through Joint Committee, of a comprehensive technically and financially feasible plan, including recommendations and timelines for Council approval (2014 – 2019); and,
6. Complete a retrospective assessment of the approved 2014/15 Embedded Energy Manager program, and provide future recommendations to Regional Council regarding potential implementation of similar programs across other Regional facilities and program areas (2015 – 2019).

Consistent with the vision for energy management, as aligned with the Durham Region Strategic Plan 2009-2014 - to attain continuous improvement in energy conservation and awareness throughout all Regional sectors - the Region will ensure that energy conservation remains central to the organization's culture and best-practice decision-making, reporting and approvals processes.

Appendix A – Summary of Prior Regional Initiatives

Retrofits and Operational Improvements

As part of the audit and energy improvement process, as well as the asset management program, which includes opportunities to address energy efficiency as a component of infrastructure renewal, several energy efficiency programs and improvements/retrofits have been implemented over the last several years, or are currently underway:



229 Lakeview Park Dr. (DRLHC), City of Oshawa

- Leveraging senior government funding, the Region implemented a furnace replacement program which involved the upgrade of 365 low-efficiency furnaces to high-efficiency models at DRLHC properties.
- Implementation of a computer server ‘virtualization’ project is underway to reduce the number of servers. There are over 200 servers utilized corporate-wide, which consume significant amounts of energy to operate and cool. With full virtualization, it is estimated that electricity savings of 20% to 25% are possible.
- Local Authority Services (LAS) Interval metering is being utilized in specific regional facilities, connected through internet, to allow monitoring of electricity consumption, with light-sensor switches to reduce load.

- Behavioural shifts include opening of blinds at Regional facilities on sunny winter days, to increase solar heating, and close blinds on sunny summer days, to reduce heat load on the air conditioning loads. Furthermore, various facilities turn off equipment including air handlers, at night in unoccupied areas.

Facility Lighting Upgrades

As energy-efficient bulbs and lighting upgrades are an integral aspect in achieving corporate energy efficiency objectives. A brief summary of more recent measures include:

- In 2013, the Region completed the retrofit of its multi-level Regional Headquarters (HQ) parking garage structure which involved the replacement of 388 metal halide high intensity discharge (HID) outdoor lighting fixtures with new T8 fluorescent outdoor lighting fixtures and associated cold start ballasts.



Parking Garage, Durham Regional Headquarters, 605 Rossland Rd. E, Town of Whitby

- Lighting retrofits completed at the Region’s DRLHC properties included installation of photoluminescent exit signs that require no electricity, in addition to other lighting upgrades.

The retrofit is expected to result in annual electricity savings in excess of 134,600 kWh and peak demand reductions of 4.4 kW for total annual cost savings of approximately \$15,000. The initiative was part of the saveONenergy Retrofit program which provided \$7,600 in incentive funding.

- The DRPS Central East Division in the City of Oshawa saw the conversion of lighting to light emitting diode (LED) in central cells and completion of a lighting retrofit in the basement level. The new lighting is anticipated to result in a 20% energy reduction and cost savings of \$6,500 over the life of the equipment.
- The Region participated in the saveONenergy Small Business Lighting Program where over 20 eligible locations have been completed including Uxbridge EMS, Lakewoods Child Care Centre, Sunderland Depot and Garage and Cherrywood Water Pumping Station. The locations, with demand less than 50 kW, are anticipated to save over 70,000 kWh per year in electricity and over \$9,000 in total cost savings.



Hillsdale Estates, 590 Oshawa Blvd., City of Oshawa

- In 2013, the Region completed a lighting retrofit at the Hillsdale Estates LTC Home. The retrofit is anticipated to save 185,000 kWh per year and reduce peak demand by 35 kW, a total cost savings of \$23,000. The initiative was part of

the saveONenergy Retrofit program, including \$9,100 in incentive funding.

LED Traffic Signal Conversion Program

- The LED Traffic Signal Conversion Program involved the conversion of over 16,000 bulbs. The retrofitting of close to 400 intersections was completed in 2010, with a 52% energy reduction confirmed on hydro billings. The Works Department operates and maintains over 500 traffic signal locations. Approximately 25 are added to the system annually.



Water and Sewer Upgrades/ Improvements

- The new Duffin Creek WPCP dewatering facility is now online and enhanced waste-product stability has greatly reduced fuel usage during incineration. Improvements included implementation of centrifuges in place of batch-operated presses, which result in a more consistent feedstock. With enhancements to operational processes and monitoring, decreases in fuel usage have resulted in significant annual cost savings.
- Since 2007, Ajax WSP has been part of the OPA Demand Response Program (DRP).
- In 2013, a water pump efficiency pilot was undertaken on various high and low lift water pumps, based on a study previously undertaken by the Works Department through the OPA's Conservation Fund. With the completed refurbishment of three pumps, the pilot has measured energy efficiency gains as well as GHG emissions reductions.



Ajax WSP, 75 Lake Driveway, Town of Ajax

- In July 2008, Duffin Creek WPCP obtained ISO 14001 Environmental Management Standard Certification. Evaluation of adopting ISO 50001 is currently underway, which would further integrate energy management into operations.
- Duffin Creek Water Pollution Control Plant, through the Phase 3 Expansion, became the first facility to receive LEED Gold Certification under criteria for solids handling facility. The initial LEED application was prepared and submitted in 2006 where a continuous, comprehensive audit review process required to comply with LEED certification requirements.

- Power monitoring systems have been implemented throughout Duffin Creek WPCP which will assist with analysis of facility energy usage by load types.
- The Region is currently participating in the OPA's Embedded Energy Manager (EEM) program for Duffin Creek WPCP, which involves a dedicated staffing resource for energy management.

The EEM is tasked with developing an energy management plan (EMP); identifying ECM opportunities and achieving a mandated reduction of 300 kW of peak demand and approximately 1.67 million kWh on annual consumption. As identified in this Plan, the EEM will be used as a model for considering dedicated energy management staffing resources for other Regional sectors.

- Initiatives at Ajax WSP include rescheduling of high lift pumps for energy optimization, load-shifting of backwash to periods of low high lift pump load, in addition to a general raising of energy awareness among of operations and maintenance staff.
- Staff manage and monitor facility energy usage to: identify and implement energy saving measures; conduct energy audits; optimize energy usage; and, implement energy optimization initiatives, including refilling standpipes and reservoirs after hours.



Duffin Creek WPCP, 901 McKay Rd., City of Pickering

Appendix B – Summary of Energy Efficiency Initiatives for 2014 through 2019

Energy Audits and Technical Assessments									
Facility		Project/Energy Efficiency Measure	Estimated Implementation Period			Estimated Project Cost	Annual Estimated Savings		
			2014	2015	2016-2019		Energy		Cost
							Electricity	Natural Gas	
Depots	Oshawa/Whitby Depot	Electrical site assessment for identifying ECMs in collaboration with Whitby Hydro				No Cost	TBD - Pending Review of Recommended ECMs		
EMS	EMS Whitby Headquarters	Electrical site assessment for identifying ECMs in collaboration with Whitby Hydro				No Cost	TBD - Pending Review of Recommended ECMs		
Offices	Durham Regional HQ	Electrical site assessment for identifying ECMs in collaboration with Whitby Hydro				No Cost	TBD - Pending Review of Recommended ECMs		
	Traffic Operations and Environmental Health Department	Electrical site assessment for identifying ECMs in collaboration with Whitby Hydro				No Cost	TBD - Pending Review of Recommended ECMs		
LTC	Hillsdale Estates	Opportunities Accelerator under Process and Systems (saveONenergy) for identifying ECMs in collaboration with Oshawa PUC				No Cost	TBD - Pending Review of Recommended ECMs		
	Hillsdale Terraces	Opportunities Accelerator under Process and Systems (saveONenergy) for identifying ECMs in collaboration with Oshawa PUC				No Cost	TBD - Pending Review of Recommended ECMs		
Local Housing	Bowling Green Towers (DRLHC)	Electrical site assessment for identifying ECMs in collaboration with Whitby Hydro				No Cost	TBD - Pending Review of Recommended ECMs		
	Centre Residence (DRLHC)	Electrical site assessment for identifying ECMs in collaboration with Whitby Hydro				No Cost	TBD - Pending Review of Recommended ECMs		
	Harwood Manor (DRLHC)	Electrical site assessment for identifying ECMs in collaboration with Veridian Connections				No Cost	TBD - Pending Review of Recommended ECMs		
	Windsor Place (DRLHC)	Electrical site assessment for identifying ECMs in collaboration with Whitby Hydro				No Cost	TBD - Pending Review of Recommended ECMs		
Police Services	DRPS Central West Division	Electrical site assessment for identifying ECMs in collaboration with Whitby Hydro				No Cost	TBD - Pending Review of Recommended ECMs		
	DRPS Regional Reporting Centre	Electrical site assessment for identifying ECMs in collaboration with Whitby Hydro				No Cost	TBD - Pending Review of Recommended ECMs		
	DRPS West Division	Electrical site assessment for identifying ECMs in collaboration with Veridian Connections				No Cost	TBD - Pending Review of Recommended ECMs		
Sanitary Sewer	Courtice WPCP	Comprehensive energy and water audit				Staff Resources	TBD - Pending Review of Recommended ECMs		
Misc	Various Locations	Comprehensive energy and water audit				Staff Resources/TBD	TBD - Pending Review of Recommended ECMs		
Transit	DRT Raleigh Garage Facility	Lighting site assessment for identifying ECMs in collaboration with Oshawa PUC				No Cost	TBD - Pending Review of Recommended ECMs		
Solid Waste	Garrard Rd Recycling and WPS	Electrical site assessment for identifying ECMs in collaboration with Whitby Hydro				No Cost	TBD - Pending Review of Recommended ECMs		

