VANCOUVER COMMUNITY COLLEGE

# Strategic Energy Management Plan

**Senior Management Support**

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September 2023

Ajay Patel

VANCOUVER COMMUNITY COLLEGE

BC Hydro
Power smart

## LAND ACKNOWLEDGEMENT

We acknowledge with deep respect and appreciation that this report was produced on the traditional and unceded territories of the xʷməθkʷəyəm̓ (Musqueam), Sḵwx̱wú7mesh Úxwumixw (Squamish), and səlilw̓ ətaʔɬ (Tsleil-Waututh) Nations.

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# 1. Executive Summary

The 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 SEMP includes a specific energy reduction target and an action plan of how the target will be achieved.

The Strategic Energy Management Plan (SEMP) aligns with VCC's Strategic Innovation Plan (SIP) and its five key priorities, which reflect VCC's aspirations as a prominent post-secondary institution in British Columbia. This alignment establishes clear and attainable objectives. Among these priorities is the commitment to environmental sustainability, involving the expansion of current initiatives and the introduction of new ones for climate justice and emergency management. This commitment is an integral part of the Campus of the Future priorities.

To learn more about the SIP, please visit: **https://www.vcc.ca/president/strategic-innovation-plan/**

## 1.1 Energy Targets

**Progress to Date towards Long-Term Targets**

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 end of fiscal year 2017/18. The new target was achieved one year earlier,

by end of March 2017. As a result, in March 2020 Vancouver Community College selected a new target to reduce energy consumption by 25% below 2010/2011 levels. That target was also achieved 15 months before the target date.

**Current year and future targets.**

VCC will continue to build on its history of energy conservation success by working towards its current targets which are as follows:

**VCC will reduce campus energy intensity in existing buildings 50% by 2024/2025 and 60% by 2029/2030 below 2010/2011 fiscal year levels through the implementation of cost-effective energy management initiatives. This equates to a kWh reduction target of approximately 800,000kWh for the 2023/2024 fiscal year.**

**VCC will reduce campus GHG intensity 60 % by 2030 compared to a 2007 baseline.**

It is anticipated that this will result in a total cumulative electricity savings of 40 GWh and a total cumulative fuel (gas and steam combined) savings of 250,000 GJ between 2010 and 2025.

## 1.2 Budget Approval for Current Year

To meet this target, VCC has spent approximately $3,445,000 in the last nine fiscal years (2014/15 to 2022/23). During this period, BC Hydro has contributed $330,000 towards energy savings measures which has reduced the implementation cost to $3,115,000.

In fiscal year 2022/23, VCC spent over $900,000 on energy ($691,100 for electricity, $219,000 for natural gas and $73,800 for steam). The total electricity, gas, and steam use in 2021/22 were 7,038,500 kWh, 16,670 GJ and 2,500 GJ respectively. Some of the projects undertaken to reduce energy consumption in 2021/2022 included optimization of Direct Digital Control (DDC) System, electrification of Domestic Hot Water (DHW) systems using heat pumps, enhancements of exterior lighting systems, upgrades of air conditioning (AC) systems, and installing new Electric Vehicle (EV) Charging Stations at Broadway and Downtown Campuses.

For the 2023/2024 fiscal year VCC has committed over $350,000 toward energy efficiency projects such as a decarbonization study, a kitchen electrification study, the installation of two EV charging stations, improvement of a direct digital control (DDC) system, and the replacement of heat pumps that have reached the end of their lifecycle. These projects are estimated to result in 350,000 kWh and 1,800 GJ of energy savings.

## 1.3 The Benefits of Energy Management

An effective energy management program can produce multiple benefits for VCC and its campus communities such as energy and maintenance and cost savings, greenhouse gas emissions reduction, increased occupant comfort and improved indoor air quality and equipment reliability.

# 2. Our Commitment

The 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.

## 1.4 Energy Commitment

VCC is committed to efficient energy management. Since 2013, our Facilities Management department has been identifying energy-saving opportunities and closely monitoring consumption across our campuses. These efforts cut costs, reduce emissions, and enhance comfort and safety, showcasing our dedication to sustainability.

## 1.5 Sustainability Commitment

A new Environmental Sustainability Strategy will provide a roadmap that will help position VCC as a leader in environmental stewardship in the advanced education sector. We are accountable for our

environmental impacts and, with this strategy, are taking steps over the next 5 years to continue to embed environmental sustainability values and practices across the organization. Complimenting the strategy, VCC also established the Environmental Sustainability Strategy Implementation Workbook, a tool to help us plan and implement efforts to achieve the goals outlined in the Strategy 2023-2028. Other than the provision of a clear framework, the workbook encourages and facilitates communication among stakeholders, enables progress tracking and promotes accountability, through the identification of key actions, responsible parties, timelines, and resources needed to achieve the goals. The implementation roadmap will be modified as existing goals are reached and new goals set by the Environmental Sustainability Advisory Group (ESAG)

## 1.6 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 Climate Change Accountability 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**.

VCC's 2022 Climate Change Accountability Report is available at the following link:

**https://www.vcc.ca/about/college-information/reports-and-publications/**

As part of VCC's 2022 Strategic Energy Management 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 emissions by **50%** below fiscal year 2010/11 by March 2025. As of March 2023, the energy use was reduced by **45%**.

## 1.7 Why Energy Management Is Important to Us?

Energy management is an essential element of VCC's environmental commitment, driven by our response to the Intergovernmental Panel on Climate Change's directive to limit global temperature increases. Since 2013, our Facilities Management department has actively pursued energy-saving initiatives, not only for cost efficiency but also as a demonstration of our sustainability dedication outlined in our Environmental Policy. This policy emphasizes our high standards of environmental stewardship, integrating environmental considerations into all decision-making processes.

Recent natural disasters in British Columbia underscore the urgency of understanding climate change hazards and their potential impact on VCC. Our vulnerability assessment is crucial to help identify concrete actions that can enhance climate change resilience and minimize risks to our operations, built environment, and the well-being of our community members. While our efforts to reduce carbon emissions contribute to global climate goals, it is equally vital to comprehensively grasp future climate hazards faced by our campuses and develop proactive plans to ensure long-term resilience.

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.

## 1.8 Stakeholder Engagement Plan

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

*Table 1. Stakeholder Engagement Plan*

| Stakeholder group | Engagement Frequency | Engagement Activity |
|---|---|---|
| **Facility operators and management** | Monthly | Energy projects are discussed and energy performance from utility monitoring reports are reviewed at monthly facility meetings |
| **Environmental Sustainability Advisory Group (ESAG)** | Monthly | A review of current energy and sustainability projects is provided by the energy team and the group discusses future potential projects covering various topics, including Environmental Education, Carbon Reduction, Energy Conservation, Climate Resilience, Waste Management, and Sustainable Food Systems, along with Green Purchasing Practices |
| **BC Hydro** | Quarterly | Energy management report and meeting. This quarterly check-in is required as part of the BC Hydro energy management program and ensures tracking against required energy reduction targets to stay in the program. |
| **VCC Staff and Students** | No set schedule | The sustainability team prepares success stories on topics such as lighting upgrades and achievements of cost avoidance to share with staff and students via a variety of communications mediums such as Student News, Employees News, Employee Digest. |

ESAG is currently developing a **communication strategy** to keep the VCC community informed on various topics, including energy, sustainability, climate resilience initiatives, project development, and behavior change. The strategy aims to establish effective communication methods with the community of staff and students across VCC campuses, utilizing the following approaches:

- Create an annual communications plan for sharing sustainability-related content throughout the year. Collect and share stories of sustainability initiatives across campus.
- Create opportunities for students, staff, faculty, administration, other VCC stakeholders and
- the broader community to get involved in sustainability initiatives.
  Foster partnerships with like-minded community groups to collaborate on common goals.
- Identify and improve the reach of our communication channels.


