STRATEGIC ENERGY MANAGEMENT PLAN REPORT

2017/2018

Abbotsford, Canada Education Park, Aerospace, 5 Corners, & Chilliwack North Campuses.

University of the Fraser Valley
33844 King Road,
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August 2018

Blair McFarlane is UFV's Energy Manager and a key contributor to the institution's growth in sustainability and energy efficiency. Prior to working in post-secondary at UFV, McFarlane drove energy efficiency, sustainability, and carbon emissions reduction campaigns within a number of industries including mining, healthcare, and education – elementary, secondary. His educational background includes a Bachelor of Arts in Geography degree and advanced certificate in Sustainable Energy Management with Distinction. This broad foundation has enable him to successfully approach many issues related to environmental consciousness. McFarlane aspires to continue his quest for higher learning by pursuing a master's degree in 2019.

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UNIVERSITY OF THE FRASER VALLEY

August 16, 2018

Letter of Commitment to Energy Efficiency

The University of the Fraser Valley's Strategic Plan outlines key strategic directions, including: to be a "leader of social, cultural, economic, and environmentally-responsible development in the Fraser Valley" and to be "innovative, entrepreneurial, and accountable in achieving our goals". A major component of our environmental responsibility as an organization is to effectively manage the energy that we consume. Natural gas allows us to keep our buildings warm, and hot water flowing from the taps. Electricity provides lighting, cooling, and allows us to use computers and other equipment. While the use of energy is intrinsic to our operation as a university, as community leaders we must also be innovative and accountable for minimizing the environmental impact and greenhouse gas emissions that result.

At the University of the Fraser Valley we are committed to energy efficiency and conservation. This commitment is deeply engrained. In 1999 we joined Natural Resources Canada's Energy Innovator Program. In 2002 an energy study was conducted to find ways in which energy consumption could be reduced at that time. In 2005, after the measures identified in the study were implemented, we succeeded in reducing our annual greenhouse gas emission intensity by 11%. In the summer of 2010, with the support of BC hydro, we hired a dedicated Energy Manager for the Abbotsford Campus and Aerospace Centre resulting in a further 10% energy reduction during the first 3 years. In 2016 we re-affirmed our dedication to environmental stewardship in the Fraser Valley by hiring a new Energy Manager tasked with addressing energy efficiency, rapidly escalating utility costs, and reducing the environmental impact of university operations. To reinforce our commitment to energy efficiency and conservation, and to link our commitment to outcomes, we are have re-developed the Strategic Energy Management Plan Report (SEMP). The SEMP provides us with the framework and direction required to further reduce our energy consumption and meet reduction targets.

I am proud of our commitment to energy efficiency and conservation, knowing that we are not only providing a benefit to the environment, but also to our community. Further, by providing a means of generating a more sustainable university we are also improving our economic bottom-line – a win-win situation. I encourage all members of our campus community to provide support for our commitment, as the benefits extend to each and every one of us.

Betty Poettcker,
Chief Financial Officer and Vice President Administration
University of the Fraser Valley

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Executive Summary

UFV's energy management program tracks energy consumption which involves monitoring of the energy used amongst 23 core buildings across 2 regional campuses and 3 other locations.

This report is provided to demonstrate the results of effective energy management and to reinforce UFV's commitment to energy conservation and sustainability throughout 2017/2018. A framework is provided that outlines how the Energy Manager is tracking progress and planning future actions that are aimed at increasing energy efficiency. This report also draws attention to trends in energy consumption (electricity, natural gas, and associated carbon emissions) and emissions from university vehicles and purchased paper.

Within the timeline of 2017/2018, UFV spent $1.4 million on electricity and natural gas, which provided 10,640,000kWh of electricity to power lights and equipment, as well as ventilation and cooling, and 44,935gj of natural gas for heating the spaces and water. All of this energy was used to provide and ensure the comfort of students and staff. These figures, however, change as a result of the revolving building portfolio of UFV. As of March 31, 2018, for example, 95,323m^2 of UFV floorspace changed due to a sequence of sales and lease agreements, which resulted in a 2.4% increase in m^2 compared to the previous year.

Additionally, the manners in which students and staff operate have significant impacts on energy use and efficiencies at UFV. This report also provides context for and analysis of energy consumption with regards to the impacts of space utilization.

One challenge that was faced in 2017/2018 was that 7 of the 8 heating months (spring, fall, and winter) had below-average temperatures. As a result, the consumption of natural gas – the main resource used to heat UFV – increased by 1.2% compared to 2016/2017. Energy management is hinged on the ability to control or at least influence certain contributing factors with regards to energy efficiency. Weather and its fluctuations cannot be controlled by UFV, which poses an external, unpredictable challenge to maneuver. An analysis of energy efficiency and the impacts of outdoor air temperatures is also provided in this report.

Despite the various challenges faced by the energy management team, the profile and impact of this department has increased due to the success of a series of projects, programs, initiatives, and events. These improvements include lighting upgrades that have increased efficiency and provided high quality lighting; mechanical upgrades that have increased reliability, efficiency, and effectiveness regarding temperature maintenance; and awareness of, and participation in, behavioural change campaigns has cultivated the culture of energy awareness and sustainability.

A multitude of events in 2017/2018 that highlighted the connection between UFV's operations and the big picture of climate change, which further emphasized UFV's intentions to mitigate its environmental impact, both locally and globally.

Introduction

This Strategic Energy Management Plan (SEMP) Report supports the commitment of the University of the Fraser Valley (UFV) to energy efficiency and conservation by providing a framework for reducing energy consumption and its associated environmental impact. This SEMP includes a specific energy reduction target and an action plan related to how the target will be achieved.

Energy management allows UFV to strive towards the key strategic directions outlined in the organization's Strategic Plan; namely, to be a "leader of social, cultural, economic, and environmentally-responsible development in the Fraser Valley" and to be "innovative, entrepreneurial, and accountable in achieving our goals."

By implementing the actions detailed in this Strategic Energy Management Plan, UFV is demonstrating leadership through innovation and accountability for the resources it uses as an organization. Furthermore, UFV's hiring of a dedicated Energy Manager in the spring of 2016 emphasizes their commitment to the following:

- To reduce operating costs through energy conservation and efficiency;
- To minimize the environmental impact of the organization;
- To reduce greenhouse gas emissions, which is of global importance;
- To reduce exposure to energy cost escalations;
- To reduce reliance on the province's energy infrastructure;
- To demonstrate effective management of resources;
- To promote our successes to the general public and other universities;
- To strive towards educating those who will shape the future of our community, province, and country on the importance of managing the resources we use

Overview

UFV has been an important partner, contributing to the educational and economic development of the Fraser Valley over the last 40+ years and has undergone many changes itself during this time. The university was founded as Fraser Valley College (FVC) in 1974, became the University College of the Fraser Valley (UCFV) in 1991, and gained university status in 2008. Currently, UFV has campuses in Abbotsford, Chilliwack, and Mission, with regional centres in Hope and Chandigarh, India and now hosts over approximately 15,000 students annually. The scope of this report will demonstrate this pattern of continual growth by focussing on the following:

- 23 core buildings
- 95,323m^2 of facility space*
- 2 certified LEED Gold buildings (18,358m^2)
- 16,595 on-site students, Chandigarh excluded (2017/2018)
- 1,369 faculty and staff (2017/2018)

* Floor space, for the purpose of this report, is based on 92,835m^2, which excludes CEP Building S (occupied as of February 2018), which accounts for only 0.44% of the portfolio's ekWh (equivalent kilowatt hours), but a disproportionate 2.5% of floorspace in 2017/2018.

