LAURIER

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Energy Conservation & Demand Management

Executive Summary

This Energy Conservation and Demand Management (ECDM) Plan is written in accordance with sections 4, 5, and 6 of the recently amended Electricity Act, 1998, O. Reg. 507/18. As concerns surrounding energy availability and cost continue to rise, an ECDM Plan is an effective way to strengthen Wilfrid Laurier University's energy management initiatives.

Our Goals and Objectives

As a leading post-secondary educational institution and a responsible corporate citizen, Wilfrid Laurier University ("Laurier") is committed to practicing environmental sustainability through education and corporate practices, and balancing future growth with the protection of the environment. Implementing a strategic ECDM Plan addresses the interconnected issues of indoor environmental quality, energy use and facility operations. Our goal is to continuously monitor our current practices so that a) maximum operating efficiency can be reached and b) resources can be allocated more appropriately to serve our community.

In conjunction with the Energy Working Group and Sustainability Office, Laurier will continue to evolve its strategy to:

- Review our practices to explore opportunities for improved results
- Enhance energy conservation education and awareness for students and staff
- Integrate Laurier's ECDM Plan and data into classroom and experiential learning opportunities for students
- Continue to monitor and optimize energy consumption for all facilities

Using this report, we will further outline energy efficiency and greenhouse gas (GHG) reduction goals, objectives and targets geared toward cementing our status as environmental leaders.

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1. Introduction

The purpose of Laurier's ECDM Plan is to promote sustainable stewardship of our environment and community resources. In keeping with our core values of system efficiency and financial responsibility, Laurier's energy management program would aim to increase energy conservation as outlined in clauses 4, 5, and 6 of the recently amended Electricity Act, 1998, O. Reg. 507/18. The results and the progress of the previous ECDM plan, and the projected impact of the new ECDM Plan is presented in the chart and table below.

Table 1. *Historic Energy Consumption for WLU*

Campus-wide Energy Use	2013	2014	2015	2016	2017	2018
Electricity Consumption (ekWh)	31,405,991	35,152,172	37,247,219	38,003,170	34,906,434	34,690,799
Natural Gas Consumption (ekWh)	42,072,427	49,241,788	46,304,769	42,695,612	46,907,448	49,756,108
Fuel Oil 1-4 Consumption (ekWh)	55,477	43,264	20,680	8,233	22,731	29,110
Total Energy Consumption (ekWh)	73,533,895	84,437,224	83,572,668	80,707,014	81,836,614	84,476,017
Total Energy Saved (ekWh)	-	-10,903,328	864,556	2,865,653	-1,129,599	-2,639,403
Campus Size (sq. ft.)	2,603,768	2,603,768	3,072,622	3,339,612	3,570,232	3,577,336

The table above demonstrates an increase in total energy use (negative savings) for 2014, 2017 and 2018. This increase is attributed to the growth of our campuses (Waterloo, Kitchener, and Brantford). Our Energy Use Intensity or EUI (ekWh/sq. ft.) declined in 2018 from the EUI in 2013, in spite of the increase in actual energy consumption. This is demonstrated in the chart below.

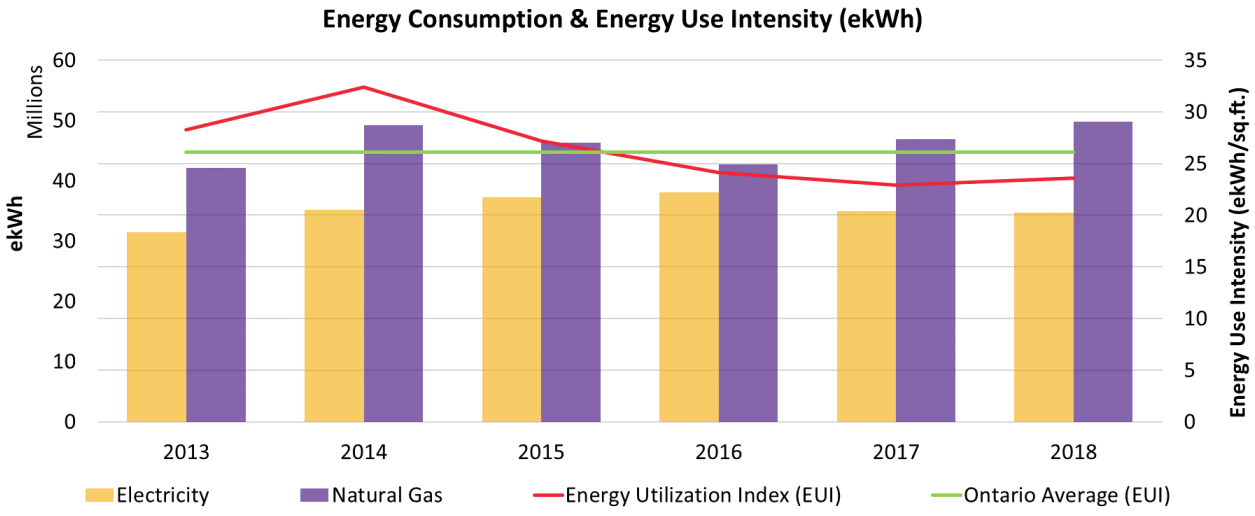

Figure 1. *Historic Energy Use and Energy Use Intensity for WLU*

Laurier recognizes that intellectual inquiry, critical reflection and scholarly integrity are the cornerstones of all universities including our institution.

Values

Our unique values are drawn from the key elements on which Laurier was founded and which will continue to nurture and shape what we become. We value:

- Our intimate community environment.
- Our academic and institutional tradition.
- New and integrated communities of learning and application.
- Diversity and a culture of inclusivity.
- Developing the whole person: mind, spirit and body.
- Community focus and global engagement.
- A life of purpose and citizenship.
- Learning through experience.

Vision

Our vision provides a lens that we use to look at the world to understand what we do and what we aspire to be:

Our commitment is to justice and sustainability now and in the future, so we strive to ignite the minds, spirits and hearts of our communities through excellence in teaching and learning, in the discovery, scholarly exploration, and application of new ideas, and in instilling the courage to engage and challenge the world in all its complexity.

