



STRATEGIC ENERGY MANAGEMENT PLAN (SEMP)

Vancouver Community College



Senior Management Support:

Jamie Choi, CPA, CGA
Interim Vice President, Administration & CFO

September 2019

Signature: 

Partnering with:



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SEMP prepared by
Prism Engineering Ltd.
majid@prismengineering.com

1. EXECUTIVE SUMMARY

This Strategic Energy Management Plan (SEMP) supports Vancouver Community College's (VCC) commitment to energy efficiency and conservation by providing a framework for reducing energy consumption and its associated environmental impact. This SEMF includes a specific energy reduction target and an action plan of how the target will be achieved.

In the 2011-2014 VCC Strategic Plan, one of the VCC's values is environment respect, which includes:

"VCC respects the environment and seeks to reduce its environmental impact" and to "respect the environment, and educate students, staff and faculty about environmental stewardship."

In fiscal year 2018/19, VCC spent approximately \$1,057,000 on energy (\$797,000 for electricity, \$165,000 for natural gas and \$95,000 for steam). The total electricity, gas and steam use in 2018/19 were 8,392,600 kWh, 17,700 GJ and 4,900 GJ respectively.

As part of VCC's 2011-2014 Strategic Plan, a preliminary **10%** energy reduction target below 2010/11 by 2015/16 for Vancouver Community College was selected. However, by the end of March 2014, results of energy monitoring indicated that the 10% energy reduction target had been achieved. Based on a review of the campus operations, a detailed review of energy usage and opportunities identified by the VCC energy management team, a new energy reduction target was set. The new target was **20%** energy reduction below 2010/11 by 2017/18. However, the new target was achieved by end of March 2017. As a result, Vancouver Community College selected a new target to reduce energy savings by 25% in March 2020. The new target was also achieved 15 months before the target date.

The new target is as follows:

VCC will reduce campus energy intensity in existing buildings (Annacis Island campus excluded) by 45% from 2010/2011 fiscal year levels by end of 2020/2021 fiscal year through the implementation of cost-effective energy management initiatives.

It is anticipated that over this period total cumulative electricity savings would be approximately 15.5 GWh. The cumulative fuel (gas and steam combined) savings over the nine-year period would be approximately 109,600 GJ.

To enable VCC to achieve the reduction target, cost-effective energy management initiatives will be undertaken. In addition to energy savings potential, the initiatives taken will also be selected based on non-energy benefits, including occupant comfort, equipment reliability, maintenance costs, and operational improvements.

To meet this target, VCC has spent approximately \$1,692,000 in the last five fiscal years (2014/15 to 2018/19). During this period, BC Hydro has contributed over \$218,000 towards energy savings measures which has reduced the implementation cost to \$1,474,000.

VCC has allocated funding of approximately \$250,000 for fiscal year 2019/20 to upgrade lighting at Downtown Campus. The potential BC Hydro incentive is approximately \$68,000. The potential annual electricity savings is 375,000 kWh for a cost avoidance of \$37,000. In addition to the lighting upgrade, VCC has allocated funding of \$80,000 to add 20 heat pumps serving the second floor spaces to the Direct Digital Control (DDC) system.

2. INTRODUCTION

This SEMP supports VCC's commitment to energy efficiency and conservation by providing a **framework for reducing energy consumption** and its associated environmental impact. It includes a specific energy reduction target and an action plan of how the target will be achieved.

By implementing the actions detailed in this SEMP, VCC is demonstrating leadership through innovation and accountability for the resources it uses as an organization. Further, VCC is also reducing its exposure to energy cost escalations, demonstrating environmentally-responsible development, and reducing its reliance on the province's energy infrastructure.

To assist VCC with energy management, BC Hydro sponsored an Energy Management Assessment (EMA) for the organization in March 2012. The purpose of this assessment was to conduct a holistic analysis of energy-related practices at VCC and identify opportunities for organizational improvement. The 2012 EMA identified the five most critical areas for energy management at VCC, which included the need for an Energy Manager. A dedicated Energy Manager sponsored by the BC Hydro Power Smart program was engaged in March 2013 to address this gap.

The five critical areas identified by the BC Hydro Energy Management Assessment of VCC are:

- | | |
|-------------------------------|---|
| 1. Policy | <ul style="list-style-type: none">• Quantify past energy conservation activities; Create organization-wide directive, the SEMP; Communicate and report on the SEMP; Update the SEMP |
| 2. Targets / Reporting | <ul style="list-style-type: none">• Develop target; Develop specific KPIs; Incorporate operational parameters; Communicate to public and technical audiences; Develop procedure and follow-up on out-of-variance sites |
| 3. Plans / Actions | <ul style="list-style-type: none">• Develop Identify systems where upgrades were and can be performed; Execute work scopes including energy baseline studies. Analyze results; Maintain and prioritize project list; Plan for capital projects & review with management |
| 4. Teams / Committees | <ul style="list-style-type: none">• Obtain approval for Energy Manager and train energy manager; Assign tasks to Energy Manager; Establish a working committee |
| 5. Employee Awareness | <ul style="list-style-type: none">• Evaluate past activities; Determine avenues for communications and available resources; Plan & deliver communications; Encourage curriculum; Communicate: simply, quantified savings, SEMP, externally; Create feedback mechanism; Develop acknowledgement program. |

This SEMP provides the framework required to link together all aspects of energy management at VCC and give strategic direction for VCC to succeed in meeting its reduction target.

3. OUR COMMITMENT

3.1 Energy Commitment

Through signing this SEMP, VCC's Interim Vice President, Administration & CFO, **Jamie Choi**, has approved and signed VCC's commitment to energy conservation.

3.2 Climate Change Commitment

Under the Carbon Neutral Government Regulation of BC's Greenhouse Gas Reduction Targets Act, VCC reports on emissions to BC Climate Action Secretariat, and purchases credits to offset these emissions. As part of this, a Carbon Neutral Action Report is prepared by VCC each year outlining efforts undertaken and planned to reduce carbon emissions. Through the purchase of offsets **VCC is carbon neutral by definition.**

These reports can be found at:

<http://www.vcc.ca/about/college-information/reports-and-publications/>

As part of VCC's 2011-2014 Strategic Plan VCC committed to seeking innovative and improved practices that reduce its carbon footprint. The College had set a target to reduce its energy use and greenhouse gas emissions by 20% below fiscal year 2010/11 by March 2018. As of March 2018, greenhouse gas emissions were reduced by 46%. The reduction as of March 2019 was 51% below 2010/11.

3.3 Why Energy Management is Important to Us?

There are multiple commitments and reasons why energy management is important to VCC. First, the VCC *Environmental Policy* (2012 update) reads:

"The College establishes and maintains high standards of environmental stewardship to protect natural resources and minimize environmental impact. The College considers environmental factors in all its planning and decision-making activities."

In the 2011-2014 VCC Strategic Plan, one of the VCC's values is environment respect, which includes:

"VCC respects the environment and seeks to reduce its environmental impact" and to "respect the environment, and educate students, staff and faculty about environmental stewardship."

Furthermore, energy management also allows VCC to:

- Reduce operating costs through energy conservation and efficiency;
- Minimize the environmental impact of our organization;
- Reduce greenhouse gas emissions – of global importance;
- Reduce exposure to energy cost escalations;
- Reduce reliance on the province's energy infrastructure;
- Demonstrate effective management of resources;
- Promote our successes to the general public and other colleges and universities;
- Strive towards educating those who will shape the future of our community, province, and country on the importance of managing the resources we use.

4. OUR ORGANIZATION

4.1 Organizational Profile

Vancouver Community College (VCC) opened its doors in 1965, and currently focuses on delivering more than 140 certificates, diplomas, and bachelor degree in a variety of disciplines including arts, hospitality, health, transportation, English language, and education. There are two main campuses: the *Downtown campus* and the *Broadway campus*. Both campuses are included in this SEMP. Since August 2014, a new building - the Motive Power Centre located on Annacis Island - has been added to VCC buildings. Referred to as the Annacis Island Campus (AIC); this is a shared facility with BCIT. The energy consumption of AIC is not included in this document.

Table 1: Organization Profile

Organization Profile				
P E O P L E	Sector	Education (post-secondary)		
	Number of Full Time Students (2017/18 – approximate):	FTE students 6,149 FTE Students	Number of Sites:	Two main sites: - <i>Downtown campus</i> 34,030 m ² - <i>Broadway campus</i> 37,719 m ²
O P E R A T I O N S	Energy Management Issues / Obstacles	<ul style="list-style-type: none"> ▪ Availability of funding for energy efficiency projects; ▪ Limited sub-metering, particularly natural gas; ▪ Energy awareness and the behavioural change amongst faculty, staff, and students. ▪ Transient student population. 		
	Core Business Metrics	1. Building floor area (m ²) 2. Full-time equivalent (FTE) students 3. Classroom hours		
	Business Year	April 1 st to March 31 st		
	Budget Cycle	April 1 st to March 31 st		
	Operations/Maintenance Budget (<i>includes salaries, supplies, janitorial</i>)	2013/14: \$6,101,609 2016/17: \$5,863,373	2014/15: \$5,622,387 2017/18: \$5,980,965	2015/16: \$5,806,876 2018/19: \$6,408,028
	Utilities Budget* (<i>Elec, Gas, Steam, Water</i>)	2013/14: \$1,283,500 2016/17: \$1,207,600	2014/15: \$1,245,200 2017/18: \$1,177,300	2015/16: \$1,235,500 2018/19: \$1,192,900
	Energy Efficiency Projects (Capital)	2013/14: \$140,000 2016/17: \$309,000	2014/15: \$500,500 2017/18: \$375,500	2015/16: \$193,000 2018/19: \$330,000

4.2 Finance

In Fiscal 2018/19, \$227,000 was spent for lighting retrofits and upgrades at Broadway Campus which was finished by March 2019. Twenty nine heat pumps serving Downtown campus first floor were added to the DDC system with a cost of \$84,000.

Overall in Fiscal 2018/19, VCC spent \$311,000 for installing energy efficient systems at its campuses.

For Fiscal 2019/20, a budget of \$250,000 has been assigned for lighting upgrades at Downtown and Broadway campuses. In addition, a budget of \$80,000 is assigned for adding 20 heat pumps at Downtown campus to the DDC system.

For subsequent years, the Energy Manager Consultant will present a comprehensive list of projects from which VCC can allocate the funds during the budget process. The budget for energy projects will be allocated on a project by project basis, dependant on the proposed payback and the available funds.

4.3 Facility Profile

VCC operates on two main campuses, as follows¹:

- Broadway Campus
- Downtown Campus

Table 2 describes these facilities in more detail.

Table 2: Facility Profile for Apr 1st 2018 to Mar 31st 2019 (2018/19 Fiscal)

Campus	Building	Area (m ²)	Purposes	Annual Energy Consumption (ekWh)	Annual Energy Cost (\$)	Energy Intensity (ekWh/m ²)
Broadway	Building A	25,177	Administrative Offices (includes VPs, marketing and communications, finance, IT, HR), Registrar's Office and Student Counselling, Adult Basic Education, Music, Arts & Science, Automotive Trades, Language Studies, Cafeteria, Library	7,399,500	\$478,100	196
	Building B	12,542	Health Sciences			
Downtown	Downtown Complex	34,003	Culinary, Baking and Pastry Arts (15 kitchen labs), Jewellery Art & Design, Dental Programs, Hospitality Management, Registrar's Office and Student Counselling, Cafeteria and 2 Restaurants, Hair Design and Aesthetics (including the hair salon and spa), Library	7,259,700	\$578,900	214
Total		71,722		14,659,200	\$1,057,000	204

¹ Note that in August, 2014, VCC established a third campus, the Annacis Island Campus (AIC), in partnership with BCIT.

A summary of the energy intensities by energy source type is shown in Table 3.