# 3. Understanding Our Situation

## 1.9 Organizational Profile

Vancouver Community College (VCC) opened its doors in 1965, and currently focuses on delivering more than 90 certificates, diplomas, and bachelor's 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.

From 2015 to April 2022, VCC's heavy mechanical trades programs were conducted at the Annacis Island campus. After this period, VCC relocated the heavy mechanical trades programming to VCC's Broadway campus. The energy consumption of the Annacis Island campus was not included in previous versions of SEMP.

*Table 2: Organization Profile*

| Organization Profile | | | | |
|---|---|---|---|---|
| PEOPLE | Sector | Education (post-secondary) | | |
| | Number of Full Time Students (2022/23 – approximate): | 7,169.58 FTE Students | Number of Sites: | Two sites:<br>Downtown campus 34,030 $m^2$<br>Broadway campus 37,719 $m^2$ |
| OPERATIONS | Energy Management Issues / Obstacles | Availability of funding for energy efficiency projects;<br>Limited sub-metering, particularly natural gas;<br>Energy awareness and the behavioural change amongst faculty, staff, and students.<br>Transient student population. | | |
| | Core Business Metrics | 1. Building floor area ($m^2$)<br>2. Full-time equivalent (FTE) students<br>3. Classroom hours | | |
| | Business Year | April 1st to March 31st | | |
| | Budget Cycle | April 1st to March 31st | | |
| | Operations/Maintenance Budget *(includes salaries, supplies, janitorial)* | 2013/14: $6,101,609<br>2016/17: $5,863,373<br>2019/20: $6,582,000<br>2022/23: $5,347,000 | 2014/15: $5,622,387<br>2017/18: $5,980,965<br>2020/21: $6,800,000 | 2015/16: $5,806,876<br>2018/19: $6,408,028<br>2021/22: $4,479,000 |
| | Utilities Budget*<br>*(Elec, Gas, Steam, Water)* | 2013/14: $1,283,500<br>2016/17: $1,207,600<br>2019/20: $1,129,000<br>2022/23: $1,110,000 | 2014/15: $1,245,200<br>2017/18: $1,177,300<br>2020/21: $888,000 | 2015/16: $1,235,500<br>2018/19: $1,191,000<br>2021/22: $988,800 |
| | Energy Efficiency Projects (Capital) | 2013/14: $140,000<br>2016/17: $309,000<br>2019/20: $200,000<br>2022/23: $975,000 | 2014/15: $500,500<br>2017/18: $375,500<br>2020/21: $336,000 | 2015/16: $193,000<br>2018/19: $313,600<br>2021/22: $230,000 |

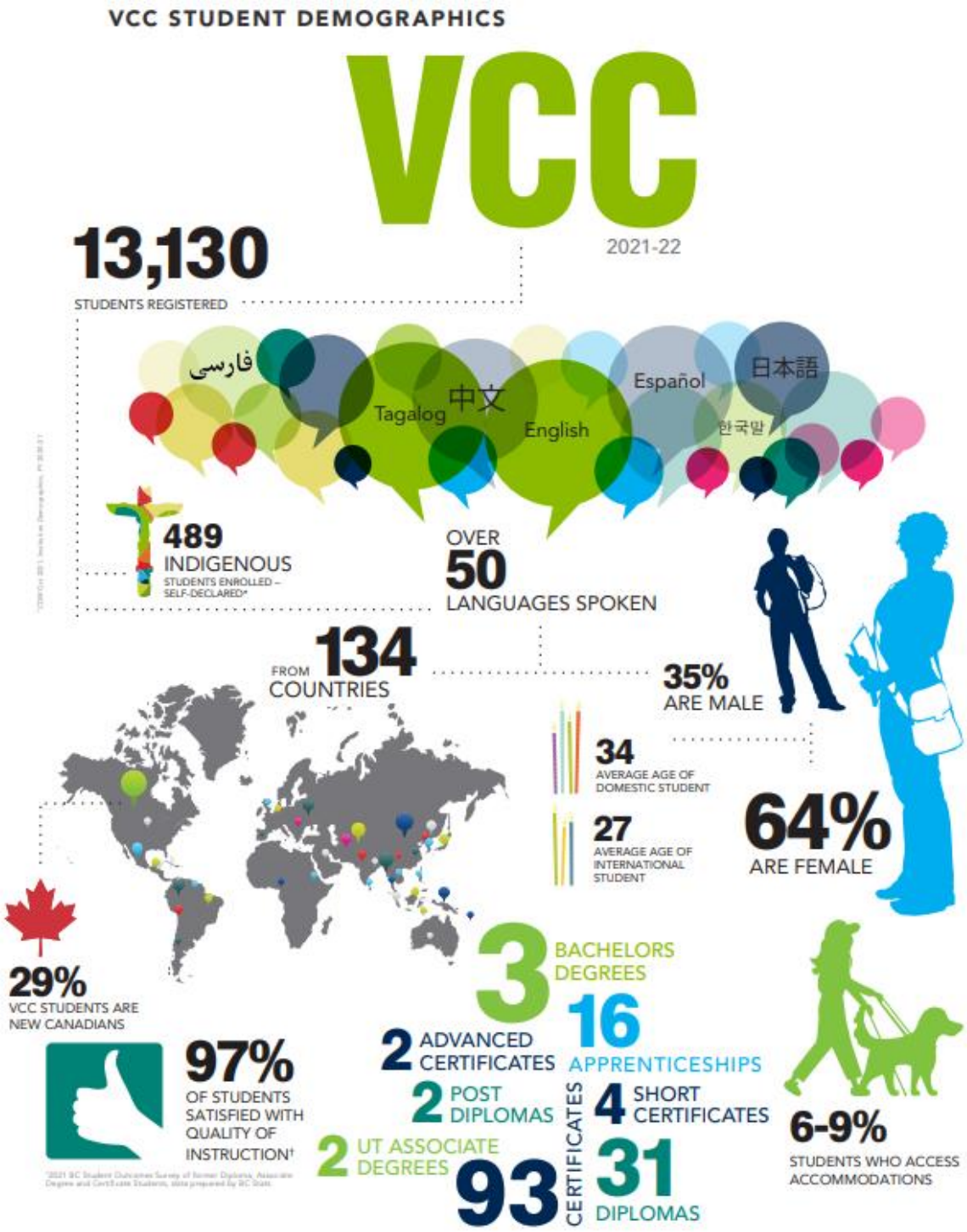



*Figure 1: VCC's Student Demographics.*

## 1.10 Facility Profile

VCC operates on two main campuses:

- The Downtown Campus is located in the heart of Downtown Vancouver
- The Broadway Campus is located in a highly accessible location in East Vancouver along major bus and SkyTrain lines

