



ENERGY CONSERVATION AND DEMAND
MANAGEMENT PLAN
JULY 1, 2019

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Many inputs were utilized in the creation of the plan including current and past recommendations made from the Sustainability Committee, Energy Audits, Green House Gas reviews, and consultations with various departments within the college. The planning process involved the following steps:

1. **Defining the Preferred State:** Building on our current policies and strategic plans for the College, a Preferred State was developed that is in alignment with where we want to be with respect to energy conservation and to set the long-term direction for energy management at the College.
2. **Understanding the Present State:** Data was gathered and reviewed on recent and current projects along with a review of existing policies and procedures that impact energy management to understand where we are today.
3. **Strategic Planning:** Ensuring alignment between the ECDM Plan and the Strategic Plan of the College is critical. As a destination college, we need to ensure the College is looking at and implementing sustainable energy practices of a high standard facility and campus.

PREFERRED STATE

The College has a long term vision of being a destination college that is operationally sustainable. We will focus on the student experience, ensuring that every student has the opportunity to pursue multiple pathways while on a personal journey to their destination. We will offer a five star student support experience including the continuum of learning from pre-application to graduation, through a 24/7 operation, and a flexible delivery structure.

As a destination college, we will maximize the high value students, faculty and staff place on the College as a caring institution. This will be enhanced with updated facilities designed to serve students and the needs of employers.

To align the College's vision, the Plan has three high-level goals to guide future action:

1. Organizational Leadership & Awareness
2. Supporting Action
3. Performance & Innovation

Table 1 – Loyalist College's Preferred State of Energy Management, outlines the preferred state of energy.

**TABLE 1 – LOYALIST COLLEGE’S PREFERRED STATE OF ENERGY
MANAGEMENT**

ORGANIZATIONAL LEADERSHIP & AWARENESS
<ul style="list-style-type: none">• The College has a tradition of monitoring, managing and conserving energy. We continue to act as leaders in energy conservation within our sector and strive to build upon past efforts and continually adopt best practices.• Energy management is considered a priority for the College. Goals and actions to conserve and reduce energy are aligned with our Strategic Plan and the College dedicates resources to support and monitor the implementation of actions.• The College has a culture of energy awareness. Energy management is considered in institutional decision-making and students, staff and faculty recognize the importance of energy conservation and take action to reduce energy use.• Energy use and costs are visible to student, staff and faculty, fostering a better understanding of the College’s impact and empowering the college community to be part of the solution.
SUPPORTING ACTIONS
<ul style="list-style-type: none">• A committee is to be established to provide input and advice on this Plan and guide future actions. The committee shall consists of representatives from each of the college community.• Members of the Executive Team shall approve a policy that establishes guidelines for energy conservation and demonstrates a high level of support for energy conservation and reduction measures.• The College creates strong partnerships with its utilities and other external partners to take advantage of all available resources and funding opportunities to minimize the cost of energy projects.• All procurement decisions consider the lifecycle impact of products and services, including energy use to reduce the College’s energy footprint and extend the reach of our sustainability efforts across the supply chain.
PERFORMANCE & INNOVATION
<ul style="list-style-type: none">• Performance indicators are reviewed and refined over time to ensure they are aligned with strategic initiatives and support meaningful analysis and continuous improvement.• Energy project expenditures are planned for and funded separately from other operational activities.• Awareness and collaboration yields greater results. The College actively fosters and participates in opportunities for information sharing with internal and external stakeholders regarding energy conservation best practices.

PRESENT STATE

Energy Policies, Plans and Procedures

The College will undertake a review of the College’s existing energy policies, plans and procedures to ensure that it aligns with the Plan, the Strategic Plan and the Sustainability Policy and Procedures. The referenced plans, policies and procedures are summarized in Table 2 – References to Energy in Loyalist College Policies, Plans and Procedures.

