



Energy Conservation and Demand Management Plan

Executive Summary

On January 1st, 2012, the Energy Conservation and Demand Management Plans Regulation (O. Reg. 397/11) came into effect under the Green Energy Act 2009. The regulation requires public agencies, including universities, to report their annual energy consumption and greenhouse gas (GHG) emissions as well as to implement an Energy Conservation and Demand Management Plan (ECDM) beginning in 2014. These plans are required to be reviewed and updated every 5 years.

This Laurentian University ECDM will serve as a guide to better understand its energy usage, educate its community (including students, faculty and staff) and identify strategies for reducing energy consumption and corresponding greenhouse gas (GHG) emissions. Conserving energy will not only aid the University in realizing a reduction in waste, but also lower operating costs. The ECDM also ensures compliance to O. Reg. 397/11 and aids in providing a framework for communicating targets, planning for new and retrofit equipment and infrastructure installations, and monitoring progress in reducing energy demand.

This document is available on the Laurentian University website and intranet site. It is available in print or other formats to suit individual needs, upon request.

Table of Contents

Executive Summary..... 2

Introduction 4

Energy Consumption Review 6

Previous Energy Conservation Activities..... 7

Energy Conservation Goals 9

 Proposed Measures 9

 Time, Resources and Estimated Savings 10

 Renewable Energy 13

Concluding Remarks..... 14

Appendix 1: Summary of 2011 Energy Consumption 15

Appendix 2: Summary of 2012 Energy Consumption 16

Appendix 3: ECDM Approval from Senior Management 17

Appendix 4: Relevant Conversion Factors and List of Acronyms..... 18

Introduction

Laurentian University in Sudbury is located at the edge of Ontario's Near North, a region recognized for its remarkable environment (the south portion of the Boreal Shield ecozone) and its natural resources (especially water, minerals, and forests). Since its creation in the early 1960's, Laurentian University has been recognized worldwide for its environmental research, especially in the fields of water and freshwater ecosystems, restoration of industrially damaged ecosystems, Boreal Shield and Ontario's Far North ecosystems, and conservation. Laurentian is home to Canada Research Chairs in areas such as Environmental Microbiology, Environment, Cultures & Values, Stressed Aquatic Systems as well as Applied Evolutionary Ecology. Laurentian also has dedicated research centres for Evolutionary Ecology and Ethical Conservation, a Cooperative Freshwater Ecology Unit and the new Vale Living with Lakes Centre. In 2013, Laurentian University announced a brand new School of Environment and approved a new Manager of Energy and Sustainability position for the organization. As evidenced by the President's recent commitment to the Council of Ontario Universities to create greener campuses¹, environmental responsibility is an important value at Laurentian University

At Laurentian University the new Manager of Energy and Sustainability, along with the Facility Services department (formerly Physical Plant and Planning), is actively involved in campus sustainability initiatives and leads the development and implementation of this ECDM. They are also responsible for all related reporting under O. Reg. 397/11. Under this regulation all broader public sector (BPS) organizations, including Universities, are required to:

By July 1, 2013 submit:

- Energy consumption and greenhouse gas (GHG) emissions for 2011
- Corresponding facility information

By July 1, 2014 submit:

- Updated energy consumption and greenhouse gas (GHG) emissions for 2012
- Updated corresponding facility information
- A five-year Energy Conservation and Demand Management (ECDM) Plan
- Detailed costs and estimated savings for all proposed Energy Conservation Measures
- Identification of benchmark facilities
- Previous energy conservation initiatives (optional)

¹ Ontario Universities Committed to a Greener World. <http://www.cou.on.ca/news/commentary---events/events/events-pdfs/committed-to-a-greener-world---a-pledge-from-execu>.

All reports and submissions are available on the Laurentian University website (laurentian.ca/sustainability). In addition, the ECDM and its energy conservation efforts were presented to the Vice President Administration for approval. As required under O. Reg. 397/11, approval by senior management for this ECDM is documented in Appendix 3.