Lighting Upgrades									
Facility		Project/Energy Efficiency Measure	Estimated Implementation Period			Estimated Project Cost	Annual Estimated Savings		
			2014	2015	2016-2019		Energy		Cost
							Electricity	Natural Gas	
EMS	Beaverton EMS	Lighting upgrades as part of OPA Small Business Lighting Program				\$560	310 kWh	-	\$40
Misc	Corporate-Wide Lighting Assessment Retrofit Strategy	Comprehensive assessment of Regional facilities identifying lighting requirements as part of 5-year strategic retrofit plan				TBD	TBD		
Local Housing	Harwood Manor (DRLHC)	Interior Lighting Upgrades for Common Areas/Hallways and Exteriors including LED Conversion				TBD	TBD		
	Kellett Manor (DRLHC)	Conversion to LED for Common Areas/Hallways				TBD	TBD		
	Spruce Haven (DRLHC)	Interior Lighting Upgrades for Common Areas/Hallways				\$9,700	4,200 kWh, 1.1 kW	-	\$600
	Spruce Haven (DRLHC)	Exterior Lighting Upgrades including LED Conversion				\$16,900	2,700 kWh, 0.7 kW	-	\$400
	Spruce Lawn Apartments (DRLHC)	Interior Lighting Upgrades for Common Areas/Hallways including LED Conversion				\$14,700	6,900 kWh, 1.7 kW	-	\$900
LTC	Hillsdale Estates	Outdoor LED Lighting Retrofit				TBD	TBD		
Police Services	DRPS Central East Division	Exterior Lighting Retrofit				TBD	TBD		
Sanitary Sewer	Duffin Creek WPCP	Proposed lighting upgrades based on recommendations of consulting study				\$200,000	TBD		
	Lake Simcoe WPCP	Lighting Retrofit per Energy Audit Recommendations				\$56,400	39,300 kWh, 7.2 kW	-	\$5,100
	Newcastle WPCP	Lighting Retrofit per Energy Audit Recommendations				\$1,500	3,500 kWh	-	\$450
Child Care	Ajax Child Care Centre	Lighting upgrades as part of OPA Small Business Lighting Program				\$4,200	7,300 kWh	-	\$950
	Pickering Child Care Centre	Lighting upgrades as part of OPA Small Business Lighting Program				\$2,900	10,000 kWh	-	\$1,300
Transit	DRT Raleigh Garage Facility	Proposed lighting upgrades for bus storage building				TBD	TBD		
Water Supply	Ajax WSP	Lighting Retrofit per Energy Audit Recommendations				\$98,000	258,500 kWh, 42.7 kW	-	\$29,200
	Grandview South WPS	Lighting Retrofit per Energy Audit Recommendations				\$3,500	1,000 kWh, 0.3 kW	-	\$126
	Whitby WSP	Lighting Upgrades from Metal Halides to LED				\$4,700	3,000 kWh, 1.4 kW	-	\$430
Depots	Ajax Works Maintenance Depot	Lighting upgrades as part of OPA Small Business Lighting Program				\$10,300	10,100 kWh	-	\$1,320

Equipment Replacement, Operational Improvements, Renewables and Other Conservation Initiatives

Facility	Project/Energy Efficiency Measure	Estimated Implementation Period			Estimated Project Cost	Annual Estimated Savings			
		2014	2015	2016-2019		Energy		Cost	
						Electricity	Natural Gas		
Local Housing	Beatrice Terrace (DRLHC)	Home Assistance Program (HAP) - assessment/ECMs including appliance replacement, lighting and insulation.				No Cost	Up to 750 kWh/unit	-	Up to \$100/unit
	Brookside Apartments (DRLHC)	Home Assistance Program (HAP) - assessment/ECMs including appliance replacement, lighting and insulation.				No Cost	Up to 750 kWh/unit	-	Up to \$100/unit
	Cedar/Carleton/Wasaga family units (DRLHC)	Home Assistance Program (HAP) - assessment/ECMs including appliance replacement, lighting and insulation.				No Cost	Up to 750 kWh/unit	-	Up to \$100/unit
	Centre Residence (DRLHC)	Home Assistance Program (HAP) - assessment/ECMs including appliance replacement, lighting and insulation.				No Cost	Up to 750 kWh/unit	-	Up to \$100/unit
	Centre Residence (DRLHC)	Attic Insulation				TBD	TBD		
	Dean Heights (DRLHC)	Home Assistance Program (HAP) - assessment/ECMs including appliance replacement, lighting and insulation.				No Cost	Up to 750 kWh/unit	-	Up to \$100/unit
	Fairport Lodge (DRLHC)	Home Assistance Program (HAP) - assessment/ECMs including appliance replacement, lighting and insulation.				No Cost	Up to 750 kWh/unit	-	Up to \$100/unit
	Harwood Manor (DRLHC)	Replacement of MUA-4 and fans with Energy Recovery Ventilator (ERV)				\$128,700	11,300 kWh, 10.8 kW	13,000 m ³	\$6,100
	Harwood Manor (DRLHC)	Replacement of MUA-1, MUA-2 and MUA-3 and fans with Energy Recovery Ventilators (ERVs)				\$386,100	34,000 kWh, 32.4 kW	39,000 m ³	\$18,400
	Kellett Manor (DRLHC)	Home Assistance Program (HAP) - assessment/ECMs including appliance replacement, lighting and insulation.				No Cost	Up to 750 kWh/unit	-	Up to \$100/unit
	Lakeview/Birchcliffe family units (DRLHC)	Home Assistance Program (HAP) - assessment/ECMs including appliance replacement, lighting and insulation.				No Cost	Up to 750 kWh/unit	-	Up to \$100/unit
	Linden/Poplar family units (DRLHC)	Home Assistance Program (HAP) - assessment/ECMs including appliance replacement, lighting and insulation.				No Cost	Up to 750 kWh/unit	-	Up to \$100/unit
	Lomond family units (DRLHC)	Home Assistance Program (HAP) - assessment/ECMs including appliance replacement, lighting and insulation.				No Cost	Up to 750 kWh/unit	-	Up to \$100/unit
	Malaga family units (DRLHC)	Home Assistance Program (HAP) - assessment/ECMs including appliance replacement, lighting and insulation.				No Cost	Up to 750 kWh/unit	-	Up to \$100/unit
	Nelson Street (DRLHC)	Home Assistance Program (HAP) - assessment/ECMs including appliance replacement, lighting and insulation.				No Cost	Up to 750 kWh/unit	-	Up to \$100/unit

