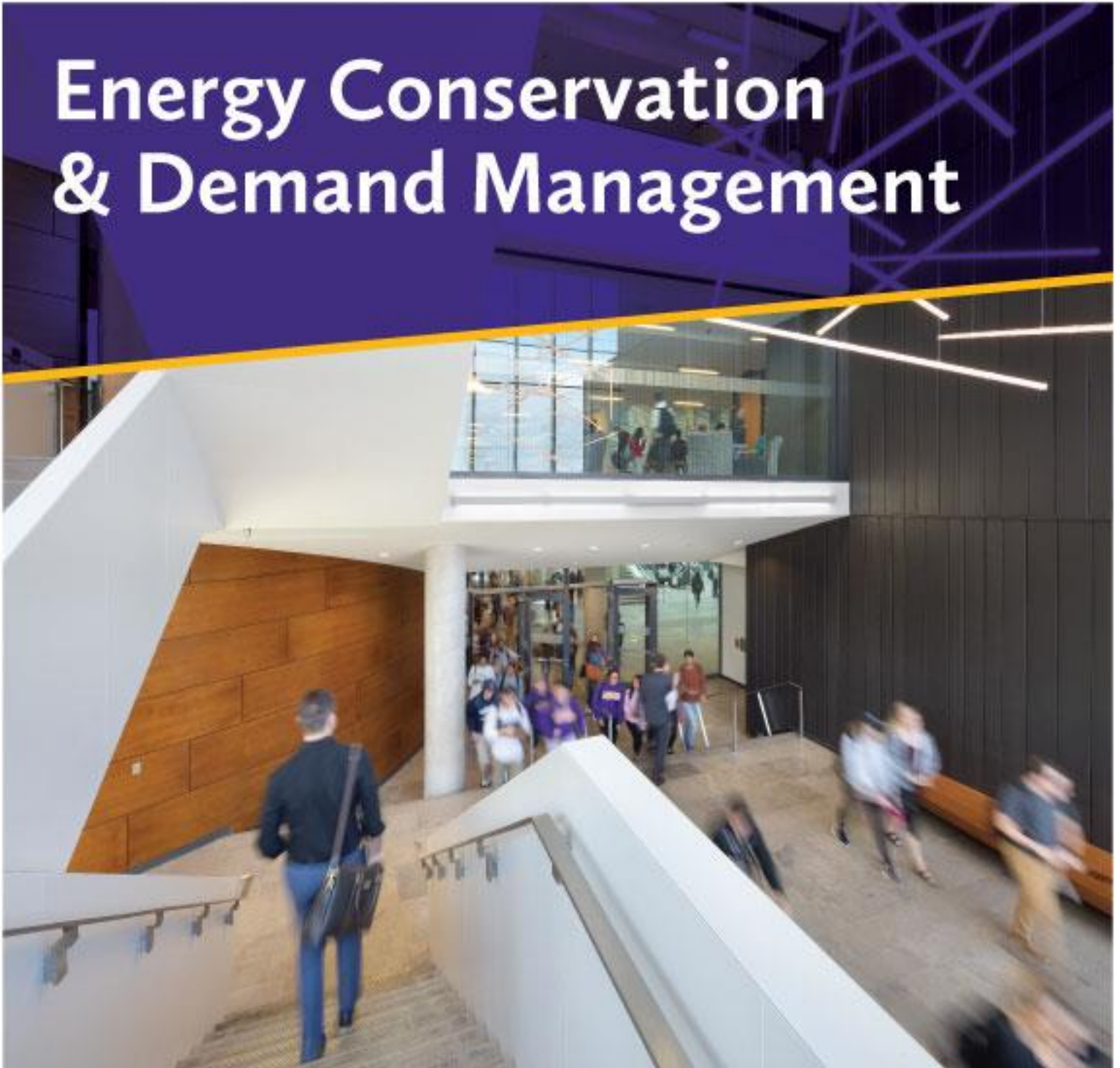


2019



# 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 Environmental Sustainability Committee, 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
- Build bridges with local industry leaders to support academic transition to workforce support for sustainable technology-based employment

