

2019

Conservation and Demand Management Plan



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1 Executive Summary

1.1 Obligations for Ministry Reporting

Algonquin has met its annual July 1 obligations to the Provincial Government by reporting energy consumption and greenhouse gas (GHG) emissions and in developing, implementing and submitting an energy Conservation and Demand Management (CDM) plan to be posted on its web site.

1.2 Approvals

Algonquin's Board of Governors and Senior staff has approved the Energy and Emissions Strategy, a strategy aligned with the College 50+5 : Algonquin College Plan 2017-2020 providing True North Goals on energy and emission.

1.3 Energy and Emissions Strategy

The Energy and Emissions Strategy, along with Water Strategy and Transportation Strategy, is the third strategy developed by the Algonquin College to support its journey towards sustainability.

At Algonquin, energy is fundamental to its daily operation and to the mission of the College to transform hopes and dreams into lifelong success. Energy is inextricably connected to our quality of life and learning.

Algonquin College's first Energy and Emissions Strategy will be its compass to establish a direction that will help the College align its goals with the province, achieve carbon neutrality, and serve as a catalyst for global citizenship.

Algonquin's Energy and Emissions Strategy has been developed within a quickly evolving landscape. The Strategy responds to, and aligns with, the College's core strategic documents as well as Federal and Provincial Policy.

Globally, two long-term energy transitions are unfolding: decarbonization, the shift from fossil fuels to renewable and clean energy; and the electrification of the energy sector.

The Algonquin College Strategic Plan 2017- 2022, 50+5, reinforces the College's commitment to "reducing its environmental impact with the ultimate goal of becoming carbon neutral and serving as a leader in the education, research and exchange of environmentally sustainable practices." The Energy and Emissions Strategy provides a framework to work towards these goals, by identifying ways in which the College can better manage, and reduce, the energy it uses; thereby reducing greenhouse. In addition to the proposed Algonquin College Energy and Emission targets listed in table 1, the 2017-2022 College Strategic Plan identified a True North metric of net zero carbon college, i.e. 100% emission reduction.

Table 1 – Proposed Energy and Emission Targets

INDICATOR	BASELINE (2005 ¹)	2018 ²	2030	2050
Total Energy Use³ - ekWh	49,319,255	71,637,817	68,000,000	68,000,000
Energy Intensity⁴ - ekWh/m² (ekWh/gsf)	326 (30.3)	380 (35.4)	329 (30.5)	329 (30.5)
Emissions Reduction⁵ - TCO_{2e}	9,928 TCO _{2e}	11,875 TCO _{2e}	37%	80%

¹Algonquin's baseline year is 2005, rather than 1990. Comprehensive electrical and gas consumption data is not available prior to this date.

²Estimated peak year based on cogen 1 and 2 being fully operational - for reference.

³Based on energy purchased, such as natural gas and electricity. For example, solar panels generate electricity, reducing the energy purchased from the grid.

⁴Energy intensity is a measure of the energy efficiency of an organization. It is calculated as units of energy per unit of floor area, or students. Declining energy intensity is a proxy for optimization and modernization improvements. Algonquin's target is College-wide, new buildings will aim for much lower EUI targets, to be established as part of the action plan.

⁵Scope 1 and 2 emissions only

1.4 Past Successes

Algonquin has actively pursued energy conservation since early 1990 and those efforts are distilled into the energy use profiles now existing and presented herein. More recently, the College has embedded sustainability in its strategic plan and demonstrated leadership by pursuing many green initiatives to achieve its sustainability goals, including:

- First Canadian College to sign the Talloires Declaration on 23 November 2007.
- Signatory of the Association of Canadian Community College's Pan-Canadian Protocol for Sustainability on Earth Day 2009.
- All future facilities will be built to LEED standards and of Algonquin's latest three new construction projects one is LEED Platinum and two are LEED Gold.

ESCO1; Algonquin College had previously initiated a 10-year Energy Performance Contract (EPC) between June 2006 and January 2008 at the Woodroffe Campus. The project invested \$6,000,000 of capital to pay for retrofits and upgrades for energy savings and the project payout was achieved in 2018.