Table 3: Building Areas and Energy Data Summary (2018/2019 fiscal)

Broadway

Site Name	Floor Area m ²	Electricity kWh	Electricity Cost	Natural Gas GJ	Natural Gas Cost	Steam GJ	Steam Cost	ekWh / m ²	Cost \$/m ²
Broadway- Electricity	37,719	3,541,200	\$348,700			-	-	94	\$9.24
Broadway- Gas	37,719	-	-	13,890	\$129,400	-	-	102	\$3.43
TOTAL		Total ekWh= 7,399,500		Total cost= \$478,100				196	\$12.67

Downtown

Site Name	Floor Area m ²	Electricity kWh	Electricity Cost	Natural Gas GJ	Natural Gas Cost	Steam GJ	Steam Cost	ekWh / m ²	Cost \$/m ²
Downtown- Electricity	34,003	4,851,400	\$448,600	-	-	-	-	143	\$13.19
Downtown- Gas	34,003	-	-	3,780	\$35,700	-	-	31	\$1.05
Downtown- Steam	34,003	-	-	-	-	4,890	\$94,600	40	\$2.78
TOTAL		Total ekWh= 7,259,700		Total cost= \$578,900				214	\$17.02

Total

Site Name	Floor Area m ²	Electricity kWh	Electricity Cost	Natural Gas GJ	Natural Gas Cost	Steam GJ	Steam Cost	ekWh / m ²	Cost \$/m ²
VCC- Electricity	71,722	8,392,600	\$797,300					117	\$11.12
VCC- Gas	71,722			17,670	\$165,100			68	\$2.30
VCC- Steam	71,722					4,890	\$94,600	19	\$1.32
TOTAL		Total ekWh= 14,659,200		Total cost= \$1,057,000				204	\$14.74

4.4 Key Performance Indicators

The standard metric used as a key performance indicator (KPI) within the Post-secondary Education sector is building area (m²). This alone only paints part of the picture however, and to provide a metric which can be related to by all levels of the organization, full-time equivalent students are also analyzed in Table 4.

Table 4: Energy Usage Intensity by Area and FTE Students

Fiscal Year	Total Energy Usage (ekWh)	Area (m ²)	FTE Students	ekWh/m ²	ekWh/ FTE Student
2010/11	23,806,700	71,722	7,908	332	3,010
2011/12	23,945,100	71,722	7,799	334	3,070
2012/13	22,627,000	71,722	8,010	315	2,825
2013/14	21,684,700	71,722	7,888	302	2,749
2014/15	19,110,900	71,722	6,908	266	2,766
2015/16	18,504,800	71,722	6,240	258	2,966
2016/17	17,897,600	71,722	6,159	250	2,906
2017/18	15,750,900	71,722	6,149	220	2,562
2018/19	14,659,200	71,722	6,584	204	2,226

5. UNDERSTANDING OUR SITUATION

5.1 Utility meters

VCC does not currently have sub-metered buildings, but has one electrical account, and one natural gas account per campus. The Downtown campus also uses steam.

Table 5: Utility Accounts

Name	Fuel Type	Account Number	Vendor Name	Rate
GAS-DTN	Natural Gas	1178581	Fortis BC, Shell	Large Commercial
GAS-BWY	Natural Gas	1178795	Fortis BC, Shell	Large Commercial
ELEC-DTN	Electrical	1180840001	BC HYDRO	1611
ELEC-BWY	Electrical	5551123351	BC HYDRO	1610
STM-DTN	Steam	58	Creative Energy	Creative Energy

5.2 Utility Consumption and Costs

The overall utility energy use and cost for VCC are shown by the pie charts below. As shown in Figure 1, in 2018/19 electricity accounted for 57% of the total energy use, but 75% of the overall energy cost. Natural gas accounted for 34% of the total energy consumption, and 16% of the overall energy cost. Purchased steam accounted for 9% of the total energy consumption, and 9% of the overall energy cost.

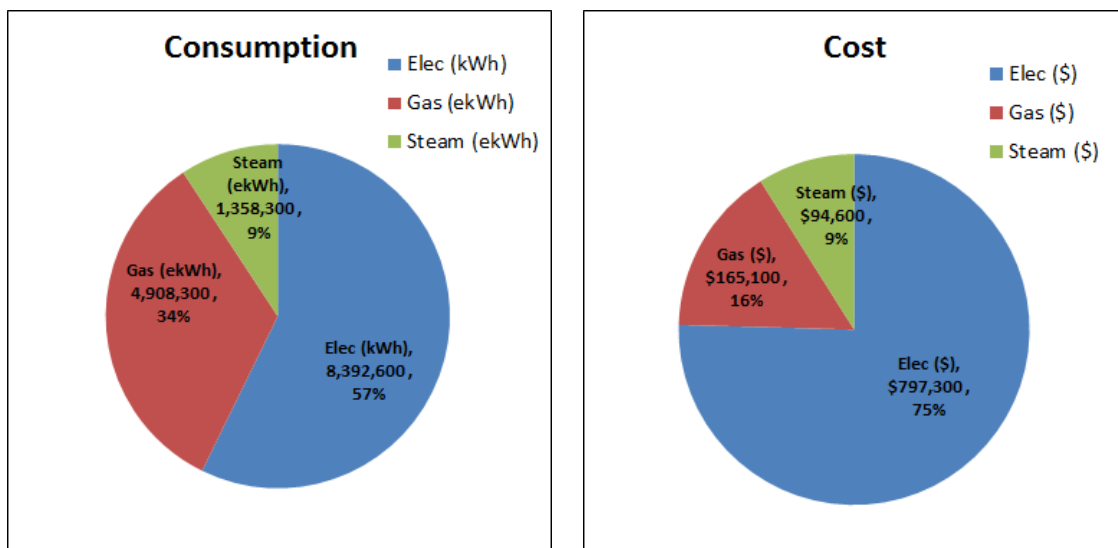


Figure 1: FY 2018/19 Energy Consumption and Cost Breakdown

The historical energy consumption (in ekWh) and costs for VCC is shown graphically below.

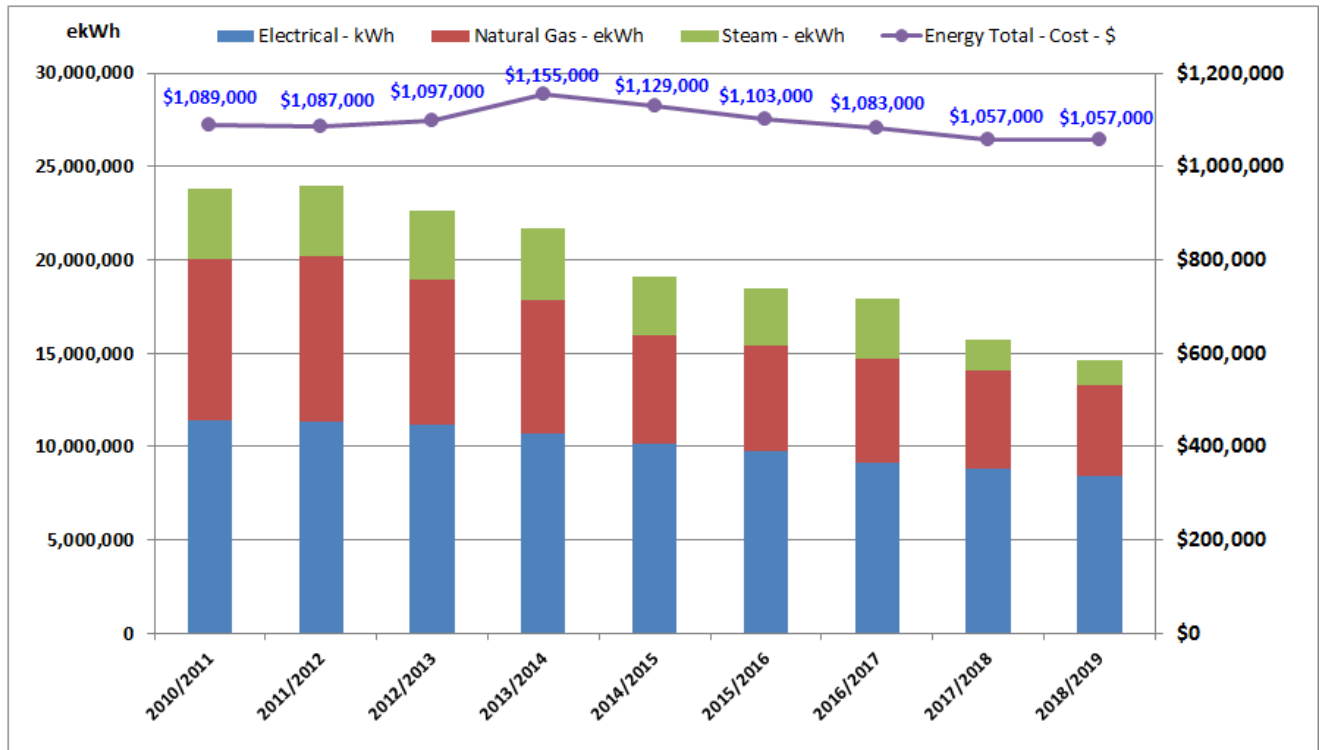


Figure 2: Historical Energy Consumption and Cost – both campuses

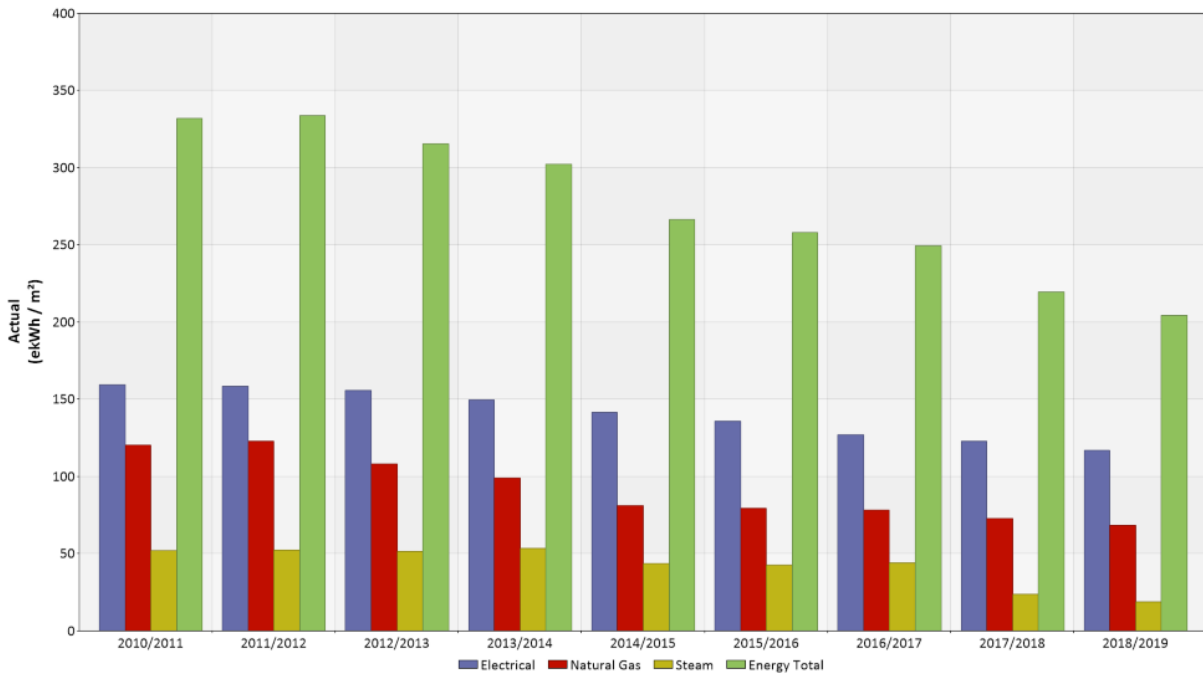


Figure 3: Historical Energy Use Intensity – both campuses

5.3 Base Period Selection

In order to track energy savings, a 'base period' must be selected in order to provide a platform for comparing energy use. The base periods have been established for each energy account based on the following considerations:

- A full 12-month base period, as close to the fiscal 2010/2011, was selected to incorporate seasonal fluctuations in weather.
- The base period selected was after any major retrofits which have occurred – the base period therefore represents consistent operation;
- The base period selected was prior to the Energy Manager Program start and matches the year in which VCC became carbon neutral under the Carbon Neutral Government Regulation of BC's Greenhouse Gas Reduction Targets Act.