Equipment Replacement, Operational Improvements, Renewables and Other Conservation Initiatives									
Facility	Project/Energy Efficiency Measure	Estimated Implementation Period			Estimated Project Cost	Annual Estimated Savings			
		2014	2015	2016-2019		Energy		Cost	
						Electricity	Natural Gas		
Local Housing	Nelson Street (DRLHC)	Home Assistance Program (HAP) - assessment/ECMs including appliance replacement, lighting and insulation.				No Cost	Up to 750 kWh/unit	-	Up to \$100/unit
	Nevis/Christine/Normandy family units (DRLHC)	Home Assistance Program (HAP) - assessment/ECMs including appliance replacement, lighting and insulation.				No Cost	Up to 750 kWh/unit	-	Up to \$100/unit
	Normandy Hall (DRLHC)	Home Assistance Program (HAP) - assessment/ECMs including appliance replacement, lighting and insulation.				No Cost	Up to 750 kWh/unit	-	Up to \$100/unit
	Ritson Rd S family units (DRLHC)	Home Assistance Program (HAP) - assessment/ECMs including appliance replacement, lighting and insulation.				No Cost	Up to 750 kWh/unit	-	Up to \$100/unit
	Spruce Haven (DRLHC)	Home Assistance Program (HAP) - assessment/ECMs including appliance replacement, lighting and insulation.				No Cost	Up to 750 kWh/unit	-	Up to \$100/unit
	Spruce Lawn DRLHC)	Home Assistance Program (HAP) - assessment/ECMs including appliance replacement, lighting and insulation.				No Cost	Up to 750 kWh/unit	-	Up to \$100/unit
	Villa Valeau (DRLHC)	Home Assistance Program (HAP) - assessment/ECMs including appliance replacement, lighting and insulation.				No Cost	Up to 750 kWh/unit	-	Up to \$100/unit
	Wayside Apartments (DRLHC)	Home Assistance Program (HAP) - assessment/ECMs including appliance replacement, lighting and insulation.				No Cost	Up to 750 kWh/unit	-	Up to \$100/unit
LTC	Hillsdale Estates	Re-commissioning for building automation system (BAS) including repairs/resequencing based on ECM recommendations				TBD	TBD		
	Hillsdale Estates	Replace 2 large freezers				TBD	22,400 kWh	-	\$2,500
	Hillsdale Estates	Replace Combi Re-Therm Unit				TBD	26,800 kWh	-	\$2,900
Police Services	DRPS Reporting Centre	Rooftop Unit Replacement				TBD	TBD		
	DRPS North Division	Building automation system (BAS) upgrade project				TBD	TBD		
	DRPS West Division	Building automation system (BAS) upgrade project				TBD	TBD		
	DRPS West Division	Replace exhaust fans with high efficiency VFD operating fans				\$8,000	8,200 kWh	-	\$900

Equipment Replacement, Operational Improvements, Renewables and Other Conservation Initiatives

Facility	Project/Energy Efficiency Measure	Estimated Implementation Period			Estimated Project Cost	Annual Estimated Savings			
		2014	2015	2016-2019		Energy		Cost	
						Electricity	Natural Gas		
Sanitary Sewer	Corbett Creek WPCP	Boiler Replacement				\$96,000		TBD	
	Duffin Creek WPCP	Various HVAC and System Upgrades				TBD		TBD	
	Duffin Creek WPCP	Installation of VFDs in incineration operations				TBD		TBD	
	Duffin Creek WPCP	Optimization and DO control				TBD		TBD	
	Duffin Creek WPCP	HVAC ventlation upgrades				TBD		TBD	
	Harbour St. SPSS	Replacement of pump and MCCs				\$360,000		TBD	
	Lake Simcoe WPCP	Boiler Replacement				\$10,000	-	18,400 m3	\$6,300
	Lake Simcoe WPCP	Installation of Aerator Variable Frequency Drives (VFD)				\$29,000	115,600 kWh, 22.8 kW	-	\$16,200
	Newcastle WPCP	Boiler Replacement (2 units)				\$132,000			TBD
	Newcastle WPCP	Applicance replacement as per Energy Audit Recommendations				\$500	381 kWh	-	\$50
	Newcastle WPCP	Installation of new mixer for high oxygen and change operations in anoxic zone				\$30,500	23,700 kWh, 2.7 kW	-	\$3,600
	Newcastle WPCP	Power factor correction				\$8,000	-	-	\$5,000
	Corbett Creek WPCP	Digester gas utilization in boiler operations to displace/offet natural gas usage				No Cost	-	150,000 m3	\$35,000
	Courtice WPCP	Assessment of energy resource recovery through consultant study				\$200,000			TBD
	Courtice WPCP	Power monitoring upgrade for use of internal real time power monitoring for load shifting and peak shaving for daily operations				\$5,000	862,300 kWh, 78.0 kW	-	\$94,000

Equipment Replacement, Operational Improvements, Renewables and Other Conservation Initiatives

Facility	Project/Energy Efficiency Measure	Estimated Implementation Period			Estimated Project Cost	Annual Estimated Savings			
		2014	2015	2016-2019		Energy		Cost	
						Electricity	Natural Gas		
Sanitary Sewer	Courtice WPCP	Digester gas utilization in boiler operations to displace/offet natural gas usage				No Cost	-	735,000 m3	\$180,000
	Regional Environmental Lab	Replacement of exhaust fans				\$30,150	TBD		
	Duffin Creek WPCP	Digester gas utilization in boiler operations to displace/offet natural gas usage				No Cost	-	500,000 m3	\$125,000
	Harmony Creek WPCP	Digester gas utilization in boiler operations to displace/offet natural gas usage				No Cost	-	100,000 m3	\$25,000
Water Supply	Ajax WSP	Restoration of High Lift Pump #1				\$32,000	TBD		
	Ajax WSP	Restoration of Low Lift Pumps 4 & 5				\$51,800	37,200 kWh, 7.1 kW	-	\$4,600
	Ajax WSP	Backwash optimization				TBD	130,500 kWh	-	\$30,500
	Ajax WSP	Feasibility Study for HVAC System Upgrade including Boiler Replacement				TBD	567,000 kWh, 47.0 kW	2,900 m3	\$64,600
	Ajax WSP	Energy Optimzation through Scheduling of High Lift Pump Operations				No Cost	210,500 kWh	-	\$25,000
	Ajax WSP	Load shifting of backwash to periods where High Lift Pump load is low				No Cost	147.0 kW	-	\$13,000
	Ajax WSP	New replacement diesel generator				\$310,000	TBD		
	Grandview South WPS	HVAC Replacement				TBD	TBD		
	Grandview South WPS	Replace High Lift Pump with smaller pump and VFD (with feasibility study)				TBD	172,600 kWh, 137 kW	-	\$35,200
	Harwood Ave. WPS	Replacement of diesel standby generator				\$620,000	TBD		
Offices	Traffic Operations	Air Conditioner Replacement				\$37,000	TBD		

New Facility Construction and Major Renovations

Facility	Project/Energy Efficiency Measure	Estimated Implementation Period			Estimated Project Cost	Annual Estimated Savings		
		2014	2015	2016-2019		Energy		Cost
						Electricity	Natural Gas	
EMS	EMS Oshawa North (Wilson) Station	Construction of new paramedic facility				\$3.1 million		TBD
	EMS Seaton Station	Construction of new paramedic facility				\$3.8 million		TBD
	EMS Sunderland Station	Construction of new paramedic facility				\$3.8 million		TBD
LTC	Fairview Lodge LTC Facility Rebuild	Construction of new 175,000 sq ft LTC facility to replace existing Fairview Lodge (LEED Silver Certified).				\$49.0 million		TBD
Police Services	DR Police Clarington Complex - Regional Support Centre	Construction of new 86,000 sq ft facility.				\$76.5 million		TBD
	DRPS Clarington Police Complex - Center for Investigative Excellence Facility	Construction of new 86,700 sq ft facility.						TBD
	DR Police Northwest Seaton	Construction of new DRPS facility located in the future community of Seaton				\$28.8 million		TBD
	DRPS Clarington Police Complex - East Division Facility	Construction of new 49,000 sq ft facility (LEED Silver Certified)				\$40.7 million		TBD
	DRPS Clarington Police Complex - Forensic Investigation Facility	Construction of new 23,500 sq ft facility (LEED Silver Certified)						TBD
	DRPS Operations Training Centre - Phase 2	Construction of new 40,000 sq ft facility				\$23.0 million		TBD
Sanitary Sewer	Baseline Rd Sewage Pumping Station (oversizing)	Oversizing of sanitary sewer pumping station				\$3.4 million		TBD
	Carruthers Creek SSPS	Pumping station expansion from 317 l/s to 634 l/s				\$1.7 million		TBD
	Corbett Creek WPCP	Digester modification/Solids handling capacity				\$26.2 million		TBD
	Corbett Creek WPCP	Construction of new headwork building					\$5.0 million	