Energy Consumption Review

O. Reg. 397/11 requires public agencies to provide information on their annual energy consumption during the last year for which information is available for a full year. On July 1, 2013, Laurentian University submitted the required baseline data for 2011. This data was submitted using the Ministry of Energy's Energy Consumption and Greenhouse Gas Emission Template. This report, along with the report containing data for 2012, can be found on the Laurentian University website (laurentian.ca/sustainability). Data contained in these reports for 2011 and 2012 is conveniently summarized here in Appendix 1 and 2 respectively.

Discussions involving other Ontario Universities and the Ministry of Energy, through the Ontario Association of Physical Plant Administrators (OAPPA) Energy Committee, identified that most campuses are unable to track consumption for separate buildings on campus. This is the case at Laurentian University as sub-metering is not yet installed for each building. As a result, electricity and natural gas consumption were reported for the University campus as a whole for 2011 and 2012. Future sub-metering at all facilities will not only help to track consumption, but also provide the ability to analyze energy efficiency at each building. This is reviewed in greater detail in the following sections.

Previous Energy Conservation Activities

The Laurentian University campus is nestled among trees on roughly 750 acres and over the past 40 years, environmentally friendly alternatives and energy conservation has been at the forefront of the growing university. Examples of energy conservation initiatives over the last several years are highlighted below:

- The Health Science Education Resource Centre, completed in 1992, received an Award of Merit from Ontario Hydro for energy efficiency.
- In 2005, The Northern Ontario School of Medicine opened its doors and received a \$60,000 award from Natural Resources Canada for its design that cuts energy consumption in half.
- The West Residence, constructed in 2006, boasts a reduction in heating costs of over 25 per cent.
- The Jenő Tihanyi Olympic Gold Pool brick finish was replaced and wall insulation was upgraded in 1992, in addition to roof insulation and roof replacement in 2008.
- The new Vale Living with Lakes Centre's eco-friendly design received a Holcim Award in 2008, along with \$25,000USD towards construction. The building was one of only three North American awards presented for energy efficient buildings, and holds Leadership in Energy and Environmental Design (LEED) platinum certification.
- In 2008 the School of Education building opened with LEED silver certification for energy efficiency. Its high-performance exterior envelope, superior ventilation and insulation, and natural light help make the building 65 per cent more efficient than standard code.
- In February of 2009, the B. F. Avery Physical Education Centre achieved LEED silver certification due to its ability to cut energy consumption in half.
- The Classroom Building was reinsulated to reduce heat loss by 66 per cent in 2009.
- More recently, in 2013, the heating system in the R.D. Parker Building was divided into three separate automated zones for the south, east and west sections of the building. This allowed for lowering heating after regular business hours and stabilization of building temperature.
- Laurentian University's new School of Architecture opened its doors to its inaugural class in 2013; construction of many of the facilities is still in progress but is designed to LEED gold standards. The buildings are also designed as living labs so tomorrow's architects can learn about building sustainability first hand.

- Chillers with higher efficiency have been replaced in both the B. F. Avery Physical Education Centre (2013) and J. N. Desmarais Library (2011).
- In 2013 Laurentian University created a new position, Manager of Energy and Sustainability, which was filled in 2014. The position is intended to lead energy conservation measures and sustainability initiatives across the organization.
- In 2014, the Single Student Residence was completely re-insulated to create a tighter building envelope to reduce energy costs.

Energy Conservation Goals

As previously discussed, under O. Reg. 397/11, public agencies are required to develop goals and objectives for conserving and otherwise reducing energy consumption and managing demand for energy. At Laurentian University, the ECDM is an evolving document built on several proposed technical, organizational and behavioural measures. The measures aimed at conservation are based on a number of factors including organizational gaps and needs, current consumption, available funding, incentives from local companies, existing infrastructure, new technologies, etc. Over the next 5 years Laurentian University aims to **reduce overall energy intensity across campus by 5%** (as compared to 2011 baseline) and **to foster a stronger sense of sustainability in Laurentian University’s organizational culture.**

Proposed Measures

The following proposed measures are aimed at achieving the qualitative and quantitative energy conservation goals described above.