**TABLE 2 – REFERENCES TO ENERGY IN LOYALIST COLLEGE
POLICIES, PLANS AND PROCEDURES**

STRATEGIC PLAN (2015-2020)
<p>Sustainability and Capacity-Building</p> <p>We are committed to the prudent and creative management of our human, economic and environmental resources ensuring that learners today and tomorrow receive the optimal benefit from all possible resources.</p> <p>As part of our strategic initiatives, we will continue to develop and apply responsible solutions with respect to all College programs, operations and facilities through the implementation of a comprehensive and integrated Sustainability Plan.</p>
SUSTAINABILITY POLICY ADMIN 118
<p>The following are excerpts from the College’s Sustainability Policy, ADMIN 118, which may be used as a point of reference for the Committee:</p> <p>Economic: Loyalist will:</p> <ul style="list-style-type: none"> • Establish mutually beneficial partnerships and implement joint strategies with government, business and communities to work collaboratively toward sustainability and supporting green and economic growth. <p>Environmental: Loyalist will:</p> <ul style="list-style-type: none"> • Identify opportunities, and where possible implement programs, to enhance sustainability of all College operations and facilities such as green standards for buildings, alternate energy sources, conservation and reduction, Energy Star certification for products, and energy-efficient and alternative transportation; • Establish sustainability indicators to enable accountability, to communicate specific goals, and to measure and report on progress. <p>Socio-Cultural: Loyalist will:</p> <ul style="list-style-type: none"> • Participate in sustainability networks and associations, sharing best practices, research, and models; • Incorporate exemplary practices of sustainability in corporate documents and reports such as mission statements, strategic plans, annual reports, and policies.

PROCUREMENT PROCEDURES FIN200

The College's Procurement Procedures FIN200 includes a process to include sustainable and environmental procurement. The College will strive to source, promote and support products and services that are environmentally sound and sustainable.

The following excerpts are related to Section 18 – Sustainable and Environmental Procurement, which we apply to our criteria of evaluation of procurement:

“18.1 Loyalist supports environmentally responsible products and services. Notwithstanding price, Loyalist may give preference to environmentally responsible products and services, when established in the evaluation criteria.

Examples of environmental consideration given to products and services may include:

- durability, reusability and amount of recycled content
- environmentally friendly production processes
- products that eliminate or reduce waste
- products that are independently recognized for meeting high environmental standards
- manufacturers and suppliers that have a registered environmental management system
- enhanced health and safety standards
- reduced disposal fees and/or life cycle costs

18.2 Loyalist is committed to considering life cycle costs in the evaluation of bids for goods and services. This type of evaluation takes into consideration the total cost of performing the intended function over the lifetime of the task or piece of equipment. Such considerations could include initial costs, frequency for repair, downtime costs, skilled labour requirements, material waste, cost of consumables (when applicable), maintenance & repair contracts, energy use, length of useful life and salvage value/disposal costs.”

Current Energy Consumption

As part of the Ministry of Energy's requirements, the College reports energy consumption for buildings and facilities that are owned or leased by the College and for which we are responsible for making payments for energy use. Facilities that fall under this category include the College's main campus, College-owned student residences, the Community Employment Services office as well as satellite campuses in Bancroft and Port Hope. These facilities represent 616,706 square feet of building space and are the focus of this Plan.

The student population of approximately 3,300 is served by over 400 employees and faculty and College-owned residences house 476 students. The campus sees some decline in activity levels in the summer months. In the past two years, the College has also dramatically increased hours of operation by >40%, which has increased energy consumption and demand. As an institution we need to find ways to absorb increased demand and create a net reduction in overall energy demand over the next 5 years.

As required by the Ministry of Energy, the College first began preparing and submitting reports detailing energy consumption and GHG emissions in 2013. The baseline report consisted of data

from 2011 derived from the College's utility bills. The most recent report, found in Appendix A, covers the reporting period of January to December 2017. Since 2011 the College has been reducing overall energy demand (electricity, natural gas and fuel oil) however, we have recently seen a one year increase due to changes in overall College operations (longer operating hours and increased student populations). The Plan intends to build upon earlier successes to stabilize and decrease energy demand and then start a reduction in demand. According to Ministry data, Loyalist College's energy performance is consistent with that of other colleges.