New Facility Construction and Major Renovations

Facility	Project/Energy Efficiency Measure	Estimated Implementation Period			Estimated Project Cost	Annual Estimated Savings		
		2014	2015	2016-2019		Energy		Cost
						Electricity	Natural Gas	
Sanitary Sewer	Regional Environmental Lab Upgrades				\$20.0 million			TBD
	Harwood Sewage Pumping Station				\$3.6 million			TBD
	Jeffrey St SPSS				\$13.8 million			TBD
	Newcastle WPCP				\$3.7 million			TBD
	Nonquon River WPCP				\$29.2 million			TBD
	Port Newcastle SPS (oversizing)				\$1.1 million			TBD
	Uxbridge Brook WPCP				\$2.4 million			TBD
	Harmony Creek WPCP				\$18.2 million			TBD
Transit	DRT Raleigh Garage Facility				\$30.8 million			TBD
	DRT Westney Garage Facility				\$15.0 million			TBD
	Transit North Durham facility				\$55.0 million			TBD
	Transit Seaton facility				\$25.0 million			TBD
Solid Waste	Durham York Energy Centre				\$285.3 million			TBD
Water Supply	Brock (Cannington) new well and pumphouse				\$5.6 million			TBD

New Facility Construction and Major Renovations

Facility	Project/Energy Efficiency Measure	Estimated Implementation Period			Estimated Project Cost	Annual Estimated Savings		
		2014	2015	2016-2019		Energy		Cost
						Electricity	Natural Gas	
Water Supply	Brock (Sunderland) new well and pumphouse (and standby power)				\$4.6 million			TBD
	Brock Rd Zone 1 Reservoir and Zone 3/4 WPS				\$36.6 million			TBD
	Clarington New Zone 1 Reservoir				\$6.8 million			TBD
	Clarington New Zone 2 Pumping Station				\$4.7 million			TBD
	Garrard Pumping Station Pump Modifications				\$1.2 million			TBD
	Harwood Pumping Station Expansion and Zone 1 Reservoir				\$11.0 million			TBD
	Newcastle WSP				\$21.2 million			TBD
	Quaker Hill Reservoir				\$3.5 million			TBD
	Scugog alternative water supply source				\$19.6 million			TBD
	Scugog Reservoir				\$11.0 million			TBD
	Uxbridge New Well Pumphouse				\$3.6 million			TBD
	Whitby WSP				\$128.9 million			TBD
	Whitby Zone 4 Reservoir				\$9.0 million			TBD
Depots	Orono Depot				\$5.8 million			TBD
	Scugog Depot				\$3.3 million			TBD

Appendix C – Corporate Energy Usage and Performance Measures

2012 Energy Consumption, Cost and EUI for Sanitary Sewage Systems (excluding Duffin Creek System)

Systems	Facility	Electricity		Natural Gas		Diesel		Total Energy	Flow	EUI	
		Consumption	Cost	Consumption	Cost	Consumption	Cost	GJ	M.L.	GJ/M.L.	
Corbett/ Pringle	Water Pollution Control Plants	Corbett Creek WPCP	7,038,295	\$790,282	194,896	\$59,411	7,032	\$6,030	33,076		
		Pringle Creek WPCP	1,283,072	\$151,134	22,257	\$7,824	585	\$478	5,494		
	Sanitary Sewage Pumping Station	Annes St. Sewage PS	46,156	\$5,848			564	\$506	188		
		Blair St. Sewage PS	89,753	\$11,189			388	\$338	338		
		Breakwater Sewage PS	440,510	\$59,262					1,586		
		Burns St. Sewage PS	24,221	\$3,211			186	\$172	94		
		Hanover Sewage Pump	3,039	\$632					11		
		Jeffrey St. Sewage PS	32,020	\$4,134			47	\$42	117		
		Lynde Creek Sewage PS	221,793	\$30,009			664	\$586	824		
		Lynde Shores Sewage PS	38,067	\$4,874			173	\$160	144		
		Michael Blvd Sewage PS	196,074	\$26,936			483	\$415	724		
		Sunray St. Sewage PS	28,243	\$3,693			179	\$160	109		
		Victoria St. Sewage PS	21,041	\$2,837			185	\$146	83		
		Way St. Sewage PS	2,278	\$538					8		
TOTAL		9,464,562	\$1,094,578	217,153	\$67,235	10,485	\$9,032	42,795	18,191	2.35	
Harmony / Courice	Water Pollution Control Plants	Harmony Cr. WPCP	6,770,946	\$767,702	83,138	\$28,520	4,148	\$3,462	27,720		
		Courice WPCP	8,534,347	\$921,592	98,529	\$31,416	15,071	\$13,142	35,077		
	Sanitary Sewage Pumping Station	Beaton Farms Sewage PS	19,548	\$2,510			245	\$193	80		
		Cedar Valley Sewage PS	3,103	\$502					11		
		Conlin Sewage PS	108,442	\$13,488			791	\$651	421		
		Holiday Inn Sewage PS	13,764	\$1,777					50		
		Madawaska Sewage PS	79,603	\$9,780			116	\$92	291		
		Nash Rd. Sewage PS	27,422	\$3,469			156	\$134	105		
		Simcoe St. N Sewage PS	81,856	\$11,791			496	\$392	314		
		Simcoe St. S Sewage PS	6,939	\$946			91	\$79	28		
		Whitecliffe Sewage PS	17,730	\$2,223			161	\$138	70		
TOTAL		15,663,700	\$1,735,780	181,667	\$59,936	21,275	\$18,284	64,166	26,797	2.39	
Port Darlington	Water Pollution Control Plant	Port Darlington WPCP	1,525,591	\$178,742	165,711	\$48,563	711	\$610	11,869		
	TOTAL		1,525,591	\$178,742	165,711	\$48,563	711	\$610	11,869	4,457	2.66
Newcastle	Water Pollution Control Plant	Newcastle WPCP	1,001,244	\$129,355	78,061	\$21,582	1,300	\$1,064	6,646		
	Sanitary Sewage	Ruddell Blvd Sewage PS	22,136	\$2,766					80		
		Sunset Blvd. Sewage PS	26,240	\$3,212					94		
TOTAL		1,049,620	\$135,333	78,061	\$21,582	1,300	\$1,064	6,820	1,067	6.39	
Uxbridge Brook	Water Pollution Control Plant	Uxbridge Brook WPCP	1,463,050	\$166,838	26,051	\$8,077	1,547	\$1,760	6,325		
	Sanitary Sewage Pumping Station	Sandy Hook Rd. Sewage PS	5,272	\$1,221					19		
		TOTAL		1,468,322	\$168,059	26,051	\$8,077	1,547	\$1,760	6,343	1,498
Lake Simcoe	Water Pollution Control Plant	Lake Simcoe WPCP	821,977	\$107,393	103,938	\$32,615	2,246	\$2,583	7,028		
	Sanitary Sewage	Harbour Sewage PS	159,137	\$20,278			884	\$1,042	607		
		Cedar Beach Sewage PS	40,403	\$5,948			358	\$421	159		
TOTAL		1,021,517	\$133,619	103,938	\$32,615	3,489	\$4,047	7,794	609	12.80	
Nonquon River	Water Pollution Control Plant	Nonquon River WPCP	546,839	\$59,646					1,969		
	Sanitary Sewage Pumping Station	Canterbury Commons Sewage PS	21,523	\$3,408			111	\$131	82		
		Port Perry Water St. Sewage PS	170,290	\$23,410			641	\$755	638		
		Reach St. Sewage PS	40,362	\$6,031			164	\$195	152		
TOTAL		779,014	\$92,497	0	\$0	915	\$1,081	2,840	1,057	2.69	
Beaver River #1	Sanitary Sewage Pumping Station	River St. Sewage PS	31,799	\$3,892			337	\$397	127		
		TOTAL		31,799	\$3,892			337	\$397	127	174
Beaver River #2	Sanitary Sewage Pumping Station	Laidlaw St. Sewage PS	77,564	\$8,988			396	\$447	294		
		TOTAL		77,564	\$8,988			396	\$447	294	320
2012 GRAND TOTAL		31,081,689	\$3,551,486	772,581	\$238,009	40,455	\$36,723	143,049	54,171	2.64	