**Error! Reference source not found.** provides a summary of building energy intensities by energy type.

*Table 3: Facility Profile for Apr 1st, 2022, to Mar 31st ,2023 (2022/23 Fiscal)*

| Campus | Building | Area ($m^2$) | Purposes | Annual Energy Consumption (ekWh) | Annual Energy Cost ($) | Energy Intensity (ekWh/$m^2$) |
|---|---|---|---|---|---|---|
| **Broadway** | Building A | 25,177 | Health sciences centre, automotive shops, and a music auditorium, academic upgrading, university transfer (arts and science), international culinary arts, instructor and teacher training, English as an additional language (EAL), adult upgrading, Deaf and hard of hearing, visually impaired, and music programs. | 7,499,200 | $471,500 | 199 |
| | Building B | 12,542 | | | | |
| **Downtown** | Downtown Complex | 34,003 | Dental, hospitality management, culinary arts, baking and pastry arts, hair design, aesthetics, fashion, jewellery arts and design, technology, applied business, and Continuing Studies | 5,929,100 | $512,400 | 174 |
| **Total** | | **71,722** | | **13,428,300** | **$983,900** | **187** |

*Table 4: Building Areas and Energy Data Summary (2022/2023 fiscal)*

**Broadway Campus**

| Site Name | Floor Area m² | Electricity kWh | Electricity Cost | Natural Gas GJ | Natural Gas Cost | Steam GJ | Steam Cost | ekWh / m² | Cost $/m² |
|---|---|---|---|---|---|---|---|---|---|
| Electricity | 37,719 | 3,315,900 | $299,200 | | | - | - | 88 | $7.93 |
| Gas | 37,719 | - | - | 15,060 | $172,300 | - | - | 111 | $4.57 |
| **Total** | | **Total ekWh= 7,499,200** | | | **Total cost= $471,500** | | | **199** | **$12.50** |

**Downtown Campus**

| Site Name | Floor Area m² | Electricity kWh | Electricity Cost | Natural Gas GJ | Natural Gas Cost | Steam GJ | Steam Cost | ekWh / m² | Cost $/m² |
|---|---|---|---|---|---|---|---|---|---|
| Electricity | 34,003 | 4,195,800 | $391,900 | - | - | - | - | 123 | $11.53 |
| Gas | 34,003 | - | - | 3,710 | $46,700 | - | - | 30 | $1.37 |
| Steam | 34,003 | - | - | - | - | 2,530 | $73,800 | 21 | $2.17 |
| **Total** | | **Total ekWh= 5,929,100** | | | **Total cost= $512,400** | | | **174** | **$15.07** |

**Total including both Broadway and Downtown campuses**

| Site Name | Floor Area m² | Electricity kWh | Electricity Cost | Natural Gas GJ | Natural Gas Cost | Steam GJ | Steam Cost | ekWh / m² | Cost $/m² |
|---|---|---|---|---|---|---|---|---|---|
| VCC Electricity | 71,722 | 7,511,700 | $691,100 | | | | | 105 | $9.64 |
| VCC Gas | 71,722 | | | 18,770 | $219,000 | | | 73 | $3.05 |
| VCC Steam | 71,722 | | | | | 2,530 | $73,800 | 10 | $1.03 |
| **TOTAL** | | **Total ekWh= 13,428,300** | | | **Total cost= $983,900** | | | **188** | **$13.72** |

## 1.11 Funding

During the Fiscal year 2022/23, VCC allocated approximately $975,000 to fund various energy conservation projects at both the Downtown and Broadway Campuses. These projects encompassed several initiatives, including upgrading of a Direct Digital Control (DDC) System, electrification of Domestic Hot Water (DHW) system using heat pumps, enhancements of exterior lighting systems, upgrades of air conditioning (AC) systems, and instal ling new Electric Vehicle (EV) Charging Stations.

For the fiscal year 2023/24, a budget exceeding $350,000 has been allocated for several energy conservation initiatives. These initiatives include a Decarbonization Study, a Kitchen Electrification Study, installation of two EV Charging Stations, improvement of a Direct Digital Control (DDC) System, and the renewal of heat pumps due to the end of their lifecycle.

In the upcoming years, VCC will take a proactive approach by presenting a thorough project list that prioritizes energy efficiency, climate change mitigation, and responsible resource management during the budget planning process. We will allocate funds for these projects on a case-by-case basis, considering factors like projected payback, sustainability, and alignment with VCC's Green Purchasing Policy to contribute to addressing climate change.

## 1.12 Energy Management Assessment

Every two years VCC takes part in a BC Hydro sponsored Energy Management Assessment (EMA). The purpose of these assessments is to evaluate the organization’s energy-related practices and identify opportunities for organizational improvement.

The first EMA took place in March 2012 and identified the five most critical areas for energy management at VCC, with a specific emphasis on the necessity of having an Energy Manager. In response, a dedicated Energy Manager, sponsored by the BC Hydro Power Smart program, was brought on board in March 2013 to address this gap.

Since then, VCC has been actively engaged in EMA assessments conducted every two years and uses the insights from the EMA process to help continually improve the energy management program. The latest EMA occurred in May 2022. In this assessment, 22 potential actions were identified across the following 11 topic areas:

1. Executive Involvement
2. Planning & Budgeting
3. Performance Measurement & Reporting
4. Third Party Certification & Recognition
5. Overall Effectiveness
6. Policy/ Charter & Goals
7. Energy Team
8. Employee Engagement
9. Training & Development
10. Procurement & Partnering

11. Data Collection & Management
12. Audit, Review & Control

Over the next two years VCC will work towards prioritizing and implementing many of the identified actions. For a complete list of actions by topic area see Appendix C: EMA Results.

## 1.13 Key Performance Indicators

The standard metric used as a key performance indicator (KPI) within the post-secondary education sector is building area ($m^2$). 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 below.

*Table 5: 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 | 6,582 | 204 | 2,227 |
| 2019/20 | 14,246,100 | 71,722 | 6,814 | 198 | 2,091 |
| 2020/21 | 11,239,900 | 71,722 | 6,072 | 157 | 1,851 |
| 2021/22 | 12,363,500 | 71,722 | 6,524 | 173 | 1,895 |
| 2022/23 | 13,428,300 | 71,722 | 7,170 | 188 | 1,873 |

## 1.14 Energy Conservation Challenges and Considerations

There are many factors that have the potential to impact VCC's energy management program such as:

- Climate change and extreme weather events
- Campus growth
- The availability of energy and emissions focussed incentive programs
- Regulatory and policy changes
- And others

This means that VCC's energy program and our buildings needs to be responsive and resilient to changing circumstances. The iterative nature of the SEMP is one of the tools that the energy team uses to regularly review and respond to changes over time.

## 1.15 Energy Consumption and Costs

The overall utility energy use and cost for VCC are shown by the pie charts below. As shown in Figure 2, in 2022/23 electricity accounted for 56% of the total energy use, but 70% of the overall energy cost. Natural gas accounted for 39% of the total energy consumption, and 22% of the overall energy cost. Purchased steam accounted for 5% of the total energy consumption, and 8% of the overall energy cost.