Mission

Our mission describes our core purpose and commitment to stakeholders:

Laurier is devoted to excellence in learning, research, scholarship and creativity. It challenges people to become engaged and aware citizens of an increasingly complex world. It fulfils its mission by advancing knowledge, supporting and enhancing high-quality undergraduate, graduate and professional education, and emphasizing co-curricular development of the whole student.

Guiding Principles

Our guiding principles are consistent with our vision and mission and will inform decision making as we embrace our future:

- Responsible governance
- Community citizenship
- Realizing an appropriate balance among research, teaching and service
- Recognizing the linkage between research and teaching
- Integrity and strong leadership
- Making strategic choices for the long-term health of the institution
- Learning and advancing knowledge across boundaries
- Collaboration and collegiality
- Respectful relationships
- Openness to change
- Sustainability and environmental responsibility

2. Regulatory Update

O. Reg. 397/11: Conservation and Demand Management Plans was introduced in 2013. Under this regulation, public agencies were required to report on energy consumption and greenhouse gas (GHG) emissions and to develop Conservation and Demand Management (CDM) the following year. Until recently, O. Reg. 397/11 was housed under the Green Energy Act, 2009 (GEA).

On December 7, 2018, the Ontario government passed Bill 34, Green Energy Repeal Act, 2018. The Bill repealed the GEA and all its underlying Regulations, including O. Reg. 397/11. However, it re-enacted various provisions of the GEA under the Electricity Act, 1998.

The conservation and energy efficiency initiatives, namely CDM plans and broader public sector energy reporting, were re-introduced as amendments to the Electricity Act. The new regulation is now called **O. Reg. 507/18: Broader Public Sector: Energy Conservation and Demand Management Plans (ECDM).**

As of January 1, 2019, O. Reg. 397/11 was replaced by O. Reg. 507/18, and BPS reporting and ECDM plans are under the Electricity Act, 1998 rather than the Green Energy Act, 2009.

3. About Wilfrid Laurier University

Laurier traces its roots to the opening of the Evangelical Lutheran Seminary in Waterloo more than 100 years ago in 1911. We have gone through several changes since then, and in 1973 our name changed from Waterloo Lutheran University to Wilfrid Laurier University. In 1999, we opened our campus in Brantford. In 2018, the Ontario government announced final approval for Laurier to establish a campus in Milton in partnership with Conestoga College.

3.1. Campus-Wide Historical Energy Intensity

Energy Utilization Index is a measure of how much energy a facility uses per square foot. Breaking down a facility's energy consumption on a per-square-foot-basis allows facilities of different sizes to be compared with ease. In this case, we are comparing our facility to the industry average for Ontario's educational facilities, derived from Natural Resources Canada's Commercial and Institutional Consumption of Energy Survey (2014) – which was found to be **27.63 ekWh/Sq. Ft.**

Table 2. *Historic Energy Use Intensity for WLU*

Annual Consumption (EUI)						
Campus	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
Kitchener - Waterloo	30	35	27	26	25	25
Brantford	18	20	27	18	16	19

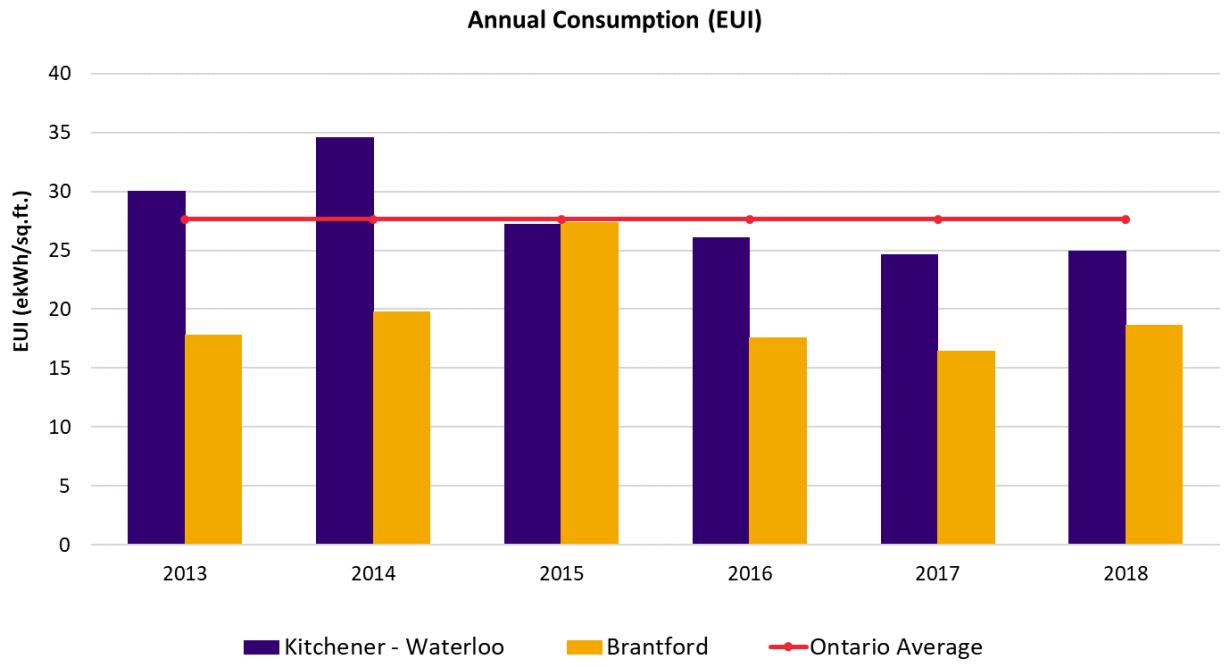

Figure 2*. WLU's Energy Use Intensity and the Industry Average*

3.2. Campus-Wide Historical GHG Emissions

Greenhouse gas (GHG) emissions are expressed in terms of equivalent tonnes of carbon dioxide (tCO_2e). The GHG emissions associated with a facility are dependent on the fuel source – hydroelectricity produces fewer greenhouse gases than coal-fired plants, while light fuel oil produces fewer GHGs than heavy oil.