2012 Energy Consumption, Cost and EUI for Water Supply

Systems		Facility	Electricity		Natural Gas		Diesel		Total Energy	Flow	EUI
			Consumption	Cost	Consumption	Cost	Consumption	Cost	GJ	M.L.	GJ/M.L.
Pickering / Ajax	Water Supply Plant	Ajax WSP	10,691,886	\$1,260,372	164,234	\$43,876	19,291	\$17,824	45,523		
	Water Pumping Stations and Reservoirs	Cherrywood Water PS	163,772	\$19,473			2,009	\$1,867	667		
		Grand Oak Water PS	99,492	\$11,738					358		
		Harwood Ave Water PS	552,090	\$65,376			958	\$875	2,024		
		Lookout Pt Water PS	56,279	\$6,754					203		
		Rosebank Reservoir & PS	672,413	\$90,951	17,037	\$6,200	1,851	\$1,693	3,144		
		Duffin Heights Water PS					2,169	\$2,040	83		
		Westney Road Reservoir	135,392	\$16,061					487		
	Finch Ave Elevated Tank	29,298	\$3,541					105			
TOTAL			12,400,622	\$1,474,267	181,271	\$50,076	26,278	\$24,299	52,595	20,211	2.60
Whitby	Water Supply Plant	Whitby WSP	9,652,197	\$1,107,376	61,653	\$19,827	4,054	\$3,899	37,266		
	Water Pumping Stations and Reservoirs	Garrard Rd. Water PS	1,140,514	\$140,691			974	\$946	4,143		
		Hwy 2 valve	1,632	\$321					6		
		Rosland Rd. Water PS	1,692	\$468					6		
		Duffs Road Reservoir	40,764	\$5,204					147		
		Thickson Rd. Water PS and Reservoir	704,893	\$97,530			1,109	\$1,060	2,580		
TOTAL			11,541,692	\$1,351,588	61,653	\$19,827	6,138	\$5,905	44,148	19,905	2.22
Oshawa	Water Supply Plant	Oshawa WSP	7,051,336	\$822,898	130,042	\$35,210	10,938	\$10,607	30,787		
	Water Pumping Stations and Reservoirs	Grandview Water PS	984,228	\$123,208					3,543		
		Taunton Water PS	1,076,124	\$147,404			1,952	\$1,887	3,949		
		Waverly Water PS	247,570	\$32,587			820	\$786	923		
		Hortop Water PS Reservoir	655,213	\$86,907			1,634	\$1,703	2,421		
		Harmony Rd. Reservoir	83,101	\$10,158					299		
		Grandview St. N. Reservoir	38,934	\$4,811					140		
TOTAL			10,136,506	\$1,227,973	130,042	\$35,210	15,343	\$14,983	42,062	16,969	2.48
Bowmanville	Water Supply Plant	Bowmanville WSP	1,744,472	\$215,204	54,578	\$16,666	6,125	\$5,938	8,606		
	Water Pumping Stations and Reservoirs	Concession St. Water PS	617,247	\$73,272			685	\$665	2,248		
		Bowmanville Zone 2 Reservoir	80,238	\$11,415					289		
		Bowmanville North Supply	8,332	\$1,700					30		
		Rills of Liberty Water PS	7,966	\$1,579					29		
TOTAL			2,458,255	\$303,170	54,578	\$16,666	6,811	\$6,603	11,202	3,902	2.87
Newcastle	Water Supply Plant	Newcastle WSP	593,440	\$72,899			1,023	\$998	2,176		
	Water Pumping Stations and Reservoirs	Andrew St. PS	35,018	\$4,257					126		
		Arthur St. Reservoir	23,323	\$3,744					84		
		Newtonville Water PS	61,601	\$6,009			236	\$233	231		
		Newtonville Water Tower	11,833	\$2,089					43		
TOTAL			725,215	\$88,999	0	\$0	1,259	\$1,232	2,659	919	2.89
Beaverton	Water Supply Plant	Beaverton WSP	449,841	\$58,537			1,509	\$1,794	1,677		
	Water Tower	Beaverton Standpipe	5,899	\$875					21		
TOTAL			455,740	\$59,412	0	\$0	1,509	\$1,794	1,698	403	4.21
Orono	Water Supply Plant	Orono Well No. 3 & 4	83,279	\$11,836			322	\$320	312		
	Water Pumping Stations and Reservoirs	Orono Standpipe	20,015	\$2,462					72		
		Orono Water Tower Lights	1,382	\$355					5		
		Mill St. Water PS	22,292	\$2,673					80		
TOTAL			126,968	\$17,325	0	\$0	322	\$320	469	105	4.46
Port Perry	Water Supply Plant	Port Perry Well # 6	336,889	\$56,482			1,201	\$1,423	1,259		
	Water Tower	Port Perry, Well 3 & 5	109,176	\$29,395					393		
		Port Perry Water Tower	8,802	\$1,212					32		
TOTAL			454,867	\$87,089	0	\$0	1,201	\$1,423	1,684	868	1.94
Uxbridge / Uxville	Water Supply Plant	Uxbridge Well No. 5	38,170	\$4,286					137		
		Uxbridge Well No. 6	215,723	\$26,796			580	\$686	799		
		Uxbridge Well No. 7	258,627	\$37,150			10,595	\$12,047	1,337		
	Water Pumping Stations and Reservoirs	Uxville Ind. Park Water PS	35,588	\$12,583			136	\$168	133		
		Brock St. Water Station	28,276	\$3,631					102		
		Uxbridge Ind. Park Elev. Tank	36,417	\$5,414					131		
Quakerhill Water PS	101,395	\$14,862			425	\$502	381				
TOTAL			714,196	\$104,722	0	\$0	11,736	\$13,403	3,021	1,065	2.84
Blackstock	Water Supply Plant	Blackstock Well 1 & 2	9,091	\$1,776					33		
		Blackstock Well 6	7,846	\$1,582					28		
		Blackstock Well # 7 & 8	114,084	\$16,068			473	\$470	429		
TOTAL			131,021	\$19,426	0	\$0	473	\$470	490	36	13.63
Greenbank	Water Supply Plant	Greenbank Pump 3	9,108	\$1,772					33		
		Greenbank Pump 4/5/6	24,222	\$3,850					87		
		Greenbank WPS (Well #1 & 2)	92,836	\$13,152			304	\$359	346		
TOTAL			126,166	\$18,774	0	\$0	304	\$359	466	42	11.14
Sunderland	Water Supply Plant	Sunderland Well 1 & 2	97,679	\$11,660					352		
	Water Tower	Sunderland Water Tower	6,080	\$1,342					22		
	TOTAL			103,759	\$13,003	0	\$0	0	\$0	374	122
Cannington	Water Supply Plant	Cannington Well 3	36,013	\$4,926					130		
		Cannington Wells No. 2 & 7	44,623	\$6,534					161		
		Cannington, Well No. 4	32,315	\$3,956					116		
		Cannington, Well No. 8 & 6	74,549	\$8,971			367	\$431	282		
		Laidlaw Water Station	10,540	\$1,239					38		
	Water Station and Reservoirs	Cannington Standpipe	11,307	\$1,510					41		
TOTAL			209,347	\$27,136	0	\$0	367	\$431	768	204	3.76
2012 GRAND TOTAL			39,584,354	\$4,792,883	427,544	\$121,779	71,740	\$71,222	161,635	64,752	2.50