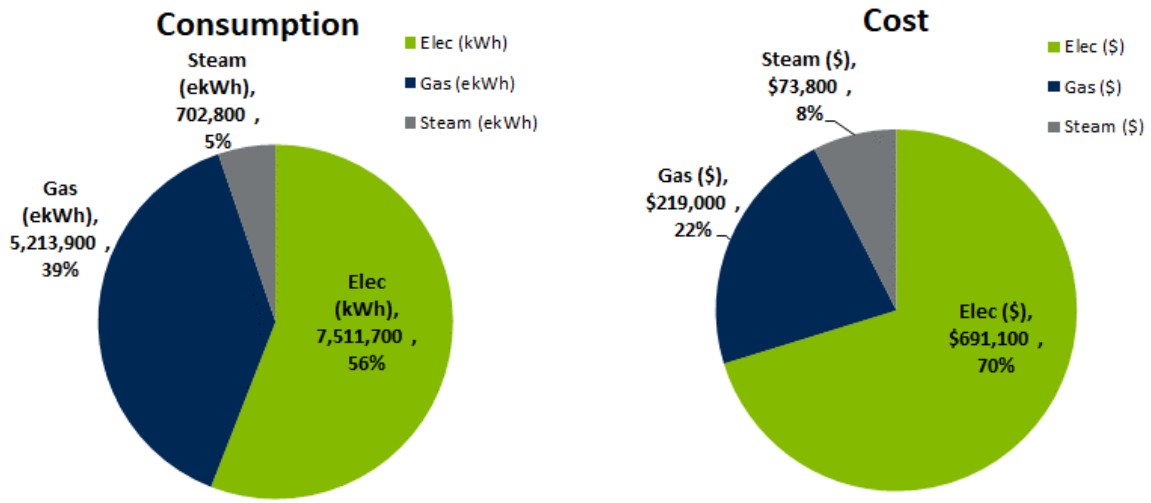



*Figure 2: FY 2022/23 Energy Consumption and Cost Breakdown*

To provide a sense of how energy consumption and costs have changed over time VCC's historical energy consumption (in ekWh) and costs and historical energy use intensity are shown in Figure 3: Historical Energy Consumption and Cost – both campusesFigure 3 and Figure 4 respectively. Both metrics have been provided as the first deals with energy consumption and cost in absolute terms and is likely to increase as VCC grows while the second, energy use intensity (EUI) which is based on floor area is a comparative metric VCC can use to try and ensure that any new buildings added have a net positive impact on VCC's overall energy use intensity score.

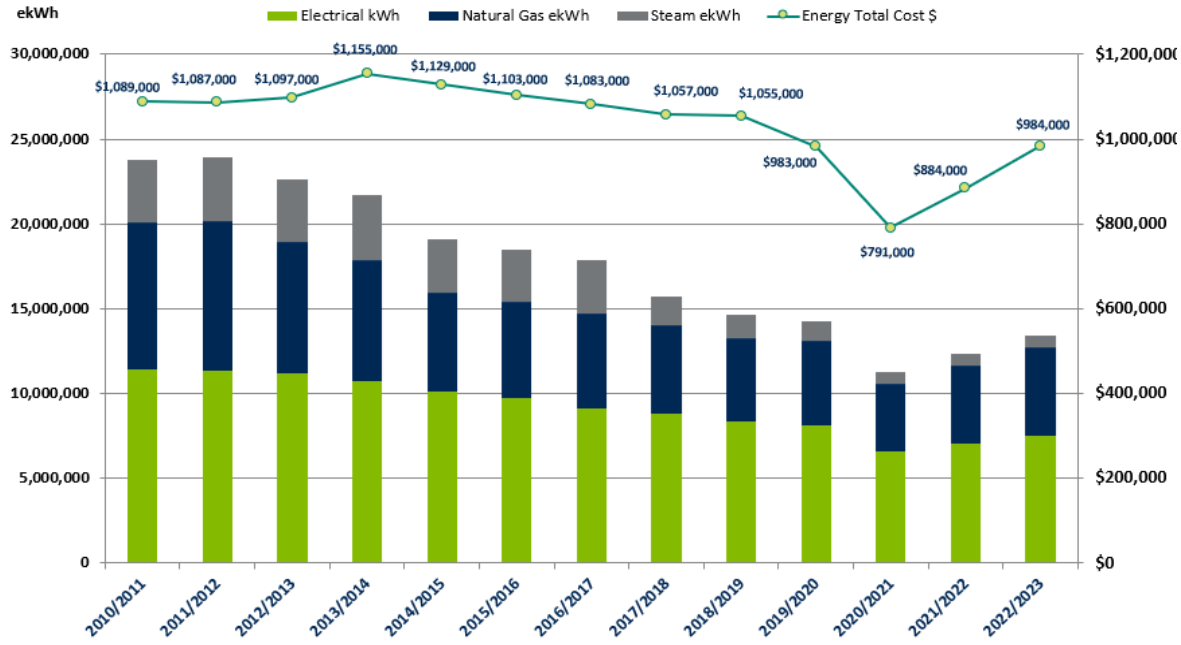



*Figure 3: Historical Energy Consumption and Cost – both campuses*

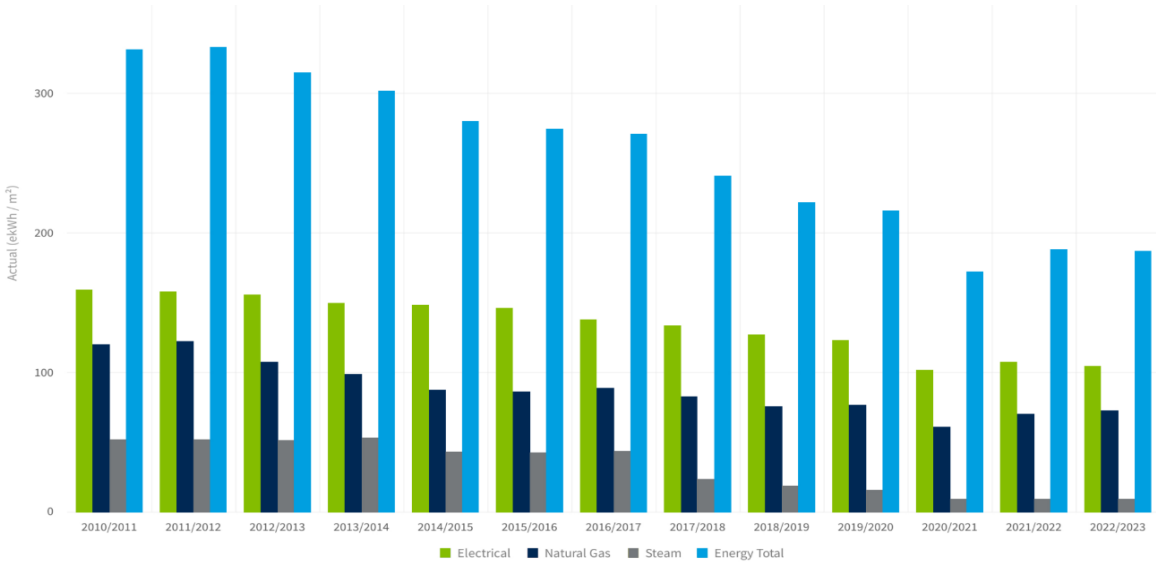



*Figure 4: Historical Energy Use Intensity – both campuses*

## 1.16 Comparative Energy Performance

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 14 campuses in BC. The energy data is for **calendar year 2022**.

The figure shows the difference between the VCC campuses. Both campuses have energy use intensities below the median. The VCC Downtown Campus (163.4 ekWh/m$^2$) has the lowest energy use intensity in the comparison. The VCC Broadway Campus (163.8 ekWh/m$^2$) has the second lowest energy use intensity among the shown campuses.