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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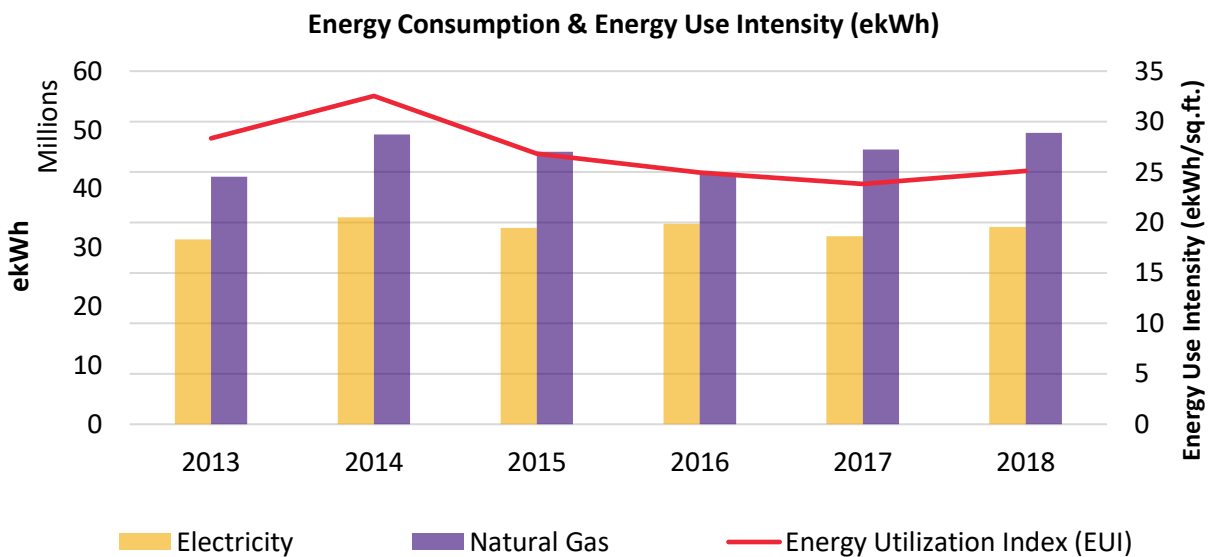
# 1. Introduction

The purpose of Laurier’s ECDM 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	33,342,046	34,077,065	31,965,720	33,543,737
Natural Gas Consumption (ekWh)	42,072,427	49,241,788	46,304,771	42,539,748	46,687,218	49,530,689
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	79,667,496	76,625,046	78,675,670	83,103,535
Total Energy Saved (ekWh)	-10,903,328	4,769,727	3,042,450	-2,050,624	-4,427,865	-10,903,328
Campus Size (sq. ft.)	2,595,015	2,595,015	3,072,622	3,072,622	3,303,242	3,310,346

The table above demonstrates an increase in total energy use (negative savings) for certain years. This increase is attributed to the increase in our campus size. Our Energy Use Intensity or EUI (ekWh/sq. ft.) has actually declined in 2018, 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*

Wilfrid Laurier University recognizes that intellectual inquiry, critical reflection and scholarly integrity are the cornerstones of all universities including our exceptional 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:

Wilfrid Laurier University 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

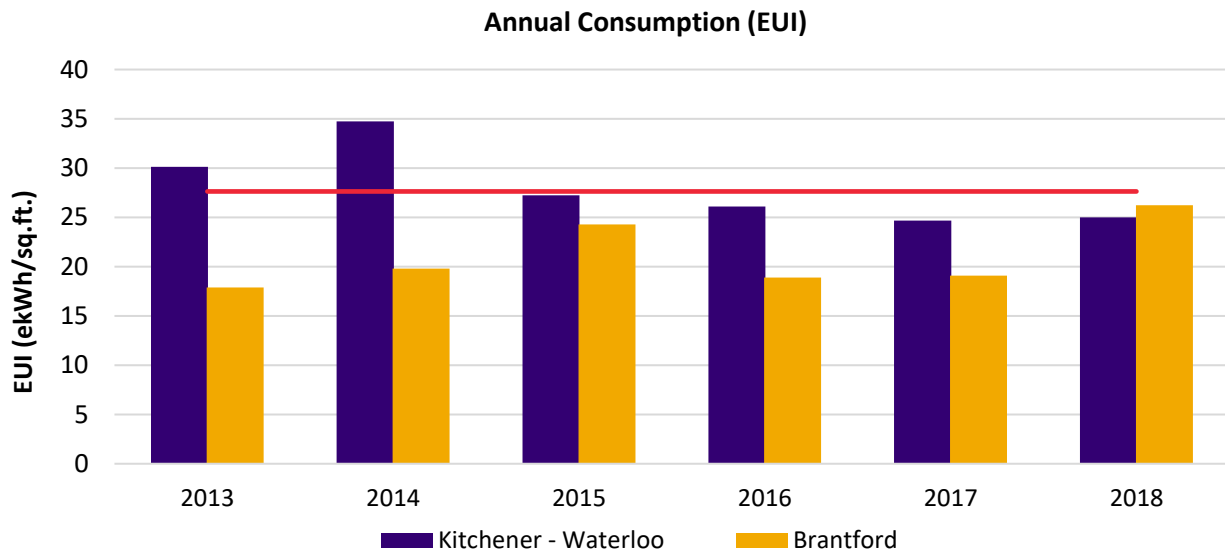
Laurier traces its roots to the opening of the Evangelical Lutheran Seminary in Waterloo more than 100 years ago in 1911. We’ve gone through several changes since then, and in 1973 our name changed from Waterloo Lutheran University to Wilfrid Laurier University. In 1999, we opened our campus in Brantford. 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	19	19	19	26