The base periods for each energy account are shown in the table below.

Table 6: Base Period selection

Site Name	Fuel Type	Account Number	Base Start	Base End	Days
Downtown	Electrical	1180840001	March 26, 2010	March 25, 2011	365
Downtown	Natural Gas	1178581	April 1, 2010	March 31, 2011	365
Downtown	Steam	58	April 1, 2010	March 31, 2011	365
Broadway	Electrical	5551123351	April 8, 2010	April 7, 2011	365
Broadway	Natural Gas	1178795	April 1, 2010	March 31, 2011	365

The baseline will be used to calculate energy savings moving forward in time, normalized for weather. Where a correlation between energy consumption and outdoor temperature exists (i.e. 'cooling' or 'heating' in the table above), a model (equation) has been generated for predicting energy consumption based on weather data.

5.4 Energy Breakdown

To determine a breakdown of energy consumption by end-use under current conditions, a detailed inventory of all energy consuming equipment would be required. To undertake this task for the entire campus is time intensive. In February 2003 an Energy Audit was conducted for the Vancouver Community College by Prism Engineering. Although changes have been made to building use since this time, the end-use breakdown shown below still provides an indicative view of where electricity is used at the two VCC campuses.

As can be seen on the charts, the largest consumer of electricity is heat pumps, lighting and air distribution systems.

Electrical Energy by Energy End Use

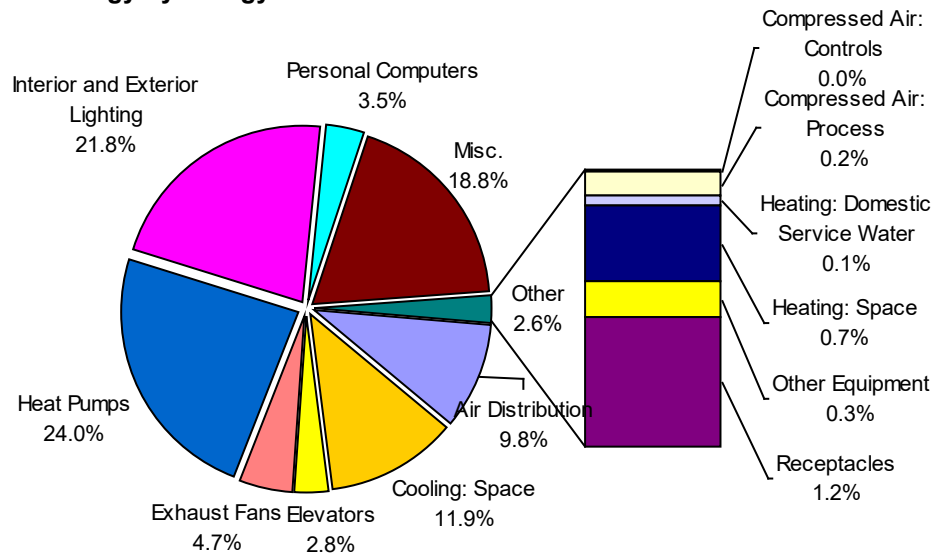


Figure 4: Electrical Energy End Use Breakdown for Downtown Campus (2001)

The miscellaneous electrical end uses at Downtown Campus include kitchen and cafeteria refrigeration systems, hairdressing and laundry equipment as well as lab equipment and tools.

Gas and Steam Usage by Energy End Use

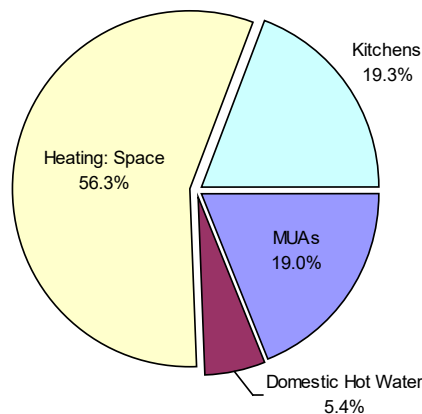


Figure 5: Gas and Steam Energy End Use Breakdown for Downtown Campus (2001)

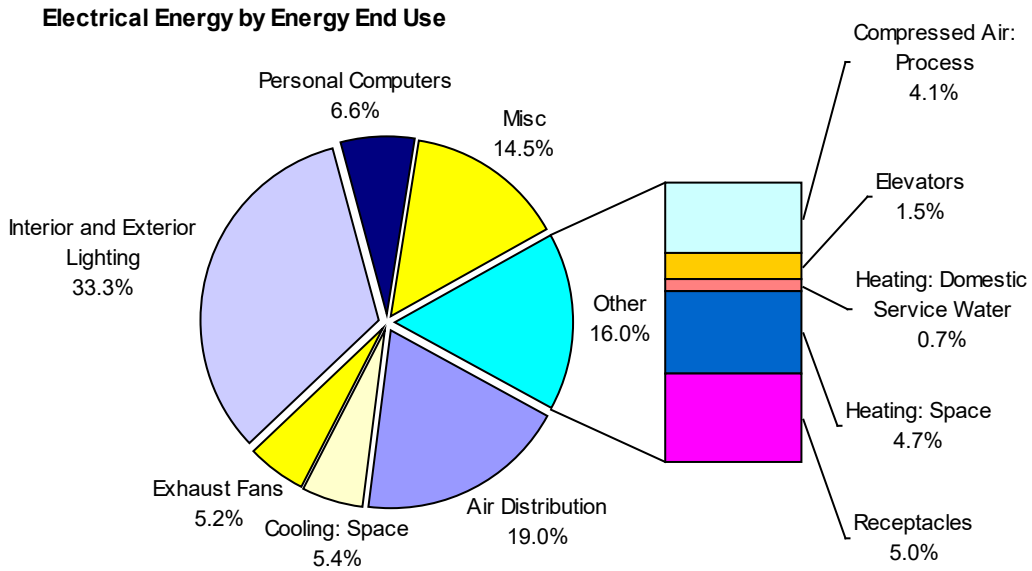


Figure 6: Electrical Energy End Use Breakdown for Broadway Campus – Building A (2001)

The miscellaneous electrical end uses at Broadway include kitchen and cafeteria refrigeration systems, as well as workshop equipment and tools.

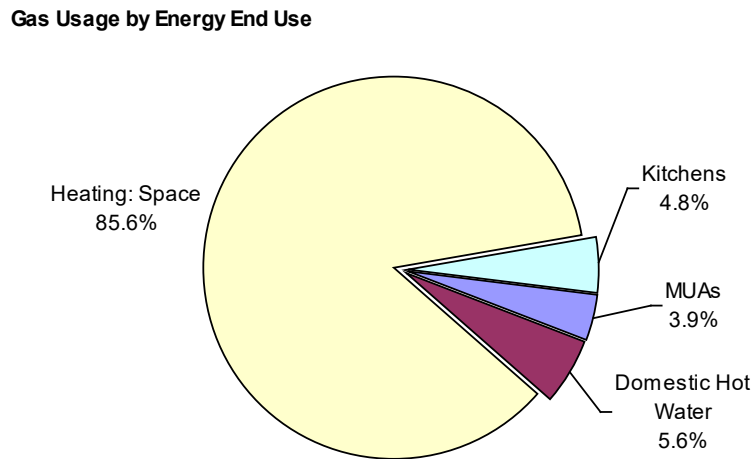


Figure 7: Gas Energy End Use Breakdown for Broadway Campus – Building A (2001)

5.5 Benchmarking

Comparison to College Sector

The following figure includes a comparison of the energy use intensity of both VCC campuses compared to other educational institutions located in BC as determined by Prism's Utility Management and Analysis software. The chart also shows the median energy intensity for 10 other campuses in BC. The energy data is for **calendar year 2018**, which is adjusted for weather in different zones.

The figure shows the difference between the VCC campuses. Both campuses have energy use intensities below the median. The VCC Broadway Campus (199 ekWh/m²) has one of the better energy use intensities in the comparison. The VCC Downtown Campus (219 ekWh/m²) showed an improvement in 2018 by becoming a lower than median for the first time.

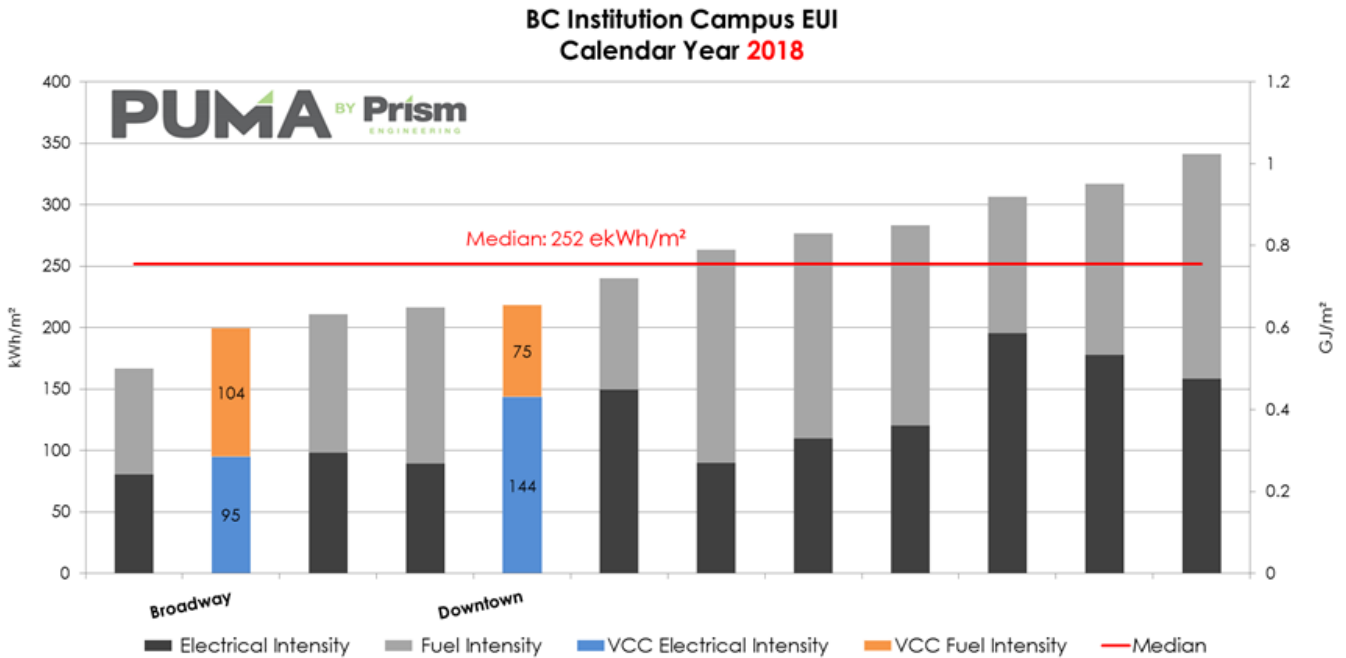


Figure 8: Benchmarking comparison to other colleges in BC

It should be noted that above energy use intensities are for calendar year 2018(not fiscal year 2017/18). Other charts and tables in this report are based on 2018/19 fiscal year.

6. OUR ACTIONS

As part of VCC's 2011-2014 Strategic Plan a preliminary target of a 10% reduction in electricity and fuel energy usage was selected. However, by the end of March 2014, results of energy monitoring indicated that the 10% energy reduction target had been achieved. Based on a review of the campus operations, a detailed review of energy usage and opportunities identified by the VCC energy management team, a new energy reduction target was set. The new target was reducing energy intensity by 20% from 2010/2011 fiscal year levels by end of 2017/2018 fiscal year. An analysis of the savings in March 2017 indicated that the 20% energy reduction target had been achieved. Therefore, a new energy reduction target was set. To reduce campus energy intensity by 25% from 2010/2011 fiscal year levels by 2019/2020 fiscal year through implementation of cost-effective energy management initiatives. Currently, VCC has achieved its target of 25% reduction in energy use.