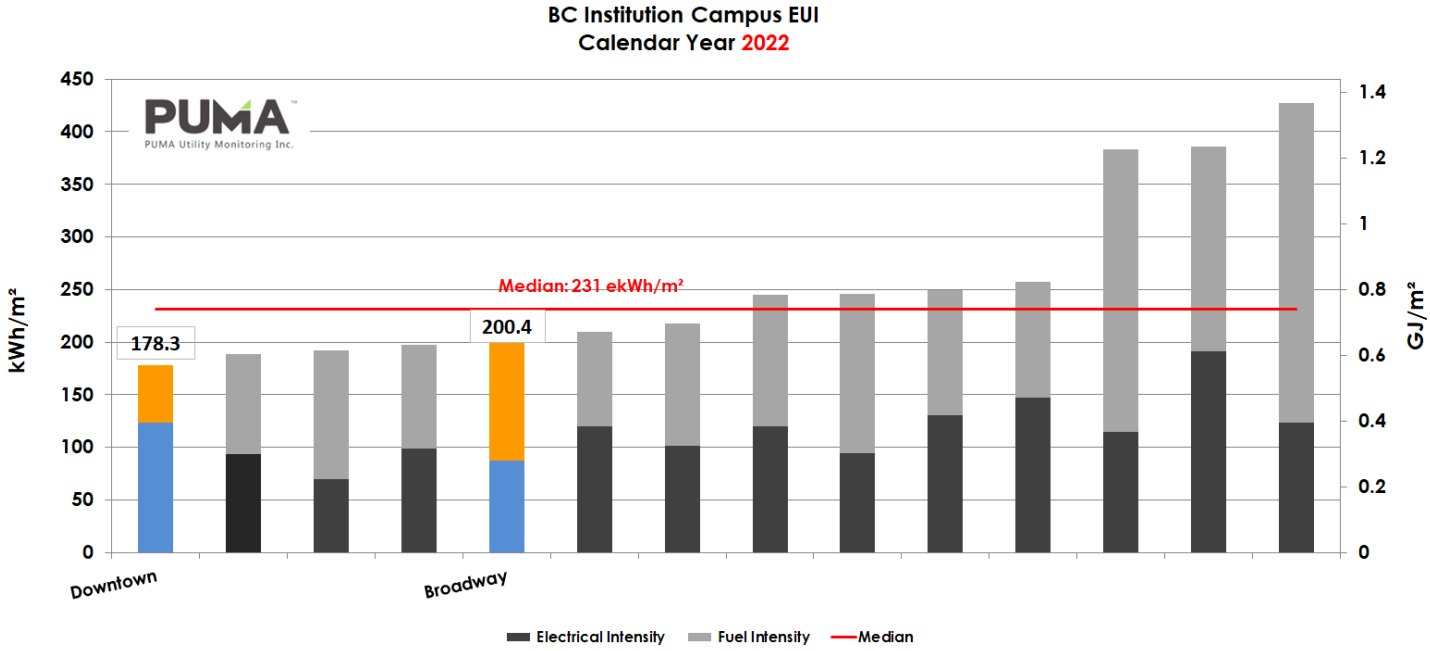



*Figure 5: PUMA Benchmarking comparison to other colleges in BC*

The above energy use intensities are for calendar year 2022 (not fiscal year 2022/23).
Other charts and tables in this report are based on 2022/23 fiscal year.

## 1.17 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 1.19.

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 2022/23 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, 2023, normalized for weather, is over 79,726,000 ekWh**.

[Electricity 29,337,600 kWh, natural gas 32,319,400 ekWh (116,350 GJ) and steam 18,069,000 ekWh (65,048 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.