Table 1: Building descriptions

Campus	Building	Originally Built	Area (m^2)	Description / Use
Aerospace	H4	1974	2,620	Aerospace Training Centre
Abbotsford	FH	1975	251	Friesen House (President's Residence)
	ABB - A	1983	9,000	Classrooms, laboratories, administration
	ABB - B	1983	8,543	Classrooms, administration, cafeteria
	ABB - C	1983	4,892	Classrooms, administration
	ABB - D	1997	5,740	Classrooms, print services, logistics department
	ABB - E	2002	3,797	Gymnasium
	ABB - F	1994	516	University House; Conference Services, Centre for Indo-Canadian studies
	ABB - G	1995	5,687	Library, administration
	ABB - H	2006	8,104	Baker House (student residences), campus bookstore
	ABB - T	2006	353	Athletics administration
	ABB - S	2014	4,358	Students Union Building, administration, banquet hall, restaurant
Chilliwack Campuses	CHWK N - D	1993	5,380	Leased to tenants
	CHWK N - E	1993	534	Leased to tenants
	CHWK N - G	1993	516	Leased to tenants
	CHWK N - P (5 Corners)	1975	650	Classrooms
Canada Education Park (CEP)	CEP - A	1971	14,000	Classrooms, administration
	CEP - H (ACE)	2012	1,944	Agriculture Centre of Excellence, greenhouses, livestock pens
	CEP - N	1960	1,720	Leased to tenants
	CEP - Q		338	Athletics
	CEP - R		1,658	Athletics, health sciences
	CEP - S (1041)		2,397	Heavy Duty Mechanical
	CEP - TTC	2007	9,904	Trades and Technology Centre, shops, classrooms, administration, cafeteria
	CEP - V	1971	892	Classrooms, administration
	CEP - W	1971	1,438	Print services, warehousing

Table 2: Energy use and estimated costs

2017/2018 Energy Consumption Costs*								
Location		Electricity		Natural Gas			Energy Total	
Campus	m^2	kWh	$	GJ	ekWh	$	ekWh	$
ABB & AERO	53,861	6,272,607	$ 631,357	22,726	6,312,672	$ 159,585	12,585,279	$ 790,942
CEP	31,894	3,724,437	$ 378,240	17,669	4,908,066	$ 140,135	8,632,503	$ 518,375
CHWK N & 5 Corners	7,080	642,992	$ 65,237	4,540	1,261,249	$ 35,133	1,904,241	$ 100,371
Total	**92,835**	**10,640,036**	**$ 1,074,834**	**44,935**	**12,481,988**	**$ 334,853**	**23,122,024**	**$ 1,409,688**

*Cost estimate accuracy is limited by fluctuating rates and administrative fees unrelated to energy consumption.

UFV's building portfolio continues to shuffle and follow a growth trend. In 2017/2018 UFV vacated the Chilliwack North Campus as well as the 5 Corners location which has been leased to CEPCO (Chilliwack Economic Partners Corporation). UFV occupied Canada Education Park Building S (1041) in a lease agreement with the Department of National Defence. These two transactions combined for a 1,720m^2 (2%) increase in floor space operated by UFV. In terms of energy, adding additional buildings or facility space yields an increase in consumption as those spaces need to be heated, cooled, and provided with electricity. The degree to which energy use is affected is influenced by a number of factors including weather, operating schedules, system efficiencies, and how occupants interact with the building/space. Consider that a trades building, such as CEP 1041 has a significantly higher energy intensity than that of classrooms and offices found within the 5 Corners building. Throughout this report, different approaches to analyzing energy efficiency performance

will be presented, highlighting key variables and providing context for the challenges in monitoring overall energy consumption patterns in a changing portfolio.

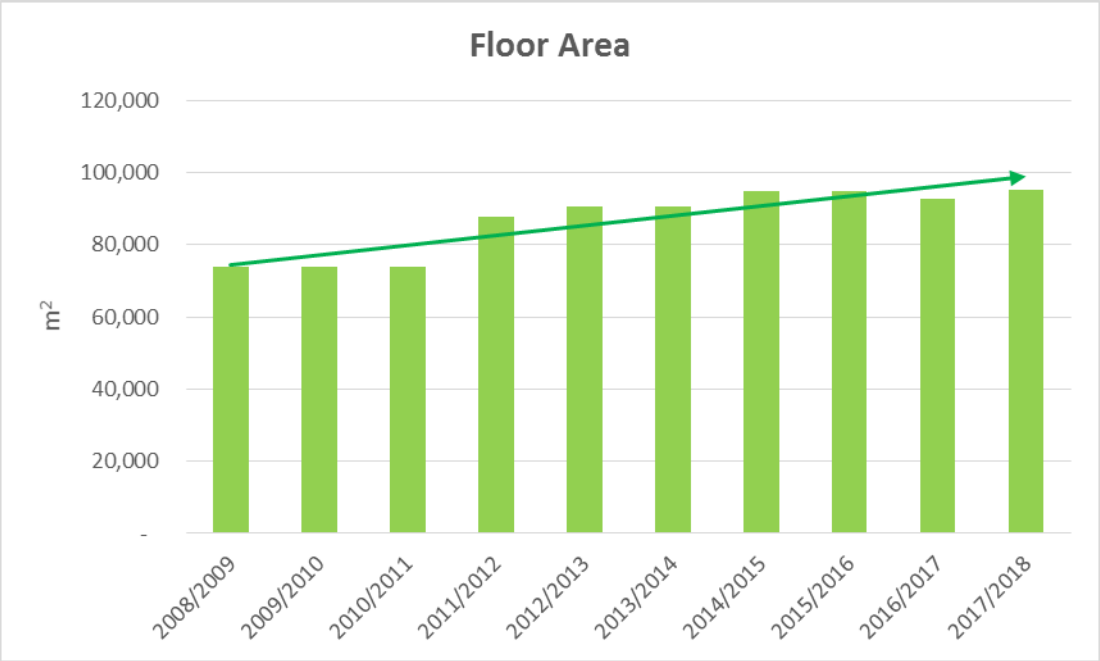


Figure 2: Floor area changes and trends over a 10 year period

Annual Goals and Objectives

1. Develop and maintain an annual SEMP, with an initial report on the 2016/2017 fiscal year.
2. Reduce energy (ekWh) per degree day (DD)* per area (m^2): ekWh/DD/m^2 by 10% by 2021/2022 from the 2015/2016 levels.

* A degree day (DD) is a measure of heating and cooling. There are two varieties of DD; when separated they are identified as: Heating Degree Days (HDD) or Cooling Degree Days (CDD). Degree days for a given day represent the number of Celsius degrees that the mean temperature is above or below, when compared to a given base temperature. For example, Heating Degree Days represent any number of degrees that fall below 18 °C. If the temperature is equal to or greater than 18 °C, then the number will be zero. A cooling degree day is the inverse. Source: Environment Canada www.climate.weather.gc.ca. Climate ID 1100031.