2012 Energy Consumption, Cost and EUI for Duffin Creek System

Systems	Facility	Electricity		Natural Gas		Diesel		Furnace Oil		Total Energy	Flow	EUI	
		Consumption	Cost	Consumption	Cost	Consumption	Cost	Consumption	Cost	GJ	M.L.	GJ/M.L.	
Duffin Creek	Water Pollution Control Plant	Duffin Creek WPCP	61,212,782	\$6,442,464	4,624,552	\$1,261,126	26,057	\$23,364	1,262,461	\$1,253,342	447,560		
	Ajax / Pickering Sanitary Sewage Pumping Stations	Anstead Sewage PS	82,129	\$9,773			318	\$278			308		
		Bayly St. Sewage PS	1,457,076	\$179,461			2,414	\$1,932			5,338		
		Bayview Sewage PS	21,014	\$2,669			0	\$0			76		
		Begley St. Sewage PS	10,935	\$1,445			48	\$39			41		
		Blue Maple Sewage PS	139,962	\$16,723			599	\$515			527		
		Canterbury Sewage PS	25,044	\$3,026			155	\$128			96		
		Carruthers Creek PS	495,874	\$61,941			1,510	\$1,340			1,843		
		Clover Ridge Sewage PS	67,349	\$11,440			471	\$411			260		
		Danovilla Sewage PS	49,350	\$5,901			345	\$312			191		
		Jodrel Sewage PS	54,763	\$6,487							197		
		Liverpool & Finch Sewage PS	35,822	\$4,353			512	\$473			149		
		Liverpool Rd.S Sewage PS	1,532,182	\$189,666			2,637	\$2,365			5,617		
		Rosebank Sewage PS	122,828	\$18,306			414	\$361			458		
		Southwood Sewage PS	84,069	\$9,920			214	\$198			311		
		Sundial Sewage PS	20,845	\$2,549							75		
		Toy Ave PS	18,166	\$2,330							65		
		Woodgrange Sewage PS	2,512	\$477							9		
		Pickering Townline / Finch odor	180,005	\$22,762							648		
		Pickering Townline Flowmeter SPS	18,932	\$2,668							68		
Duffin Heights					420	\$361			16				
2012 TOTAL		65,631,639	\$6,994,361	4,624,552	\$1,261,126	36,114	\$32,077	1,262,461	\$1,253,342	463,853	119,179	3.89	

2012 Energy Consumption, Cost and EUI for Office Buildings

Facility	Electricity		Natural Gas		Diesel		Total		Square Footage	Energy Use Intensity (GJ/ft ²)	EUI normalized by weather (GJ/HDD/ft ²)
	Consumption (kWh)	Cost	Consumption (m ³)	Cost	Consumption (L)	Cost	Energy (GJ)	Cost			
Regional Headquarters	8,289,034	\$963,115	380072	\$96123.9	12437	\$12635	44,881	\$1,071,873	358,950	0.13	0.14
Social Services Ajax	26,614	\$3,293	N/A	N/A	N/A	N/A	96	\$3,293	3,638	0.03	0.03
Social Services Oshawa	227,999	\$26,702	8,479	\$3,592	N/A	N/A	1,146	\$30,294	12,037	0.10	0.11
Traffic & Health Offices Consumers Dr.	643,630	\$79,259	46,256	\$14,609	N/A	N/A	4,090	\$93,869	46,249	0.09	0.10
Employment Counselling, Leased Unit	48,649	\$6,197	2,251	\$1,673	N/A	N/A	261	\$7,870	4,279	0.06	0.07
Durham Health – Dental Clinic	25,457	\$3,693	N/A	N/A	N/A	N/A	92	\$3,693	3,647	0.03	0.03
Durham Health – Breastfeeding Clinic	122,867	\$16,490	N/A	N/A	N/A	N/A	442	\$16,490	2,450	0.18	0.20
2012 Total	9,384,250	\$1,098,749	437,058	\$115,998	12,437	\$12,635	51,008	\$1,227,381	431,250	0.12	0.13

2012 Energy Consumption, Cost and EUI for Long Term Care Homes

Facility	Electricity		Natural Gas		Diesel		Total		Square Footage	Energy Use Intensity (GJ/ft ²)	EUI normalized by weather (GJ/HDD/ft ²)
	Consumption (kWh)	Cost	Consumption (m ³)	Cost	Consumption (L)	Cost	Energy (GJ)	Cost			
Hillsdale Estates	5,659,935	\$641,802	822,614	\$229,935	3,819	\$3,770	52,045	\$875,507	261,918	0.20	0.22
Hillsdale Terrace	3,542,955	\$408,530	429,203	\$110,899	4,078	\$4,082	29,358	\$523,511	164,000	0.18	0.20
Fairview Lodge	2,006,360	\$235,951	324,190	\$93,867	N/A	N/A	19,646	\$329,818	128,310	0.15	0.17
Lakeview Manor	2,554,674	\$306,660	363,529	\$94,560	2,346	\$2,730	23,217	\$403,949	123,000	0.19	0.21
2012 Total	13,763,924	\$1,592,942	1,939,536	\$529,261	10,243	\$10,582	124,265	\$2,132,786	677,228	0.18	0.21

2012 Energy Consumption, Cost and EUI for Works Depot Facilities

Facility	Electricity		Natural Gas		Total		Square Footage	Energy Use Intensity	EUI normalized by weather
	Consumption (kWh)	Cost	Consumption (m ³)	Cost	Energy (GJ)	Cost		(GJ/ft ²)	GJ/HDD/ft ²
Ajax Works Maint. Depot	255,621	\$30,166	30,606	\$10,308	2,093	\$40,474	18,665	0.11	0.13
Orono Depot	155,887	\$21,795	22,564	\$7,408	1,426	\$29,202	9,211	0.15	0.17
Oshawa/Whitby Depot	614,946	\$75,781	78,606	\$23,979	5,226	\$99,760	53,725	0.10	0.11
Scugog Depot	134,522	\$18,748	16,485	\$5,340	1,116	\$24,088	9,035	0.12	0.14
Sunderland Depot (West Bldg)	68,277	\$9,787	15,482	\$5,785	839	\$15,572	6,045	0.14	0.16
Sunderland Depot (East Bldg)	28,420	\$4,334	7,510	\$3,342	390	\$7,676	2,570	0.15	0.17
2012 Total	1,257,673	\$160,612	171,253	\$56,162	11,090	\$216,773	99,251	0.11	0.13

2012 Energy Consumption, Cost and EUI for DRLHC Facilities

Category	Facility	Electricity		Natural Gas		Total		Square Footage	Energy Use Intensity	EUI normalized by weather
		Consumption (kWh)	Cost	Consumption (m ³)	Cost	Energy (GJ)	Cost		(GJ/ft ²)	GJ/HDD/ft ²
Small LHC, <= 50 units	342 Main St., Beaverton	270,865	\$30,088	6,603	\$2,664	1,228	\$32,752	20,800	0.06	0.07
	103 Cameron St.W., Cannington	223,417	\$24,999	13,558	\$4,301	1,324	\$29,299	17,200	0.08	0.09
	385 Beatrice St. E., Oshawa	436,676	\$46,445	22,549	\$6,586	2,436	\$53,031	34,130	0.07	0.08
	460 Normandy St., Oshawa	225,288	\$24,320	12,134	\$3,911	1,276	\$28,231	18,900	0.07	0.08
	1910 Faylee Cres., Pickering	325,373	\$35,189	19,658	\$5,851	1,925	\$41,040	22,800	0.08	0.09
	1330 Foxglove Ave., Pickering	305,739	\$33,145	35,784	\$9,685	2,472	\$42,830	24,339	0.10	0.11
	327 Kellett St., Port Perry	248,198	\$28,382	30,375	\$8,309	2,057	\$36,691	21,800	0.09	0.11
	385 Rosa St., Port Perry	316,268	\$34,999	10,763	\$3,676	1,551	\$38,675	17,130	0.09	0.10
	1529 Ritson Rd S, Oshawa	86,291	\$10,806	14,526	\$4,550	867	\$15,356	9,800	0.09	0.10
	409 Center St S, Whitby	125,309	\$15,547	15,480	\$4,849	1,044	\$20,396	7,200	0.15	0.16
Large LHC, >50 units	2 Nelson St., Bowmanville	202,264	\$23,074	15,851	\$4,907	1,336	\$27,981	15,600	0.09	0.10
	4 Nelson St., Bowmanville	123,901	\$14,213	11,353	\$3,791	881	\$18,004	9,100	0.10	0.11
	655 Harwood Ave., Ajax	1,336,310	\$138,970	117,385	\$28,370	9,309	\$167,340	78,000	0.12	0.13
	439 Dean Ave., Oshawa	489,691	\$51,310	17,699	\$5,324	2,441	\$56,634	37,703	0.06	0.07
	155 King St., Oshawa	1,620,823	\$167,111	71,792	\$28,209	8,586	\$195,320	107,250	0.08	0.09
	20 Perry St., Uxbridge	504,349	\$52,893	31,982	\$8,191	3,041	\$61,084	27,700	0.11	0.12
2012 Total	8,200,202	\$876,925	547,744	\$158,757	50,510	\$1,035,681	603,552	0.08	0.09	

