



Cambrian College

5-Year Corporate Energy Conservation and Demand Management Plan

July 2019

Prepared in co-operation with:



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Our Commitment to Energy Conservation



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June 3, 2019

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While attempting to reduce the impact of rising energy costs, and in response to current regulatory requirements, Cambrian College has developed a new 5-Year Energy Conservation and Demand Management (ECDM) Plan. This Plan outlines our progress against our original 2014 Plan as well as our planned conservation actions forward to 2024. This new plan and its related strategies and initiatives is supported by College management.

This new Energy Conservation and Demand Energy Management Plan (ECDM Plan) has been updated in response to Ontario Regulation 507/18 made under the Conservation and Energy Efficiency section of the Electricity Act, 1998, requiring all public agencies to prepare, publish and implement an ECDM Plan. Our ECDM Plan fulfills the reporting requirements of the above regulations and provides a framework to support continued energy and sustainability initiatives within the built environment, operations and programs. The Plan further identifies opportunities for continued energy conservation measures and sustainability initiatives to build on our existing plans and conservation efforts. Implementation of all initiatives is subject to future funding availability and budget approvals.

Our ECDM Management Plan has also been developed to address the fiscal, societal, and environmental costs and risks associated with energy consumption. Appropriate energy management will permit Cambrian College to display leadership, improve the delivery of services, and enhance the overall quality of campus life.

Warmest Regards,

A handwritten signature in black ink, appearing to read 'Leo Vienneau'.

Leo Vienneau
Interim Director Facilities Management
Cambrian College

Introduction

Background

Cambrian College's Energy Conservation and Demand Management (ECDM) Plan was developed to meet the obligations of Ontario Regulation 507/18 requiring all public sector organizations to complete an update to their original 2014 ECDM Plan by July 1, 2019. This comprehensive Plan is an effective method of identifying energy conservation opportunities, selectively implementing the best projects and then measuring their effectiveness. The Plan has been developed to protect the interests of our students and community and ensure that Cambrian College obtains the best possible value from our operating budgets. In addition to meeting our regulatory obligations, the College believes that a strong commitment to energy conservation and a reduction of energy use demonstrates our belief in becoming a more sustainable member of our community.

Purpose of the Plan

The 5-Year Energy Conservation and Demand Management Plan is designed to guide Cambrian College towards a more energy-efficient future. The policies, practices and energy conservation measures identified illustrate the importance the College places on acting responsibly towards energy consumption through the wise use of resources in College operations.

To enhance our understanding of energy use and return on investment through conservation, this document contains a thorough review of the measures implemented since the creation of the original Plan, issued on July 1, 2014. Since then, the College has initiated a large Honeywell project, as well as other energy conservation initiatives, yielding significant savings results, including:

- Boiler retrofits and upgrades
- VFD installations
- Extensive lighting upgrades
- Electrical system improvements

The above projects have resulted in an estimated savings of over \$280,000.

The wise and efficient use of energy are important options for meeting energy demands. They also provide many other environmental, economic and social benefits, including reducing greenhouse gas (GHG) emissions, cost avoidance and savings. Along with the primary benefits, the responsible use of energy also promotes local economic development opportunities, energy system reliability, improved energy supply security and reduced-price volatility.

Following the path of our previous ECDM Plan, this document is a continuation of a process involving the:

- Integration of establishing and evaluating a baseline for performance to be measured against;
- Reviewing the effectiveness of previous conservation efforts while setting future performance goals and objectives;
- Continuous improvement through identification of energy conservation potential;
- Strategic alignment of improvement measure implementation and fiscal constraints; and,
- Evaluation, measurement and communication of results achieved.

The following report summarizes the significant efforts applied by the Cambrian College Energy Conservation Team to create a Plan that can be implemented responsibly, over time, to create lasting results. The Plan takes advantage of internal expertise as well as all available external financial incentives and rebates currently being offered to support the implementation of energy savings ideas. The current energy picture for Cambrian College and our future Vision, Goals and Objectives as shown in the Energy Conservation and Management Policy, are outlined. Our strategic focus areas are discussed in detail and our 5-year Action Plan is laid out.

1.0 Historic Energy Performance

Historical Energy Usage

Effectively managing energy requires the creation of a robust energy monitoring strategy and establishing an accurate energy baseline is an essential first step in this process. This baseline assists with energy conservation and greenhouse gas reduction target setting, energy procurement and budgeting, bill verification, energy awareness, and the selection and assessment of potential energy projects. Cambrian College, similar to many other campuses, relies on utility bills to establish this energy baseline.