Table 3: Energy efficiency target timeline

ekWh/DD/m^2	Reduction Target	Target	Actual	Year-to-Year Change	Cumulative Change From Base
2015/2016*	-	-	**0.0889**	-	-
2016/2017	-2%	0.0871	0.0867	-2.5%	-2.5%
2017/2018	-2%	0.0854	0.0841	-3.0%	-5.6%
2018/2019	-2%	0.0837			
2019/2020	-2%	0.0820			
2020/2021**	-2%	**0.0804**			

* Base Year Period
** Target Year Period

Climate Change Commitment

Climate is the term used to refer to the average weather patterns in a particular area over a long period of time. Climate change, by extension, is understood to be the relatively rapid increase in global temperature, with localized rises in extreme weather and shifts in climate. These rapid temperature increases have been observed and measured most significantly throughout the 21st century. The greenhouse gas emissions that result from human activities are driving climate change and significantly contribute to the continuous rise of global temperatures. These emissions are currently at their highest levels in recorded history. Climate change is now affecting every country on every continent. It is disrupting national economies and affecting lives; costing people, communities, and countries dearly today and will even more tomorrow. Communities are experiencing significant impacts as a direct result of climate change, including changing weather patterns, rising sea levels, and increasing amounts of extreme weather. For example, precipitation, wind, extreme temperatures have led to catastrophic wildfires, flooding, hurricanes, droughts, and coastal erosion events.

UFV recognizes the impacts of climate change and that institutional effects stretch far beyond the classroom, into the local and international communities wherein students and graduates reside, work, and/or conduct business. UFV prepares students for when they enter society with new skillsets, ideas, and expectations; and so in an effort to better serve our students and the global community, UFV refreshed its approach to the development, promotion, and support of sustainability initiatives in 2016/2017, including both immediate and long term efforts to mitigate negative operational impacts on climate change.

Carbon Emissions

UFV reports emissions to LiveSmart BC using the SMARTTool reporting system, and purchases credits to offset these emissions. As part of this, a Carbon Neutral Action Report (CNAR) is prepared by UFV each year outlining the efforts both undertaken and planned to reduce carbon emissions. Through the purchase of offsets, UFV is carbon neutral by definition. The Carbon Neutral Action Report can be viewed at: **www.ufv.ca/energy/.**

BC's public sector organizations are to reduce carbon emissions by 33% by 2020, compared to 2007 levels. UFV has adopted this provincial target as a guideline for organizational emissions reductions.

The carbon footprint for the University of the Fraser Valley (including the Chandigarh, India campus) registered at 2,701 tCO_2e (tonnes of carbon emissions equivalent) in 2017 (not including 2016 adjustments); that value was higher than the previous year's value of 2,338 tCO_2e. The most significant emissions sources being used in our buildings were for heating both space and water and the use of electricity which comprised 96% of emissions sources. Paper consumption comprised 2.5% and mobile (fleet, or UFV registered vehicles) combustion rounded out to a minor 1.38%.

Through a variety of efforts – from increasing energy efficiency to reducing paper usage – gross carbon emissions have declined by 17% from 2009 levels. It should be noted that floor space has increased 20.5% during the period between 2009 and 2017. Carbon emissions intensity, which considers floor space (tCO_2e/m^2), at UFV has been reduced 51% during the 2009 – 2017 period. In relation to the university's activity as measured by full time equivalent (FTE) on-site student enrolment (7,512), the 2017 carbon footprint slightly increased compared to the previous year. 2016's value of 0.314 tCO_2e /FTE increased to 0.36 tCO_2e/FTE in 2017, an increase of 12.6% in GHG emissions when factoring a 0.9% increase in student enrolment.

Gross carbon emissions in 2017 deviated from the declining trend of past years with an overall increase of 13% from 2016. Weather is the driving factor in these results. A cold 2016/2017 winter, and cool start to the 2017/2018 winter, resulted in the calendar 2017 year to be significantly colder than a typical year; in turn, this gave rise to significantly more natural gas being burned to heat buildings (an act that is responsible for 96% of the portfolio emissions). However, when accounting for weather and space increases ($tCO_2E/HDD/m^2$), UFV increased emissions efficiency by 0.2%. Even though the weather cannot be controlled, how buildings, fleet, and paper consumption is managed can be. Overall, $tCO_2E/HDD/m^2$ has been reduced by 46% in the 2009 – 2017 period.

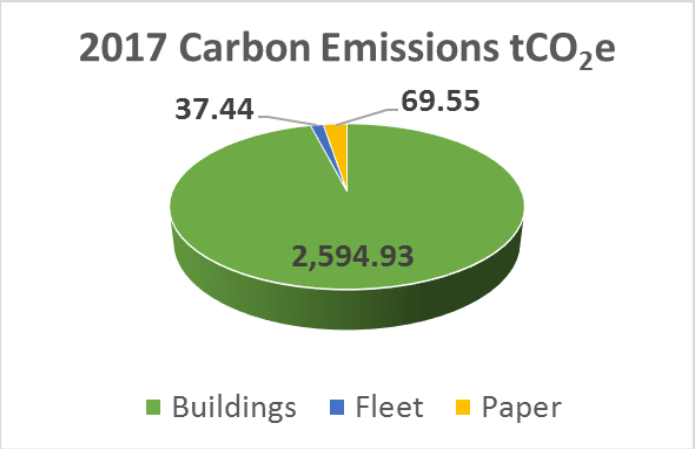


Figure 3: 2017 Carbon emissions by source

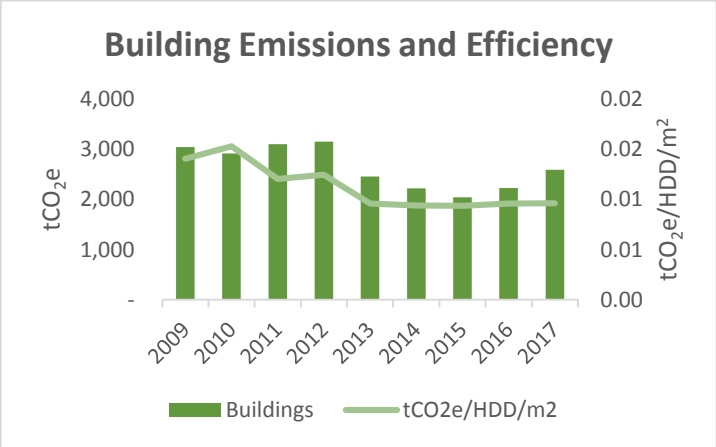


Figure 4: Building emissions per year, and normalized emissions for space and weather fluctuations

2017/2018 Projects

There is an increased reliance on technology (computers, scanners/printers, laptops, tablets, projectors, etc.) in classrooms and offices, which in turn increases the demand for electricity, and can require additional cooling in some spaces. With this increased utilization of energy-requiring technology, and through an abnormally cold winter, there was an increased onus on the Facilities department to optimize major energy consuming systems, such as boilers, chillers, and the HVAC system that brings conditioned air to learning and working spaces.