*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<sub>2</sub>e). 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 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.

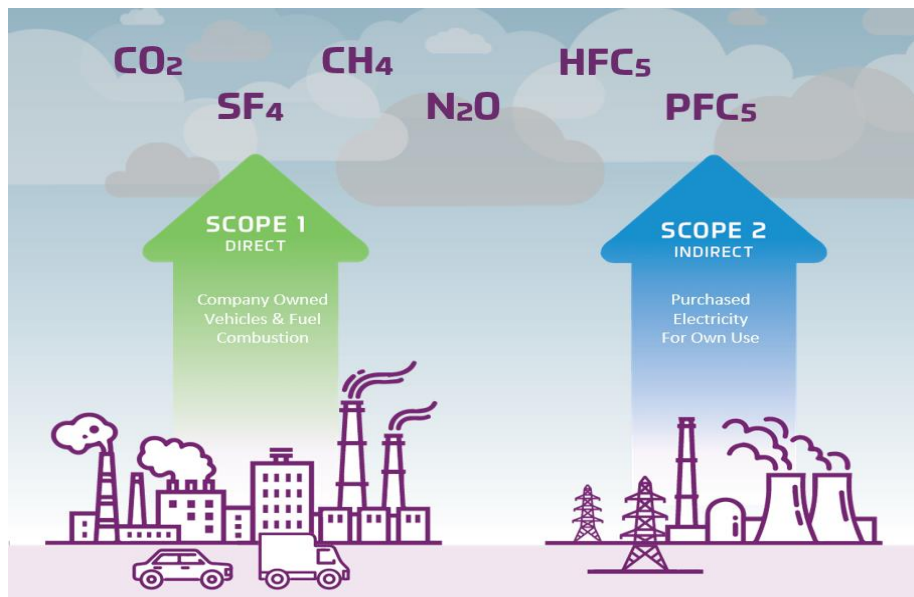


Figure 3. Scope 1 & Scope 2 Emission Sources

Table 3. University-Wide GHG Emissions from Energy Use

Emissions by Scope University-wide	2013	2014	2015	2016	2017	2018
Electricity (Scope 2)	1,288	1,441	1,367	1,397	1,311	1,375
Natural Gas (Scope 1)	7,698	9,009	8,472	7,783	8,542	9,062
<b>Total Scope 1 &amp; 2 Emissions</b>	<b>8,985</b>	<b>10,451</b>	<b>9,839</b>	<b>9,180</b>	<b>9,853</b>	<b>10,438</b>