To evaluate the effectiveness of the College’s previous energy conservation measures, the year 2013 was chosen as the base year for measurement; this aligns with the Ministry of Energy’s Regulation 507/18 requirements for reporting. Overall, the College’s consumption in 2013 was 13.4 million kWh of electricity and 834,000 m³ of natural gas. This usage equates to spending \$1.6 million for electricity and \$216,000 for natural gas for the year (2013).

For comparative purposes, the raw energy consumption breakdowns by month since the original baseline for the College are as follows:

Figure 1-1 – Electricity Use (2013 – 2018)

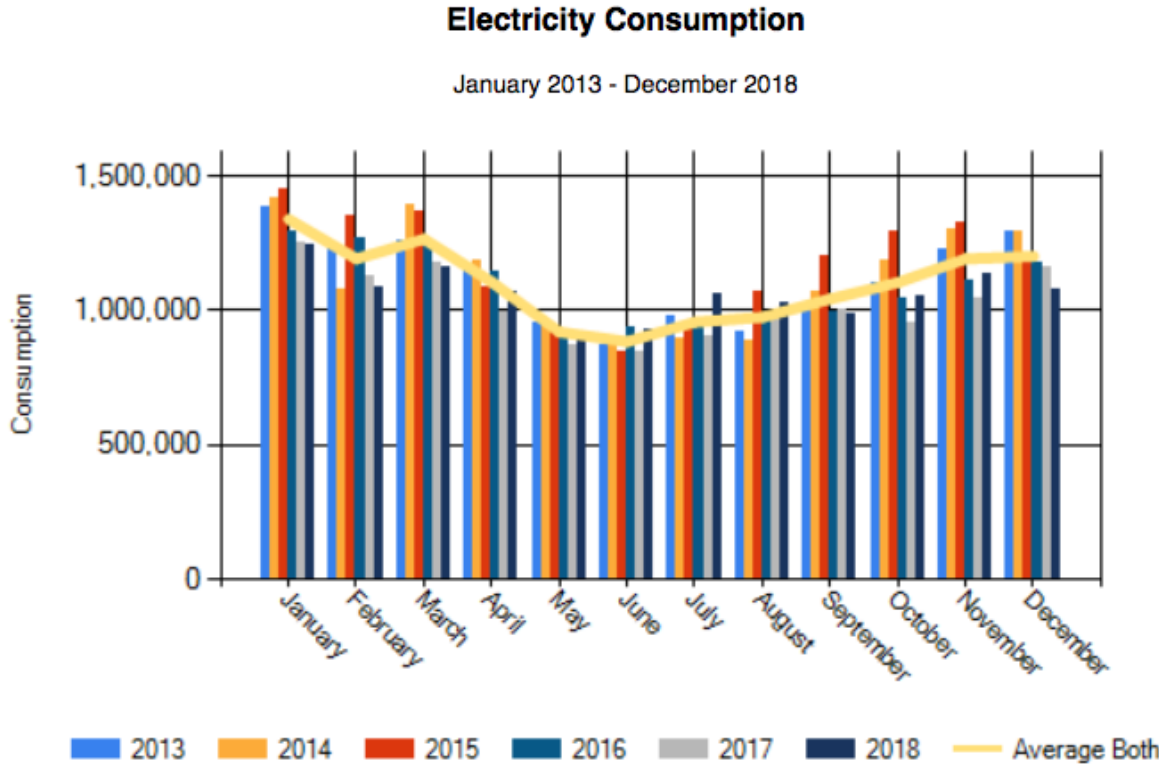
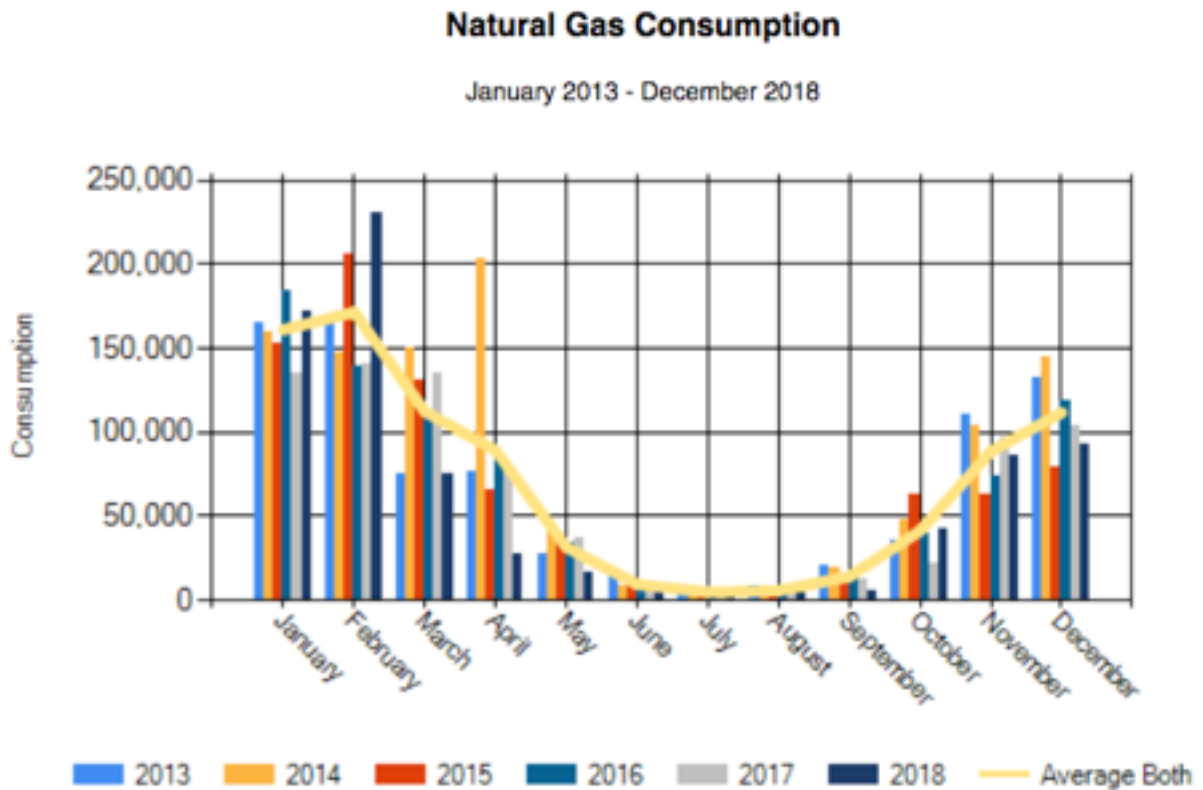
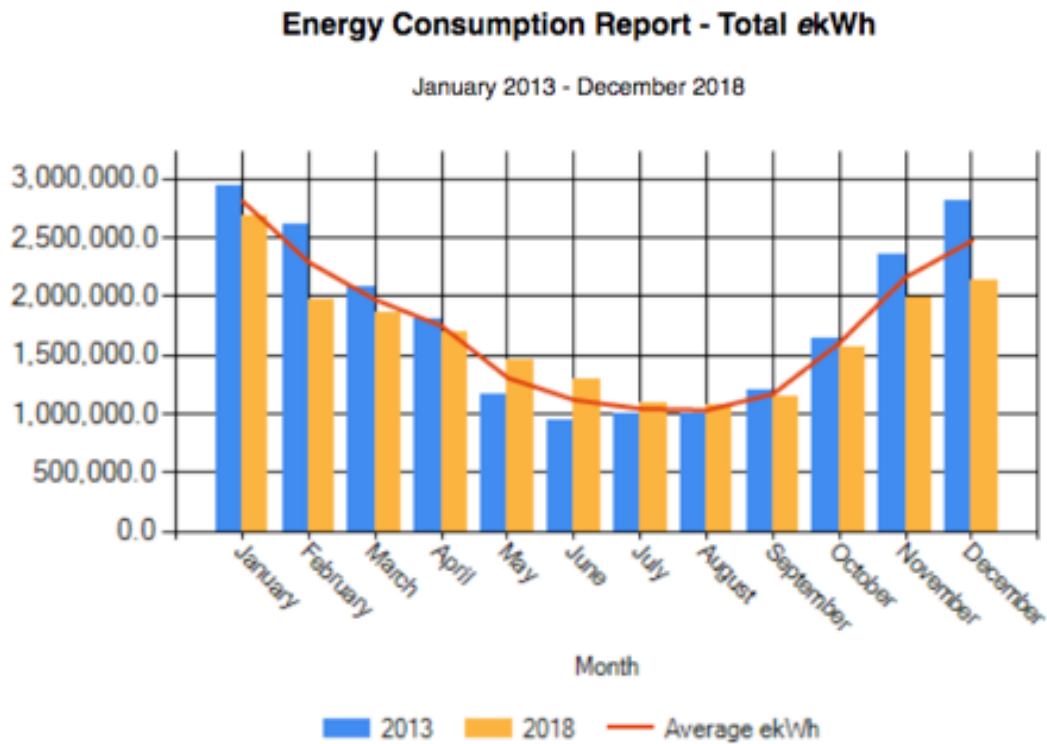


Figure 1-2 – Natural Gas Use (2013 – 2018)



In the original ECDM Plan, the College set a target of a 2% reduction in energy consumption over the 5-year term of the Plan (2014-2019). The graph below illustrates that the College not only met this target but exceeded it with an overall 7% reduction in ekWh/m² energy intensity over the 5-year period.