Electricity from the grid in Ontario is relatively "clean", as the majority of it is derived from low-GHG hydroelectricity and nuclear power, as coal-fired plants have been phased out. Scope 1 (natural gas) and Scope 2 (electricity) consumption levels have been converted to their equivalent tonnes of greenhouse gas emissions in the table below. Scope 1 represents the direct emissions from sources owned or controlled by the institution, and Scope 2 consists of the indirect emissions from the consumption of purchased energy generated upstream from the institution.

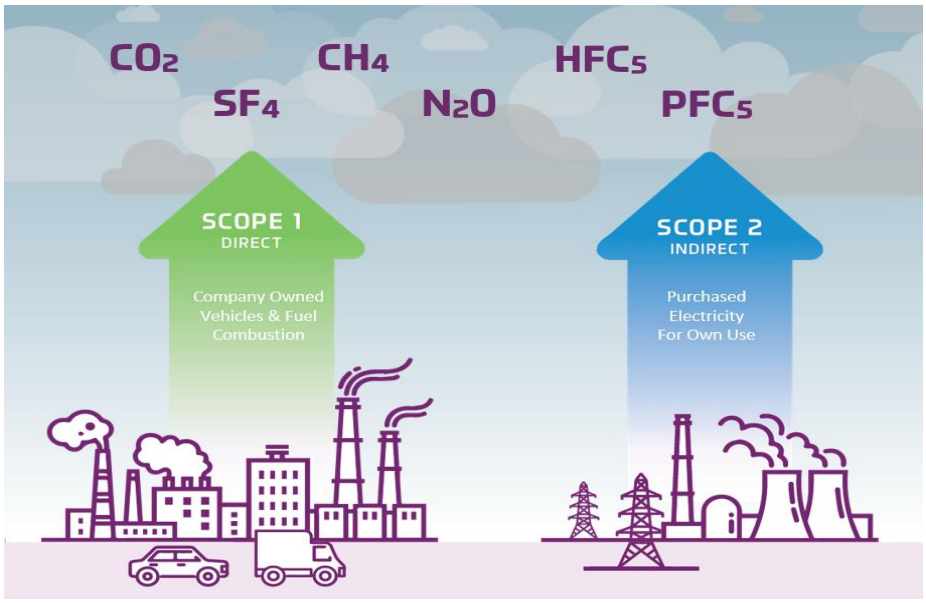

Figure 3. *Scope 1 & Scope 2 Emission Sources*

Table 3. *University-Wide GHG Emissions from Energy Use*

Emissions by Scope (tCO2e) University-wide	2013	2014	2015	2016	2017	2018
Electricity (Scope 2)	2,512	1,441	1,527	1,558	1,431	1,422
Natural Gas (Scope 1)	7,698	9,009	8,461	7,812	8,582	9,103
Total Scope 1 & 2 Emissions	**10,210**	**10,451**	**9,988**	**9,370**	**10,013**	**10,526**

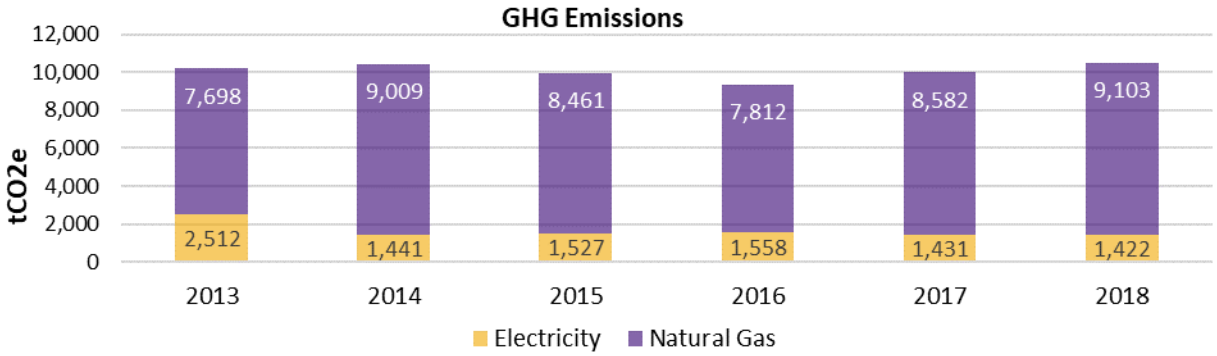

Figure 4. *University-Wide GHG Emissions for WLU*

3.2.1. GHG Emissions Targets

Laurier is a proud pledging partner of the Sustainable Waterloo Region's *Regional Carbon Initiative (RCI).* As part of this initiative, we have established a GHG emissions reduction target of 25% based on our 2018 levels, for our Kitchener and Waterloo Campuses.

The Laurier Sustainability Action Plan 2018-2022 also outlines our short-term GHG emissions reduction target of 15% by 2022, based on 2009 levels. The target includes all our campuses (Kitchener, Waterloo and Brantford).

This is illustrated in the chart below.