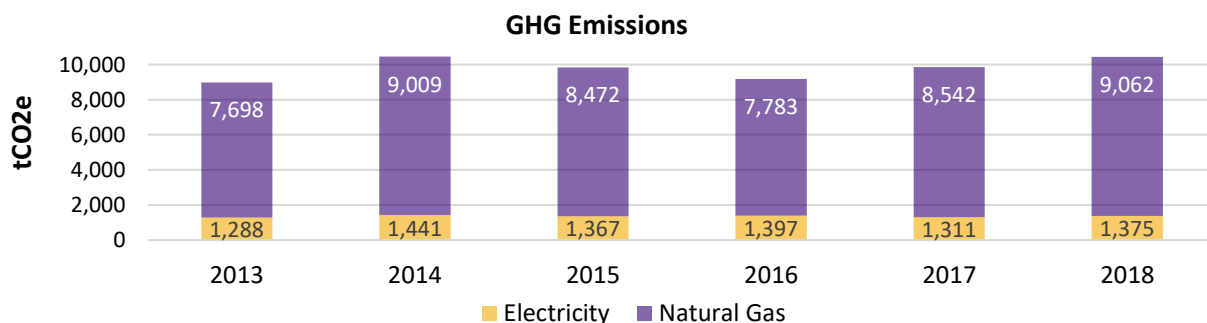


Figure 4. University-Wide GHG Emissions for WLU

### 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 into the communities we call home and sustainability is a universal phenomenon of economic, ecological and social importance. Laurier's Sustainability Office is 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.

Laurier's Sustainability Action Plan outlines this journey through an overall greenhouse gas reduction target of 15% over 5 years. This plan has allowed us to become a proud pledging partner through Sustainable Waterloo Region's *Regional Carbon Initiative*.

#### **Sustainability Campus Committee**

Our Sustainable Campuses Committee is a multi-campus committee that is made up of students, staff and faculty from Laurier that works directly with the Sustainability Office to increase awareness and understanding of on-campus sustainability challenges and opportunities.

#### **Sustainability Council**

The Sustainability Council is a first-year program for students who wish to become involved in campus sustainability issues, focusing primarily on residence life. Key events include the annual residence energy competition and end-of-year move-out 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 \$20,000 of funding and expert supervision for students who would like to implement sustainability projects at Laurier.

#### **EcoHawks**

The EcoHawks are an undergraduate group that works to raise awareness of environmental issues, encourage the development of environmentally friendly living habits of students, and work towards limiting our campuses' ecological footprint.

#### **Geo-Enviro Studies Residence Learning Community**

Created for Geography and Environmental Studies students, the Geo-Enviro Studies Residence Learning Community provides students who are interested in the natural world with a chance to live and interact with like-minded peers in the same residence area.

#### **Farm Market**

The Laurier Farm Market, which runs on Wednesdays throughout the fall and winter terms, has a variety of produce for sale, as well as ready-made snacks. The market is run by the Laurier Food Bank, a student-run campus club that is supported by the Sustainability Office and Food Services.

### ***Young City Growers' Northdale Garden***

Young City Growers is a grassroots initiative focused on creating urban agriculture opportunities for youth in the Waterloo Region. In addition to sustainable food systems programs for university students and youth, Young City Growers provides the Laurier community with weekly bushels of veggies and herbs through their community shared agriculture program.

On the Waterloo campus, Laurier hosts urban garden plots for those interesting in renting space to garden. This Northdale garden space is run by Patchwork Community Gardens and KW Urban Harvesters.

### ***Aboriginal Gardens***

Mino-Kummik — the Ojibwa word for good, bountiful earth — is a vegetable and fruit garden, ceremony space, and seating area on the Waterloo campus. It also has a 2,350-litre rain-harvesting cistern and rain garden. The garden is open for class instruction, campus group meetings or study space.

The Brantford Aboriginal Medicine Garden provides garden space where traditional, medicinal plants are grown. The garden provides many opportunities for learning through curriculum, workshops, and hand-on cultivating.

### ***Waste Management***

Laurier services a comprehensive waste-management program for organics, commingled recycling, e-waste, batteries, fluorescents, furniture and materials, and even cell phones!

### ***CAB Bikeshare Station***

Laurier is host to one of many CAB Bikeshare stations across the region, providing affordable access to bicycles as alternative transportation to students, staff, faculty and community members.

### ***Secured Bike Storage***

Laurier Brantford and Waterloo have secured bike storage areas, located at Grand River Hall and adjacent to MacHouse. Both campuses also have a bike repair station.

### ***CarShare***

Carshares offer access to vehicles without the cost, hassle or pollution of owning your own. Community Carshare vehicle stations may be found in high-profile areas across the community and on campus. Student Carshare has cars available across many Canadian campuses, including Laurier.