Figure 1-3 – Annual ekWh (2013 – 2018)

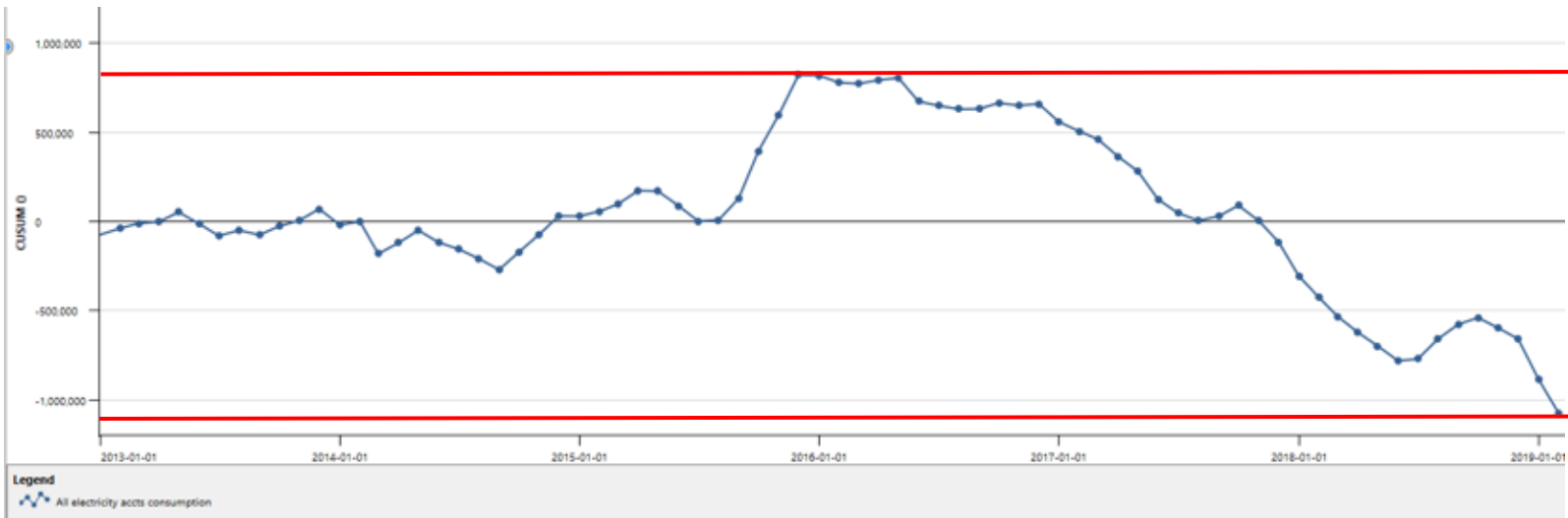


Month	2013 ekWh	Variance		2018 ekWh
		#	%	
January	2,937,257.9	-254,534.1	-9 %	2,682,723.8
February	2,602,647.6	-625,403.4	-24 %	1,977,244.2
March	2,082,306.5	-218,153.4	-10 %	1,864,153.1
April	1,810,823.7	-120,480.2	-7 %	1,690,343.5
May	1,163,731.7	289,734.0	25 %	1,453,465.7
June	952,690.0	338,990.8	36 %	1,291,680.8
July	1,001,203.9	91,436.6	9 %	1,092,640.5
August	994,706.9	82,863.6	8 %	1,077,570.5
September	1,207,070.7	-67,713.0	-6 %	1,139,357.7
October	1,639,446.1	-65,543.6	-4 %	1,573,902.5
November	2,348,439.8	-368,853.2	-16 %	1,979,586.6
December	2,808,447.7	-668,417.0	-24 %	2,140,030.7
Annual Totals	21,548,772.4	-1,586,073.0	-7 %	19,962,699.4