In an effort to reach the annual ekWh/DD/m^2 reduction targets, there were numerous mechanical and systematic upgrades in 2017/2018 that were aimed at increasing the energy efficiency of the university and the comfort of UFV students, staff, and faculty. They were as follows:

Table 4: 2017/2018 Energy Efficiency Projects

Campus	Bldg.	Project	Electricity Savings	Natural Gas Savings	Increased Comfort	Energy Study	Cost Management
ABB	A	Chiller upgrade	✓		✓		
ABB	B	Cooling tower upgrade	✓		✓		
ABB	B	Lecture hall LED upgrade	✓				
ABB	C	Exterior door insulation upgrade		✓	✓		
ABB	G	Entrance LED upgrade	✓				
ABB	G	Library LED upgrade	✓				
ABB	G	Solar PV feasibility study	✓			✓	
CEP	A	Heating/cooling cross connection corrections		✓			
CEP	H	Added to BCNET Natural Gas Rate					✓
CEP	T	Interior LED lighting purchased (Carbon Neutral Fund)	✓				
CEP	T	Overhead door installations (2)		✓	✓		
All		DDC holiday re-scheduling to optimize HVAC	✓	✓			
All		EndoTherm Installation (Innovation Fund Project)		✓			
All		Fortis BC Commercial Energy Assessments		✓		✓	
All		Fortis BC Energy Specialist Funding Approval					✓

Utility Consumption and Costs

Table 4 depicts the historical changes in electricity and natural gas usage, and floor space, as well as the estimated costs associated with the energy source. As UFV grows, we continue to be challenged to reduce overall energy consumption. Mechanical maintenance workers and operations staff, the Associate Director of Building Systems, the Energy Manager, as well as the Campus Planning and the Project Management office all have significant influence on how energy on campus is consumed. One important aspect of energy management that cannot be influenced by operations is the cost rate. As customers of BC Hydro for electricity, and FortisBC and Shell Energy North America for natural gas, our influence does not extend into their rate structure process. Therefore, the success or failure of any energy management program must not be solely based upon costs.

Table 5: Historical energy consumption and costs

		UFV Historical Energy Consumption and Estimated Costs						
		Electricity		Natural Gas			Energy Total	
Year	m^2	Elec kWh	$	GJ	NG ekWh	$	Total ekWh	$
2011/2012	87,782	10,481,103	$ 723,451	55,892	15,525,474	$384,675	25,964,602	$1,095,266
2012/2013	90,376	10,809,236	$ 791,552	51,578	14,327,352	$381,249	25,136,588	$1,167,498
2013/2014	90,376	10,448,205	$ 827,097	44,508	12,363,212	$425,251	22,811,417	$1,241,877
2014/2015	94,734	10,266,500	$ 911,313	35,677	9,910,230	$342,119	20,176,730	$1,253,432
2015/2016	94,734	11,297,690	$1,080,527	40,425	11,229,255	$327,502	22,526,945	$1,408,029
2016/2017	92,835	11,040,667	$1,091,951	44,391	12,330,940	$356,027	23,371,607	$1,447,979
2017/2018	92,835	10,640,036	$1,074,834	44,935	12,481,988	$334,853	23,122,024	$1,409,688

Energy Use and Degree Days

Energy use has significant correlations to outdoor air temperature/weather conditions. Regionally, we have significantly more days that require heating (Heating Degree Days) than cooling (Cooling Degree Days) to keep occupants comfortable while teaching, learning, and working. Figure 5 outlines the consumption of electricity and natural gas, the

total energy use, as well as the number of Degree Days within the associated time period. The Degree Days line generally follows the pattern of energy consumption which on a macro level aides in determining whether there are any significant problems within the buildings or whether we are operating appropriately. The larger the gap between the Degree Days line and energy total suggests that the portfolio is increasingly efficient. In addition to Degree Days, there are many other determining factors affecting the efficiency of operations within buildings; as such, they will be outlined further into this report.

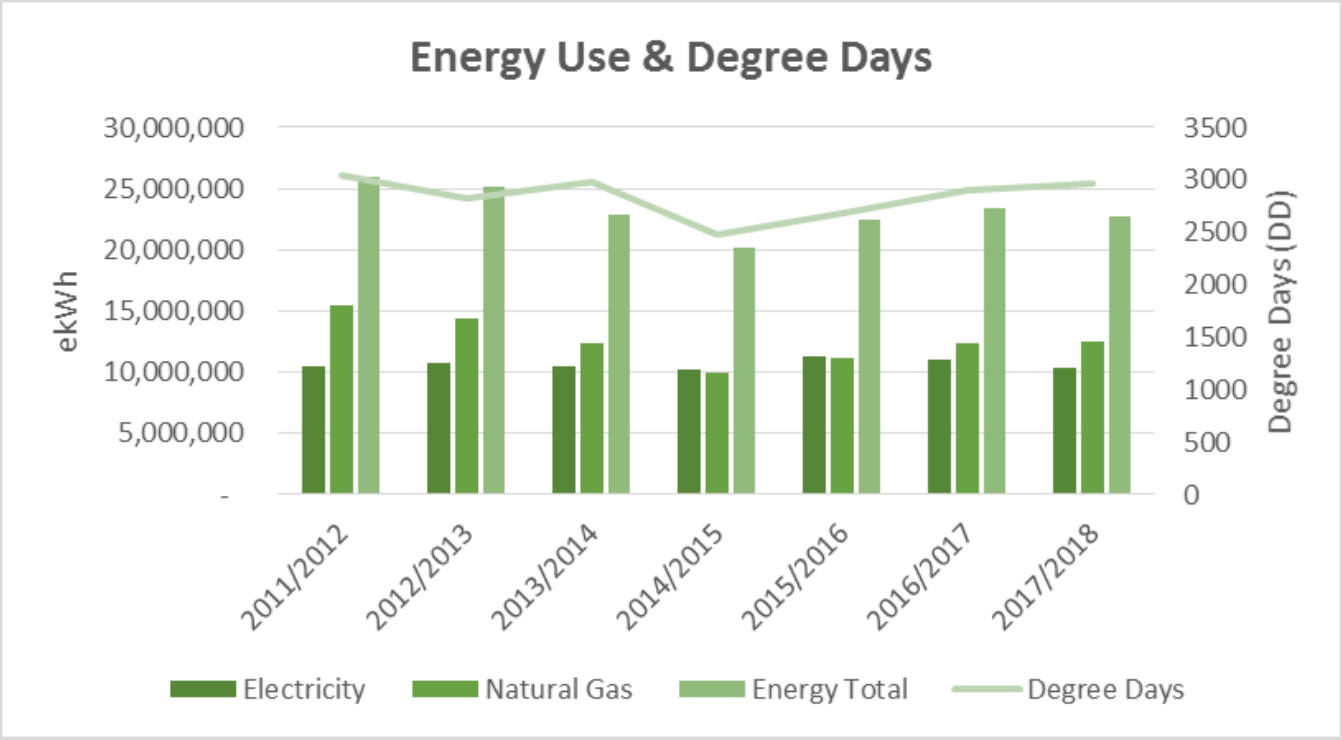


Figure 5: Energy use and degree day correlation

Energy Costs

The energy cost breakdown by campus is shown in Figure 6 below. The Abbotsford campus accounts for the majority of the energy cost for UFV. CEP, however, has two of the highest energy intense buildings: Building T (the Trades and Technology Centre) and Building H (the Agriculture Centre of Excellence).