2012 Energy Consumption, Cost and EUI for Transit Facilities

Facility	Electricity		Natural Gas		Total		Square Footage	Energy Use Intensity	EUI normalized by weather
	Consumption (kWh)	Cost	Consumption (m ³)	Cost	Energy (GJ)	Cost		GJ/ft ²	GJ/HDD/ft ²
Transit Office, 4-44 Williams St, Oshawa	31,383	\$4,152	N/A	N/A	113	\$4,152	2,350	0.05	0.05
Transit, Raleigh (Oshawa Bus Garage)	616,621	\$70,766	226,204	\$58,913	10,888	\$129,679	58,455	0.19	0.21
Transit, Westney (Ajax Bus Garage)	874,812	\$103,367	165,031	\$42,676	9,473	\$146,043	68,448	0.14	0.16
Transit Presto Office	9,742	\$1,522	N/A	N/A	35	\$1,522	1,076	0.03	0.04
2012 Total	1,532,558	\$179,808	391,235	\$101,589	20,509	\$281,396	130,329	0.16	0.18

2012 Energy Consumption, Cost and EUI for DR Police Facilities

Facility	Electricity		Natural Gas		Diesel		Total		Square Footage	Energy Use Intensity	EUI normalized by weather
	Consumption (kWh)	Cost	Consumption (m ³)	Cost	Consumption (L)	Cost	Energy (GJ)	Cost		GJ/ft ²	GJ/HDD/ft ²
DR Police Beaverton	11,049	\$1,535	1,369	\$1,372	N/A	N/A	92	\$2,907	1,800	0.05	0.06
DR Police East Division	166,761	\$24,275	N/A	N/A	N/A	N/A	600	\$24,275	6,546	0.09	0.10
DR Police Property Bureau	345,038	\$44,804	54,571	\$16,004	N/A	N/A	3,333	\$60,808	23,503	0.14	0.16
DR Police South Oshawa	46,498	\$5,728	1,716	\$1,490	N/A	N/A	233	\$7,218	2,200	0.11	0.12
DR Police Central East Division	2,382,668	\$271,006	250,511	\$71,737	0	\$0	18,177	\$342,742	66,114	0.27	0.31
DR Police West Division	783,401	\$95,588	49,269	\$15,768	503	\$519	4,708	\$111,875	27,843	0.17	0.19
DR Police North Division	284,433	\$34,583	14,804	\$5,310	98	91	1,591	\$39,984	11,245	0.14	0.16
DR Police Reg. Reporting Center	288,866	\$37,319	N/A	N/A	25	\$26	1,040	\$37,345	14,842	0.07	0.08
DR Police Central West Division	827,455	\$101,071	46,787	\$13,443	0	\$0	4,772	\$114,513	37,000	0.13	0.14
DR Police Kid's Safety Village	21,263	\$2,873	2,086	\$1,604	N/A	N/A	156	\$4,477	1,670	0.09	0.11
2012 Total	5,157,432	\$618,781	421,113	\$126,728	627	\$635	34,704	\$746,144	192,763	0.18	0.20

Facility	Propane for heating		Total	
	Consumption (L)	Cost	Energy (GJ)	Cost
Miscellaneous Locations	15,837	\$10,823	401	\$10,823
2012 Total	15,837	\$10,823	401	\$10,823

2012 Energy Consumption, Cost and EUI for Child Care Centers

Facility	Electricity		Natural Gas		Total		Square Footage	Energy Use Intensity	EUI normalized by weather
	Consumption (kWh)	Cost	Consumption (m ³)	Cost	Energy (GJ)	Cost		GJ/ft ²	GJ/HDD/ft ²
Ajax Day Care Centre	66,791	\$8,007	5,475	\$2,986	450	\$10,994	4,100	0.11	0.12
Pickering Daycare Centre	52,235	\$6,273	10,041	\$4,086	573	\$10,359	4,334	0.13	0.15
Whitby Day Care Centre	52,412	\$6,618	6,254	\$2,494	428	\$9,112	4,089	0.10	0.12
Edna Thompson Day Care Centre	62,467	\$7,500	3,803	\$2,092	371	\$9,591	6,889	0.05	0.06
Gibb St Day Care Centre	25,248	\$3,200	1,557	\$1,439	151	\$4,639	2,008	0.07	0.08
Lakewoods Day Care Centre	50,299	\$6,207	5,702	\$2,700	400	\$8,907	4,088	0.10	0.11
2012 Total	309,452	\$37,805	32,832	\$15,797	2,372	\$53,602	25,508	0.09	0.10

2012 Energy Consumption, Cost and EUI for EMS Stations

Facility	Electricity		Natural Gas		Diesel		Total		Square Footage	Energy Use Intensity	EUI normalized by weather
	Consumption (kWh)	Cost	Consumption (m ³)	Cost	Consumption (L)	Cost	Energy (GJ)	Cost		GJ/ft ²	GJ/HDD/ft ²
EMS Ajax	64,429	\$7,721	20,483	\$6,513	N/A	N/A	1,017	\$14,234	5,977	0.17	0.19
EMS Beaverton	28,029	\$3,486	1,935	\$1,916	N/A	N/A	175	\$5,402	2,528	0.07	0.08
EMS Bowmanville	28,607	\$3,504	5,314	\$2,943	N/A	N/A	307	\$6,447	2,602	0.12	0.13
EMS Courtice	62,941	\$9,173	13,555	\$4,801	N/A	N/A	746	\$13,974	6,200	0.12	0.14
EMS Oshawa	64,423	\$7,848	10,328	\$3,829	N/A	N/A	628	\$11,677	4,608	0.14	0.15
EMS Pickering	59,346	\$6,834	11,295	\$4,541	N/A	N/A	646	\$11,375	6,200	0.10	0.12
EMS Port Perry	32,994	\$4,956	4,678	\$2,351	N/A	N/A	298	\$7,306	2,600	0.11	0.13
EMS Uxbridge	32,227	\$3,945	6,021	\$2,895	N/A	N/A	347	\$6,840	2,630	0.13	0.15
EMS Headquarters, Whitby	504,550	\$61,590	35,106	\$10,413	1,237	\$1,256	3,162	\$73,259	19,945	0.16	0.18
Central Logistics Building	N/A	N/A	19,122	\$6,395	N/A	N/A	733	\$6,395	9,100	0.08	0.09
EMS Storage Facilities	649	\$363	N/A	N/A	N/A	N/A	2	\$363	Closed		
2012 Total	878,195	\$109,421	127,837	\$46,599	1,237	\$1,256	8,108	\$157,276	62,390	0.13	0.15

2012 Energy Consumption, Cost and EUI for Waste Management Facilities

Facility	Electricity		Natural Gas		Propane		Total	
	Consumption (kWh)	Cost	Consumption (m3)	Cost	Consumption (L)	Cost	Energy (GJ)	Cost
Brock WMF	32,287	\$5,044	N/A	N/A	N/A	N/A	116	\$5,044
Durham Material Recovery Facility	163,081	\$20,057	41,703	\$13,563	N/A	N/A	2185	\$33,621
Scugog WMF	42,149	\$6,931	N/A	N/A	N/A	N/A	152	\$6,931
Oshawa WMF	205,504	\$25,028	N/A	N/A	1,374	\$939	775	\$25,967
2012 Total	443,021	\$57,060	41,703	\$13,563	1,374	\$939	3,228	\$71,563

2012 Energy Consumption, Cost and EUI for Traffic Signals

Hydro Company	Category	Electricity		Total	Number of Traffic Signals	Energy Use Intensity
		Consumption (kWh)	Cost	Energy (GJ)		(GJ/Acc)
Hydro One	Signal	148,252	\$24,230	534	36	14.83
Hydro One	Warning Signal	27,010	\$5,150	97	19	5.12
Whitby Hydro	IPS	4,632	\$812	17	2	8.34
Whitby Hydro	Signal	220,519	\$35,103	794	67	11.85
Whitby Hydro	Warning Signal	638	\$198	2	1	2.30
Oshawa PUC	IPS	68,664	\$8,947	247	20	12.36
Oshawa PUC	Signal	631,202	\$80,744	2,272	133	17.09
Oshawa PUC	Warning Signal	5,988	\$876	22	4	5.39
Veridian Connections	IPS	13,720	\$2,148	49	5	9.88
Veridian Connections	Signal	453,718	\$53,908	1,633	91	17.95
Veridian Connections	Warning Signal	2,324	\$1,025	8	8	1.05
2012 Total		1,576,667	\$213,141	5,676	386	14.70

2012 Energy Consumption, Cost and EUI for Other Small Facilities

Facility	Electricity		Natural Gas		Propane		Total	
	Consumption (kWh)	Cost	Consumption (m3)	Cost	Consumption (L)	Cost	Energy (GJ)	Cost
Miscellaneous Locations	36,044	\$6,438	7,277	\$3,230	797	\$545	429	\$10,212
2012 Total	36,044	\$6,438	7,277	\$3,230	797	\$545	429	\$10,212

Appendix D - Terminology and Conversion Units

Gigajoule (GJ)

A GJ is a metric term used for measuring energy use. For the purposes of this report, electricity consumption (kWh) and natural gas consumption (m³) were converted to GJ to compare historical and total energy consumption per square footage or per number of units/beds.