Past and Ongoing Energy Reduction Initiatives

The College has been making significant improvements to its energy infrastructure in the past five years. Many of which are ongoing activities. Any renovations to the facility ensure as many energy efficiency initiatives as possible are included. They include:

- Replacement of windows and improve glazing performance
- Addition of insulation into exterior walls
- Upgrading to LED lighting fixtures
- Installing occupancy sensors to control lighting
- Installing carbon dioxide sensors in classrooms and offices
- Addition of variable frequency drives to heating water pumps and fans
- Installing control valves for better control of heating and cooling systems
- Replacement of existing motors with premium efficiency motors
- Leveraging power of sun and then blinds in cooling season

Other projects include:

1. In the past couple of years about two-thirds of the third floor of the Kente building has gone through a retrofit. Any new roof top unit was appropriately sized with Variable Frequency Drives (VFD) upon replacement.
2. Installed solar power array on the Skills Center. Energy generated from these panels is used to help power the Loyalist Skills Center at the Belleville campus. Solar panels are generating about 26 000 kWh per year that is directly consumed.
3. Major over haul of the Building Automation Systems (BAS) to ensure it is properly functioning and can be tuned for optimal building performance.
4. A pump audit will be conducted by a third party contacted by the College to assess the efficiency of the existing pumps on site. The Plan will be updated as appropriate based on results from this or any other audit.
5. Smaller projects will be undertaken to address specific areas of building where the HVAC is not up to par, allowing a balanced approach to HVAC workload.
6. EcoRep program was launched within our sustainability area. The program initiated energy campaigns at Residence on minimizing both water and energy, several contests were held to engage as many students as possible.

7. The College is currently working on a study for a replacement residence complex and new Athletics facility. As the designs move forward, there will be focused on minimizing any energy consumption. In the case of the residence we would expect to see a significant drop in energy usage as the current facilities are not energy efficient.
8. New Roofing has been completed over much of the Hasting, Northumberland and Lennox wings. Designs include additional insulation and reflective surfaces to minimize the impact of midday sun.
9. Soft Joint Sealant program has been implemented to help seal the building shell from heating and cooling loss thereby improving efficiency of existing HVAC plant.
10. A number of indirect programs have also been related to manage overall community energy consumption. These include:
 - Centralized waste collection and enhanced recycling programs;
 - Car pooling programs that incentivize students to utilize the spaces;
 - Improvements with local transit to move folks from their cars.
11. A study was completed in 2017 on Green House Gas reduction strategies and an updated energy audit is planned for 2019. The Plan will be updated as appropriate based on results from this or any other audit.
 - From 2011 through 2017, the College has seen a reduction of close to 29% in energy.

ACTION PLAN/MEASURES

This Plan outlines action items that align with the Preferred State goals based on preliminary data and anecdotal evidence. However, a more robust analysis is needed to:

- Develop measurable targets (e.g. energy intensity reduction targets, awareness levels, etc.)
- Assess cost savings opportunities
- Determine priority levels and timelines for action

Therefore, it is recommended that a formal energy management function be established that is responsible for conducting a benchmarking exercise and lifecycle cost analysis and using its results to develop SMART goals by the end of Q2 2020. Furthermore, additional action items will be developed and existing ones updated as appropriate based on results of the planned energy audit.

Provided below is a list of recommended measures to facilitate a transition from Loyalist College's present state of energy management to its preferred state.

TABLE 3 – MANAGEMENT AND ORGANIZATIONAL ACTION ITEMS

MANAGEMENT AND ORGANIZATIONAL MEASURES
<ol style="list-style-type: none"> 1. Create an energy management function within the Infrastructure department whose mandate is to: <ol style="list-style-type: none"> a. Conduct benchmarking exercises and lifecycle cost analysis b. Develop SMART goals c. Monitor ECDM Plan implementation d. Develop energy-related policies, guidelines and strategies e. Identify energy saving opportunities 2. Create a policy that addresses the use of energy at all Loyalist College locations. This will include everything from building/renovation standards to use of personal appliances vs. departmental kitchens. 3. Develop resources on lifecycle cost analysis for all ECDM initiatives and the College's energy projects. 4. Continually review innovative funding opportunities for energy projects and develop a funding strategy. 5. Improve channels that deliver real-time energy use from existing monitoring systems. For example, expand information presented from solar panel energy generation. 6. Develop a support network to increase knowledge and awareness about energy management best practices.