## 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 – Kitchener-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 Campus Overview*

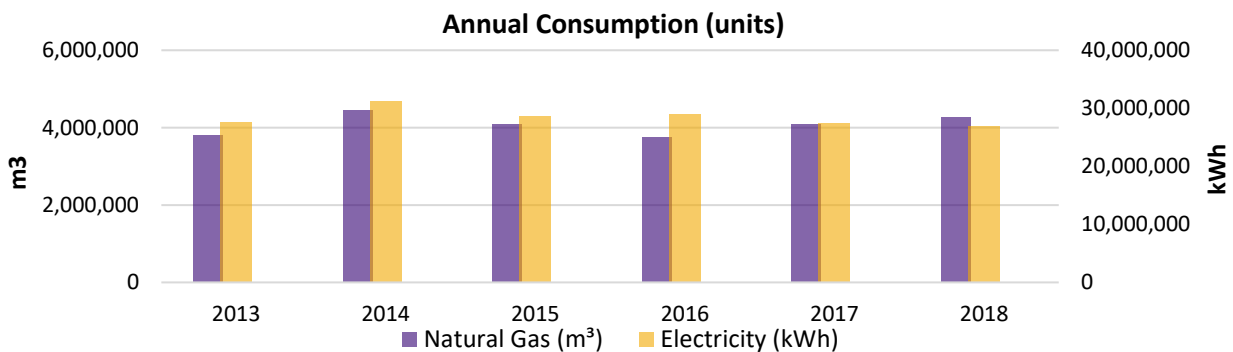
Facility Information	
Facility Name	Wilfrid Laurier University – Kitchener-Waterloo Campus
Address	75 University Ave W., Waterloo, ON
Gross Area (Sq. Ft)	2,837,277
Average Operational Hours Per Week	107

### 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	28,619,445	28,925,630	27,499,433	26,881,691
Natural Gas (m <sup>3</sup> )	3,806,624	4,452,717	4,080,190	3,766,123	4,095,253	4,260,508
Campus Size (sq. ft.)	2,222,552	2,222,552	2,599,553	2,599,553	2,830,173	2,837,277



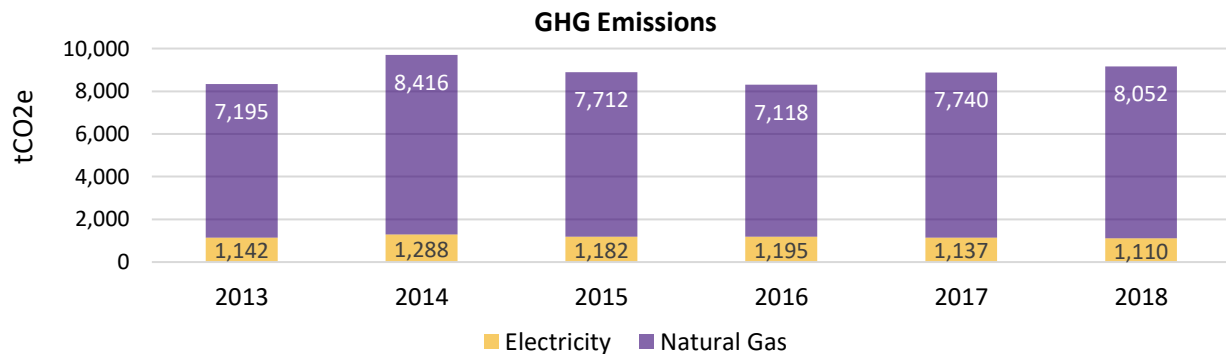
*Figure 5. Historic Energy Use for WLU - Kitchener-Waterloo*

### 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 (tCO <sub>2</sub> e)						
Utility Source	2013	2014	2015	2016	2017	2018
Electricity (Scope 2)	1,142	1,288	1,182	1,195	1,137	1,110
Natural Gas (Scope 1)	7,195	8,416	7,712	7,118	7,740	8,052
<b>Totals</b>	<b>8,337</b>	<b>9,703</b>	<b>8,893</b>	<b>8,313</b>	<b>8,877</b>	<b>9,162</b>