High Heat Value (HHV)

HHV is the amount of heat energy released by the combustion of a unit quantity of a fuel, including the latent heat of vaporization of water embedded in the fuel.

Conversion units:

1 kWh = 3.6×10^{-3} GJ

1 m³ (of natural gas) = 0.03832 GJ

1 L Diesel = 0.0383 GJ

1 L No. 2 Oil = 0.0388 GJ

1 L Propane = 0.02531 GJ

Energy Use Intensity (EUI)

EUI is a unit of measurement that describes energy use for a building/operation relative to its size. While EUI is measured in kWh/ft² or GJ/ft², for buildings this report utilizes GJ for total energy consumption in relation to square footage of occupied area. For Water Supply and Sanitary Sewage facilities, EUI is based on energy consumed per million litres of flow, or per megalitre (GJ/M.L.).

Energy Cost Intensity (ECI)

This metric is the sum of all energy costs used per unit of gross building area (\$/ft²) or for water supply and sanitary sewage facilities per unit of flow (\$/M.L.).

Heating Degree Days (HDD)

The HDDs for a given day equals the degrees Celsius degrees that the mean temperature is **below** 18°C (when greater or equal to 18°C, then equals zero). For example, a day with a mean temperature of 15.5°C has 2.5 HDDs; a day with a mean temperature of 20.5°C has zero HDDs. HDDs are used to estimate building heating requirements.

Normalized Energy for Buildings

Energy benchmarking is the tracking and recording of building energy use and comparing it with that of other similar buildings (i.e. size, function). All buildings (rated and non-rated) can utilize a weather normalized EUI (GJ/ft²).

Calculation of normalized energy for buildings:

$$E_n = E_a \times [0.3 + 0.7 (HDD_{30}/HDD_a)]$$

E_n = normalized annual consumption for the year

E_a = actual annual consumption for the year

HDD_{30} = 30-years annual average of heating degree-days (based on 18°C)

HDD_a = actual annual average of heating degree-days (based on 18°C)

Source: Natural Resources Canada - Energy Efficiency in Buildings/Benchmarking Guide for Facility Managers

Heating Degree Days (HDD) data for Toronto Buttonville Weather Station

HDD 30-year average	N/A
*HDD 26 year average	3972
<i>*available data for Toronto Buttonville Weather Station</i>	
HDD for 2012	3376

Greenhouse Gas Emissions (GHG)

GHGs are atmospheric gases that trap the sun's energy and thereby contribute to rising surface temperatures. GHGs include carbon dioxide (CO₂), a byproduct of burning fossil fuels, methane (CH₄) and nitrous oxide (N₂O).

Emission Factors (EF)

An EF relates the quantity of a pollutant released to the atmosphere with an activity. These factors are usually expressed as the weight of pollutant divided by a unit weight, volume, distance, or duration of the activity emitting the pollutant. Such factors allow for estimation of emissions from various sources of air pollution.

Units of measure and emission factors

GHGs are calculated based on tonnes of CO₂ needed to produce a similar warming effect (CO₂ equivalent (CO₂e), is a product of the amount of gas and its associated Global Warming Potential (GWP)). For example, the GWP of CH₄ is 21 times the GWP of CO₂ and the GWP of N₂O is 310 times the GWP of CO₂. Every source unit (e.g. litre of diesel, cubic meter of natural gas) has emissions factors for each of its constituent GHGs (CO₂, N₂O, CH₄) as follows:

Fuel Type	Emission factors		
	CO ₂	CH ₄	N ₂ O
Natural Gas	1,879 g/m ³	0.037 g/m ³	0.035 g/m ³
Diesel for industrial/commercial equipment	2,663 g/L	0.133 g/L	0.40 g/L
Light Fuel Oil (Furnace Oil)	2,725 g/L	0.026 g/L	0.031 g/L
Propane	1,510 g/L	0.024 g/L	0.108 g/L

Source data: National Inventory Report: Greenhouse Gas Sources and Sinks in Canada, 1990-2012, April 2014
Guideline for Greenhouse Gas Emissions Reporting under O.Reg. 452/09, February 2012

The total CO₂e for quantity of fuel burned is the sum of the three GHGs released as a result, each multiplied by its associated GWP (Global Warming Potential) as it is shown below:

$$\text{CO}_2\text{e} = [(\text{CO}_2) + (\text{CH}_4 \times 21) + (\text{N}_2\text{O} \times 310)]$$

Alternatively, GHG emissions for electricity are calculated with the following formula:

$$\text{CO}_2\text{e} = \text{electricity purchased [kWh]} \times \text{EF}$$

EF = Generation intensity emission factor for electricity (g CO₂e/kWh)

The generation intensity factors for Ontario are presented in the following table:

Year	2008	2009	2010	2011	2012
EF for Ontario (g CO ₂ e/kWh)	170	100	130	93	96

Source data: National Inventory Report: Greenhouse Gas Sources and Sinks in Canada, 1990-2012, April 2014

Appendix E - List of Acronyms

AHU	Air Handling Unit
ASHRAE	American Society of Heating, Refrigerating, and Air-Conditioning Engineers
BAS	Building Automation System
BCA	Building Condition Assessment
CDM	Conservation and Demand Management
CFL	Compact Fluorescent Light
CH ₄	Methane
CO ₂	Carbon Dioxide
CO ₂ e	Carbon Dioxide Equivalent
DRLHC	Durham Regional Local Housing Corporation
DRP	Demand Response Program
DRPS	Durham Regional Police Services
DRT	Durham Region Transit
ECI	Energy Cost Intensity
ECM	Energy Conservation Measure
EEM	Embedded Energy Manager
EF	Emission Factor
ekWh	Equivalent Kilowatt-Hour
EMP	Energy Management Plan
EMS	Emergency Medical Services
ERV	Energy Recovery Ventilator
EUI	Energy Usage Intensity
FCM	Federation of Canadian Municipalities
FIT	Feed-In Tariff
GFA	Gross Floor Area
GHG	Greenhouse Gas
GJ	Gigajoules
GWP	Global Warming Potential
HAP	Home Assistance Program
HDD	Heating Degree Day
HHV	High Heating Value
HID	High Intensity Discharge
HQ	Headquarters
HPNC	High Performance New Construction
HVAC	Heating, Ventilation and Air Conditioning
IESO	Independent Electricity System Operator

Appendix E - List of Acronyms (Cont'd)

kW	Kilowatt
kWh	Kilowatt-Hour
LAS	Local Authority Services
LDC	Local Distribution Company
LED	Light Emitting Diode
LEED	Leadership in Energy and Environmental Design
LTC	Long-Term Care
M ³	Cubic Metre
M&V	Measurement and Verification
ML	Megalitre
MUA	Make-Up Air Unit
N ₂ O	Nitrous Oxide
OBC	Ontario Building Code
OEB	Ontario Energy Board
OPA	Ontario Power Authority
PS	Pumping Station
PUC	Public Utility Commission
PV	Photovoltaic
SPSS	Sanitary Sewer Pumping Station
TBD	To Be Determined
TOU	Time-of-Use
VFD	Variable Frequency Drive
WEM	Water Efficiency Measure
WMF	Waste Management Facility
WPCP	Water Pollution Control Plant
WPS	Water Pumping Station
WSP	Water Supply Plant