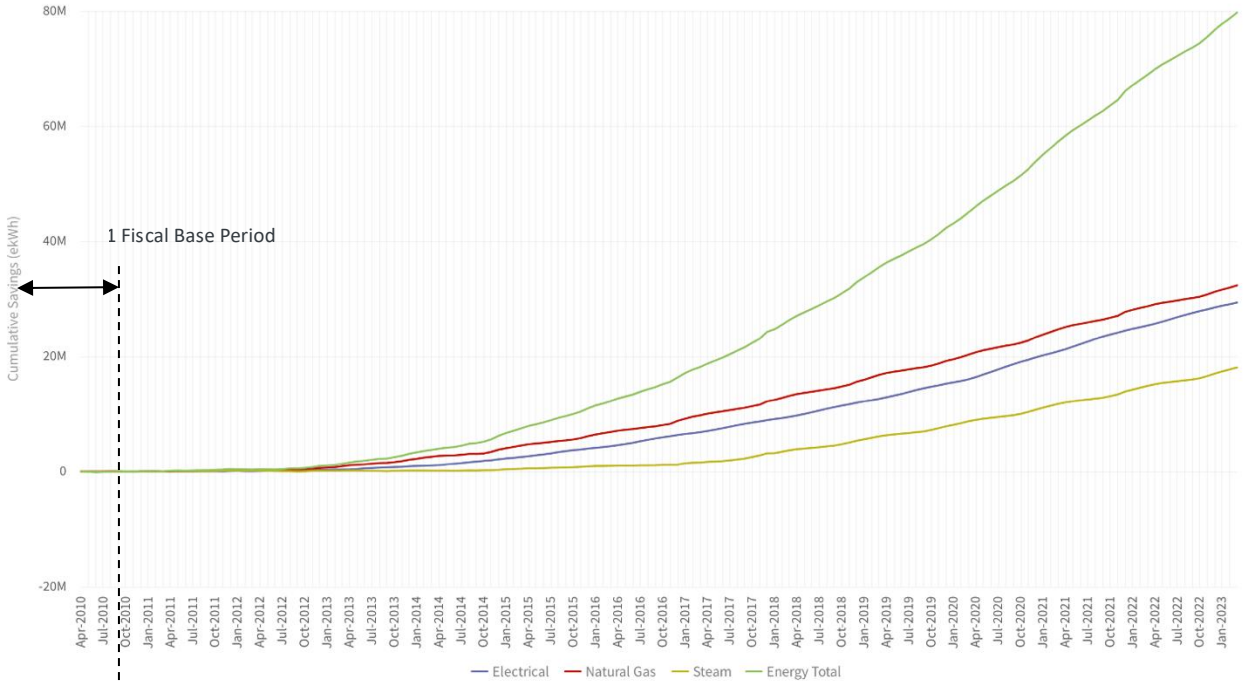



*Figure 6: Cumulative Sum of **Energy Savings** – VCC **BWY and DTN combined***

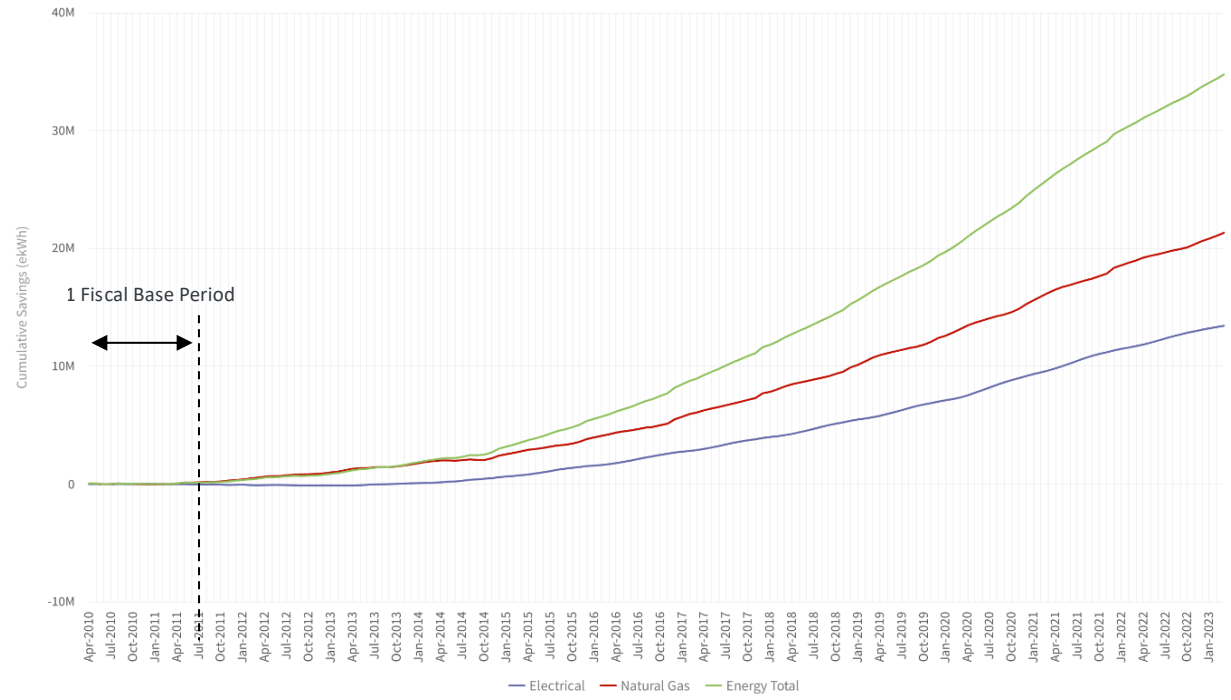



*Figure 7: Cumulative Sum of **Energy Savings** – **Broadway** Campus only*

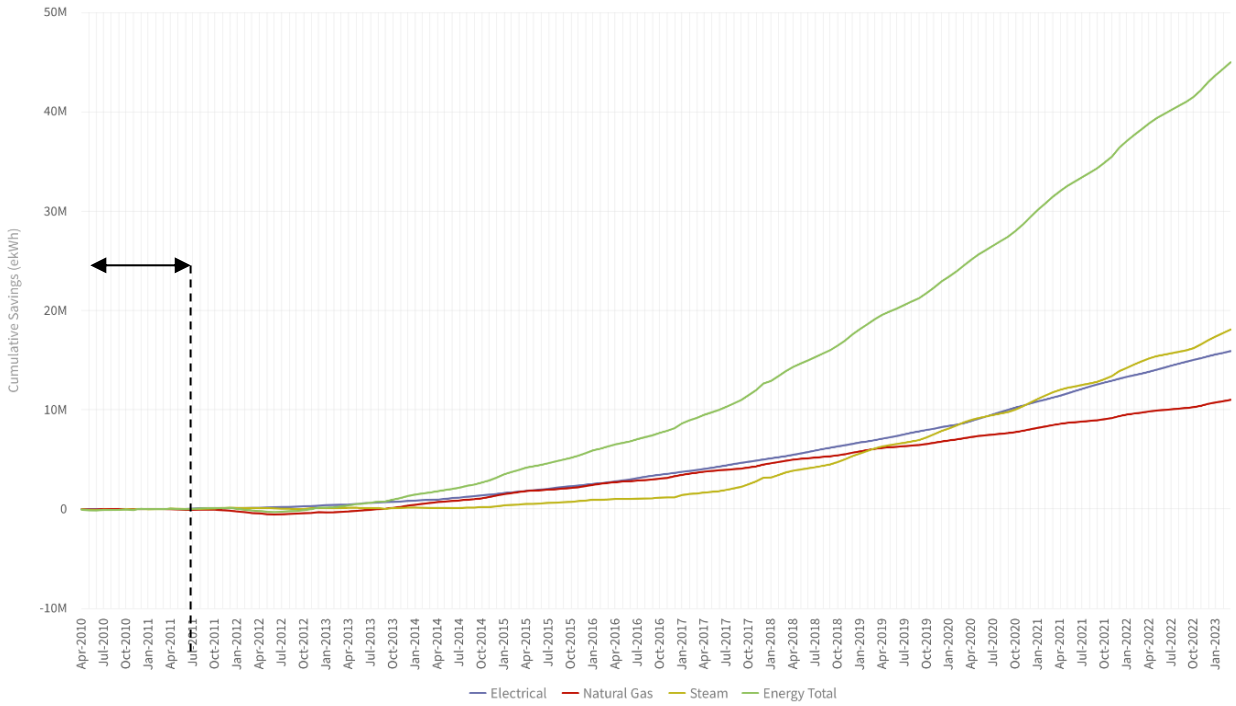



*Figure 8: Cumulative Sum of **Energy Savings** – **Downtown** Campus only*

A breakdown of Energy Savings per year is shown in Table 6, 7 and Table 8 for VCC, Broadway campus and Downtown campus, respectively.

*Table 6: 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 | 270,204 | 2,709 | -47 | 2,662 | **1,009,708** |
| 2013/2014 | 730,605 | 5,948 | 91 | 6,039 | **2,408,046** |
| 2014/2015 | 1,472,681 | 6,982 | 1,180 | 8,161 | **3,739,744** |
| 2015/2016 | 1,866,410 | 8,480 | 1,868 | 10,347 | **4,740,656** |
| 2016/2017 | 2,437,699 | 10,371 | 2,146 | 12,516 | **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** |
| 2019/2020 | 3,398,232 | 12,605 | 9,430 | 22,034 | **9,518,862** |
| 2020/2021 | 4,860,099 | 15,861 | 10,872 | 26,733 | **12,285,940** |
| 2021/2022 | 4,490,389 | 14,427 | 11,247 | 25,674 | **11,622,025** |
| 2022/2023 | 3,981,903 | 13,046 | 11,513 | 24,559 | **10,803,791** |
| **Grand Total** | **29,337,587** | **116,350** | **65,048** | **181,399** | **79,725,935** |

*Table 7: 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 | -38,461 | 2,278 | - | 2,278 | **594,195** |
| 2013/2014 | 251,875 | 2,747 | - | 2,747 | **1,015,060** |
| 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** |
| 2019/2020 | 1,688,001 | 8,778 | - | 8,778 | **4,126,390** |
| 2020/2021 | 2,286,729 | 11,065 | - | 11,065 | **5,360,268** |
| 2021/2022 | 2,069,600 | 9,899 | - | 9,899 | **4,819,208** |
| 2022/2023 | 1,724,246 | 8,438 | | 8,438 | **4,068,210** |
| **Grand Total** | **13,438,530** | **76,770** | **-** | **76,770** | **v34,763,512** |

*Table 8: 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 | 308,665 | 431 | -47 | 385 | **415,512** |
| 2013/2014 | 478,730 | 3,201 | 91 | 3,291 | **1,392,986** |
| 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 | 13,020 | **5,226,131** |
| 2019/2020 | 1,710,231 | 3,826 | 9,430 | 13,256 | **5,392,472** |
| 2020/2021 | 2,571,770 | 4,797 | 10,872 | 15,669 | **6,925,672** |
| 2021/2022 | 2,420,789 | 4,528 | 11,247 | 15,775 | **6,802,817** |
| 2022/2023 | 2,257,656 | 4,608 | 11,513 | 16,121 | **6,735,582** |
| **Grand Total** | **11,222,212** | **39,580** | **65,048** | **104,628** | **44,962,425** |

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 9.