Electricity costs have risen 33% within the 7 year period between 2011/2012 and 2017/2018. In 2014 BC Hydro announced a 28% hike in electricity rates over 5 years, beginning that year with a 9% rise, followed by annual 6%, 4%, 3.5%, and 3% rises in the final year of the plan, 2019/2020. While having rate increases published in advance allows for better preparation and planning, the challenge presented by significantly escalating costs remains.

Natural gas rates have been fluctuating between $7.45 and $9.59 per gigajoule since 2011/2012 with 2017/2018 rates being the lowest within the past 5 years. This is due in part to expanding the BCNET contract to include CEP Building H. BCNET is a network of post-secondary institutes that leverage purchasing power by buying Shell gas in bulk after speculating on the market as prices rise and fall. An increase in the volume of natural gas purchased through this agreement typically translates into cost savings, which have been realized this year.

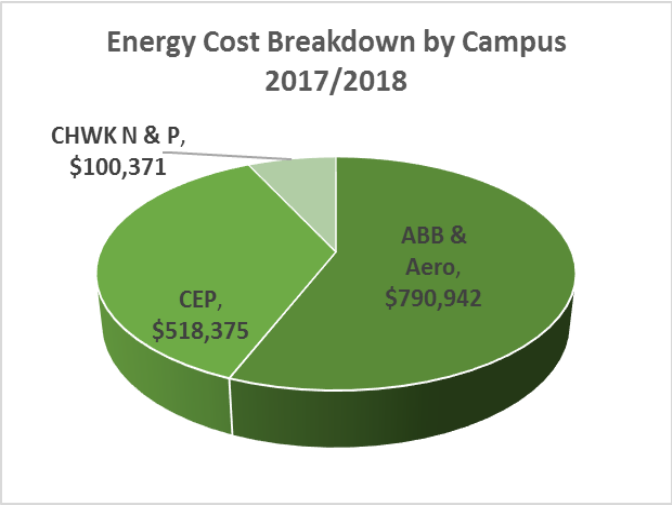


Figure 6: Energy costs per campus

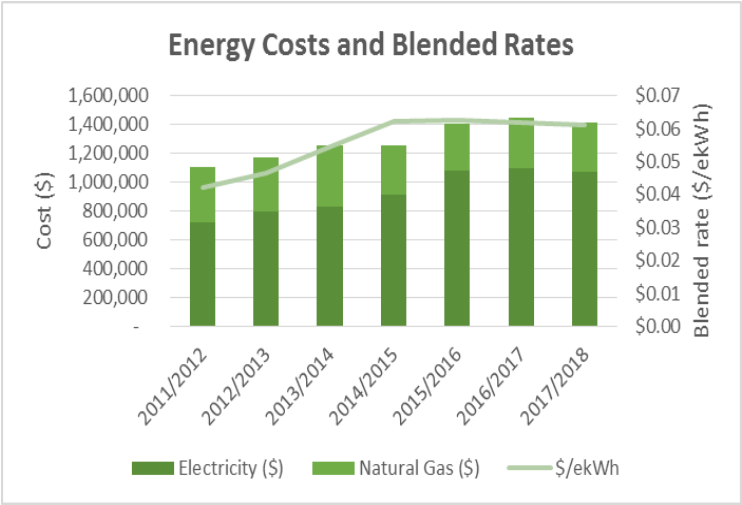


Figure 7: Energy costs and blended rates have risen drastically

Building Energy Performance Index

UFV is continuously acquiring and selling buildings. Each of these buildings have their own unique Building Energy Performance Index (BEPI), which is a measure of energy intensity (ekWh/m^2). Depending on the type of building and the users of that building (See Figure 2), some can have a comparatively much higher BEPI. Therefore, the sale and acquisition of buildings can have a significant impact on BEPIs at the campus level. BEPIs are useful for measuring the energy intensity between two similar facilities that operate under similar conditions (occupant type, operating hours, etc.). This measure, however, has significant limitations. BEPIs do not consider weather, schedules, occupants, or end uses. In light of these limitations, BEPIs provide a starting point for looking at energy efficiency and building performance. The following charts and graphs will provide increasingly specific details related to BEPIs. The cumulative BEPIs of each campus are outlined below in the Campus Energy Performance Index graph.

Table 6: Annual campus Building Energy Performance Index (BEPI)

BEPI (ekWh/m^2)	ABB & AERO	CEP	CHWK - N & 5 Corners	Overall	Difference	Overall Cumulative Difference	Difference From Previous Year
2011/2012	311.9	198.2	482.6	**295.8**	0.0	0	0
2012/2013	277.0	288.4	255.3	**278.1**	-17.7	-17.7	-6.3%
2013/2014	276.9	240.5	174.4	**252.4**	-25.7	-43.4	-10.2%
2014/2015	214.8	224.9	171.6	**213.0**	-39.4	-82.8	-18.5%
2015/2016	238.1	266.7	157.5	**237.8**	24.8	-58.0	10.4%
2016/2017	242.7	256.8	298.0	**251.8**	14.0	-44.0	5.5%
2017/2018	233.4	270.7	269	**249.1**	-2.7	-46.7	-1.1%

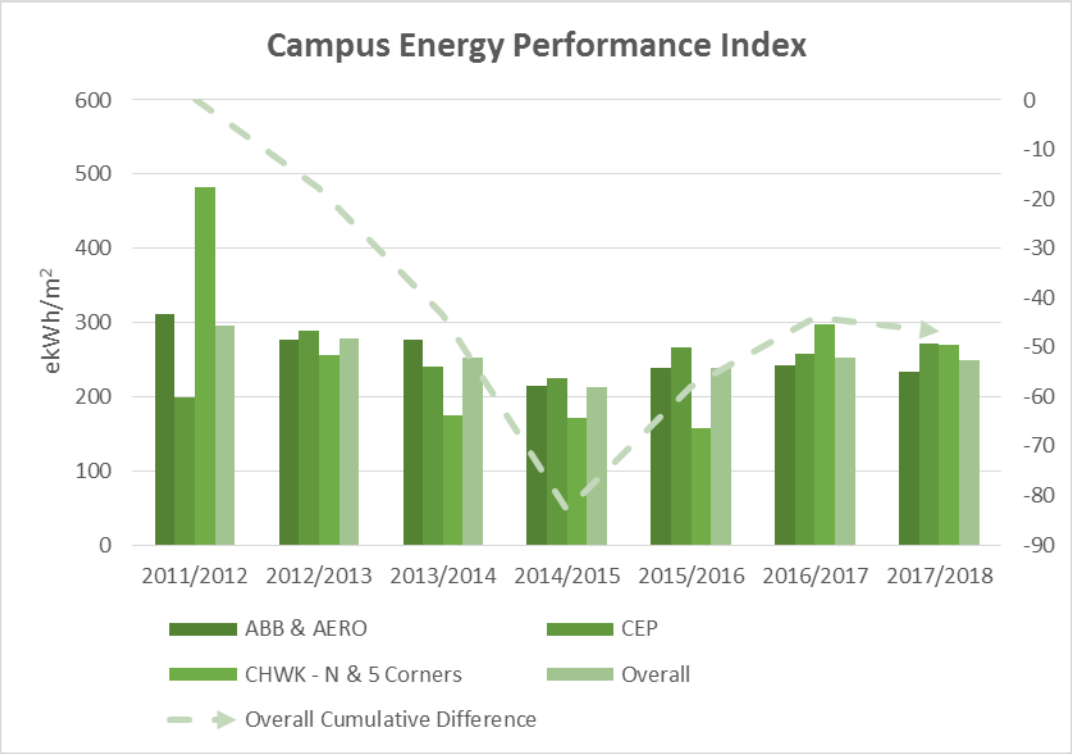


Figure 8: Annual campus Building Energy Performance Index (BEPI)

Energy and Weather Correlation

Weather, as discussed, plays a significant role in energy consumption. Heating and cooling systems are influenced by weather, i.e. colder winters demand higher heating loads, and therefore higher energy consumption. Similarly, hotter summers have higher cooling loads, and increased energy consumption.