The new energy reduction target for VCC is as follows:

VCC will reduce **campus energy intensity in existing buildings by 45% from 2010/2011 fiscal year levels by 2020/2021 fiscal year** through implementation of cost-effective energy management initiatives.

Progress towards the target will be corrected for fluctuations in weather.

6.1 Annual Goals and Objectives

The following table outlines annual goals for energy reduction so that the overall goal can be achieved.

Table 7: Annual Energy Reduction Targets

Fiscal Year	Electricity			Fuel			Overall Energy			
	Reduction Target	Energy Intensity	Energy Use	Reduction Target	Energy Intensity	Energy Use	Reduction Target	Energy Intensity	Energy Use	
	% of Base Period	kWh/m ²	kWh	% of Base Period	ekWh/m ²	ekWh	% of Base Period	ekWh/m ²	ekWh	
2010/2011 (Base)		160	11,440,400		172	12,366,300		332	23,806,700	Actual
2011/2012	1%	159	11,368,100	-2%	175	12,577,000	-1%	334	23,945,100	"
2012/2013	2%	156	11,172,400	7%	159	11,454,600	5%	315	22,627,000	"
2013/2014	6%	150	10,738,000	11%	152	10,946,700	9%	302	21,684,700	"
2014/2015	11%	142	10,155,300	28%	124	8,955,600	20%	266	19,110,900	"
2015/2016	15%	136	9,742,400	29%	122	8,762,400	22%	258	18,504,800	"
2016/2017	20%	127	9,114,500	29%	122	8,783,100	25%	250	17,897,600	"
2017/2018	23%	123	8,817,500	44%	97	6,930,600	34%	220	15,748,100	"
2018/2019	27%	117	8,392,600	50%	87	6,264,700	38%	204	14,657,300	"
2020/2021	33%	107	7,665,100	58%	72	5,193,800	46%	179	12,858,900	Projected
2024/2025	33%	107	7,665,100	73%	47	3,338,900	54%	153	11,004,000	"
2029/2030	39%	97	6,978,600	80%	34	2,473,300	60%	132	9,451,900	"

These targets may be subject to adjustment over time due to:

- The timing of implementation of projects;
- Availability of funding for energy projects;
- Major changes in building use.

6.2 Planned Actions

To enable VCC to achieve the reduction target outlined in Section 6.1, cost-effective energy management initiatives will be undertaken. In addition to energy savings potential, the initiatives taken will also be selected based on non-energy benefits, including occupant comfort, equipment reliability, maintenance costs, and operational improvements.

6.2.1 Potential Projects

Major potential projects which will help VCC to achieve the reduction target include:

- **Lighting**

Multiple opportunities at both campuses, examples include:

- *Daylight controls installs for high fenestration areas*
- *Occupancy control in corridors*
- *Daylight control of fluorescent luminaires in hallways in Tower*
- *Convert T8 fluorescent to LED technology*
- *Demand response and dimming control for offices*

- **Demand Controlled Ventilation for Kitchens**

- *Constant 100% fan speed at present*
- *Proposed system varies the exhaust and makeup fan speeds based on the level of cooking activity taking place.*
- *Cooking activity measured by temperature sensors in kitchen hood collar.*
- *Savings achieved through reduced outdoor air ventilation heating requirements, and fan electrical savings.*

Table 8: Summary of Potential Energy Savings Projects – Two Fiscal Years

FY	Project	Location	Projected Completion Date	Potential Electrical Savings (kWh)	Potential Other Fuel Savings (GJ)	Potential Total Savings (Energy + Operational) (\$)	Total Cost (\$)	BC Hydro/ Fortis BC Incentive (\$)	Projected Total Cost incl. Incentive (\$)
2019/20 & 2020/21	Behavioral Change Program	VCC	Ongoing	20,000	0	\$1,200	\$3,000	\$1000	\$2,000
"	Lighting Upgrades - LED Lamps	DTN	Mar-20	375,000	0	\$40,000	\$250,000	\$68,000	\$182,000
"	Lighting Upgrades - Building "B" Bookstore and Atrium LED Lamps	BWY	Mar-20	24,000	0	\$2,000	\$35,000	\$4,000	\$31,000
"	Installing VFDs for 12 AHUs Fan Motors	BWY	Mar-20	118,500	0	\$7,000	\$110,000	\$20,000	\$90,000
"	Add 2nd & 3rd Floor Heat Pumps to DDC and Add Occupancy Sensors	DTN	Mar-21	175,000	0	\$11,000	\$120,000	\$0	\$120,000
"	Install Kitchen Hood Demand Controlled Ventilation	DTN	Mar-21	100,000	1,000	\$14,000	\$150,000	\$0	\$150,000
"	C.Op. (DDC Continuous Optimization) - Implementation - VFDs	DTN	Mar-21	53,400	0	\$3,200	\$50,000	\$0	\$50,000
	Total			865,900	1,000	\$78,400	\$718,000	\$93,000	\$625,000

Table 9: Summary of Energy Savings Projects-Past

FY	Project	Location	Projected Completion Date	Potential Electrical Savings (kWh)	Potential Other Fuel Savings (GJ)	Potential Total Savings (Energy + Operational) (\$)	Total Cost (\$)	BC Hydro/ Fortis BC Incentive (\$)	Projected Total Cost incl. Incentive (\$)
2014/15	Compressed Air Leakage Repairs	BWY	Jun-14	67,000	0	\$4,600	\$500	\$0	\$500
"	Align AHUs Operation with Occupancy	BWY	Aug-14	158,000	500	\$17,000	\$500	\$0	\$500
"	Lighting Retrofits-Ph1	DTN	Mar-15	237,000	0	\$36,600	\$276,500	\$64,100	\$212,400
"	Lighting Retrofits-Exterior	BWY	Mar-15	68,000	0	\$10,000	\$223,000	\$15,250	\$207,750
	Sub-Total			530,000	500	\$68,200	\$500,500	\$79,350	\$421,150
2015/16	Behavior Change Program	DTN & BWY	Mar-16	51,000	0	\$3,800	\$3,000	\$0	\$3,000
"	Lighting Retrofits and Controls-Interior	BWY	Mar-16	175,000	0	\$25,000	\$190,000	\$46,600	\$143,400
	Sub-Total			226,000	0	\$28,800	\$193,000	\$46,600	\$146,400
2016/17	Behavior Change Program	DTN & BWY	Mar-17	50,000	0	\$4,000	\$3,000	\$1,000	\$2,000
"	C.Op. Investigation	BWY	Mar-17	0	0	\$0	\$38,000	\$19,000	\$19,000
"	Lighting Retrofits and Controls	BWY	Mar-17	45,350	0	\$5,000	\$86,000	\$0	\$86,000
"	C.Op. Investigation	DTN	Nov-16	0	0	\$0	\$38,000	\$19,000	\$19,000
"	C.Op. Implementation	DTN	Mar-17	70,000	1,800	\$35,000	\$23,000	\$0	\$23,000
"	Lighting Retrofits and Controls	DTN	Mar-17	67,300	0	\$6,100	\$63,000	\$0	\$63,000
"	Add HPs to DDC and Occupancy Sensor (Floor 9)	DTN	Mar-17	57,500	0	\$4,600	\$55,500	\$0	\$55,500
"	Add RTUs-318 and-320 to DDC	DTN	Mar-17	13,100	0	\$1,100	\$2,500	\$0	\$2,500
	Sub-Total			303,250	1,800	\$55,800	\$309,000	\$39,000	\$270,000
2017/18	Behavior Change Program	DTN & BWY	Mar-18	20,000	0	\$1,900	\$3,000	\$1,000	\$2,000
"	Lighting Upgrades – LED Lamps	DTN	Mar-18	57,000	0	\$6,700	\$69,500	\$8,000	\$61,500
"	Lighting Upgrades – LED Lamps	BWY	Mar-18	114,700	0	\$17,800	\$145,000	\$20,000	\$125,000
"	Install Premium Efficient Motors for Fluid Coolers	DTN	Jan-18	12,000	0	\$1,100	\$22,000	\$0	\$22,000
"	Add First Floor Heat Pumps (31) to DDC and Add Occupancy Sensors for 12 Classrooms	DTN	Jan-18	160,300	0	\$15,000	\$66,000	\$0	\$66,000
"	C.Op. Implementation	BWY	Mar-18	100,000	700	\$14,600	\$70,000	\$0	\$70,000
	Sub-Total			464,000	700	\$57,100	\$375,500	\$29,000	\$346,500

FY	Project	Location	Projected Completion Date	Potential Electrical Savings (kWh)	Potential Other Fuel Savings (GJ)	Potential Total Savings (Energy + Operational) (\$)	Total Cost (\$)	BC Hydro/ Fortis BC Incentive (\$)	Projected Total Cost incl. Incentive (\$)
2018/19	Behavioral Change Program	DTN & BWY	Mar-19	20,000	0	\$1,200	\$3,000	\$1,000	\$2,000
"	Lighting Upgrades - LED Lamps	BWY	Mar-19	129,000	0	\$19,400	\$227,000	\$23,400	\$203,600
"	Add 1 st Floor Heat Pumps (29) to DDC and Add Occupancy Sensors for 8 Classrooms/Board room	DTN	Dec-18	135,400	0	\$8,100	\$83,600	\$0	\$83,600
	Sub-Total			284,400	0	\$28,700	\$313,600	\$24,400	\$289,200
Total 5 Years				1,807,650	3,000	\$238,600	\$1,691,600	\$218,350	\$1,473,250

6.2.2 Projects Completed

- **Energy Conservation and Awareness:** This activity, based on the BC Hydro Energy Wise Network Program, provides VCC with the campaign support to change behaviours across campus. The annual savings from changing behaviour is estimated at 0.5% of total electricity consumption per year.

Planned activities for **2014/15** included:

- **Random Acts of Green:** A competition to share photos of VCC's staff and students green actions (From September to October 2014)
- **Communications:** Recruitment to the Green Team and behaviour modeling through increased membership
- **Training:** Instructions and training session for students on use of leak tags for compressed air distribution lines

Planned activities for **2015/16** included:

- **Infographic & Newsletter:** Updating the sustainability infographic on a quarterly basis and writing a newsletter (September, January, March, Summer)
- **Communications:** Two success stories on the technical projects
- **Student Promotions:** Support during Welcome Days for sustainability engagement

Planned activities for **2016/17** included:

- **Elevators Campaign:** Target students to use stairs instead of elevators
- **Room Booking Campaign:** Target Program assistants, Dean assistants, Department assistants who book the rooms for classes and labs to book the rooms only for the hours needed

Planned activities for **2017/18** included:

- **Communications:** Working with the ESAG and the VCC Green Team, VCC produced a green e-newsletter in 2017 and a success story regarding one million Dollar savings on avoided energy cost since fiscal year 2010/11.
- **Holiday Shutdown Campaign:** A "Holiday Shutdown" campaign was planned and implemented in December 2017.

Planned activities for **2018/19** included:

- **Communications:** Working with the ECAT (Environmental Committee Action Team), VCC prepared a success story regarding update savings on avoided energy cost since fiscal year 2010/11.
- **Space Heater Campaign:** A "Space Heater" campaign was implemented in November 2018.
- **Holiday Shutdown Campaign:** A "Holiday Shutdown" campaign was implemented in December 2018.

-
- **Lighting Retrofits at Downtown Campus:**
 - **2014/15:** The phase 1 of lighting upgrade in Downtown was approved for implementation in 2014. This phase was completed by March 2015.
 - **2016/17:** The lobby and exterior lighting systems were upgraded with LED technology. Occupancy sensors were installed in washrooms and daylight sensors were installed in cafeteria sitting area and select corridors. The upgrades were completed by March 2017.
 - **2017/18:** The lighting upgrades to the Downtown campus were completed in March 2018. The project involved upgrading the T8 fluorescent lighting systems to LED in select areas such as the parkade, lecture theatre, carpentry shop, and hallways. Occupancy sensors were installed in the parkade to automatically dim the lights down to 50% when there are no occupants. Incandescent exit signs were also retrofitted with LED conversion kits. These upgrades would result in savings of over 57,000 kWh per year.