ESCO2: The College entered into a long-term (20 years) partnership with SIEMENS Canada to deliver a comprehensive Energy Performance Contract (ESCO) financed through energy savings. An investment of more than \$55M to pay for retrofits, upgrades and innovation. The project payout is expected in 2036. Included in Appendix 2, the ESCO 2 Quarterly Savings and Project Summary – Jan March 2019.

1.5 Present and Anticipated Projects and Initiatives

1.5.1 Recommended Priority Projects and Initiatives

The following table lists the recommended short-term projects to be considered within the next five years subject to prioritization and funding.

Table 2 – Proposed Energy and Emission Targets

GUIDING PRINCIPLE	RECOMMENDED PRIORITY PROJECT
A. Build and Maintain Energy Awareness Create a culture of energy awareness by engaging the College Community and inspiring action and teamwork.	Establish an integrated, Energy Education and Engagement plan that: <ul style="list-style-type: none"> ▪ Fosters energy conservation behavior among students, faculty and staff; ▪ Provides opportunities for students to actively engage with energy management, discussion and debate; ▪ Creates and promotes an online hub for energy awareness at Algonquin College; ▪ Utilizes existing channels and annual events, such as orientation, to raise awareness; ▪ Identifies funding opportunities that support the development and delivery of engagement activities;
B. Practice Energy Stewardship Motivate the college community, stakeholders and strategic partners to use energy sustainably.	Develop and implement a monitoring process to ensure comprehensive and reliable energy data for the purpose of tracking and reporting at the college, campus, and building scales.
	Complete a GHG Inventory related to Scope 1, 2 and 3 emissions.
	Complete an Environmental Sustainability Plan, which provides strategies towards meeting the energy and emission targets at all College campuses.
	Optimize the performance of College energy systems by: <ul style="list-style-type: none"> ▪ Hiring an Energy Manager to respond to changes in facilities and advances in technology; ▪ Implementing a continuous commissioning program; ▪ Providing relevant, ongoing training for building operators;
C. Future-proof our Infrastructure Create resilient building and energy infrastructure that will support a transition to a clean energy future and accommodate growth of the College.	Collaborate with large College energy users to develop energy conservation measures, targets and specific Energy Action Plans
	Develop procurement guidelines to inform purchasing decisions for all energy using purchases, including vehicles, equipment, paper, transportation, etc.
	Develop a strategy to become energy resilient, and address: <ul style="list-style-type: none"> ▪ An emergency management policy for the Ottawa Campus that maintains at least 50% of the College's critical operating functions during a power outage; ▪ Access to at least two different electrical feeds for each building; ▪ Replacing the existing 44kV primary electrical feed to meet Hydro Ottawa 13.8kV standards.
	Assess the impact that cogeneration will have on projects pursuing LEED for New Construction, version 4.
D. Leverage Innovations in Energy Provide leadership by embracing innovative energy technologies and partners to support and stimulate the clean energy economy	Develop Green Building guidelines that establish energy performance requirements for new construction, major renovation, existing building projects, and where relevant officially affirms the college's commitment to LEED.
	Expand collaboration between academic program teams and Physical Resources to: <ul style="list-style-type: none"> ▪ Connect energy projects and initiatives with academic programming, experiential learning opportunities, and applied research; ▪ Maximize living lab opportunities using innovative on-campus technology and buildings; ▪ Disseminate knowledge and resources related to advancements in clean energy; Work with industry to: <ul style="list-style-type: none"> ▪ Develop a Centre for Applied Energy Innovation; ▪ Monitor, identify and participate in relevant incentive programs related to clean energy; ▪ Develop a transition plan for Cogeneration, with a view to accelerating a shift away from natural gas to a renewable fuel source; ▪ Introduce new programming related to emerging career opportunities in clean energy and energy demand management;

1.5.2 Five-Year Outlook for Energy Usage

- Finalize the implementation and commissioning of ESCO2, reducing our electrical consumption by 61% from the hydro electrical grid;
- Finalize the implementation and commissioning of a 500 kW solar array;
- Finalize the implementation and commissioning of a 500 kW Battery Energy Storage System;
- Finalize the implementation and commissioning of a microgrid software.
- Built a new 125,000 sq. ft. recreational facility designed to a minimum LEED Gold accreditation;

2 Facility and Utility Delivery Description

2.1 Facilities and Location Detail

Algonquin's three owned and active Ontario locations are at Ottawa, Perth and Pembroke. Additionally there are numerous rented facilities as well as international campus locations (not Algonquin owned).