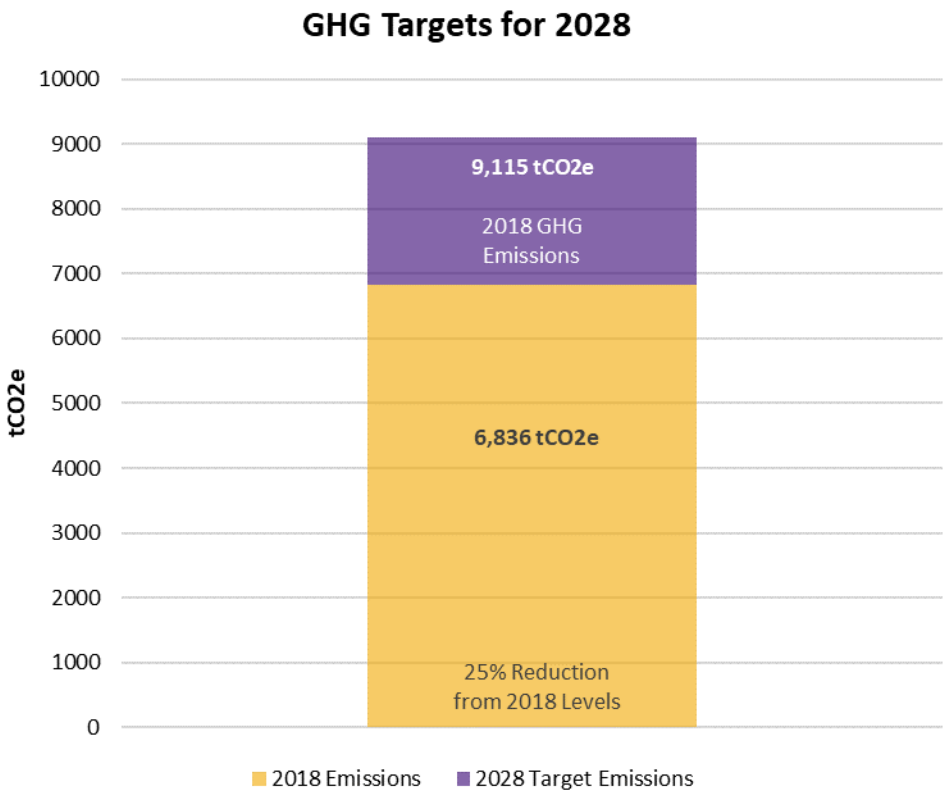

Figure 5. *2028 GHG Emissions Target for the Kitchener and Waterloo Campuses as part of RCI.*

3.3. Sustainability at Laurier

At Laurier, community is at the heart of who we are. A deep sense of connection and belonging is felt across our campuses and resonates in the communities we call home. Creating a culture of sustainability in this community is a primary mandate of Laurier's Sustainability Office and we are committed to advancing awareness and action on campus and beyond. Through projects that span operations, education and community partnerships, the goal of the office is to create a culture where sustainability is embedded into university life. For more details on Laurier's sustainability actions and goals, see our 5-year Sustainability Action Plan.

3.3.1. Energy Sustainability

The following sections describe the ongoing energy-related sustainability projects and programs undertaken by Laurier.

Laurier's Energy Working Group

The Energy Working Group aims to improve energy and water usage at the Waterloo, Brantford, Kitchener, and Milton campuses. All buildings and properties 100% owned or operationally controlled by Laurier are included in the scope of the Energy Management program. The Energy Working Group also structures its approach to achieve efficient and effective use of energy by aligning with key elements of the ISO 50001:2018 standard, Energy Management Systems. The ISO 50001 standard is used by small and large organizations all over the world to improve energy use and maximize the use of energy sources and energy-related assets.

The group consists of key members of the Facilities and Asset Management group, stakeholders from faculty, offices, and services who influence energy related decisions across Laurier's campuses. This allows representation of different interests as well as knowledge sharing and ensures a collaborative and integrated approach to developing a successful Energy Management program.

Laurier Energy Efficiency Program (LEEP)

LEEP is a comprehensive, multi-phase initiative to transform Laurier's building portfolio into a leading example of sustainable management and includes the installation of rooftop solar panels, battery storage, and a fully functioning microgrid. The following table summarizes the projects being executed under the LEEP program.

Status	Measure	Utility Affected			
		Electricity (kWh)	Electricity (kW)	Natural Gas (m3)	Water (m3)
Completed	LED Lighting & Controls	X	X	No data	No data
	Low-Flow Water Fixtures	No data	No data	X	X
	Demand Control Ventilation	X	X	X	X
	Building Automation Recommissioning	X	X	X	X
	Electric to Natural Gas Heating Conversion	X	X	X	No data
	High Efficiency Boiler Upgrades	No data	No data	X	No data
	Partial HVAC Energy Efficient Retrofits	X	X	X	No data
	Exhaust Heat Recovery	No data	No data	X	No data
	New Highly Efficient Windows, Doors & Skylights	X	X	X	No data
	New Energy Efficient Roofing	X	X	X	No data

	500kW Solar Photovoltaic	X	X	No data	No data
	Solar Wall	No data	No data	X	No data
	Window Film	X	X	X	No data
	Weather Stripping	X	X	X	No data
	Air Curtains	X	X	X	No data
	Load Specific Sub-Metering	N/A	N/A	N/A	N/A
In Progress	HVAC Energy Efficient Retrofits	X	X	X	No data
	Battery Energy Storage	No data	X	No data	No data
	Microgrid	No data	X	No data	No data

Residence Energy Challenge

The Residence Energy Challenge is a student competition run by the First Year Leadership Program Sustainability Council in the spring of each academic year. As part of the challenge, Laurier's residences compete to conserve energy over the course of one week. Energy consumption is typically reduced by 5-10% during this week as a result of the competition. The competition is incented through a prize for the winning residence that lowers its energy consumption by the largest percentage. Students can track their energy usage through Laurier's Real-time Energy Dashboard.

Laurier's Real-time Energy Dashboard

The Dashboard provides real-time energy use data, including renewable energy generation, for buildings on Laurier's Waterloo and Brantford campuses. Along with illustrating our campus' energy use and carbon footprint, it also provides information on green features and initiatives taking place across our campuses, energy conservation tips, sustainability links, an interactive discussion board, and a click-to-commit section dedicated to the Laurier community. The Dashboard is also used to track buildings in the annual Residence Energy Challenge (described above).

The Green Office Program

The Green Office Program enables staff to take leadership over sustainability practices in their offices to contribute to the sustainability goals of the campus. The program is broken down into four key phases:

- Measure
- Commit & Act
- Track Progress
- Get Recognized

Offices that sign onto the program accumulate points based on how many sustainability projects and initiatives they undertake and can achieve bronze, silver, or gold standing as they progress through the program. Part of the program focuses on energy use within units and encourages staff to seek opportunities to reduce consumption in order to conserve energy and contribute to reduced emissions.

3.3.2. General Sustainability

The following sections describe other ongoing sustainability projects and programs undertaken by Laurier.

Sustainability Campus Committee

The Sustainability Campus Committee (SCC) is a multi-campus committee made up of students, staff and faculty from Laurier. The committee works directly with the Sustainability Office to increase awareness and understanding of on-campus sustainability challenges and opportunities. The committee's primary tasks include reviewing applications and sit on a judging panel for the Sustainable Hawk Fund program.

Sustainable Hawk Fund

The Sustainable Hawk Fund leverages Laurier's entrepreneurial and community spirit to integrate sustainability practices into all aspects of student life at Laurier. Every year, our Sustainability Office dedicates up to $30,000 of funding and expert supervision for students who would like to implement sustainability projects at Laurier.