 - **Lighting Retrofits at Broadway Campus:**
 - **2014/15 Exterior:** The exterior and parkade lighting upgrade in Broadway campus was approved for implementation in February 2015. The upgrades were completed by end of March 2015.
 - **2015/16 Interior:** The interior lighting upgrade in Broadway campus was approved for implementation in June 2015. The upgrades were complete by end of March 2016.
 - **2016/17:** The Automotive Shop in Building A was re-lamped with LED technology lamps. The fluorescent luminaires in Building B corridors were replaced with new LED luminaires. The upgrades were completed by March 2017.
 - **2017/18:** The lighting upgrades at the Broadway campus were completed in March 2018. The project involved retrofitting all of the fluorescent luminaires (approximately 1,600 in total) in Building B with dimmable LED T8 lamps and drivers. This upgrade is expected to result in savings of approximately 115,000 kWh per year.
 - **2018/19:** Additional lighting upgrades at the Broadway campus were completed in March 2019 that included upgrading all T8 fluorescent luminaires in Building A to LED technology. The annual energy savings was approximately 129,000 kWh. The project cost was \$227,000, which was reduced to \$204,000 after BC Hydro incentive.

-
- **Continuous Optimization of DDC System at Downtown Campus:**
 - **Investigation:** The investigation phase of the Continuous Optimization for Downtown campus was approved in September 2015. The investigation report was complete by November 2016.
 - **Implementation:** Majority of the recommended measures were implemented in March 2017. Installing variable frequency drives for fluid coolers is planned for future fiscal years.
 - **Continuous Optimization of DDC System at Broadway Campus:**
 - **Investigation:** The investigation phase of the Continuous Optimization for Broadway campus was approved in June 2016. The investigation report was complete by July 2017.
 - **Implementation:** The recommended measures were implemented by March 2018, which are estimated to save 100,000 kWh electricity and 700 GJ natural gas per year.
 - **Mechanical Systems Retrofits at Downtown Campus:**
 - **2016/17 - Add Fifteen Heat Pumps and Two Rooftop Units to DDC System:**

Fifteen heat pumps serving tower's floor 9 offices and classrooms were added to the DDC system and a weekly schedule was used to control the units. In addition, two Rooftop units serving JJ Restaurant and a storage room were added to DDC with weekly schedules.
 - **2017/18 - Add Thirty One Heat Pumps to DDC System:**

Thirty One heat pumps serving third floor offices and classrooms were added to the DDC system and a weekly schedule was used to control the units.
 - **2017/18 – Replace Standard Efficiency Motors with Premium Efficiency:**

In 2017, the standard efficiency electrical motors of three existing fluid coolers were replaced with premium efficiency motors. Estimated annual energy savings for this upgrade was approximately 12,000 kWh.
 - **2018/19 - Add Heat Pumps serving first and second floors to DDC System:**

Thirty seven heat pumps serving first and second floor offices and classrooms were added to the DDC system and a weekly schedule was used to control the units.

7. MONITORING AND REPORTING – HOW ARE WE DOING?

7.1 Energy Savings

This section of the SEMP tracks the energy savings in comparison to the baseline, and provides the means necessary to track success towards the energy reduction target as set in Section 6.1.

The following chart shows cumulative savings over time since the 2010/11 base period for Vancouver Community College. As time goes on, this graph will be updated and progress followed. The cumulative savings shown in the graph are represented by equivalent kWh (ekWh) and are **adjusted for fluctuations in weather**. Negative savings (downward slope) on the graph represent an *increase* in consumption, and vice-versa.

As can be seen, at the end of Fiscal Year 2018/19 the cumulative energy savings since the base period is positive, representing a **decrease in consumption in comparison to the base period**.

The total energy saved between April 1st 2011 and March 31st 2019, normalized for weather, is approximately 35,494,300 ekWh.

[Electricity 12,609,200 kWh, natural gas 16,778,400 ekWh (60,430 GJ) and steam 6,106,700 ekWh (22,000 GJ)]

Based on the above achievement, VCC is moving in right direction to meet reduction target and will continue this momentum through an effective energy management program lead by the Energy Manager.