*Figure 6. 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*

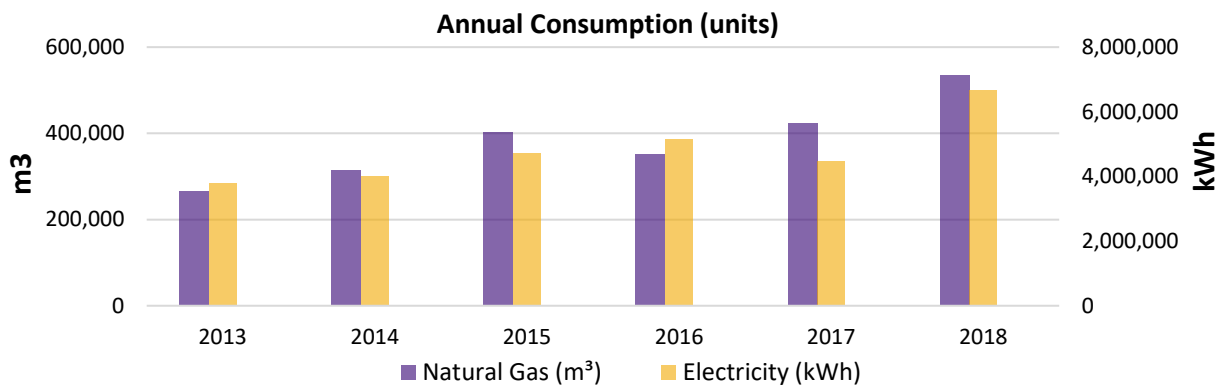
Facility Information	
Facility Name	Wilfrid Laurier University – Brantford Campus
Address	73 George St, Brantford, ON
Gross Area (Sq. Ft)	473,069
Average Operational Hours Per Week	107

### 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	4,722,601	5,151,435	4,466,287	6,662,046
Natural Gas (m <sup>3</sup> )	266,215	314,155	402,363	351,955	424,323	534,331
Campus Size (sq. ft.)	372,463	372,463	473,069	473,069	473,069	473,069



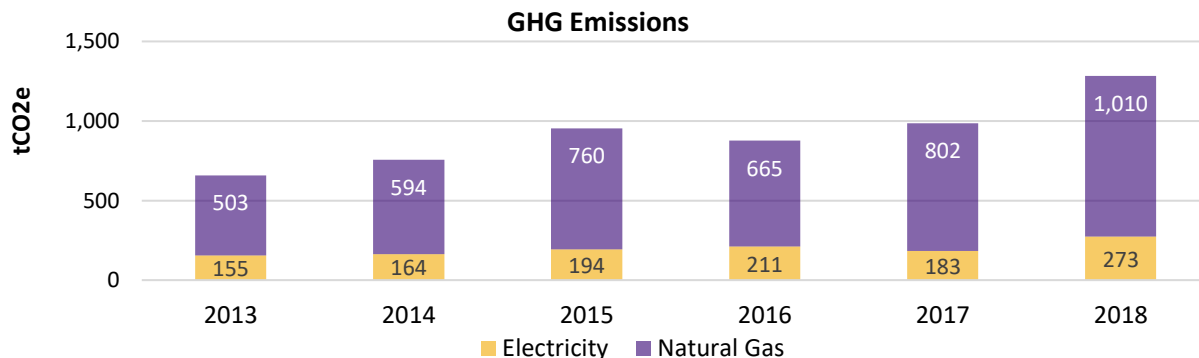
*Figure 7. Historic Energy Use for WLU - Brantford*

### 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 (tCO <sub>2</sub> e)						
Utility Source	2013	2014	2015	2016	2017	2018
Electricity (Scope 2)	155	164	194	211	183	273
Natural Gas (Scope 1)	503	594	760	665	802	1,010
<b>Totals</b>	<b>659</b>	<b>757</b>	<b>954</b>	<b>876</b>	<b>985</b>	<b>1,283</b>