	Proposed Measure	Evaluation of Results
A	Evaluation of Energy Efficiency for All Facilities	<ul style="list-style-type: none"> Sub-metering installed in all facilities for electricity and Natural gas. Campus facility benchmarking completed (Energy Intensity Evaluation of consumption/occupied area).
B	Energy Conservation Activities	<ul style="list-style-type: none"> Reduction in consumption as measured by meters and invoices for electricity and natural gas. Identification and implementation of energy saving opportunities.
C	New and Existing Infrastructure Planning	<ul style="list-style-type: none"> Review projects for new and existing infrastructure to ensure incorporation of energy efficient technologies. Evaluate energy saving post-projects for existing infrastructure.
D	Evaluation of Renewable Energy Technologies	<ul style="list-style-type: none"> Identification and evaluation of at least two renewable energy options.
E	Collaboration with External Partners (Local Utility Companies, Municipal/Provincial/National Sustainability Groups, etc.)	<ul style="list-style-type: none"> Identification and evaluation of energy saving incentives through Union Gas, municipality incentives, Ministry of Energy’s Business Incentive Database, Infrastructure Ontario, energy service companies (ESCO), etc. Affiliation with professional network such as Association for Advancement of Sustainability in Higher Education (AASHE), etc.
F	Collaboration with Internal Partners (IT, Housing and Food Services, Student Unions, etc.)	<ul style="list-style-type: none"> Development, implementation and annual evaluation of plans aimed at energy conservation and awareness. Evaluation of reinstatement of President’s Action Committee on the Environment (PACE), or alternative forum
G	Increased Energy Awareness and Communication	<ul style="list-style-type: none"> Sustainability website developed Increased presence in campus wide news pertaining to energy and sustainability initiatives

Time, Resources and Estimated Savings

Under the requirements of O. Reg. 397/111, an evaluation of each proposed measure identifying cost and saving estimates, as well as estimated length of time a measure will be in place, is discussed below.

A. Evaluation of Energy Efficiency for All Facilities

In order to accurately measure energy consumption at all facilities, installing sub-metering will be required. This is currently not in place and the estimated costs are under review. In addition, Laurentian University, in partnership with other Ontario Universities and Energent Incorporated, were successful in an application for funding approval from the Ontario Ministry of Training, Colleges and Universities (MTCU) Productivity and Innovation Fund (PIF). This funding sparked a collaborative initiative to review an integrated Utility Energy Database and Benchmarking Software (UEDBS) at all partnering Ontario universities. Since campus utility (electricity, natural gas, water) consumption ranks amongst the highest annual operating expenses, this endeavour will help to identify appropriate energy conservation activities and lower annual operating costs. This software is still in development, but expected to be functional for pilot facilities in the coming year (2014). Sub-metering at all facilities is expected to be installed through the next 5-years (2019).

B. Energy Conservation Activities

Several energy conservation initiatives were previously identified in this document, however Laurentian University strives for continuous improvement in reducing consumption and managing demand. Understanding baseline consumption, by way of measuring and monitoring with accurate data and software, allows for identification of areas of concern. For instance, buildings will be benchmarked against each other to prioritize those operating inefficiently. In addition, within these building, software can assist in identifying whether heating/cooling, insulation or lighting, etc. should be the target for retrofit planning. There is no direct cost yet associated with this target, however this measure is ongoing through the 5-year ECDM, and the life of the campus.

C. New and Existing Infrastructure Planning

In 2013, Laurentian University released its Campus Master Plan which highlights effective sustainable planning and design of the campus buildings and infrastructure. Facility Services is integral in campus modernization planning and will evaluate all opportunities to improve existing infrastructure, for example increased efficiency for lighting, insulation, or Heating, Ventilation and Air Condition (HVAC) units. New infrastructure planning will be developed in conjunction with Facility Services, and campus stakeholders, to ensure that the organization

strives for designs adhering to LEED standards, purchases new appliances with Energy Star ratings, etc.