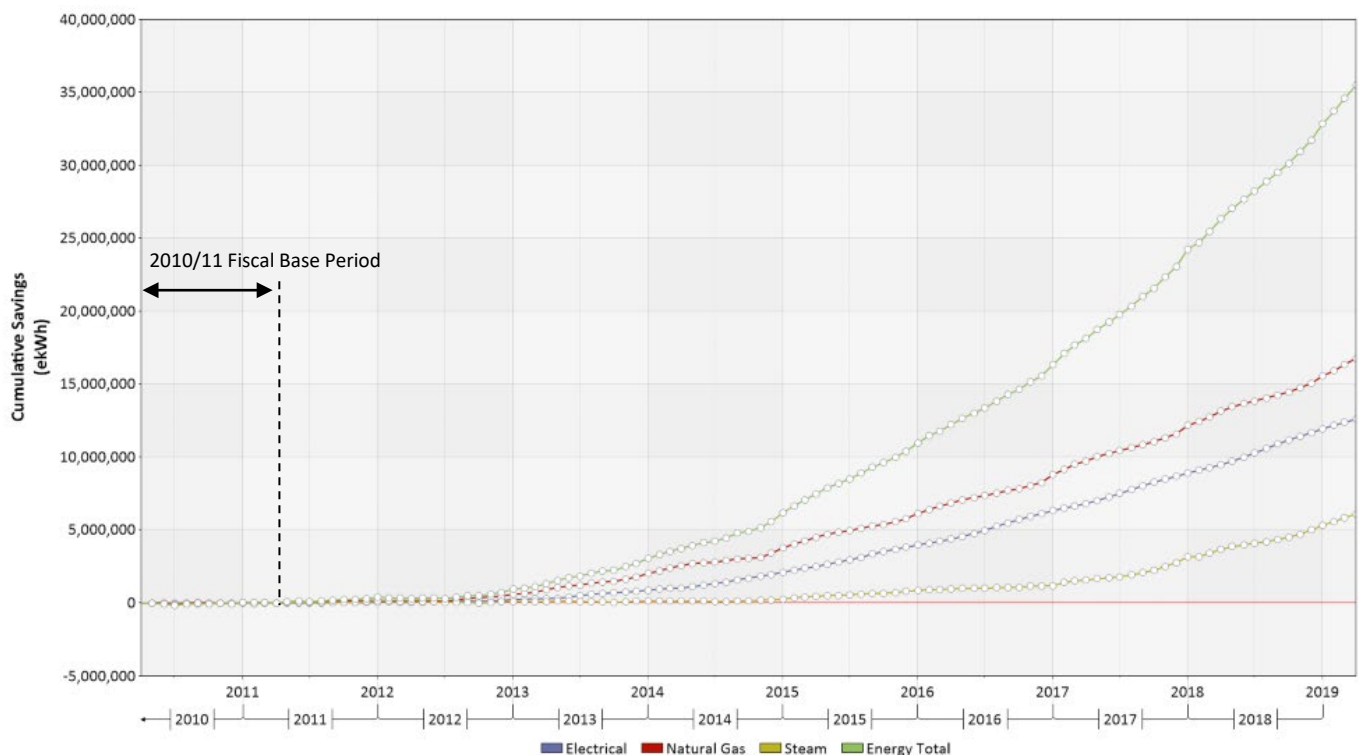


Figure 9: Cumulative Sum of **Energy Savings** – VCC BWY and DTN combined

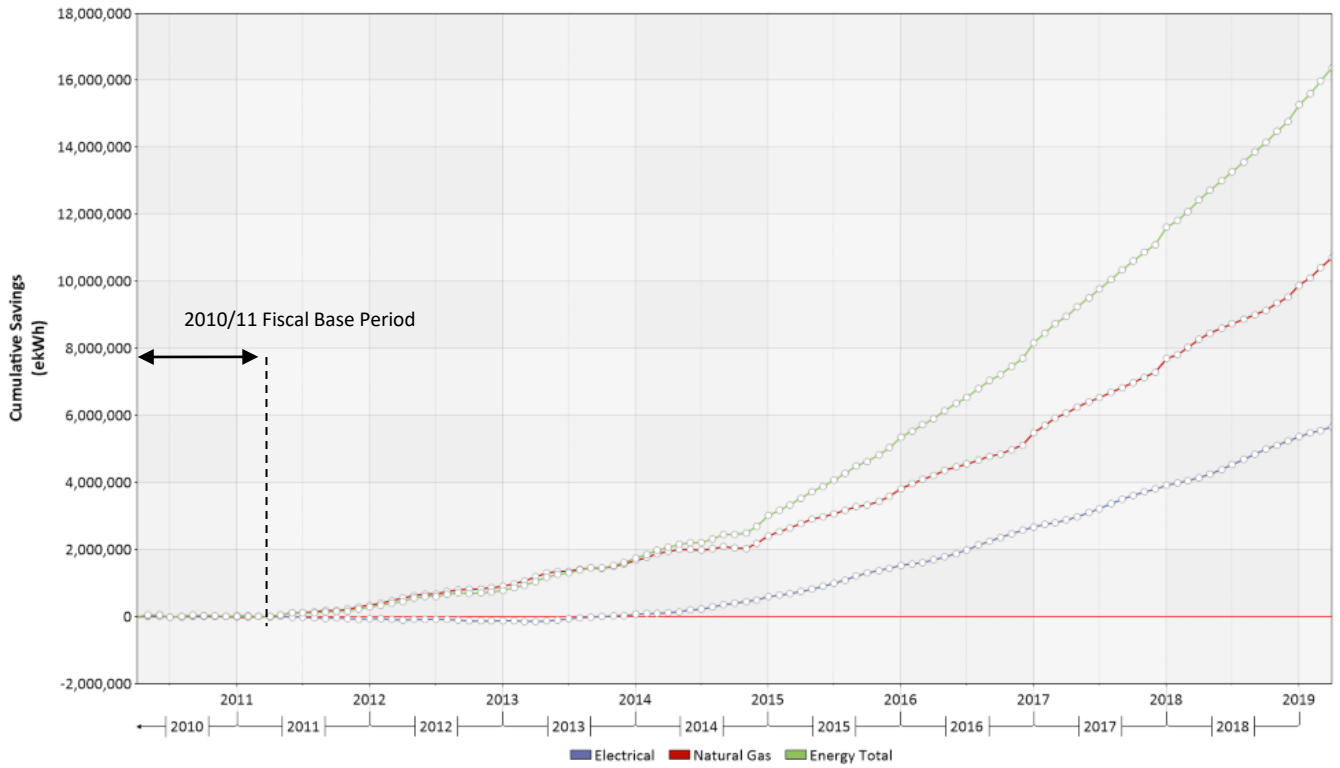


Figure 10: Cumulative Sum of **Energy Savings** –Broadway Campus only

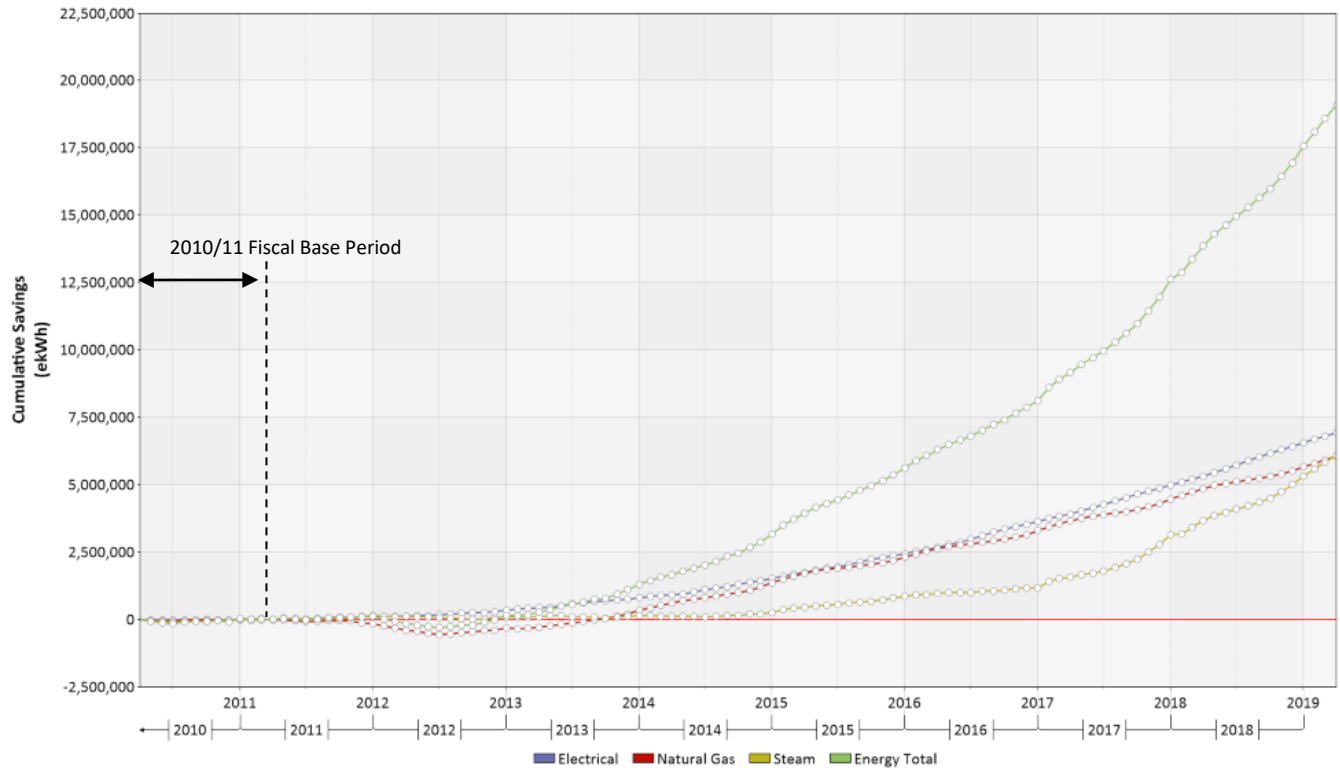


Figure 11: Cumulative Sum of **Energy Savings** –Downtown Campus only

As time goes on we will update this section with more current data.

A breakdown of Energy Savings per year is shown in Table 10, Table 11 and Table 12 for VCC, Broadway campus and Downtown campus respectively.

Table 10: Summary of Energy Savings by Year – VCC

Fiscal Year	Electrical Savings -kWh	Natural Gas Savings - GJ	Steam Savings - GJ	Fuel Total Savings - GJ	Energy Total Savings - ekWh
2011/2012	36,333	593	432	1,025	321,052
2012/2013	270,482	2,711	-46	2,665	1,010,764
2013/2014	730,938	5,938	86	6,024	2,404,390
2014/2015	1,472,681	6,982	1,180	8,162	3,739,744
2015/2016	1,866,410	8,480	1,868	10,348	4,740,656
2016/2017	2,437,699	10,371	2,146	12,517	5,914,439
2017/2018	2,665,708	12,258	7,610	19,868	8,184,527
2018/2019	3,122,904	13,071	8,708	21,779	9,172,724
Grand Total	12,609,176	60,402	21,984	82,386	35,494,317

Table 11: Summary of Energy Savings by Year – Broadway Campus

Fiscal Year	Electrical Savings -kWh	Natural Gas Savings - GJ	Steam Savings - GJ	Fuel Total Savings - GJ	Energy Total Savings - ekWh
2011/2012	-96,945	2,006	-	2,006	460,220
2012/2013	-38,300	2,279	-	2,279	594,866
2013/2014	252,068	2,740	-	2,740	1,013,045
2014/2015	637,648	2,987	-	2,987	1,467,247
2015/2016	940,581	5,187	-	5,187	2,381,302
2016/2017	1,188,711	6,674	-	6,674	3,042,586
2017/2018	1,270,497	7,953	-	7,953	3,479,757
2018/2019	1,513,573	8,759	-	8,759	3,946,593
Grand Total	5,670,308	38,584	-	38,584	16,388,090

Table 12: Summary of Energy Savings by Year – Downtown Campus

Fiscal Year	Electrical Savings -kWh	Natural Gas Savings - GJ	Steam Savings - GJ	Fuel Total Savings - GJ	Energy Total Savings - ekWh
2011/2012	133,278	-1,413	432	-981	-139,167
2012/2013	308,782	431	-46	385	415,898
2013/2014	478,871	3,199	86	3,285	1,391,345
2014/2015	835,033	3,995	1,180	5,175	2,272,497
2015/2016	925,828	3,293	1,868	5,161	2,359,354
2016/2017	1,248,989	3,697	2,146	5,842	2,871,853
2017/2018	1,395,212	4,304	7,610	11,914	4,704,770
2018/2019	1,609,330	4,313	8,708	13,021	5,226,131
Grand Total	6,938,868	21,818	21,984	43,802	19,106,227

Similarly as we have just done for energy, we can also generate the same CUSUM chart for greenhouse gas emission avoidance, as shown in Figure 12.

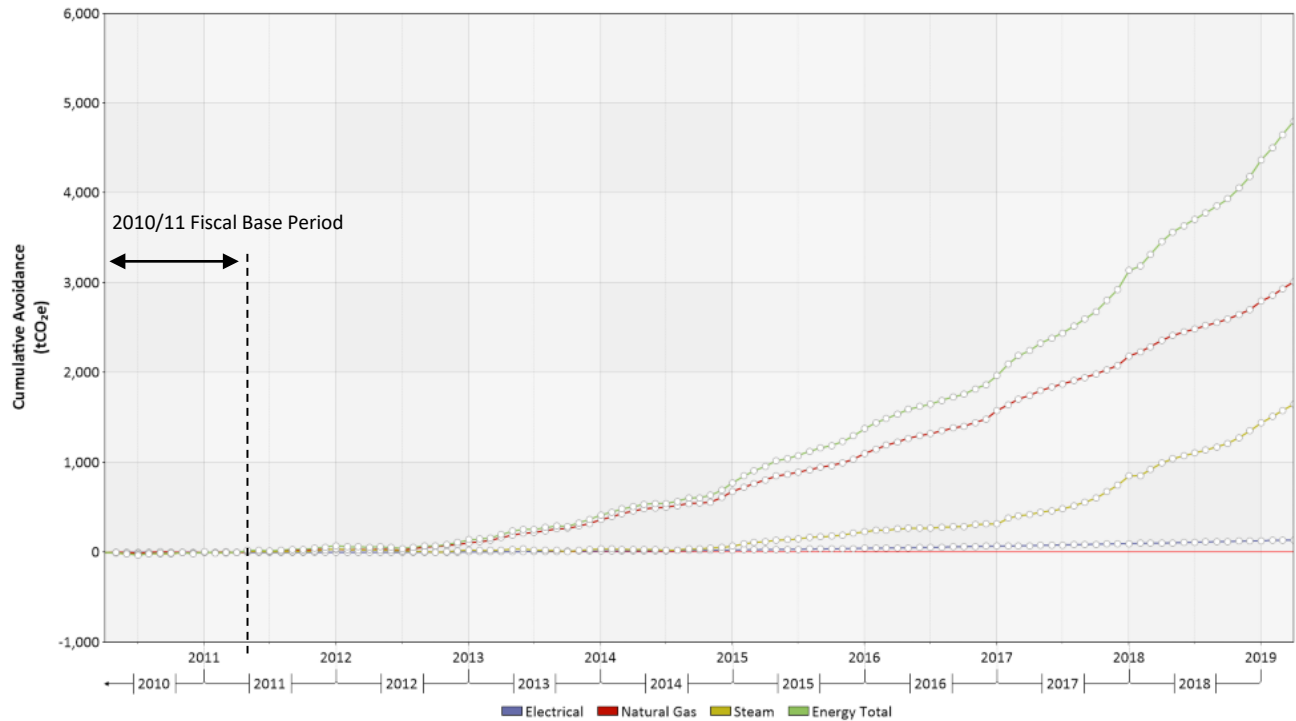


Figure 12: Cumulative sum of GHG emission avoidance – since 2010/11 base period

The cumulative GHG emission avoidance by the end of Fiscal Year 2018/19 is approximately 4,800 tonnes of eCO₂.

A breakdown of Emission Avoidance per year is shown in Table 13.

Table 13: Summary of Emission Avoidance by Year (Tonnes of equivalent CO₂) – VCC

Fiscal Year	Electricity	Natural Gas	Steam	Fuel Total	Energy Total
2011/2012	0.9	29.5	29.3	58.9	59.8
2012/2013	6.0	135.2	-3.1	132.1	138.0
2013/2014	9.6	296.1	5.4	301.5	311.1
2014/2015	14.7	348.1	88.1	436.2	451.0
2015/2016	18.9	422.8	140.6	563.4	582.4
2016/2017	26.0	517.1	161.5	678.6	704.7
2017/2018	28.4	611.2	572.9	1,184.1	1,212.5
2018/2019	33.3	651.8	655.5	1,307.3	1,340.6
Grand Total	138.1	3,011.9	1,650.2	4,662.1	4,800.2

7.2 Avoided Energy Cost

Cost Avoidance is avoided spending, not necessarily decreased spending. If an energy project is implemented that yields consumption savings, but energy rates increase at the same time, then looking at the actual cost savings/decrease in the bills will not show the full cost that was avoided. In other words, if that same project had not been implemented and energy rates increased, then more would have been spent than beforehand. So by looking at avoided cost rather than just actual cost savings, the full financial impact of the energy management initiatives is captured.

Similarly as for energy, the same CUSUM chart for energy cost avoidance can be generated, as shown in Figure 13.

As can be seen, the cumulative energy cost avoidance by end of Fiscal Year 2018/19 is over **\$1,955,000**.