Waste Reduction and Diversion

To align with Goal #5 of our Sustainability Action Plan, Laurier offers several different waste reduction and diversion programs, including: organics, comingled recycling, e-waste, batteries, fluorescents, materials and cell phones. Key programs include:

- 40 cent discount for hot drink purchases when a reusable mug is used at any vendor on the Waterloo campus.
- Eco-container program provides reusable clamshell containers from participating campus locations.
- Water-fill stations located across campus with digital counters that track the number of plastic bottles each location has diverted.

Alternative Transportation

To align with Goal #3 of our Sustainability Action Plan, a variety of alternative transportation options are offered by Laurier and the Region of Waterloo to reduce the environmental impacts of commuting. Benefits available include:

- Grand River Transit and Brantford Transit passes.
- Carshare memberships with *Communauto* or *Enterprise* Carshare.
- Bike racks and secure bike storage.
- Bike hubs for Drop Mobility, a regional bike share program with service stretching across Cambridge, Kitchener and Waterloo.
- Electric vehicle (EV) charging stations.

Community Gardens

Laurier has a large community garden at the Northdale campus in Waterloo, located just north of the main campus. The garden hosts numerous community partners such as Young City Growers, KW Urban Harvesters, Patchwork Community Gardens, and more.

Pollinator Friendly

The Sustainability Office undertakes projects and partners with other units on our campuses to raise awareness around the issue of pollinator decline. To align with Goal #7 of our Sustainability Action Plan,

Laurier is working to create a habitat that supports wild pollinating species (such as native bees and butterflies) by intentionally planting pollinator friendly plants and flowers. We are taking steps to make our campuses friendlier to bees, butterflies, moths, wasps, hummingbirds, and other native pollinators.

Farmers Market

Laurier and its community partners work hard during the spring and summer months to cultivate the land in our community garden at Northdale to grow hyperlocal produce for the Laurier community to enjoy. Produce is available for purchase at a farmer's market stand located at Veritas Cafe throughout the summer and fall.

Fair Trade Campus

As a Fair Trade designated campus, Laurier actively supports fairer conditions and better prices for people in the Global South who grow and make products – whether it is coffee, cocoa or cotton t-shirts. Being a Fair Trade campus supports the Laurier community in making choices that align with our personal values and have a positive social and environmental impact.

4. Site Analysis

The following section will introduce each of our sites and provide a brief description about the building and its operations, energy and greenhouse gas (GHG) emissions trends, and specific conservation measures.

4.1. Kitchener–Waterloo Campus

Image 1. *Wilfrid Laurier University –Waterloo Campus*

Of Laurier's 19,000 graduate and undergraduate students, 16,000 are enrolled at our Waterloo campus, which trades on the energy from the thriving, tech-savvy Region of Waterloo. Faculties in Arts, Music, Science, Education, Graduate Studies and the Lazaridis School of Business and Economics are based here. Laurier is a leading force in research among Canadian universities, and many of our research centres and institutes are housed here. Laurier's Lyle S. Hallman Faculty of Social Work program is housed in a fully renovated century-old building in downtown Kitchener. Close to 300 graduate students are based in the heart of the downtown area, and minutes away from Laurier's Waterloo campus.

Table 4. *WLU - Kitchener-Waterloo Campuses Overview*

Facility Information	
Facility Name	**Wilfrid Laurier University – Kitchener-Waterloo Campuses**
Address	75 University Ave W., Waterloo, ON
Gross Area (Sq. Ft)	2,837,277
Average Operational Hours Per Week	107

4.1.1. Utility Consumption Analysis

Utilities to the site are electricity and natural gas. The following table summarizes the accounts for each utility. Utility consumption for each respective utility has been adjusted to fit a regular calendar year (365 days).

Table 5. *Historic Energy Use for WLU - Kitchener-Waterloo*

Annual Consumption (units)						
Utility	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
Electricity (kWh)	27,613,991	31,161,371	28,607,148	28,925,630	27,499,433	26,881,691
Natural Gas (m^3)	3,806,624	4,452,717	4,080,190	3,766,123	4,095,253	4,260,508
Campus Size (sq. ft.)	2,231,305	2,231,305	2,312,934	2,312,934	2,543,553	2,550,658

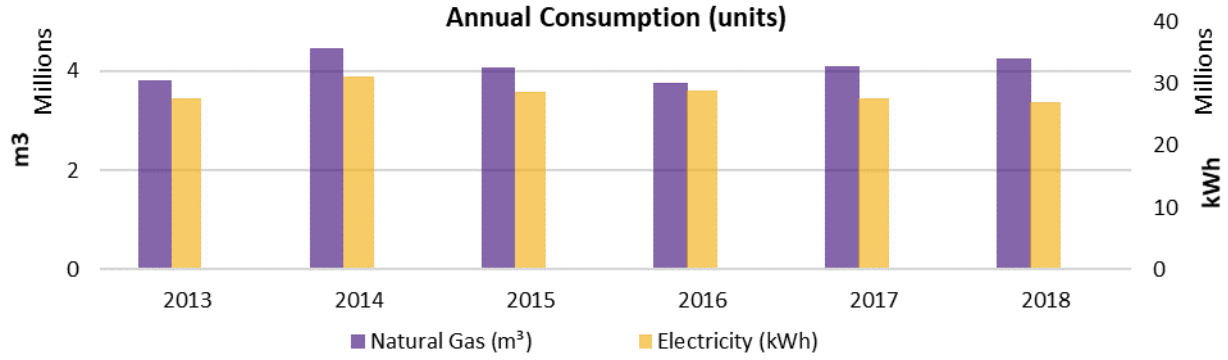

Figure 6. *Historic Energy Use for WLU - Kitchener-Waterloo*

4.1.2. GHG Emissions Analysis

The greenhouse gas emissions are calculated based on the energy consumption data analyzed in Table 5.