D. Evaluation of Renewable Energy Technologies

As Laurentian University's organization and infrastructure grow, evaluation of renewable energy technologies is critical to meeting increased campus energy requirements. Through the 5-year term of this ECDM, Laurentian University commits to evaluating a minimum of 2 renewable energy technologies. This will require discussions with local utility companies and extensive research for appropriate incentive applications; however the savings and costs are undeterminable at this time.

E. Collaboration with External Partners (Local Utility Companies, Municipalities, Provincial and National Sustainability Groups, etc.)

Collaborating with External Partners, including local utility companies, ensures that all available incentives and programs are evaluated and implemented accordingly. These companies are excellent resources to assist in implementing projects aimed at continuously improving energy conservation across the campus. The savings from these incentives will be evaluated on an individual basis, whereby implementing some projects may prove to have 100 per cent paybacks, or greater, if significant savings are demonstrated. Additionally, memberships with the Canadian Alliance of College and University Sustainability Professionals (CUSP), Ontario Sustainability Coordinators Association (OSCA) and the Association for the Advancement of Sustainability in Higher Education (AASHE) will promote knowledge sharing, education and partnerships. Through 2014, Laurentian University will have presence in these associations.

F. Collaboration with Internal Partners (IT, Housing, Food Services, Student Unions, etc.)

Campus stakeholders are vital partners in energy conservation goals at Laurentian University. Examples of initiatives to be explored in, and beyond the 5-year term of this ECDM, include implementing better composting and recycling programs with Housing and Food Services, reviewing new equipment purchases with Information Technology (IT) for energy efficiency, etc. Collaborations between the Security and Risk Department and the Registrar may help to identify better options for operating hours at various buildings to reducing lighting and energy requirements across campus outside of business hours. In 2010, an example of collaboration between Facility Services and the Laurentian Students' General Association (SGA), aimed to promote elimination of plastic water bottles with water bottle filling stations. Through this collaboration, all aging water fountains were prioritized and evaluated. Several were replaced or upgraded. Lastly, a critical internal partner is the President's Advisory Committee on the Environment (PACE). This committee will be reinstated in 2014 to ensure that all campus stakeholders can voice concerns and cooperate in driving energy conservation and sustainable ventures around campus.

G. Increased Energy Awareness and Communication

Development of effective communication plans with the Laurentian community is required to promote awareness and engagement with respect to energy conservation and sustainability on campus. Development of an Energy and Sustainability website is underway in 2014 and will allow for dissemination of reports like this ECDM, promotion of events and initiatives and availability of various resources to facilitate behavioural changes across the campus. Increasing the presence of energy conservation and sustainable actions through campus news avenues will exhibit ongoing developments not only to the organization, but to the Sudbury community at large. The cost of ongoing measures such as these are deemed negligible, however it is anticipated that they will accelerate savings in energy and operating costs in tandem with the abovementioned proposed measures.

Renewable Energy

O. Reg. 397/11 requires public agencies to describe any renewable energy technology in their ECDM. This includes ground source energy harnessed by ground source heat pump technology and/or solar energy harnessed by thermal air technology or thermal water technology. The Vale Living with Lakes Centre at Laurentian University boasts both geothermal and solar heat exchange technologies. Energy from the natural warmth of the bedrock under the parking lot contributes to winter heating using a mixture of glycol and water circulating through tubes. The glycol mix passes through a heat exchanger and heat pump where purified “heating water” is warmed before circulating through a network of tubes embedded in the concrete floor slabs. In the summer, the same circulation carries warmth from the building down to the bedrock where it is stored for the winter. Solar heat exchange panels on the roof of the Watershed heat glycol in thread thin aluminum tubes that then warm water before it is heated by a natural gas boiler to supply hot water.