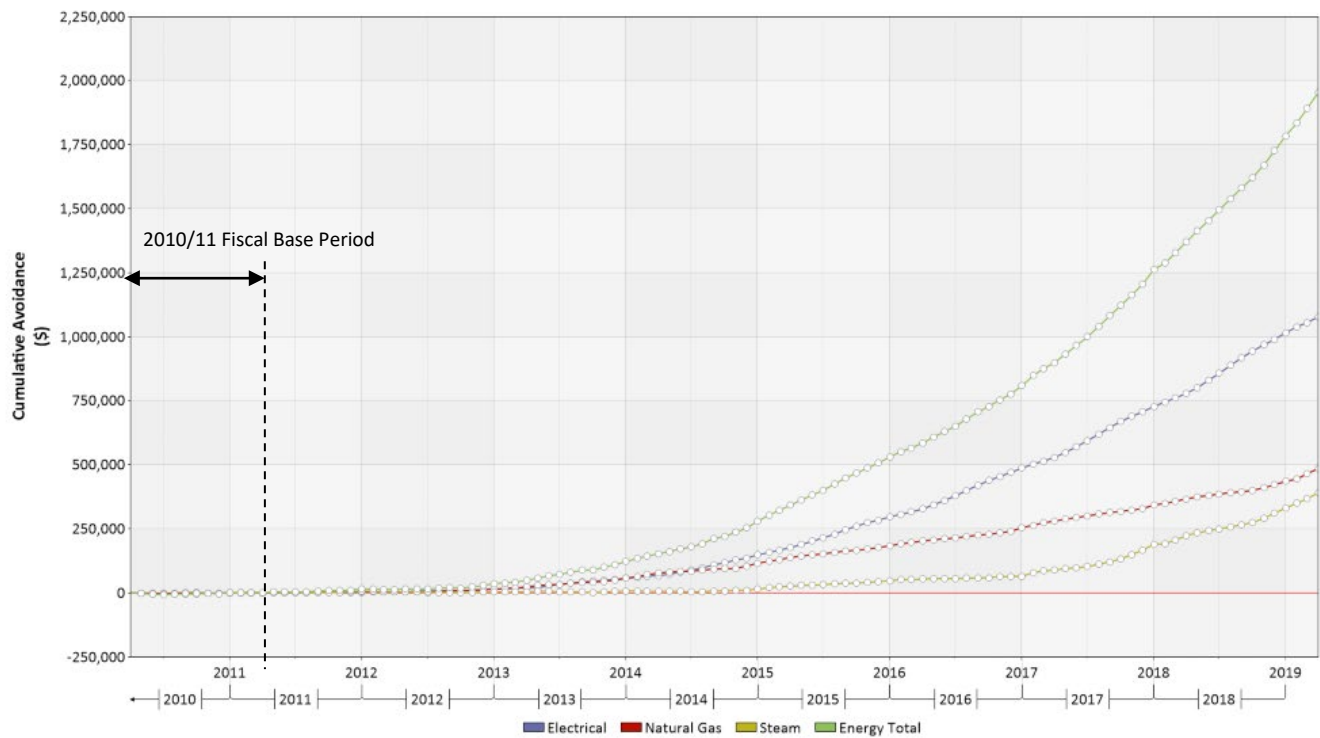


Figure 13: Cumulative sum of cost avoidance – since 2010/11 base period

Table 14: Summary of Cost Avoidance by Year – VCC

Fiscal Year	Electrical	Natural Gas	Steam	Fuel Total	Energy Total
2011/2012	\$3,527	\$3,993	\$6,011	\$10,004	\$13,531
2012/2013	\$16,108	\$20,469	-\$618	\$19,851	\$35,959
2013/2014	\$48,585	\$53,080	\$981	\$54,061	\$102,647
2014/2015	\$109,144	\$60,635	\$20,001	\$80,636	\$189,779
2015/2016	\$150,434	\$64,628	\$28,447	\$93,075	\$243,508
2016/2017	\$201,488	\$77,750	\$34,668	\$112,418	\$313,906
2017/2018	\$250,210	\$87,033	\$134,777	\$221,810	\$472,020
2018/2019	\$298,054	\$117,999	\$166,986	\$284,985	\$583,039
Grand Total	\$1,078,062	\$485,811	\$391,257	\$592,082	\$1,955,130

8. COMMUNICATIONS

In order to keep key stakeholders and the campus community informed of the energy management efforts at VCC, the following communication methods are currently used:

- Monthly facility meetings - energy projects are discussed and energy performance from utility monitoring reports reviewed with operators and management;
- Quarterly Energy Management reporting – results from ongoing energy management projects are reviewed and future potential projects discussed. This meeting is required as part of the BC Hydro energy management program and ensures tracking against required energy reduction targets to stay in the program.

Currently the greater community of staff and students of VCC have little exposure to the energy management efforts that supports their campus to run efficiently. Staff are engaged annually during the “holiday shutdown campaign” and through other behavioural campaigns. VCC is part of the BC Hydro Energy Wise Network, where support is provided for the campus energy management team to facilitate up to two behavioural campaigns annually.

In upcoming fiscal years, VCC would like to expand methods of communication with the community of staff and students at VCC campuses, by way of the following methods:

- **2019/20** – Energy performance improvements will be highlighted on current monitors located at campuses entrances. Content will be updated periodically by VCC energy management team.
- **2019/20** – In addition to above, improvement in energy performance will be published in the VCC digest on a quarterly basis;
- **2020/21** – Facilities plan to purchase and install several monitors throughout campus that will display an energy dashboard consisting of energy management stories and demand visualization.

9. FUTURE TARGETS: VCC'S PATH TO NET ZERO

As described in the last two sections, VCC has already achieved and exceeded its current energy reduction targets. This sections analysis will be used to set achievable yet visionary targets for the future of VCC campuses.

The term “net zero” can refer to energy and/or emissions. A net zero energy building is one that has high performance with minimal energy use and meets its energy needs from heat recovery and locally generated renewable sources. A net zero emission building is one that has high performance with minimal energy use and the energy use it has is from low or zero carbon sources such BC electricity and renewable energy respectively. VCC's path to net zero will involve various projects in the following categories:

- **Energy Efficiency and Behavioural**

Majority of VCC's projects completed to date are of the first category - “Energy efficiency and Behavioural”. VCC has had great success in achieving 40% reduction to date in this category and there are still opportunities to reduce further energy and emissions via energy efficiency.

- **Fuel Switching**

This category of projects will contribute primarily to reduction of emissions at VCC, though at times energy reduction will also be realised, such as switching from gas-fired systems to electric heat pumps, where the efficiency of the electrified system is higher than that of the gas-fired system.

- **Renewable Energy**

Sources of renewable energy can be on-site or from utility provider. At VCC there is opportunity for addition of Photovoltaic (PV) solar panels on roof of Broadway campus buildings to generate electricity on site. At Downtown campus the steam utility provider, Creative Energy, is planning to switch fuel source to biomass by 2025. This will significantly reduce the emissions associated with the campus steam consumption.

Through an analysis of existing planned Energy Efficiency and Behavioural, and implementation of Fuel Switching and Renewable Energy projects, the following reduction levels are possible:

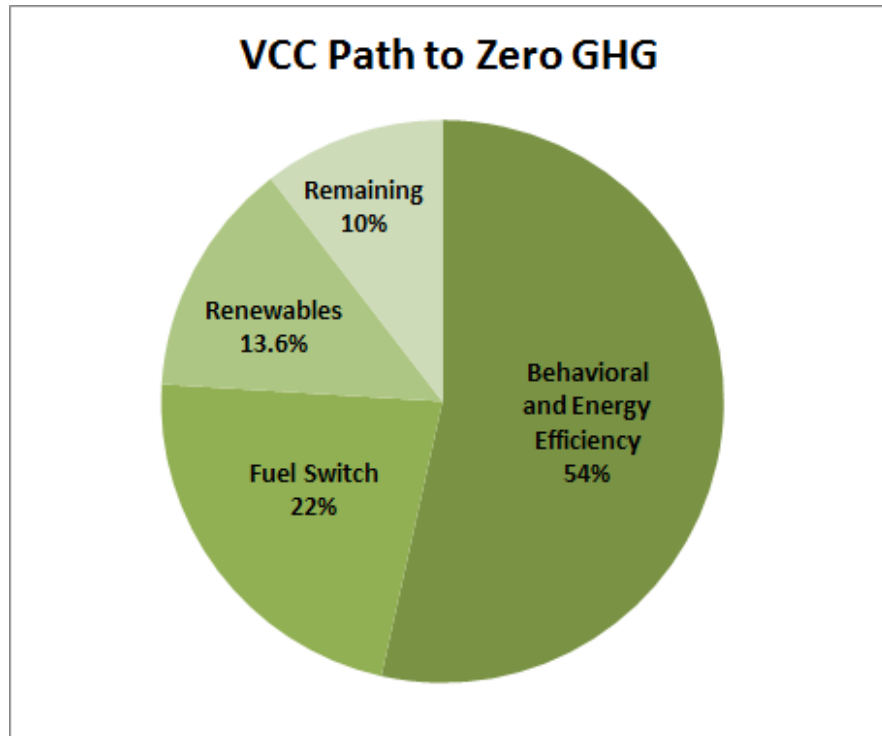


Figure 14: Breakdown of GHG Reduction

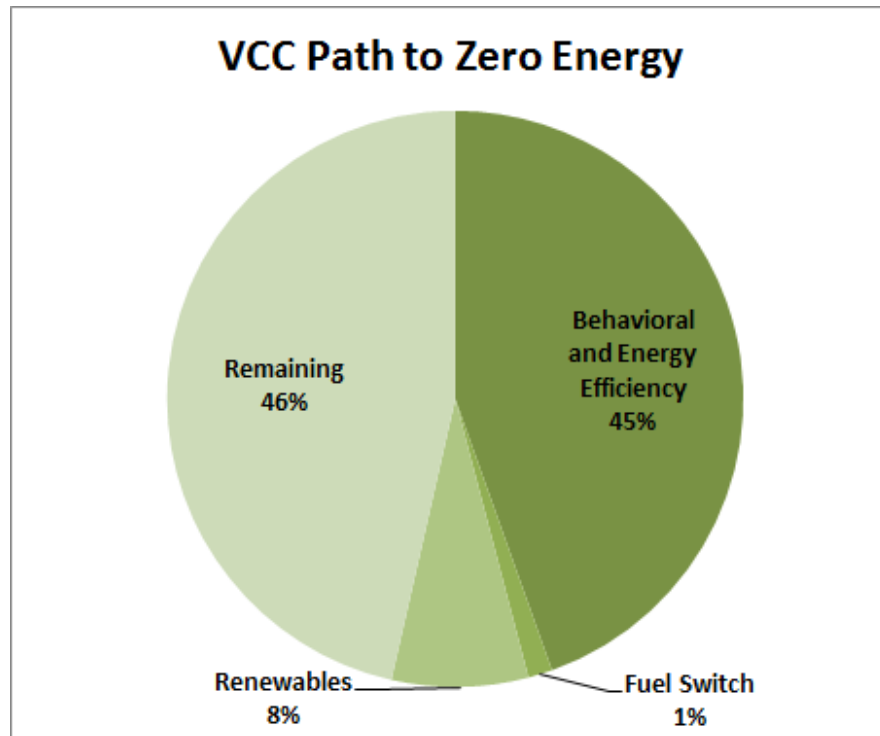


Figure 15: Breakdown of Energy Reduction

Table 15 lists the projects associated with achieving the reductions displayed in Figure 16 and 17 below. The figures indicate the near future (through fiscal year 2030) path for VCC approaching net zero energy and emission at Downtown and Broadway campuses.