Cambrian College Energy Baseline Analysis

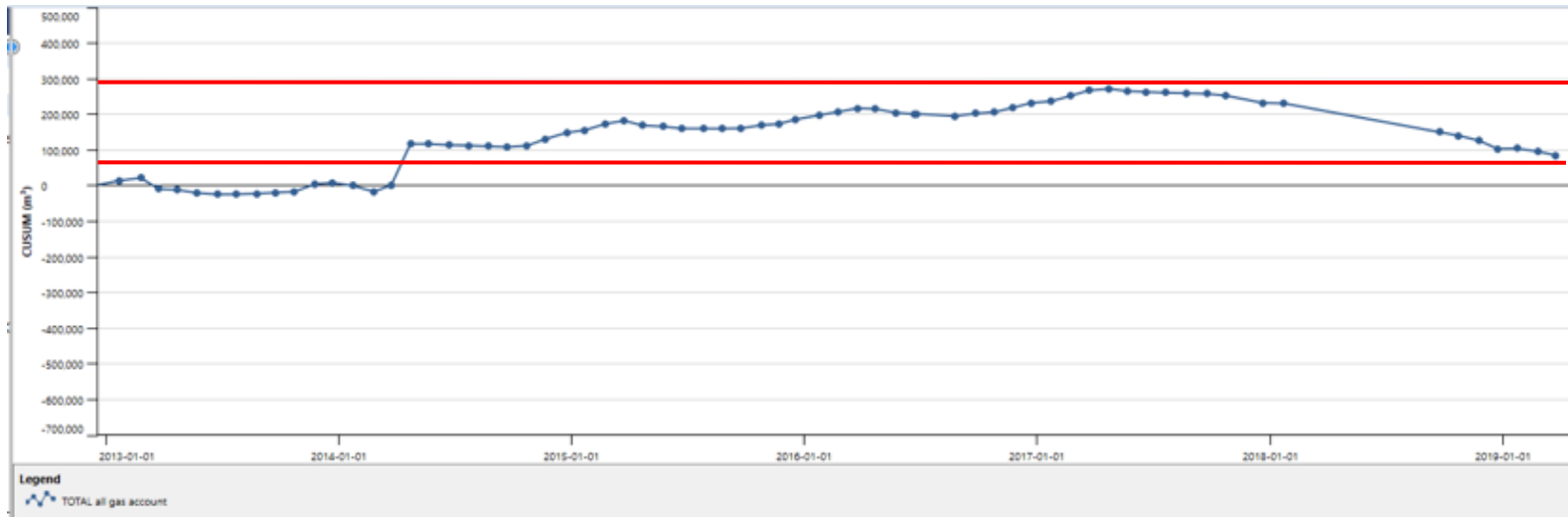
The following analysis uses RETScreen analysis of consumption data for the base year (2013) forward. This type of review allows for an objective evaluation of conservation progress by removing the variables that can independently affect energy consumption and are largely out of the College's control (i.e. weather, temperature, cooling or heating degree days).

Figure 1-4 Electricity Baseline and CUSUM analysis (Base year 2013)



Electricity consumption has begun a downward trend, indicating savings starting at the beginning of 2016. This trend has allowed the College to realize a reduction in consumption of over 1 million kWh, saving approximately \$119,000 (as shown in the area between the two red lines). This cumulative savings trend indicates that conservation initiatives are working and should be closely monitored to ensure the trend continues.

Figure 1-5 Natural Gas Baseline and CUSUM analysis (Base year 2013)



Similar to electricity, the natural gas CUSUM analysis indicates a savings trend starting around March 2017, after an initial period of baseline to slightly increasing performance. This trend has seen a reduction in consumption (between the two red lines) of approximately 200,000 m³, or \$52,000. This trend should also be monitored closely to ensure these savings continue.

Energy Conservation Project Successes

Since the creation of the last 5-Year ECDM Plan, the College has initiated significant investments in energy efficiency and energy-cost reduction. These projects include:

Facility-Related Projects

Future Energy Reduction Projects Summary	
Year	Planned Activity
2014	Lighting Controls
	Install Lead Condensing Boiler in Section 4
	Install Condensing Boilers in Section 4
	Install Lead Condensing Boiler in Section 6
	Install Condensing DHW Boiler in Section 4
	Install Condensing DHW Boilers in Section 4 Cafeteria
	Convert Section 1 Electric AHU's to Gas
	Convert Section 1 Electric DHW to Gas
	Install VSDs & DCV on Section 3/Stage 9 RTUs
	Install VSDs on Section 5 RTUs
	Install Occupancy Sensors on Section RTUs
	Install DCV Controls on Section 5 RTU's
	Re-Commission Building Automation System
	Water Conservation
	Install Vending Misers
Building Envelope	
Install 10kW Rooftop Solar PV Section 1	
2015	Lighting Upgrade
	Lighting Controls
	Gymnasium Lighting Upgrade
	Install Condensing Boilers in Section 4
	Convert Section 1 Electric AHU's to Gas

	Convert Section 1 Electric DHW to Gas
	Water Conservation
2016	Replacing All Exterior Lights with LED Fixture and Lights (Street Lights, Parking Lot and Walkways)
2017	An additional 12 Parking Lot Lights were found and replaced with LED Lights
	Insulation of walls & soffits in Section 0, Section 1 and Section 2
	Elevator 4A rebuilt - energy efficient motor & controls
	Elevator/Lift #3 - replaced - energy efficient motor & controls
	HVAC Roof Top Units - replaced 17 Units plus 1 Exhaust Fan - energy efficient motor & controls
	Replaced 4 Flat Roofs - improved insulation and water tight

As mentioned above, In the original ECDM Plan, implementation of these measures allowed the College to achieve an overall 7% reduction in energy usage, exceeding the original plan target of a 2% reduction in energy consumption over the 5-year term of the Plan (2014-2019).