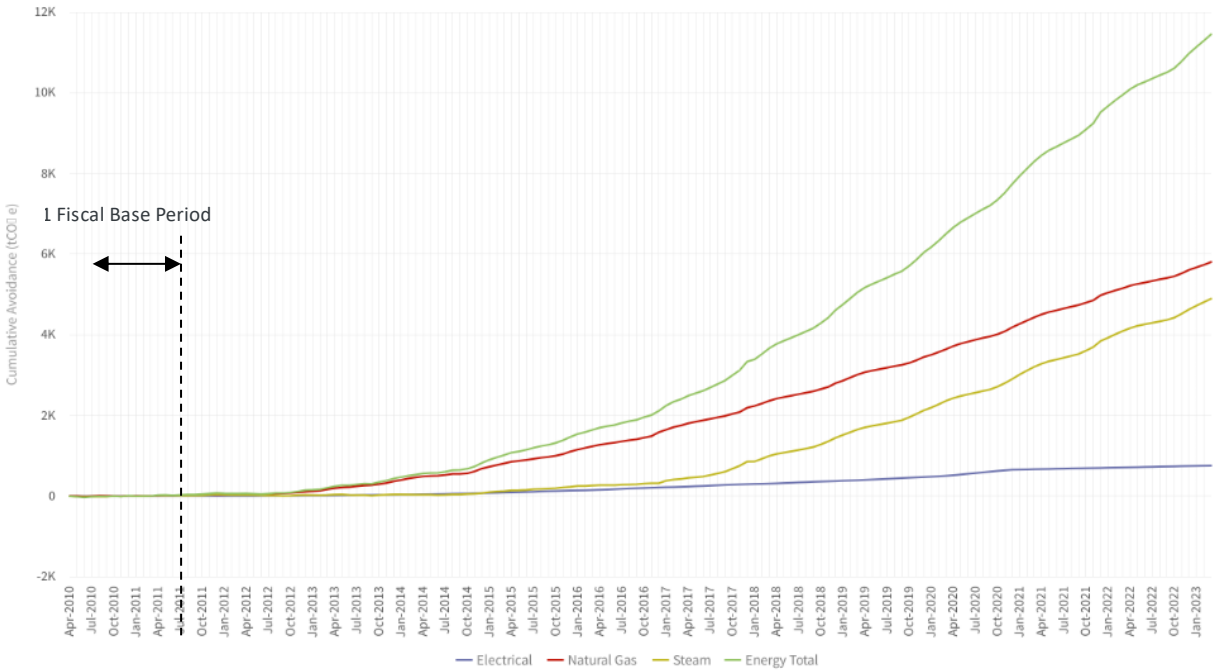



*Figure 9: Cumulative sum of GHG **emission** **avoidance** – since 2010/11 base period*[1]

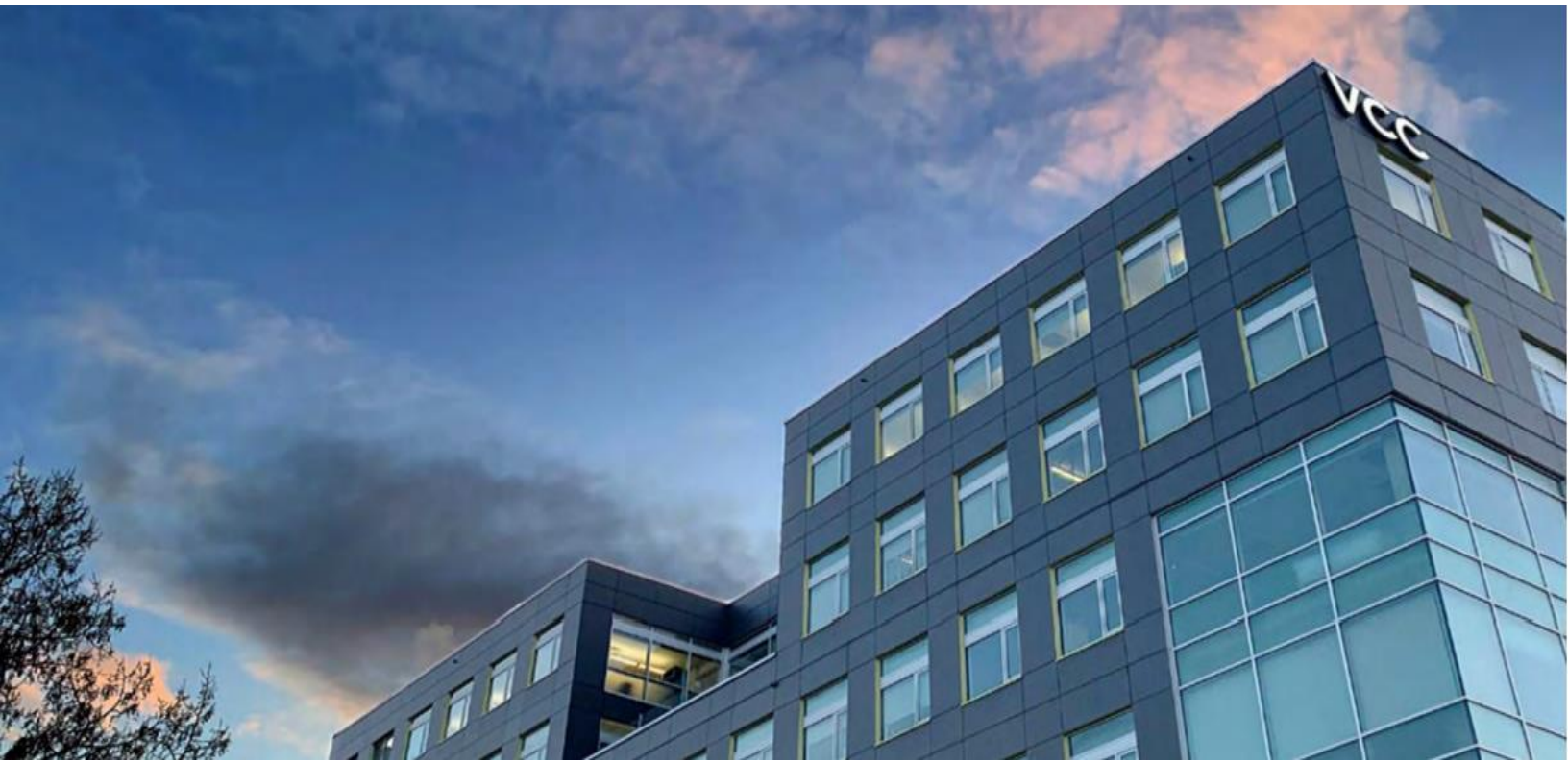
**The cumulative GHG emission avoidance by the end of Fiscal Year 2022/23 is approximately 11,448 tonnes of $eCO_2$.**

A breakdown of Emission Avoidance per year is shown in Table 9.

[1] Note: For the 2024/2025 SEMP the GHG emissions baseline year will be updated to 2007 to align with provincial emissions reduction baseline year.