TABLE 4 – BEHAVIOURAL ACTION ITEMS

BEHAVIOURAL
<ol style="list-style-type: none"> 1. Integrate ECDM principles into our sustainability programs with our Eco Reps. Utilize common channel to educate students and staff on why energy conservation is important, encourage good practices, and to solicit energy saving ideas. 2. Enhance Sustainability channels to support communications on energy success stories. 3. Create learning opportunities with students and staff on how we heat and cool the building, the challenges faced and build opportunities for community engagement in solutions.

TABLE 5 –TECHNICAL ACTION ITEMS

TECHNICAL ACTION ITEMS
<p>Loyalist College has already implemented energy conservation strategies throughout campus. The campus rolled out several programs and sustainability projects to reduce the environmental footprint of its facilities between 2011 and present day. The size and scope of each future renovation project will depend on the timing and availability of funding. The following are areas of technical focus for reductions in our Conservation and Demand Management Plans.</p>
<p>Building Envelope Improvements</p> <p>Parts of the Kente building retain its original exterior wall construction from the 1960s. The existing wall assembly consists of 1” glass fibre board insulation on the back of precast panels. Framing the exterior wall with metal studs, adding insulation, vapour barrier and gypsum board to exposed walls will provide the desired insulating effects. These additional layers assist in keeping the heat in the building during the heating season and stabilizing indoor temperatures during the cooling season. Additional work on replacing all soft joint sealant around the main building to keep the shell air tight. This should result in a reduction of loads throughout the year.</p> <p>Similarly, improving the window performance will help reduce loads. The glazing being installed is double glazed, argon filled and has a low e coating. The layers of the glazing provide insulation to the glass, while the low e coating minimizes the amount of infrared light that can pass through the glass. The improved insulating properties will reduce the amount of heat leaving the space on days when it’s colder outdoors. While the approved ability to block out solar heat will reduce the amount of cooling required in an exterior space on hot, sunny days. Glazing with similar features should be used in future renovations.</p> <p>The Pioneer building also has limited insulation within the existing exterior wall construction. Adding cladding to the exterior of the building increases the insulation properties of the wall. Projects to upgrade the building envelope require significant funding and construction.</p>
<p>Lighting Upgrades</p> <p>Upgrading existing incandescent lights to LED lighting fixtures with improved control of the lighting systems will assist in reducing the energy load of the Kente and Pioneer buildings. Using the LEDs will reduce the wattage used by each fixture without compromising the lighting levels in spaces. Installing sensors to turn off lighting when spaces are unoccupied will further reduce energy demand. The college’s current lighting control strategy consists of manual controls and lighting schedules. A similar strategy can be employed in the classroom and office spaces within the Pioneer building to reduce electricity consumption when the rooms are unoccupied.</p>

Improving Building Automation and Controls

Updating the building's automation system (BAS) and controls by installing new sensors, valves and variable frequency drives (VFDs) in the heating, ventilation and air conditioning system will assist in lowering GHG emissions by reducing loads and improving the efficiency of the overall system. Carbon dioxide sensors in spaces will inform the BAS of the number of occupants in spaces. The amount of fresh air brought into the building can then be accurately monitored and controlled to prevent the over or under ventilation of spaces. This strategy will also require the installation of variable frequency drives on equipment, such as fans and pumps. VFDs allow for better control over the supply of heating, cooling and ventilation into the space. More accurate adjustments can be made to the system when conditions change within the spaces. The installation of control valves on heating and cooling coils assist in controlling the pumps that serve the system. The pumps will run at a reduced capacity when lower loads are demanded.