Currently, no other renewable energy is generated at Laurentian University, nor is any renewable energy purchased from retailers. However, through this plan and its proposed measures, at least two renewable energy technologies will be identified and evaluated prior to the next 5-year ECDM review (2019).

Concluding Remarks

Laurentian University's organizational culture for promoting energy conservation and sustainable initiatives is evident the planning for both existing and new infrastructure, new courses, degrees and research centres as well as through education, outreach and awareness. The Laurentian University ECDM is a dynamic document intended to not only ensure compliance to O. Reg. 397/11, but also highlight and document the organization's energy and demand management conservation goals, and to measure its progress against them. Laurentian University understands its responsibility towards promoting energy conservation and sustainability, and commits to providing leadership for current and future generations at its organization.

Appendix 1: Summary of 2011 Energy Consumption

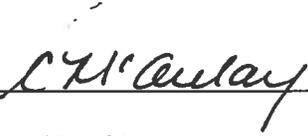
Confirm consecutive 12-month period	01-2011 to 12-2011									
Type of Public Agency (Sector):	Post-Secondary Educational Institution									
Agency Sub-Sector	University									
Organization Name	Laurentian University									
Operation Name	Operation Type	Address	City	Postal Code	Total Floor Area of the Indoor Space in which Operation is Conducted (m ²)	Energy Type and Amount Purchased and Consumed		GHG Emissions (Kg)	Energy Intensity (ekWh/sqft)	Energy Intensity (GJ/m ²)
						Electricity (kWh)	Natural Gas (GJ)			
Laurentian University	Classrooms and related facilities	935 Ramsey Lake Road	Sudbury	P3E 2C6	169,250	18,274,089	124,211	7,599,839	28.97	1.12

Appendix 2: Summary of 2012 Energy Consumption

Confirm consecutive 12-month period	01-2012 to 12-2012									
Type of Public Agency (Sector):	Post-Secondary Educational Institution									
Agency Sub-Sector	University									
Organization Name	Laurentian University									
Operation Name	Operation Type	Address	City	Postal Code	Total Floor Area of the Indoor Space in which Operation is Conducted (m ²)	Energy Type and Amount Purchased and Consumed		GHG Emissions (Kg)	Energy Intensity (ekWh/sqft)	Energy Intensity (GJ/m ²)
						Electricity (kWh)	Natural Gas (GJ)			
Laurentian University	Classrooms and related facilities	935 Ramsey Lake Road	Sudbury	P3E 2C6	169,250	20,320,000	133,733	8,234,044	29.52	1.14

Appendix 3: ECDM Approval from Senior Management

Document reviewed and approved by:



Carol McAulay, CPA, CA
Vice-President, Administration
Laurentian University

Appendix 4: Relevant Conversion Factors and List of Acronyms

Conversion Factors

1 GJ	= 26.137 m ³ = 26,137 L
1 Kg	= 0.0011 t = 2.2046 lbs
1 kWh	= 0.0036 GJ
1 m ²	= 10.7639 sqft

List of Acronyms

AASHE	Association for the Advancement of Sustainability in Higher Education
BPS	Broader Public Sector
CUSP	Canadian Alliance of College and University Sustainability Professionals
ECDM	Energy Conservation and Demand Management Plan
ESCO	Energy Service Company
GHG	Greenhouse Gas
GJ	Giga Joule
HVAC	Heating Ventilation and Air Conditioning
IT	Information Technology
Kg	Kilogram
kWh	Kilowatt Hour
LEED	Leadership in Energy and Environmental Design
MTCU	Ontario Ministry of Training, Colleges and Universities
OAPPA	Ontario Association of Physical Plant Administrators
OSCA	Ontario Sustainability Coordinators Association
PACE	President's Advisory Committee on the Environment
PIF	Project and Innovation Fund
SGA	Students' General Association
UEDBS	Utility Energy Database and Benchmarking Software