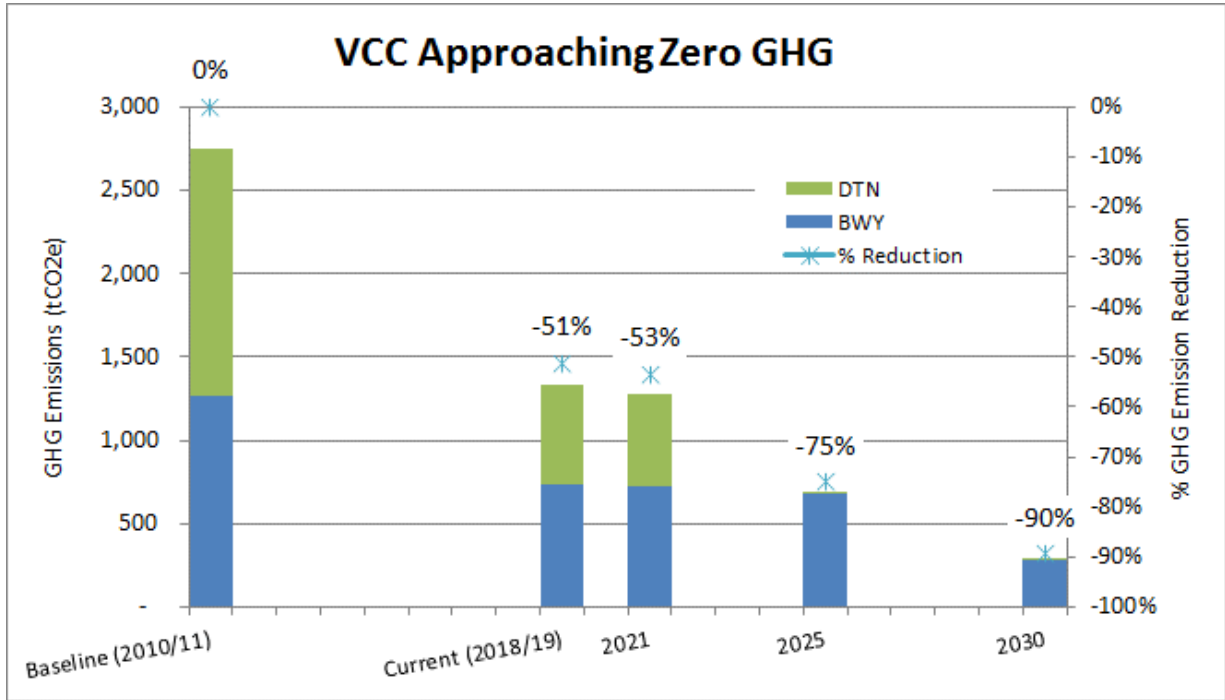


Figure 16: Modelled GHG Reduction

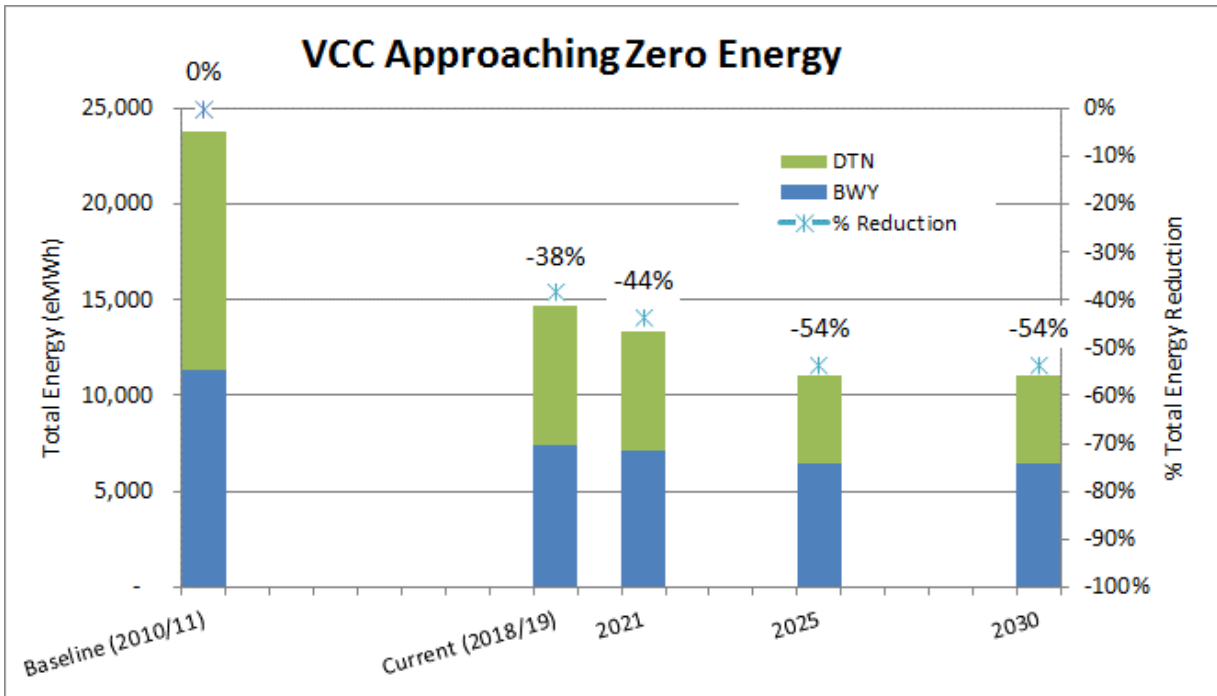


Figure 17: Modelled Energy Reduction

The analysis indicates that it is plausible for Downtown campus to achieve Net Zero GHG by 2025. This is mainly dependent on the Creative Energy steam utility provider to switch to biomass fuel source, and electrification of the building's MUAs and culinary arts kitchen equipment. For Broadway campus, a significant GHG reduction will be possible when NEU district energy extends to the campus. The remaining 10% of GHGs can be eliminated by planning for A Building renewal to be net zero (this has not been included in the analysis).

Getting to Zero Energy is modelled mainly through energy efficiency and behavioural projects. The model does include installation of solar PV on Broadway campus buildings, but much more renewables are needed to make the campuses fully self sufficient for their energy needs.

This bottom up analysis provides grounds for VCC to comfortably set future targets, knowing there is a plan for what projects need to progress to achieve the set targets. Based on the analysis, the following future targets are achievable:

- **Energy Reduction Targets**
 - 45% by 2021
 - 50% by 2025
 - 60% by 2030

- **GHG Emission Reduction Targets**
 - 50% by 2021
 - 60% by 2025
 - 75% by 2030

Table 15: Summary of Future Projects

Category	FYR	Campus	Description	Electrical Energy Savings (kWh)	Natural Gas Energy Savings (GJ)	Steam Energy Savings (GJ)	Total Energy Savings (eMWh)	GHG Emissions Savings (tCO ₂ e)
Behavioral	2020	BWY	Behavioral Change Campaigns	10,000	0	0	10	0.1
Behavioral	2020	DTN	Behavioral Change Campaigns	10,000	0	0	10	0.1
Energy Efficiency	2020	BWY	Kitchen Hood Demand Controlled Ventilation-Pilot	5,000	50	0	19	2.5
Energy Efficiency	2020	BWY	Lighting Upgrades to LED Lamps	24,000	0	0	24	0.2
Energy Efficiency	2020	DTN	Cooling Towers Upgrade: VSD Fans and Premium Pumps	62,000	0	0	62	0.6
Energy Efficiency	2020	DTN	Lighting Upgrades to LED Lamps	394,000	0	0	394	3.5
Energy Efficiency	2021	BWY	Installing VFDs for 12 AHUs Fan Motors	118,500	0	0	119	1.1
Energy Efficiency	2021	BWY	Lighting Upgrades - LED Lamps	86,000	0	0	86	0.8
Energy Efficiency	2021	DTN	Add Floor Heat Pumps to DDC and Add Occupancy Sensors	175,000	0	0	175	1.6
Energy Efficiency	2021	DTN	Install Kitchen Hood Demand Controlled Ventilation	95,000	950	0	359	48.2
Fuel Switch	2021	DTN	MUAs electrification	-249,000	3,230	0	648	158.8
Behavioral	2025	BWY	Behavioral Change Campaigns	50,000	0	0	50	0.5
Behavioral	2025	DTN	Behavioral Change Campaigns	50,000	0	0	50	0.5
Energy Efficiency	2025	BWY	Upgrade to Premium Efficiency Motors	65,000	0	0	65	0.6
Energy Efficiency	2025	DTN	Upgrade to Premium Efficiency Motors	33,000	0	0	33	0.3
Fuel Switch	2025	BWY	DHW electrification	-65,800	800	0	156	39.3
Renewable	2025	DTN	Creative Energy (steam) source change to biomass	0	0	4,900	1,361	368.9
Fuel Switch	2025	DTN	Install centralized heat pump to replace steam	-528,000	0	0	-528	-4.8
Fuel Switch	2025	DTN	Culinary school electrification	-111,000	570	0	47	27.4
Renewable	2025	BWY	Install PV on Buildings A roof (align with renewal)	418,000	0	0	418	3.8
Renewable	2025	BWY	Install PV on Buildings B roof	42,000	0	0	42	0.4
Fuel Switch	2030	BWY	Neighbourhood Energy Utility (NEU) extension to VCC campus	0	0	0	0	422.5

10. ADAPTATION TO CLIMATE CHANGE

The Province of BC is in the process of developing an adaptation strategy, to be released by 2020. However, VCC is already aware of the impacts of climate change locally and can start developing the necessary foundations to take action for when the Provincial strategy is released.

- Identify internal stakeholders (build an internal team with representatives from risk management, sustainability, capital upgrade/ asset planning, and operations)
 - Have the team initiate “low hanging fruit” adaptation tasks immediately
 - Back up building documentation
 - Move building documentation away from flood zones (e.g. basement mechanical rooms)
 - Add window films and shading to reduce over heating
 - Other immediate adaptation initiatives that VCC can consider
 - Installing moisture sensors to move elevators above ground in case of flooding
 - Integrating controls to filter or eliminate outdoor air when outdoor air conditions are worse than indoor (e.g. forest fire pollution)
- Conduct a climate change vulnerability risk assessment of Downtown Campus, and incorporate learnings into building renewal as part of end of life upgrades
 - Provide training / capacity building for internal staff
 - Get stories from operation staff on what is currently vulnerable
 - Pick a framework (and modify it to fit) for adaptation process at VCC
- Review assets up for renewal (e.g. mechanical equipment) and consider assessing their capacity for future climate (up to 2050 or asset life)
- Consider whether developing an adaptation plan or incorporate adaptation into existing policies

11. APPENDIX - STAKEHOLDERS

Executive Support:	Jamie Choi , Interim Vice President, Administration & CFO		
VCC Energy Management Consultant:	Prism Engineering <i>Majid Pishvaei, PEng, CEM</i> majid@prismengineering.com Also: <i>Robert Greenwald, PEng</i> <i>Ken Holdren, PEng</i> <i>Casey Gaetz,</i> <i>Adam Franklin, PEng</i> <i>Alexis Doyle</i>	Energy Management Committee:	Ross McPherson , CFM, PMP, LEED AP O+M <i>Director, Facilities Management and Planning (Interim)</i> Steve Horn , FMA, SMA, Facilities Manager Stephen Burns , Facilities Manager Diana Cabrero Purata , Facilities Coordinator

Executive support is critical to a successful implementation of the plan. Other stakeholders not listed by name in the table above include Administration, Facilities, Academic Staff, Students, the surrounding community and the Utility providers.

Contact Info				
Name	Title	Organization	Email	Phone
Ross McPherson	Director, Facilities Management and Planning (Interim)	VCC	rmperson@vcc.ca	604-871-7000 Ext 8603
Ron Mastromonaco	Key Account Manager	BC Hydro	Ron.Mastromonaco@bchydro.com	604-699-9418
Heather Scholefield	Program Manager	BC Hydro	Heather.Scholefield@bchydro.com	604-626-4345

12. APPENDIX - BC HYDRO: ENERGY MANAGER ASSESSMENT FORM - SEMP SELF- EVALUATION

For BC Hydro to complete

File Number		
Quarter	④	
PSE Signature: SEMP Completed		Date:
Projects that used PS incentives:	PS Program Incentive	
	kWh	
	PSP	
	PSP Express	
	New Construction	
	Total	
Behavioural Program (2%)		
Turnaround time for 4 th Q review: _____ days		

Energy Manager: Please complete appropriate year below

Note: All areas (in your contract Year) must be covered in order to receive 4th quarter payment

Year 2 +: Strategic Energy Management Plan requirements

Elements which must be included in SEMP	Page number where the element is addressed in the SEMP	Energy Manager evaluation	PSE Agrees
1) A purpose statement which answers the following questions:	-	✓	
a) What is your kWh reduction target?	Page 15 (Section 6.1)		
b) What is the Key Performance Indicator?	Page 7 (Section 4.4)		
c) Who do you need to engage to make your plan successful?	Page 28 (Section 8)		
2) A table that compares all your buildings.	-	✓	
a) BEPI	Page 7 (Table 3)		
3) Explain what the opportunities are to become more efficient.	-	✓	
a) Project list	Page 17 & 18 (Table 8 & Table 9) Page 33 (Table 15)		
b) Initiative List: Behavioural and Organizational	Page 20 (Section 6.2.2)		
c) Studies: Outline which buildings have had studies completed	Page 17 & 18 (Table 8 & Table 9)		
4) Outline the budget to implement projects.	-	✓	
a) If no budget, explain why not and what you intend to do about getting a budget.	Page 6 (Section 4.2)		
5) Conclusion: How is your plan doing?	-	✓	
a) Outlined kWh saved	Pages 23 to 25		
b) Outlined GHG tonnes saved	Page 26		
c) Actual dollars saved to the organization	-		
d) Outlined avoided cost	Page 27 (Section 7.2)		
6) Conclusion: Senior Management Support			
a) Approval of the SEMP: Signature on the SEMP	Cover Page of Final		

Tracking:

	2 nd Q Draft SEMP Submitted Date	Date PSE Coaching Comments Returned to EM	4 th Q SEMP submitted date	Reviewed and Coaching comments returned to EM: Date	*If EM needed to resubmit :date	If PSE reviewed: Date
Energy Manager						
PSE						

PSE Coaching Comments for Improvements (Not required for sign-off)

	Date: Duration	Date: Duration	Date: Duration	Date: Duration
Energy Manager contacted PSE for assistance				