Degree Days will assist in determining the effect that weather had on energy consumption in a given year, and as a result conclusions on the performance of buildings or individual systems can be made.

As an example, 2017/2018 was characterized by an average spring, a prolonged warm summer, and a below average winter. While the utility bills suggest that gas consumption (primarily for space and water heating) increased significantly compared to previous years, the graph and chart below show that the energy consumed (ekWh) as it correlates to weather conditions (DD) actually decreased a further 3.0%, pointing to an increase in overall energy efficiency organization wide.

Table 7: Annual campus energy and weather correlation

ekWh/DD	ABB & AERO	CEP	CHWK - N & 5 Corners	Overall	Difference	Overall Cumulative Difference	Difference From Previous Year
2011/2012	5,078	1,822	1,639	**8,539**	0	0	0
2012/2013	4,847	3,047	990	**8,885**	346	346.0	**3.9%**
2013/2014	4,604	2,415	643	**7,662**	- 1,223	-876.7	**-16.0%**
2014/2015	4,680	2,720	762	**8,161**	499	-377.6	**6.1%**
2015/2016	4,793	2,979	646	**8,418**	257	-120.3	**3.1%**
2016/2017	4,501	2,820	727	**8,048**	- 370	-490.7	**-4.6%**
2017/2018	4,251	2,916	643	**7,810**	- 238	-728.8	**-3.0%**

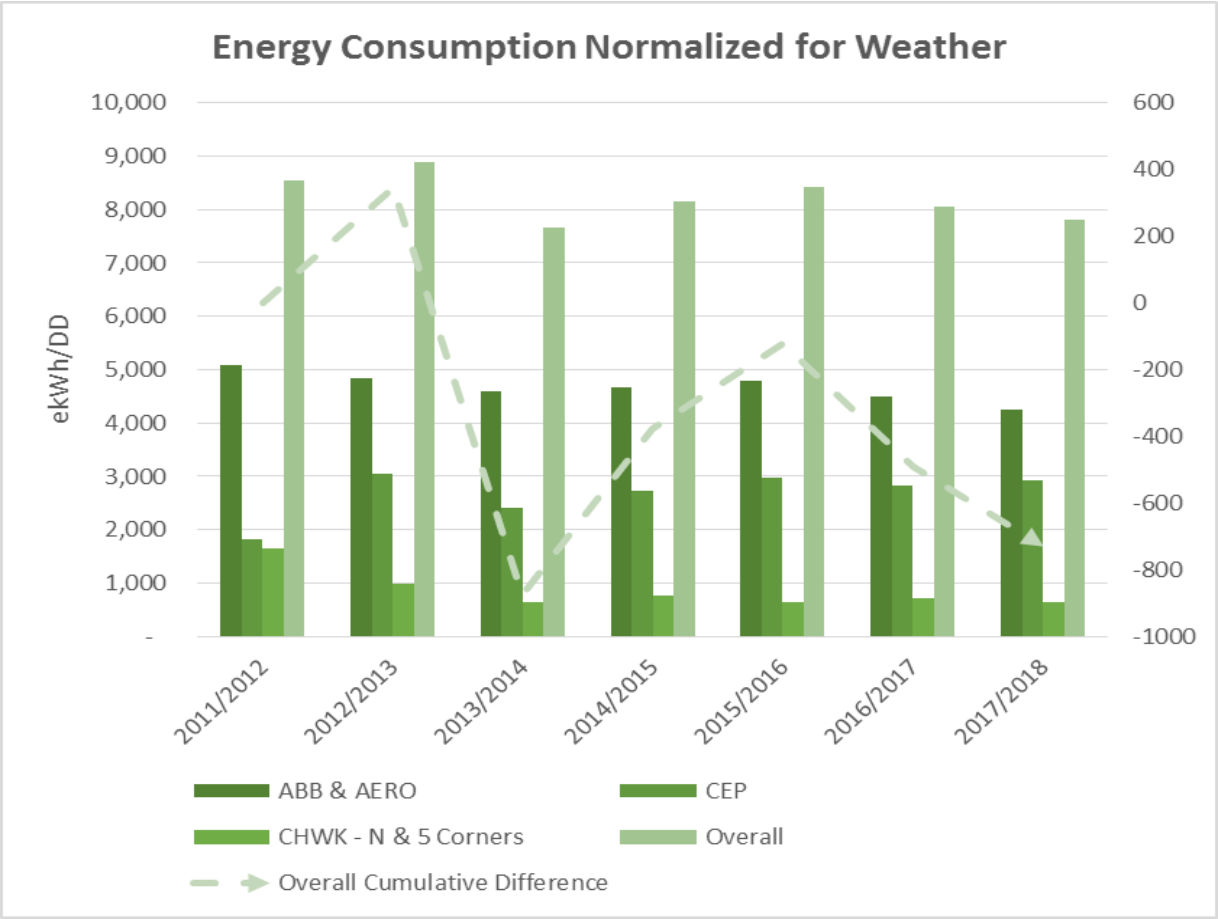


Figure 9: Annual campus energy and weather correlation

Energy Intensity Normalized for Weather

Previous sections have touched on the metrics used to monitor energy as it relates to space changes (BEPI) as well as weather (ekWh/DD). The graph and chart below account for both variables as we attempt to reliably monitor how efficiently our buildings are being operated. We do this using the following equation: ekWh/DD/m^2.

It has been demonstrated that energy consumption decreased, floor space remained the same (CEP Building S excluded), and Degree Days were above average. The 3.0% reduction in ekWh/DD/m^2 outlines the efforts of the key stakeholders in increasing energy efficiency throughout our buildings. This reduction is another positive step towards achieving the key goal outlined by the Energy Manager: reducing ekWh/DD/m^2 by 10% based on 2015/2016 levels by 2021/22. Another positive step forward for energy efficiency and sustainability at UFV.