2.0 Energy Conservation and Management Policy

Our Commitment

Cambrian College remains committed to allocating the necessary resources to develop and implement a strategic Energy Conservation and Demand Management (ECDM) Plan to continue to reduce our energy consumption and its related environmental impact. As an organization, we value the notion of efficient operations and creating a more sustainable community.

We are committed to managing energy responsibly and will use energy efficiency practices throughout our facilities, operations and equipment wherever it is cost effective to do so.

Our Vision

Cambrian College endeavours to minimize energy consumption, related costs, and carbon emissions by continuously improving its energy management practices without compromising the level of service delivery to the College community.

Our Goals and Objectives

As part of our 2019 ECDM Plan, the College created several strategic avenues to achieve specific goals and targets with regards to energy management. We have re-examined our past objectives and are re-committing to this updated version.

1. Reduce energy intensity in College facilities by 2% by 2024. This is in addition to previous reductions achieved between 2013 and 2018.
2. Enhance our culture of conservation through training and outreach to staff, students and facility users. Through this training staff will have the appropriate knowledge and training to be empowered to reduce energy consumption.
3. Expand upon our comprehensive energy management policy and practices by enhancing key existing business practices to include energy efficiency standards and energy management best practices.
4. Expand our monitoring and tracking program for energy use by providing access to our energy information to make energy consumption visible to everyone in the College and support facility/management decision-making.
5. Deliver energy cost savings through the identification and implementation of processes, programs and projects that will reduce energy consumption.
 - Re-assess and benchmark the top energy consuming facilities across the College. (2019)
 - Review previously identified energy savings opportunities by reviewing past energy audits and plan to renew energy audits and analysis of the capital asset renewal program. (Ongoing)

- Review and/or enhance standard operating and maintenance procedures to include energy conservation best practices. (Ongoing)
- Seek funding for energy-related projects from various sources to enhance the payback and reduce implementation costs. (Ongoing)

Strategic Action Plan

To achieve our new ECDM Plan, the College will employ the following strategies designed to ensure a positive outcome over the next 5 years. These key initiatives support the delivery of our Goals and Objectives.

Strategy 1. Corporate Practices

Develop corporate policies and practices that support the energy conservation effort and show leadership and commitment within the College and community.

- Energy Management Team: Roles, Responsibilities and Accountability

Strategy 2. Education, Awareness & Outreach

Provide the guidance, leadership and framework necessary to empower staff and students to develop a culture of conservation.

- Energy Skills Training Program
- Energy Awareness Training
- Outreach, Engagement and Recognition Programs
- Feedback System for Staff Suggestions
- Staff Brainstorming Sessions

Strategy 3. Energy Conservation Action Plan and Energy Information Management

Continually identify and deliver energy conservation processes, programs and projects in all areas of the College. Demonstrate sound operating and maintenance practices to complement the energy efficiencies implemented through the capital asset renewal program. Employ a robust Energy Information Management System to ensure that all conservation activities are measured and verified to ensure the College receives and maintains specified energy reductions and savings.

Energy Conservation Action Plan

- Key facility energy audits and re/retro-commissioning studies
- Asset renewal plan and energy conservation project delivery
- Standard facility operations procedure review

Energy Information Management

- Maintenance of the online energy monitoring and reporting system (electricity, natural gas and fuels)
- Regular Energy Use Review presentations for the students, accountable staff and energy users
- Energy bill verification and rate optimization
- Reporting requirements for Regulation 507/18 (formerly 397/11)

- Consistent updates and review of key performance indicators (KPIs)/benchmarking
- Standardize and implement project measurement and verification

3.0 STRATEGY 1: Energy Management Corporate Practices

Cambrian College has implemented essential corporate practices, including key personnel deployment, to ensure a strong focus on energy management and savings. These efforts remain a key component of our renewed ECDM Plan.

The Energy Management Team: Roles and Responsibilities

Energy Leader: Director of Facilities Management

The Energy Leader is ultimately responsible for creating budgets, securing spending authority and resources for the program. This role is responsible for setting and/or legitimizing the program's high-level goals and objectives, keeping track of major project activities and approving resources and funding for the team and its approved projects.