Improving Motor Efficiency

Motors in the existing fans and pumps will also be upgraded to premium efficiency motors. Modern motors can have efficiencies greater than 90% and National Electrical Manufacturers Association premium efficiency motors are now standard in new equipment. These upgrades focus on improving the performance of the equipment that is essential to the building systems. These electrical loads cannot be eliminated but their impact can be minimized.

Boiler Upgrade

Upgrading the existing boiler plant within the Kente building can also further reduce the amount of GHG emissions. Installing high efficiency, condensing water boilers and lowering the heating water temperature in the building can provide energy savings. The main heating water boiler plant in the Kente building consists of two natural gas fired boilers. The boiler efficiency of the existing equipment is between 80-84%. New condensing boilers available in today's market can have efficiencies as high as 98%. Non-condensing boilers can have efficiencies up to 89%. The higher efficiency boilers can provide the same amount of heating while using less gas. Upgrading to a condensing water boiler will require the lowering of the heating water temperature within the building. Verification of the existing equipment's performance at lower heating water temperatures will be required during the boiler selection process and additional costs may be incurred to upgrade equipment to operate at the lower temperatures. Condensing boilers can still provide heating water at higher temperatures but the benefits of the higher than 90% efficiency are only seen at return water temperatures lower than 130°F.

Installing Solar Photovoltaic Panels

Solar photovoltaic panels convert energy from the sun into electricity that can be used throughout campus. Solar power is a renewable resource which will allow for significant energy reductions. The Kente building has a lot of available space on the roof. Most of the air handling equipment is in mechanical spaces throughout the building. The unclaimed space can be utilized for solar PV panels to produce electricity for the building. The amount of solar PV panels will be dependent on the amount of square footage the College is willing to commit for this project. An energy estimate of 1100kWh/kW DC of install modules can be assumed. The total roof area of the Kente building is approximately 196,000sqft. By

installing about 2200kW of modules on the roof, the panels could provide 2,420,000kWh of electricity per year.

Installing a Solar Wall and Duct System

A solar wall system is suggested for the Pioneer building. The Pioneer building is served by rooftop units. Minimum construction is required to connect the solar wall system to the roof top units. A Solar Wall system consists of perforated metal panels installed on the exterior wall of the building. This creates an air cavity between the wall and the panel. Fresh air is drawn through the panels and ducted to the air handling units serving the building. The air moving through the cavity is heated using solar radiation from the sun as it hits the metal panels. Similarly, a solar duct system also uses solar radiation from the sun to preheat air before it is delivered to the air handling unit. For a solar duct system, the panels are mounted on insulated ductwork located on the roof of the building. These systems reduce the amount of heating provided by the gas fired heater or heating coil within the air handling unit. Solar walls can also add some insulation to the exterior wall surface when the system is running. The heat escaping the building is recaptured by the air in the cavity, helping in preheating the fresh air. This strategy uses the renewable resource of the sun to provide heating for the building.