*Figure 8. 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		Expected Year of Implementation
			kWh	m3	
202 Regina Street	Window Films	Electricity & Natural Gas	15838	3091	2022
Athletic Complex	Ground-Source Heat Pump	Electricity & Natural Gas	-40000	251850	2023
Bouckaert Hall Residence	Window Films	Electricity & Natural Gas	3859	2157	2022
Bouckaert Hall Residence	Solar (Rooftop) (56kW)	Electricity	64350		2024
BRAC East	Window Films	Electricity & Natural Gas	36657	1808	2022
BRAC East	Demand Control Ventilation	Electricity & Natural Gas	104259	29080	2021
BRAC West	Window Films	Electricity & Natural Gas	33366	1654	2022
Bricker Academic Building	Window Films	Electricity & Natural Gas	20526	1481	2022
Bricker Residence	Window Films	Electricity & Natural Gas	35429	2262	2022
Waterloo College Hall Residence	Window Films	Electricity & Natural Gas	18919	3470	2022
DAWB	Boiler Upgrades			126261	2021
Dr. Alvin Woods Building	Window Films	Electricity & Natural Gas	37898	3307	2022
King Street Residence	Boiler Upgrades	Natural Gas		32667	2019
King Street Residence	Window Films	Electricity & Natural Gas	26882	5017	2022
Lazaridis Building	Retro-Commissioning (RCx)		TBD	TBD	2019
Lyle Hallman Building	Window Films	Electricity & Natural Gas	8611	1568	2022
McDonald House Residence	Boiler Upgrades	Natural Gas		71417	2023
Schlegel Centre	Window Films	Electricity & Natural Gas	20228	1491	2022
Science	Demand Control Ventilation	Electricity & Natural Gas	518928	144739	2021
Science Building	Window Films	Electricity & Natural Gas	32871	4174	2022
Science Research Building	Demand Control Ventilation	Electricity & Natural Gas	367594	130015	2021
Science Research Building	Window Films	Electricity & Natural Gas	14199	1872	2022



Science, Science Research and Bricker Academic	Ground-Source Heat Pump	Electricity & Natural Gas	-61021	288395	2023
Selected Buildings	BES - Grid Connection, Electrical Equipment, Engineering - High Voltage Cable and Construction, Installation and Commissioning	Electricity	-131040		2019
Selected Buildings	Microgrid, BES Building Expansion, 2MW NG Generator - HVAC Energy Efficiency Retrofits Addressing Campus Renewal Items	Electricity	537462		2021
Waterloo College Hall Residence	Boiler Upgrades	Natural Gas		25784	2019
Willison Hall Residence	Boiler Upgrades	Natural Gas		24534	2020
All Buildings	Continuous Commissioning	Electricity & Natural Gas	537634	85210	2019
Cold Regions Building	Demand Control Ventilation	Natural Gas		6162	2019