The Energy Leader has direct knowledge of the College's major energy-using systems and is responsible for developing and maintaining the focus for the Energy Management Team. The Energy Leader coordinates meetings, sets agendas, and delegates and manages tasks related to the Energy Management Team. This role helps create the vision for the program and will help the program to maintain momentum, particularly when any barriers arise. The Energy Leader is also responsible for ensuring that the monitoring and tracking systems for energy are accurate, up-to-date and available for use by College staff.

College Energy Management Team

The College Energy Management Team functions on a strategic level to set expectations for each of the facilities, develop metrics for tracking overall energy improvement, and build accountability for energy management activities. In addition, this cross-functional team has direct responsibility for the consumption of energy within their respective departments. As a group, the team supports and monitors the energy management initiatives (processes, programs, and projects) at the various facilities and across the College.

Actions: Continue to seek cross-departmental membership and support for the Energy Management Team. Continue to discuss the Energy Management Program to ensure implementation of new savings ideas as well as maintain the positive momentum built over the past 5 years.

4.0 STRATEGY 2: Education, Awareness and Outreach

The College's Management Team recognizes the value of Education, Awareness and Outreach as key areas to create a culture of conversation. This will be achieved by raising awareness, understanding and general knowledge amongst staff regarding energy spending, usage and conservation. The College will use a combination of program engagement, direct awareness marketing and hands-on training to enhance our energy reduction efforts to support the achievement of our energy conservation goals and objectives. As well, energy will continue to be a regular agenda item at staff meetings to solicit new ideas for reduction of energy use, promote continued awareness of the cost of energy and ensure that energy conservation remains a key consideration for all College staff.

The Education, Awareness and Outreach program provides guidance, leadership and the framework to empower the College community and foster our culture of conservation. The program informs the organization of current energy use, operational practices as well as improvement opportunities, while ensuring that all staff has an opportunity to remain informed of the College's energy reduction efforts. This continued practice will foster the greatest possible impact of education and awareness.

The program is comprised of the following focus areas:

Energy Skills Training Program

The Energy Skills Training Program is a vehicle for staff to develop a general awareness and understanding of current energy use within the College as well as skills to identify opportunities for improvement. The Training Program combines both general knowledge training and hands-on experience to gain maximum benefit.

Staff Brainstorming Sessions are an important part of the Energy Skills Training Program and are encouraged during the Energy Management Team meetings to generate new ideas for energy conservation. As regular users and managers of College facilities, our staff are our most valuable resource to both generate and implement our energy conservation strategies.

Outreach, Engagement, Recognition and Energy Awareness Training Program

The College will continue to engage all users of College facilities and recognizes that this is essential to the continued success of the energy management program. Our energy program will continue to employ a comprehensive approach to both engaging staff and students and recognizing the efforts of staff who provide important support and ideas.

The Energy Awareness Training Program has been developed to provide consistent energy conservation messaging throughout all departments using Community-Based Social Marketing (CBSM) techniques to engage all users of College facilities.

Specific methods used to date include conservation tips, eye-catching posters and other relevant marketing tools.

Feedback System for Suggestions

Cambrian College will create a feedback system to encourage staff and other facility-users to provide input and ideas. The suggestions submitted are forwarded to the Energy Management Team to ensure a prompt response. The Energy Management Team members can engage relevant staff to ensure that all suggestions are captured and explored.

Actions: Review available energy training opportunities both generally (i.e. all staff) and for specific facilities. Establish and maintain at least annual Outreach and Engagement efforts to keep energy conservation 'top-of-mind' for staff and stakeholders.

5.0 STRATEGY 3: Energy Conservation Activities and Information Management

Energy Conservation Action Plan

The Energy Conservation Action Plan (Appendix A) forms the blueprint for implementing energy conservation and cost saving measures. The College has created a list of potential projects based on previous facility energy audits. The action plan has been created to guide this process based on a prioritized implementation schedule. All available incentives and funding sources will be explored to minimize the implementation cost of each measure. In addition to the measures shown, the College anticipates that further energy audits, completed over the next 5 years, will augment the list of available energy conservation measures.

Appendix A contains a year-by-year implementation strategy. In all, the measures will achieve:

- Insulation and roofing upgrades
- Lighting retrofits
- BAS retro-commissioning and upgrades
- HVAC and boiler retrofits
- Ground source heat pump
- Awareness, engagement and training

These projects will generate an estimated annual savings of 4 million ekWh.