Location	Address
THE Algonquin College of Applied Arts and Technology Woodroffe Campus	1385 Woodroffe Avenue, Ottawa ON K2G 1V8.
Algonquin College Heritage Institute – Perth Campus	7 Craig Street, Perth, ON K7H 1X7
Algonquin College in the Ottawa Valley – Pembroke Campus	1 College Way, Pembroke, ON K8A 0C8

2.2 Utility Delivery.

2.2.1 District Energy

The ESCO2 project led to the creation of district energy systems that leveraged large centralized plants to distribute heating and cooling to many buildings across the Woodroffe Campus excluding ACCE building. A combined heat and power (CHP) plant has been installed that generates electricity by burning gas in two, two-megawatt cogeneration engines, which utilize the waste heat within a thermal network to heat and cool its buildings.

2.2.2 Electricity

Hydro Ottawa provides Woodroffe campus electricity via two main electrical feeds. One powers the campus located on the east side of Woodroffe Avenue at 44 kV. The other powers the new ACCE building located on the west side of the Woodroffe Avenue at 13.5 kV.

The Perth campus is served by Hydro One and the Pembroke campus by Ottawa River Power.

A solar array of 500 kW was installed in 2019 on two buildings at the Woodroffe Campus. The systems should be in operation by the end of October 2019.

A 500 kW Battery Energy Storage System (BESS) was installed in 2019 at the Woodroffe Campus main plant. The systems should be in operation by the end of October 2019.

2.2.3 Natural Gas

For the Woodroffe Campus, natural gas is partially procured through bulk purchase agreements with suppliers by locking up to 80% of the natural gas requirements through long-term contracts while the balance is purchased on the spot market. Perth and Pembroke are not part of the consortium and burned at market price. *Enbridge Distribution Inc.* owns and maintains the underground distribution lines.

2.2.4 Domestic Water

Water is not reportable under the guidelines and therefore is not part of this analysis.

2.3 Existing Energy Metering and Monitoring Systems

Each main campus utility meter belongs to Local Distribution Company (LDC) and records the electrical power demand at 5-minute intervals. For the Woodroffe Campus, ACCE Building is separately metered by *Hydro-Ottawa*. Data access for both accounts is through the LDC.

All of the campuses are monitored and control by a building automation system from SIEMENS. The Woodroffe Campus has submetering capability for most of its building providing the ability to measure electricity as well as energy.

All of the campuses are monitored and control by a building automation system manufactured by SIEMENS. The sub-meters are connected to the building automation system.

A microgrid software will be implemented to control the operation of the College energy source generation for optimum uses and efficiency.

2.4 Key Challenges and Constraints

Industry accepted maintenance practices suggest a funding scenario of 2% of the asset replacement value per year to ensure that facilities are properly maintained and functional. The total assessed value of all owned Algonquin College assets is roughly \$690M and therefore \$14M would be required annually to keep up with the ongoing operation and maintenance. College allocations are typically \$2M per year resulting in a documented growing deferred maintenance backlog currently estimated at \$87M, including the \$23M reduced backlog maintenance achieved through ESCO 2 and by the complete renovation the Library Tower part of building C named the DARE District

Aging buildings with an extensive deferred maintenance backlog can have poor energy efficiency performance. The College's first building dates back to 1962 while 33% of its buildings are pre-70s construction and another 38% are pre-90s construction.

3 Conservation and Demand Management Plan

3.1 Annual Energy Consumption for the Last Year Where Information is Available for a Full Year

Table 2 – Electricity and Gas Consumption and Cost Summary

	Electricity	Gas
Energy Consumption 2017	kWh	Cubic Meters
Woodroffe Campus	19,912,512	3,111,815
Perth Campus	1,590,194	135,822
Pembroke Campus	527,688	60,267
Totals	22,030,394	3,307,904

3.2 Energy and Emissions Strategy

See Appendix 1

4 Appendix 1 – Energy and Emissions Strategy

5 Appendix 2 – ESCO2 Quarterly Savings and Project Summary – January to March 2019