Table 6. *Historic GHG Emissions for WLU - Kitchener-Waterloo*

GHG Emissions (tCO2e)						
Utility Source	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
Electricity (Scope 2)	2,209	1,278	1,173	1,186	1,127	1,102
Natural Gas (Scope 1)	7,195	8,416	7,701	7,118	7,740	8,052
Totals	**9,404**	**9,693**	**8,885**	**8,304**	**8,868**	**9,155**

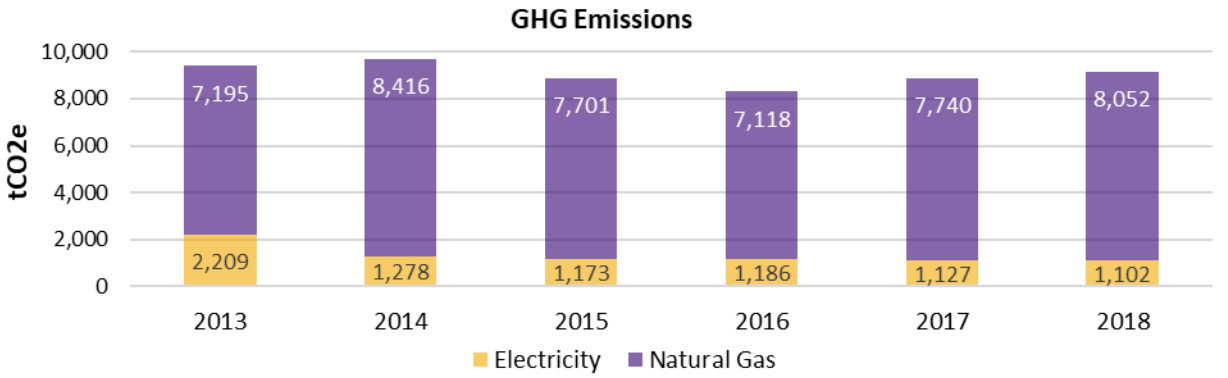

Figure 7*. Historic GHG Emissions for WLU - Kitchener-Waterloo*

4.2. Brantford Campus

Image 2. *Wilfrid Laurier University – Brantford Campus*

The Brantford campus has transformed the downtown core of the City of Brantford into a thriving student community, home to around 3,000 undergraduate and graduate students. With its 20+ buildings spread throughout the core of the city; the Brantford Campus is literally interwoven into the downtown area. The strong connections between campus and community don't end there, the close-knit campus experience Laurier is known for is achieved through community partnerships and opportunities for students. A healthy arts and culture scene, world-class trails system for walking and biking, and a strong slate of festivals and events make Brantford a vibrant place to call home for residents and students alike.

Table 7. *WLU - Kitchener - Brantford Campus Overview*

Facility Information	
Facility Name	**Wilfrid Laurier University – Brantford Campus**
Address	73 George St, Brantford, ON
Gross Area (Sq. Ft)	740,059
Average Operational Hours Per Week	107

4.2.1. Utility Consumption Analysis

Utilities to the site are electricity and natural gas. The following table summarizes the accounts for each utility. Utility consumption for each respective utility has been adjusted to fit a regular calendar year (365 days).

Table 8. *Historic Energy Use for WLU - Brantford*

Annual Consumption (units)						
Utility	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
Electricity (kWh)	3,792,000	3,990,801	8,627,774	9,077,540	7,407,001	7,809,108
Natural Gas (m³)	266,215	314,155	402,363	367,044	445,642	556,153
Campus Size (sq. ft.)	372,463	372,463	473,069	740,059	740,059	740,059

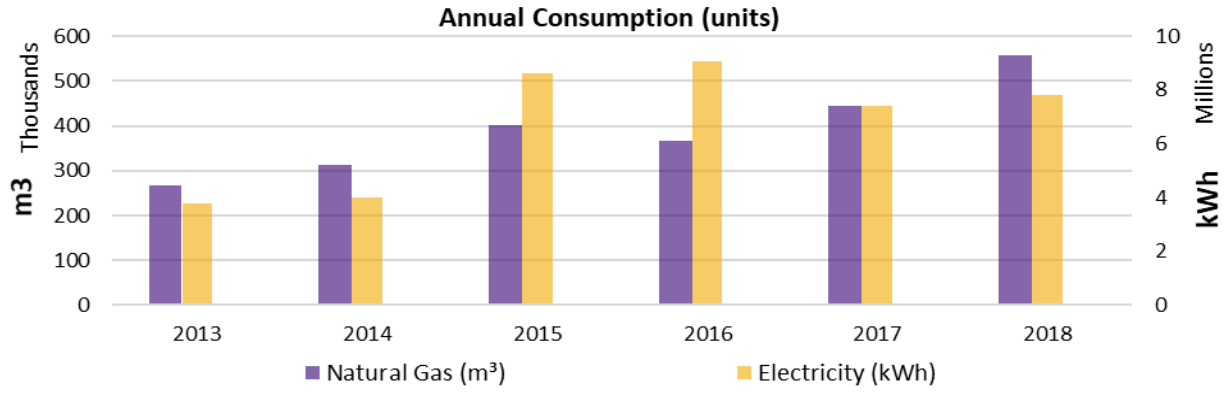

Figure 8. *Historic Energy Use for WLU - Brantford*

4.2.2. GHG Emissions Analysis

The greenhouse gas emissions are calculated based on the energy consumption data analyzed in table 8.

Table 9. *Historic GHG Emissions for WLU - Brantford*

GHG Emissions (tCO2e)						
Utility Source	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
Electricity (Scope 2)	303	164	354	372	304	320
Natural Gas (Scope 1)	503	594	760	694	842	1,051
Totals	**807**	**757**	**1,114**	**1,066**	**1,146**	**1,371**