Additional measures will be added as funding becomes available on an annual basis. In general terms, our actions are expected to yield the following results:

- Education, Awareness and Outreach: 1-2% annual energy savings
- On-going regular reviews of consumption and baselines: 0.5 to 1% annual energy savings
- Re/retro Commissioning: 2-7% annual energy savings within the facilities where it is implemented (estimated to be 1-2% overall potential total annual savings)

Actions: Maintain a schedule of energy audit and re/retro-commissioning study renewals to ensure that our list of measures is up-to-date and that previous measures are still functional and providing savings. Perform periodic reviews of available incentives and stay up-to-date on potential sources of funding to offset the implementation costs of the proposed future measures. Review the list of measures at least annually and update as necessary.

Energy Information Management

Online Energy Monitoring and Reporting System

Cambrian College has implemented a system for managing and reporting on its energy consumption (electricity, natural gas, fuels). The motivation for this effort is the notion that "you can't manage what you are not aware of". By making our energy usage visual, and keeping the information 'real-time', all personnel with

access to the information can benefit from understanding the nature of energy use in the College, as well as the impact their actions or inactions have on the College's overall energy cost and budgeting. This information is also key in evaluating the potential of new conservation projects as well as measuring the effectiveness of initiatives already taken.

Actions: Continue to gather and upload energy data into the Energy Information Management System regularly and analyze the data for patterns and savings opportunities.

Energy Management Presentations for Staff, Students and Energy Users

To gain traction for the initiatives within this Plan and ensure that the College reaches its stated reduction targets, it is imperative that information regarding energy usage and cost, as well as the College's energy conservation plans and projects, are well understood and top of mind of everyone from front-line staff to senior department heads. This broad awareness will lead to additional buy-in and support for the College's continued efforts to reduce its energy usage and spending.

Actions: Make energy a key topic at staff and senior management meetings as well as provide an update on energy use and conservation to senior management, at least annually.

Key Performance Indicators (KPI's) and Monitoring and Verification

To ensure momentum continues, and Cambrian College receives value-for-money with regards to its energy conservation efforts, a rigorous program of establishing KPI's and then monitoring and verifying ongoing savings is an essential element of this Plan. By establishing agreed upon KPI's and then performing regular and frequent monitoring, not only will College personnel be able to verify that savings expected from various projects is achieved, but that the savings continue for the duration of the project or retrofit's useful life. This practice will protect the College's investments as well as provide transparency and support for successful savings initiatives.

Actions: Review all conservation initiatives to understand the most appropriate monitoring and verification process. Review the project savings at pre-defined regular intervals and report outcomes to senior management.

Bill Verification and Rate Optimization

A consistent, periodic review of the College's energy invoices is important to ensure that rates and recorded consumption values on energy bills is accurate. This ensures that the invoices presented by utilities are correct and are providing appropriate and relevant data to the College's Energy Management Platforms.

Actions: Perform regular rationalization checks on invoices and conduct at least annual detailed billing reviews to ensure accuracy.

Ongoing Ontario Regulation 507/18 Reporting

In addition to completing this Plan, Cambrian College is required to submit annual energy consumption and greenhouse gas emissions templates to the appropriate Ministry of Energy portal. Gathering and recording monthly energy invoices are necessary to complete these reports.

Actions: Complete all required regulatory reporting by July 1 of each year.

APPENDIX A: Energy Conservation Action Plan Measures Summary

Cambrian College Future Energy Projects

Projects 2018 - 2020	Cost	Annual Estimated Savings (ekWh)
Insulation/Roofing upgrades (2018-2019)	\$ 651,734.00	281,300
Climate Control Upgrades	\$ 250,000.00	163,600
Condensing Boiler Section 6	\$ 190,000.00	528,200
Lighting retrofit Glencore Building	\$ 4,221.00	3,400
Recommission BAS	\$ 250,000.00	245,500
Department Energy Audit	\$ 4,000.00	500
HVAC Upgrades	\$ 887,335.00	116,200
Solar Wall	\$ 662,019.00	1,777,500
Student Staff Engagement	\$ 37,050.00	23,100
Total	\$ 2,936,359.00	3,139,300

Project 2020-2030	Cost	Annual Estimated Savings (ekWh)
Completion of LED retrofit	\$ 28,700.00	23,400
HVAC and control upgrades	\$ 850,000.00	111,302
Insulation upgrades	\$ 300,000.00	129,500
Solar Panels	\$ 200,000.00	500,000
Ground Source Heat Pump	\$ 1,100,000.00	*** to be estimated
Total	\$ 3,478,700.00	764,202

These projects were developed as part of the *Cambrian College Environmental Sustainability Plan, 2018 – 2050*. The items listed above are those with direct energy conservation impacts.