Table 8: Annual energy intensity normalized for weather (ekWh/DD/m^2)

ekWh/DD/m^2	ABB & AERO	CEP	CHWK - N & 5 Corners	Overall	Difference	Overall Cumulative Difference	Difference From Previous Year
2011/2012	0.1026	0.0652	0.1587	**0.0973**	0	0	0
2012/2013	0.0979	0.1019	0.0902	**0.0983**	0.0010	0.0010	**1.1%**
2013/2014	0.0930	0.0808	0.0586	**0.0848**	-0.0135	-0.0125	**-16.0%**
2014/2015	0.0869	0.0910	0.0694	**0.0861**	0.0014	-0.0111	**1.6%**
2015/2016	0.0890	0.0997	0.0588	**0.0889**	0.0027	-0.0084	**3.1%**
2016/2017	0.0836	0.0884	0.1026	**0.0867**	-0.0022	-0.0106	**-2.5%**
2017/2018	0.0789	0.0914	0.0908	**0.0841**	-0.0026	-0.0131	**-3.0%**

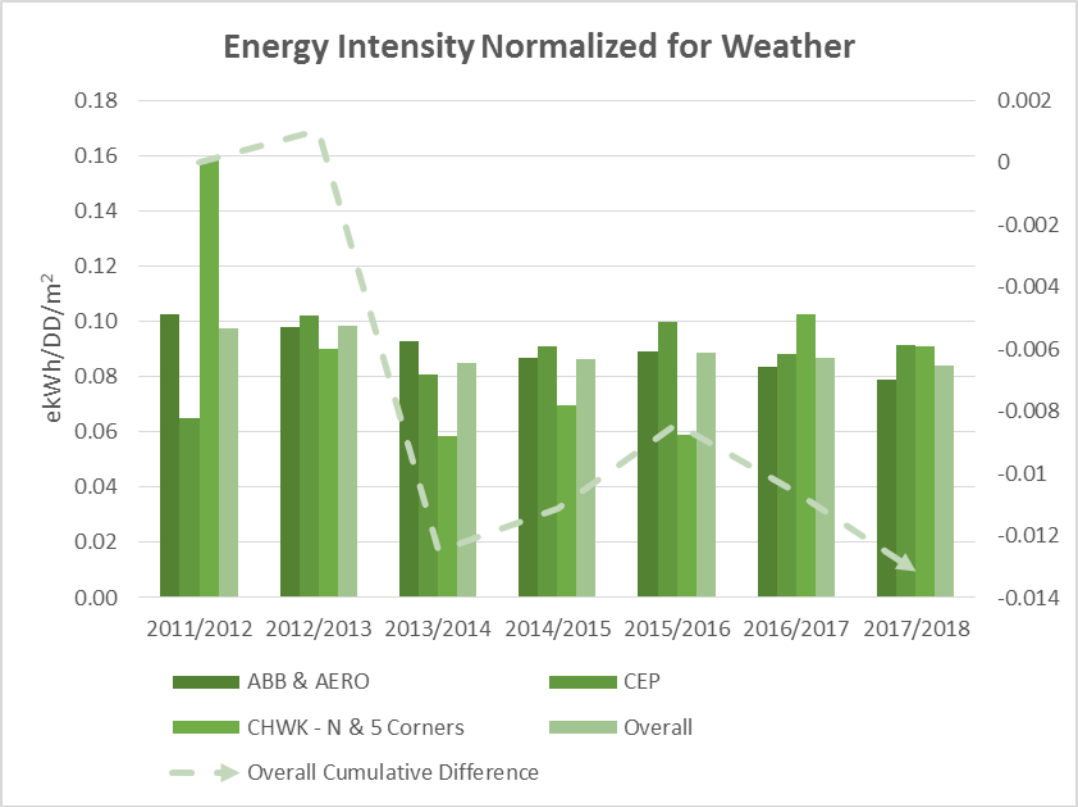


Figure 10: Annual energy intensity normalized for weather (ekWh/DD/m^2)

Energy Wise Network, Change Management, & Events

SustainableUFV, the campus champions of environmentally responsible initiatives, joined the Energy Wise Network in 2016. The Energy Wise Network is a collaborative network made up of Advanced Education, Government, Schools (K-12), Hospitality, Municipalities, Property Management, and Retail sectors. This network supplanted the Workplace Conservation Awareness program and was initiated by BC Hydro and FortisBC. The network provides campaign tool kits, professional coaching hours, networking opportunities, training webinars, and two summits per year providing the framework for many of the energy efficiency-focused initiatives throughout 2017/2018.

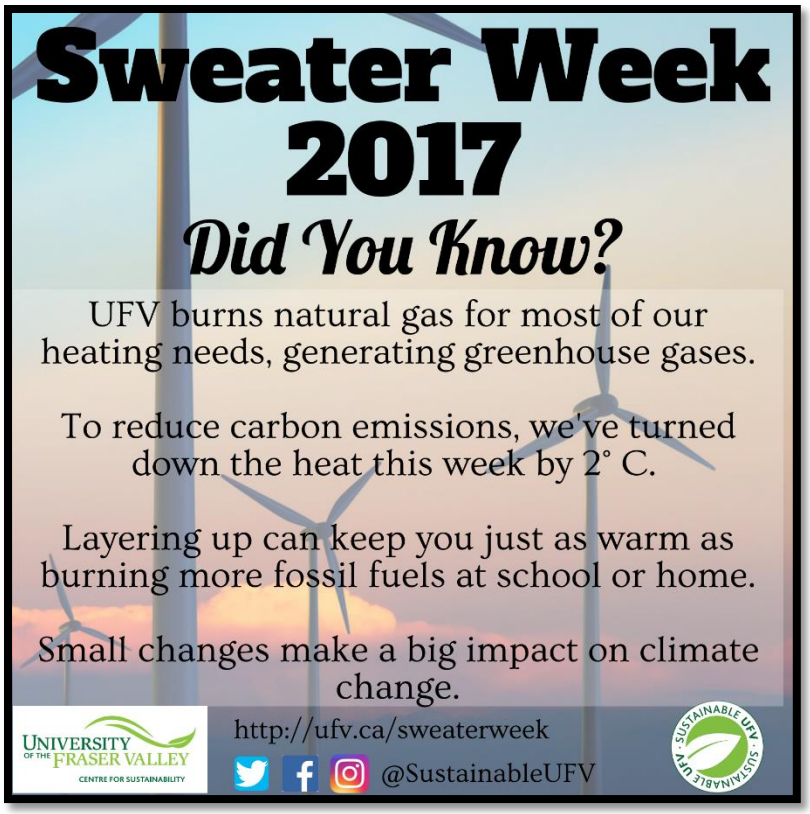
Energy Efficient Residences

In an effort to increase awareness regarding sustainability on campus, who better to involve than those that live on campus? The Energy Efficient Residences campaign was designed to start to connect students to the campus and begin to participate in the increasing sustainability culture that is being developed. While coordinating with the Housing Operations staff and management, there was immediate enthusiasm and commitment to participate in this campaign. They provided valuable insight not only into how to communicate with the residents, but also in regards to the particular behaviours that have been observed. The Energy Wise Network was instrumental in developing a framework with which to approach the residence staff, which provided them with an idea of what success looks like through a sustainability lens, and options for how to get there. The staff enabled and set in motion the *action* portion of the project that will take place in 2018/19 and beyond.

Sweater Week

The annual Sweater Week event is conducted in winter in order to promote warm workplace attire. In 2017 this event ran from the 20-24 of November, and built on the successes from the 2016 event. On an operational level, it was decided that this year the temperatures would be lowered by 2°C (to a minimum of 19.5°C instead of the previous year's minimum of 21.5°C). These reductions would be realized across all buildings – academic spaces and offices – at both of the main campuses in Abbotsford and Chilliwack. This decrease would be in full effect for the entire week, rather than administering a progressive reduction of temperatures, as was done in 2016. This new action reduced GHG emissions more significantly than by using the previous strategy, as well as created more talking points, which afforded more opportunities for participation.