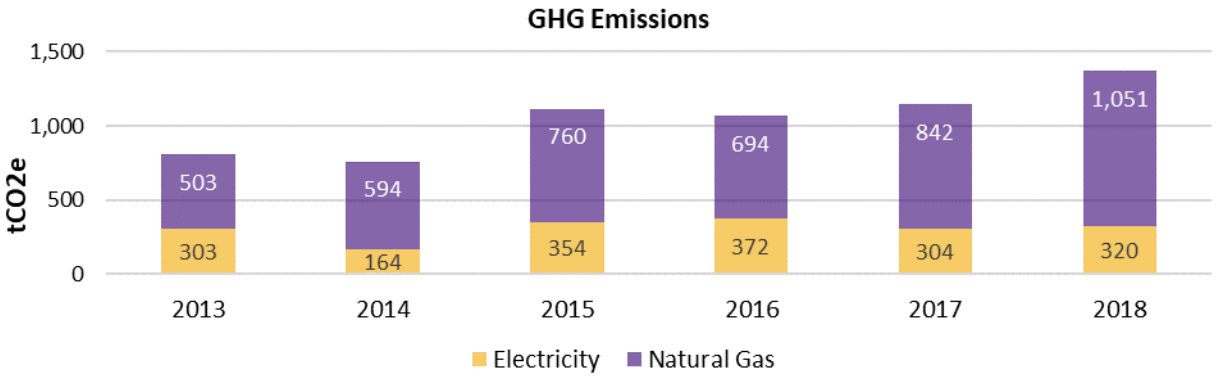

Figure 9. *Historic GHG Emissions for WLU - Brantford*

5. Proposed Conservation Measures

The energy analysis has revealed several conservation strategies for Laurier's facilities, in 5 phases for the next 5 years. The proposed energy saving initiatives are summarized in the table below outlining the targeted utilities. These measures will remain in place until another, more efficient and cost-effective technology is found.

Table 10. *List of Proposed ECDM Measures*

Building	Measure	Impacted Utility	Estimated Annual Savings in kWh	Estimated Annual Savings in m3	Expected Year of Implimentation
Athletic Complex	GGCRP Projects - 2018	Electricity & Natural Gas	60,029	2,724	2018
King Street Residence	Boiler Upgrades	Natural Gas	0	32,667	2019
Lazaridis Building	Retro-Commissioning (RCx)	Electricity & Natural Gas	TBD	TBD	2019
Selected Buildings	BES - Grid Connection, Electrical Equipment, Engineering - High Voltage Cable and Construction, Installation and Commissioning	Electricity	-131,040	0	2019
Waterloo College Hall Residence	Boiler Upgrades	Natural Gas	0	25,784	2019
All Buildings	Continuous Commissioning	Electricity & Natural Gas	537,634	85,210	2019
Cold Regions Building	Demand Control Ventilation	Natural Gas	0	0	2019
Multiple Buildings	GGCRP Projects 2019	Electricity & Natural Gas	71,396	304,459	2019
Market Darling Centre	GGCRP Projects - 2018	Electricity & Natural Gas	6,719	1,012	2019
Willison Hall Residence	Boiler Upgrades	Natural Gas	0	24,534	2020
BRAC East	Demand Control Ventilation	Electricity & Natural Gas	104,259	29,080	2021
DAWB	Boiler Upgrades	Natural Gas	0	126,261	2021
Science	Demand Control Ventilation	Electricity & Natural Gas	518,928	144,739	2021
Science Research Building	Demand Control Ventilation	Electricity & Natural Gas	367,594	130,015	2021
Selected Buildings	Microgrid, BES Building Expansion, 2MW NG Generator - HVAC Energy Efficiency	Electricity	537,462	0	2021

Building	Measure	Impacted Utility	Estimated Annual Savings in kWh	Estimated Annual Savings in m3	Expected Year of Implimentation
	Retrofits Addressing Campus Renewal Items				
202 Regina Street	Window Films	Electricity & Natural Gas	15,838	3,091	2022
Bouckaert Hall Residence	Window Films	Electricity & Natural Gas	3,859	2,157	2022
BRAC East	Window Films	Electricity & Natural Gas	36,657	1,808	2022
BRAC West	Window Films	Electricity & Natural Gas	33,366	1,654	2022
Bricker Academic Building	Window Films	Electricity & Natural Gas	20,526	1,481	2022
Bricker Residence	Window Films	Electricity & Natural Gas	35,429	2,262	2022
Waterloo College Hall Residence	Window Films	Electricity & Natural Gas	18,919	3,470	2022
Dr. Alvin Woods Building	Window Films	Electricity & Natural Gas	37,898	3,307	2022
King Street Residence	Window Films	Electricity & Natural Gas	26,882	5,017	2022
Lyle Hallman Building	Window Films	Electricity & Natural Gas	8,611	1,568	2022
Schlegel Centre	Window Films	Electricity & Natural Gas	20,228	1,491	2022
Science Building	Window Films	Electricity & Natural Gas	32,871	4,174	2022
Science Research Building	Window Films	Electricity & Natural Gas	14,199	1,872	2022
Athletic Complex	Ground-Source Heat Pump	Electricity & Natural Gas	-40,000	251,850	2023
McDonald House Residence	Boiler Upgrades	Natural Gas	0	71,417	2023
Science, Science Research and Bricker Academic	Ground-Source Heat Pump	Electricity & Natural Gas	-61,021	288,395	2023
Bouckaert Hall Residence	Solar (Rooftop) (56kW)	Electricity	64,350	0	2024

6. University Outlook

6.1. Campus-Wide Utility Consumption Forecast

From implementing the energy conservation measures stated in the previous section, the campus-wide projected electricity and natural gas use could be forecasted based on the utility savings generated from the individual measures. The campus-wide forecasted utility consumption is tabulated below, the percentage of change is based on the data from the baseline year of 2018.

Table 11. *Forecasted Energy Consumption for WLU*

Annual Consumption (units)												
Utility	2019		2020		2021		2022		2023		2024	
	Units	% Change	Units	% Change	Units	% Change	Units	% Change	Units	% Change	Units	% Change
Electricity (kWh)	34,146,062	2%	34,146,062	2%	32,617,819	6%	32,312,536	7%	32,413,557	7%	32,349,207	7%
Natural Gas (m^3)	4,364,804	9%	4,340,270	10%	3,910,176	19%	3,876,824	20%	3,265,161	32%	3,265,161	32%