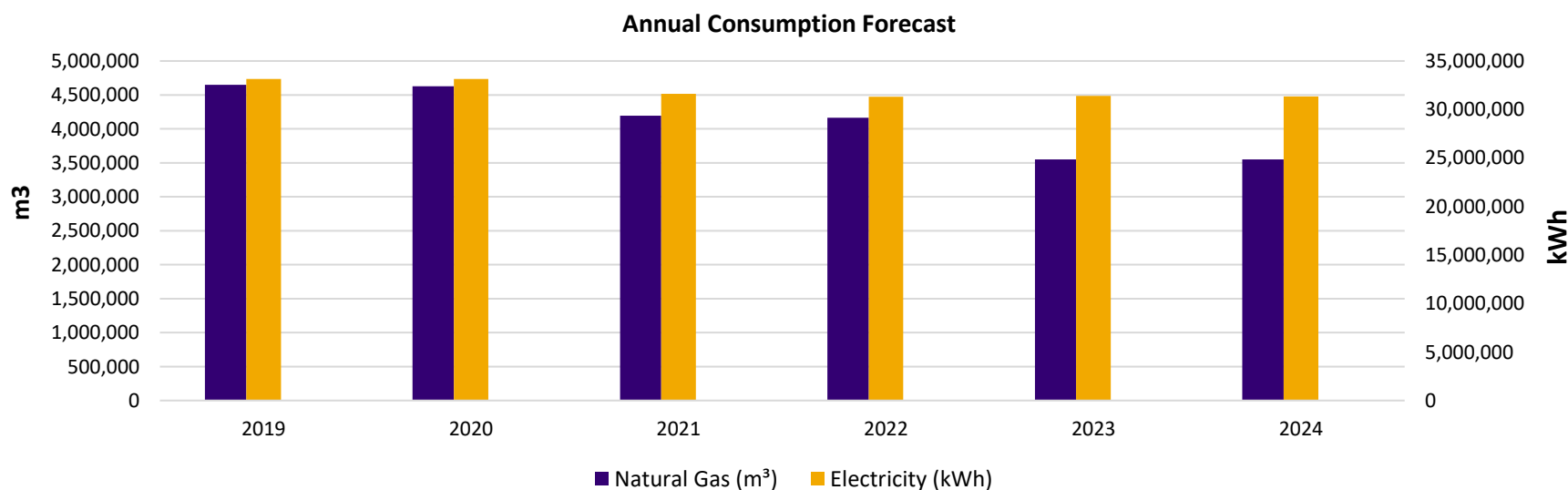
## 6. University Outlook

### 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*

Utility	Annual Consumption (units)											
	2019		2020		2021		2022		2023		2024	
	Units	% Change	Units	% Change	Units	% Change	Units	% Change	Units	% Change	Units	% Change
Electricity (kWh)	33,137,143	1%	33,137,143	1%	31,608,900	6%	31,303,617	7%	31,404,638	6%	31,340,288	7%
Natural Gas (m <sup>3</sup> )	4,651,178	3%	4,626,644	4%	4,196,549	12%	4,163,197	13%	3,551,535	26%	3,551,535	26%



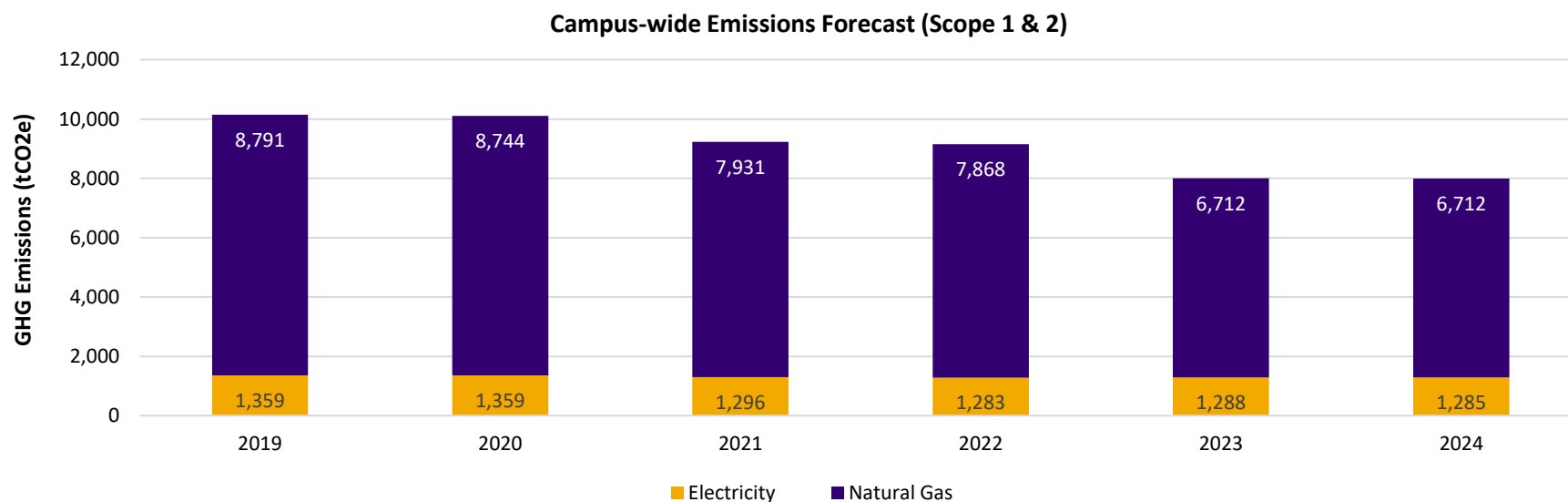
*Figure 9. Forecasted Energy Consumption for WLU*

## 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)	1,359	1,359	1,296	1,283	1,288	1,285
Natural Gas (Scope 1)	8,791	8,744	7,931	7,868	6,712	6,712
<b>Total Scope 1 &amp; 2 Emissions</b>	<b>10,149</b>	<b>10,103</b>	<b>9,227</b>	<b>9,152</b>	<b>8,000</b>	<b>7,997</b>
<b>Emissions Reduction relative to 2018</b>	<b>3%</b>	<b>3%</b>	<b>12%</b>	<b>12%</b>	<b>23%</b>	<b>23%</b>



*Figure 10. 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.