The main source of engagement was a social media contest, in which students, staff, and faculty were encouraged to either post Sweater Week selfies on various platforms (Facebook, Twitter, and/or Instagram) or email selfies to the Sustainability Coordinator. Furthermore, volunteers formed the "Sustainable Selfie Squad," which involved setting up a daily station, an info and photo booth, in the cafeteria during the coffee and lunch time rushes to further drive engagement and get people talking about greenhouse gas emissions and sustainable practices as a whole.



The selfie contest yielded $200 in prizes to winners, including five $20 Campus Card vouchers to use at any food establishment on campus and two $50 grand prize gift cards to Valhalla Pure Outfitters. These prizes were issued for the "Best Overall Selfie" and the "Most Dedicated Sweater Weeker," respectively.

With an increased Sustainable Selfie Squad presence and overall momentum compared to last year, Sweater Week 2017 saw a 15% increase in photo submissions received from 79 to 91. There was also a 24% increase in individuals making submissions from 38 to 47. 2017 provided the most successful Sweater Week to date.

Get Your Fleece On 2.0

"Get Your Fleece On!" or, simply, "The Fleece Blanket Program" as it became known had a successful second heating season. Considering the overwhelmingly positive response received in 2016/17 and the ensuing waiting list for inventory, the continuation of this program was essential. Similar to the previous year, fleece blankets were provided to employees who were feeling consistently chilly in their workspace; although only after they had provided evidence that they had made efforts to have the HVAC system in their area assessed for any deficiencies that may have been causing the cooler temperatures. Additionally, a standard was set that those who were requesting blankets must also have been consistently ensuring that windows and doors were closed in their areas, and that they had been dressed appropriately for the season or weather.

Participants of the program were given insight on the adverse effects of space heaters and asked to sign a pledge that stated they would either use such devices less frequently or would remove them entirely from campus. This year, a survey was developed: Part 1 asked why participants were feeling cool, and a follow-up Part 2 was distributed in the spring to provide opportunities for feedback on how the blankets affected their comfort levels.

There were significantly fewer blankets distributed this year when compared to the last (18 vs. 125). Does this mean that nearly everyone that was once feeling chronically chilly is now comfortable? Had the conversations about HVAC and the diligence from the mechanical staff paid off in terms of troubleshooting and correcting problematic spaces? In all likelihood, it was a bit of both.

As energy efficiency, carbon emissions reduction, and sustainability are increasingly promoted and supported at UFV, students, staff, and faculty are much more understanding of the pressing nature of these issues and welcome any sustainable solutions – in this case, passive personal temperature regulation.

The feedback that was provided by uncomfortable staff members clearly indicated appreciation at having their concerns heard and at having actions taken to improve their comfort at work; the latter being stated even more enthusiastically.

Interestingly, there was an increased number of complaints received by the Facilities department with regards to occupants being 'cool' or 'cold'. Was this a response to witnessing an institutional willingness to act on those complaints? Or perhaps this is due to the previous search for feedback upon completion of the work? Time will tell.

LEED® Certification Celebration Events

UFV is home to two LEED® Gold certified buildings. LEED® is a third party green building certification system. The system is based on a points system, rewarding environmentally responsible design, construction, and operation of new, renovated, and old buildings. There are 4 ranked (from lowest to highest) levels of certification: certified, silver, gold, and platinum.

Canada Education Park Building A was built in 2012 and emits 68% less carbon per m^2 annually than other non-certified buildings at UFV. On September 26th, 2017 a plaque certifying the building was unveiled accompanied by speeches and cake.

Abbotsford Building S, the Student Union Building, was built in 2014. During the cold winter of 2016/2017, it achieved a 67% reduction in natural gas use per m^2 compared to other non-certified buildings. As mechanical staff are becoming progressively acquainted with the building, there has also been an increase in energy efficiency. On January 8th, 2018 a certification plaque was unveiled, also accompanied by speeches and cake.

Electric Vehicle Charging Stations

UFV has four stations capable of charging up to eight vehicles simultaneously that provide electricity to all students, staff, and faculty free of charge. The stations were installed in 2012/2013 at the Aerospace Campus (1), Abbotsford Campus (2), and CEP campus (1). There have been significant annual increases in individual charging sessions, energy provided for cost-free charging, and emissions reductions from traditional combustion engine vehicles. Data, provided by ChargePoint, the company that manages the technical components of UFV's EV charging stations, from 2017/2018 supports the commentary from EV drivers that the stations are typically in-use and that the campuses could use more charging infrastructures.

Table 9: EV charging station historical use

	Sessions	Energy (kWh)	Community GHG Savings (t)
2013/2014	51	227.5	0.096
2014/2015	459	3,150	1.325
2015/2016	971	9,830	4.13
2016/2017	1,357	13,928	5.85
2017/2018	1,396	13,076	5.49

Project Plans for 2018/2019

- Abbotsford A & B Buildings: Continuous Optimization
- Abbotsford A & D Buildings: Exterior Insulation Finish System (EIFS) project
- Abbotsford B Building: Fortis BC Carbon Capture Pilot
- Abbotsford B Building: Cafeteria deep fryer upgrade
- Abbotsford C Building: Continuous Optimization
- Abbotsford D Building: Continuous Optimization
- Abbotsford D Building: Chiller Upgrade
- Abbotsford D & G Buildings: Boiler purchases
- Abbotsford E Building: Solar Wall Study
- Abbotsford E Building: Level 2 EV Charging Station Installation
- Abbotsford G Building: Continuous Optimization
- Abbotsford G Building: Corridor and Rotunda LED Upgrade
- Abbotsford Friesen House: LED upgrade
- Abbotsford Campus: DC Fast Charging Station installation
- Canada Education Park Building A: Continuous Optimization
- Canada Education Park Building A: Level 2 EV Charging Station Installation
- Canada Education Park Building H: Fortis BC Carbon Capture Pilot
- Canada Education Park Building T: Interior LED Upgrade
- Canada Education Park Building T: Parking Lot Lighting LED Upgrade Study
- All Campuses: Stairwell lighting audit
- Fortis BC Energy Specialist funding approval

Progress Update

As UFV develops in size and influence, the culture of sustainability likewise grows within the organization. The environmentally-responsible approach to facilities operations is increasingly extending to new projects, renovations, and facilities maintenance. Furthermore, the prevalence and participation within campaigns for behavioural changes is improving energy efficiency not only at UFV, but also within the communities in which students and employees reside. Considering the above, in addition to the supporting metrics outlined within this report, 2017/2018 provided continuity to support the 2016/2017 refresh for sustainable energy management at the University of the Fraser Valley. Since that refresh, energy efficiency continues to be increased and ahead schedule in exceeding targets. Impactful projects are planned for 2018/2019, with many more big-picture projects that will provide significant positive contributions to sustainability and energy efficiency at the university in the long term. Energy efficiency, the reduction of greenhouse gas emissions, and an increased dedication to environmentally-responsible operations support the outlined strategic goals that are aimed at changing lives and building community.