**Appendix A: 2012 Energy Consumption & Greenhouse
Gas Emissions Reporting**

OPERATION NAME	OPERATION TYPE	ADDRESS	CITY & POSTAL CODE	TOTAL FLOOR AREA (ft ²)	AVG HRS/WEEK	ENERGY TYPE & AMOUNT PURCHASED & CONSUMED			TOTAL	
						ELECTRICITY (kwh)	NATURAL GAS (m ³)	FUEL OIL 1 & 2 (L)	GHG EMISSIONS (Kg)	ENERGY INTENSITY (ekWh/ft ²)
Kente Building	Administrative Offices and related facilities	376 Wallbridge-Loyalist Rd.	Belleville K8N 5B9	194,163	45	1,683,069	151,507	-	315,557	16.7
Kente Building	Classrooms and related facilities	376 Wallbridge-Loyalist Rd.	Belleville K8N 5B9	55,327	90	479,589	43,172	-	89,918	16.7
Kente Building	Laboratories	376 Wallbridge-Loyalist Rd.	Belleville K8N 5B9	243,834	90	2,113,632	190,265	-	396,282	16.7
Kente Building	Student recreational facilities and athletic	376 Wallbridge-Loyalist Rd.	Belleville K8N 5B9	28,126	40	243,804	21,947	-	45,711	16.7
Kente Building	Library	376 Wallbridge-Loyalist Rd.	Belleville K8N 5B9	18,308	30	158,704	14,286	-	29,755	16.7
Pioneer Building	Administrative Offices and related facilities	284 Wallbridge-Loyalist Rd.	Belleville K8N 5E2	22,284	45	191,192	10,152	-	22,500	13.3
Pioneer Building	Classrooms and related facilities	284 Wallbridge-Loyalist Rd.	Belleville K8N 5E2	21,809	90	187,119	9,935	-	22,021	13.3
Pioneer Building	Laboratories	284 Wallbridge-Loyalist Rd.	Belleville K8N 5E2	12,482	90	107,093	5,686	-	12,603	13.3
Residence Complex	Student residences	284 Wallbridge-Loyalist Rd.	Belleville K8N 5E2	157,450	168	956,320	200,361	-	395,350	19.2
Employment Ontario	Administrative Offices and related facilities	54 Dundas St. E.	Belleville K8N 1B8	3,976	45	56,672	3,481	-	7,562	23.3
Satellite Campus - Bancroft	Administrative Offices and related facilities	P.O. Box 10	Bancroft KOL 1C0	4,172	45	39,305	-	7,680	21,687	29.2
Satellite Campus - Bancroft	Classrooms and related facilities	P.O. Box 10	Bancroft KOL 1C0	2,329	57	21,922	-	4,284	12,096	29.2
Satellite Campus - Bancroft	Laboratories	P.O. Box 10	Bancroft KOL 1C0	2,118	57	19,937	-	3,896	11,000	29.2

Appendix B: Energy Consumption Year-Over-Year Comparison

OPERATION NAME	OPERATION TYPE	ELECTRICITY (kwh)			NATURAL GAS (m3)			FUEL OIL 1 & 2 (L)		
		2011	2017	% +/-	2011	2017	% +/-	2011	2017	% +/-
Kente Building	Administrative Offices and related facilities	2,031,372	1,683,069	-17.1%	174,107	151,507	-13.0%	-	-	-
Kente Building	Classrooms and related facilities	1,450,980	479,589	-66.9%	124,362	43,172	-65.3%	-	-	-
Kente Building	Laboratories	1,625,098	2,113,632	30.1%	139,285	190,265	36.6%	-	-	-
Kente Building	Student recreational facilities and athletic	580,392	243,804	-58.0%	49,745	21,947	-55.9%	-	-	-
Kente Building	Library	116,078	158,704	36.7%	9,949	14,286	43.6%	-	-	-
Pioneer Building	Administrative Offices and related facilities	224,363	191,192	-14.8%	5,849	10,152	73.6%	-	-	-
Pioneer Building	Classrooms and related facilities	261,757	187,119	-28.5%	6,824	9,935	45.6%	-	-	-
Pioneer Building	Laboratories	137,111	107,093	-21.9%	3,574	5,686	59.1%	-	-	-
Residence Complex	Student residences	2,193,600	956,320	-56.4%	244,778	200,361	-18.1%	-	-	-
Employment Ontario	Administrative Offices and related facilities	63,651	56,672	-11.0%	3,808	3,481	-8.6%	-	-	-
Satellite Campus - Bancroft	Administrative Offices and related facilities	49,436	39,305	-20.5%	-	-	-	4,426	7,680	73.5%
Satellite Campus - Bancroft	Classrooms and related facilities	82,394	21,922	-73.4%	-	-	-	7,377	4,284	-41.9%
Satellite Campus - Bancroft	Laboratories	26,958	19,937	-26.0%	-	-	-	2,951	3,896	32.0%
Total		8,843,190	6,258,357	-29.2%	762,281	650,792	-14.6%	14,754	15,860	7.5%