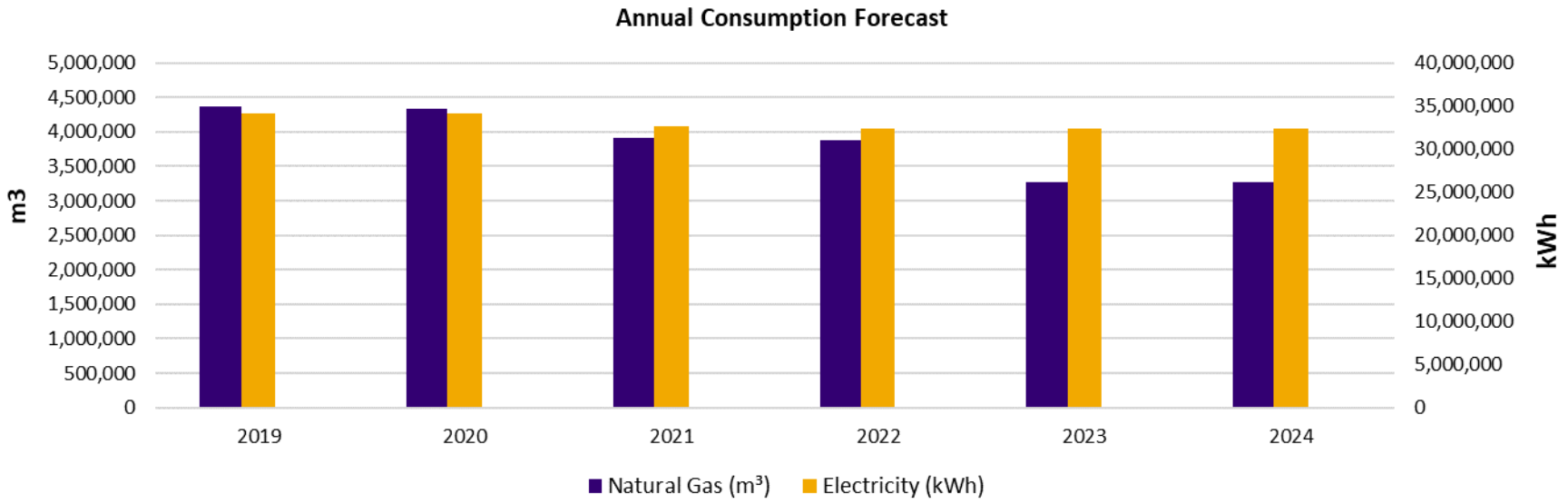

Figure 10. *Forecasted Energy Consumption for WLU*

6.2. Campus-Wide GHG Emissions Forecast

The organizational greenhouse gas emissions for Laurier are calculated based on the forecasted campus-wide energy consumption data analyzed in the previous section and are tabulated in the following table, the percentage of change is based on the data from the baseline year of 2018.

Table 12. *Forecasted GHG Emissions for WLU*

GHG Emissions	2019	2020	2021	2022	2023	2024
Electricity (Scope 2)	8,249	8,203	7,390	7,327	6,171	6,171
Natural Gas (Scope 1)	1,400	1,400	1,337	1,325	1,329	1,326
Total Scope 1 & 2 Emissions	**9,649**	**9,603**	**8,728**	**8,652**	**7,500**	**7,497**
Emissions Reduction relative to 2018	**8%**	**9%**	**17%**	**18%**	**29%**	**29%**

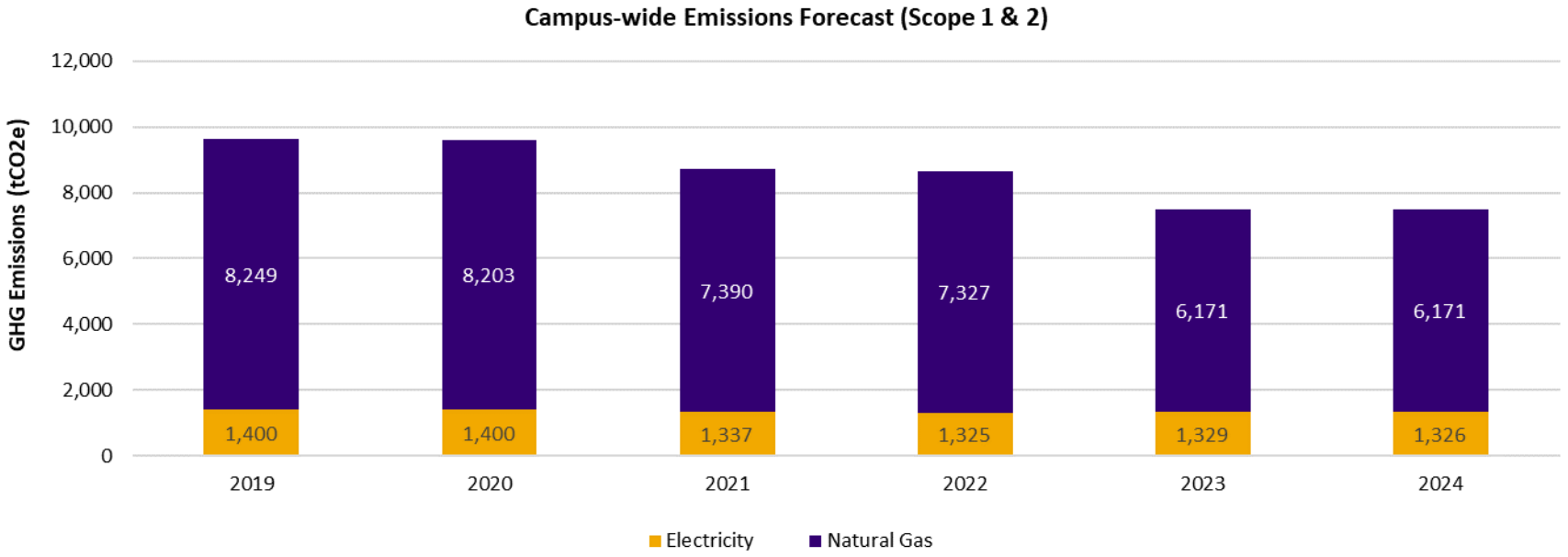

Figure 11. *Forecasted GHG Emissions for WLU*

7. Closing Comments

Thank you to all who contributed to Wilfrid Laurier University's Energy Conservation and Demand Management Plan. We consider our facility a primary source of education, and an integral part of the local community. The key to this relationship is being able to use our facilities efficiently and effectively to maximize our ability to provide the highest quality education services while integrating environmental stewardship into all aspects of facility operations.

On behalf of the Senior Management Team here at Wilfrid Laurier University, we approve of this Energy Conservation and Demand Management Plan.