*Table 9: Summary of Emission Avoidance by Year (Tonnes of equivalent $CO_2$) – VCC*

| Fiscal Year | Electricity | Natural Gas | Steam | Fuel Total | Energy Total |
|---|---|---|---|---|---|
| 2011/2012 | 1.5 | 29.5 | 29.3 | 58.9 | **60.4** |
| 2012/2013 | 10.5 | 135.1 | -3.2 | 131.9 | **142.4** |
| 2013/2014 | 25.0 | 296.6 | 5.7 | 302.3 | **327.3** |
| 2014/2015 | 47.6 | 348.1 | 88.1 | 436.2 | **483.8** |
| 2015/2016 | 63.3 | 422.8 | 140.6 | 563.4 | **626.7** |
| 2016/2017 | 79.4 | 517.1 | 161.5 | 678.6 | **758.1** |
| 2017/2018 | 80.9 | 611.2 | 572.9 | 1,184.1 | **1,264.9** |
| 2018/2019 | 82.1 | 651.8 | 655.5 | 1,307.3 | **1,389.4** |
| 2019/2020 | 109.3 | 628.5 | 709.9 | 1,338.4 | **1,447.6** |
| 2020/2021 | 162.7 | 790.9 | 845.7 | 1,636.6 | **1,799.3** |
| 2021/2022 | 45.2 | 719.4 | 884.3 | 1,603.7 | **1,648.8** |
| 2022/2023 | 45.8 | 650.5 | 802.7 | 1,453.2 | **1,499.0** |
| **Grand Total** | **753.1** | **5,801.7** | **4,893.0** | **10,694.7** | **11,448.0** |



## 1.18 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 10. As can be seen, the cumulative energy cost avoidance by end of Fiscal Year 2022/23 is approximately $5,131,000. Figure 10: Cumulative sum of **cost avoidance** – since 2010/11 base period

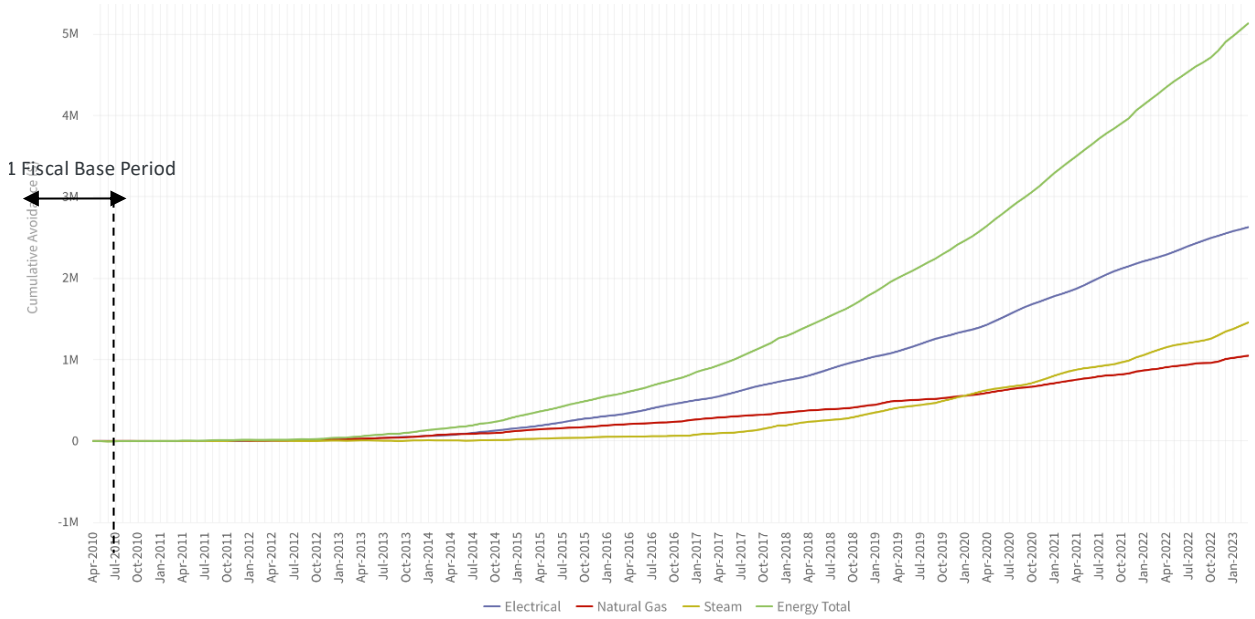



*Figure 11: Cumulative sum of **cost avoidance** – since 2010/11 base period*

*Table 10: 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 | $16,089 | $20,456 | -$630 | $19,826 | $35,915 |
| 2013/2014 | $48,563 | $53,168 | $1,045 | $54,213 | $102,776 |
| 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 | $297,424 | $117,999 | $166,986 | $284,985 | $582,409 |
| 2019/2020 | $319,357 | $90,632 | $214,163 | $304,795 | $624,152 |
| 2020/2021 | $442,626 | $162,741 | $251,070 | $413,811 | $856,436 |
| 2021/2022 | $420,868 | $150,675 | $265,473 | $416,148 | $837,015 |
| 2022/2023 | $367,064 | $158,041 | $333,629 | $491,670 | $858,735 |
| **Grand Total** | **$2,627,305** | **$1,047,974** | **$1,455,645** | **$2,011,949** | **$5,130,924** |


# 4. 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. VCC achieved this target 15 months earlier than targe date. The current energy reduction target for VCC is as follows:

**VCC will reduce campus energy intensity in existing buildings by 50% and 60% from 2010/2011 fiscal year levels by 2024/2025 and 2029/2030 fiscal years respectively**

**This equates to a kWh reduction target of approximately 800,000kWh for the 2023/2024 fiscal year.**

**VCC will reduce campus GHG intensity 60 % by 2030 compared to a 2007 baseline.**

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

## 1.19 Annual Goals and Objectives

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

*Table 11:* ***Annual Energy Reduction Actual and Targets***

| | Electricity | | | Fuel | | | Overall Energy | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Reduction | Energy Intensity | Energy Use | Reduction | Energy Intensity | Energy Use | Reduction | Energy Intensity | Energy Use | Target or Actual |
| Fiscal Year | % Of Base Period | kWh/m² | MWh | % Of Base Period | ekWh/m² | eMWh | % Of Base Period | ekWh/m² | eMWh | |
| 2010/2011 (Base) | | 160 | 11,440 | | 172 | 12,366 | | 332 | 23,807 | Actual |
| 2011/2012 | 1% | 159 | 11,368 | -2% | 175 | 12,577 | -1% | 334 | 23,945 | " |
| 2012/2013 | 2% | 156 | 11,172 | 7% | 159 | 11,455 | 5% | 315 | 22,627 | " |
| 2013/2014 | 6% | 150 | 10,738 | 11% | 152 | 10,947 | 9% | 302 | 21,684 | " |
| 2014/2015 | 11% | 142 | 10,155 | 28% | 124 | 8,956 | 20% | 266 | 19,111 | " |
| 2015/2016 | 15% | 136 | 9,742 | 29% | 122 | 8,762 | 22% | 258 | 18,505 | " |
| 2016/2017 | 20% | 127 | 9,114 | 29% | 122 | 8,783 | 25% | 250 | 17,898 | " |
| 2017/2018 | 23% | 123 | 8,818 | 44% | 97 | 6,931 | 34% | 220 | 15,748 | " |
| 2018/2019 | 27% | 117 | 8,393 | 50% | 87 | 6,265 | 38% | 204 | 14,657 | " |
| 2019/2020 | 29% | 113 | 8,132 | 51% | 85 | 6,113 | 40% | 198 | 14,245 | " |
| 2020/2021 | 42% | 92 | 6,629 | 63% | 64 | 4,610 | 53% | 157 | 11,238 | " |
| 2021/2022 | 38% | 98 | 7,039 | 57% | 74 | 5,325 | 48% | 172 | 12,364 | " |
| 2022/2023 | 34% | 105 | 7,512 | 52% | 82 | 5,914 | 44% | 187 | 13,426 | " |
| 2024/2025 | 40% | 96 | 6,864 | 60% | 69 | 4,947 | 50% | 165 | 11,811 | Target |
| 2029/2030 | 45% | 88 | 6,292 | 75% | 43 | 3,092 | 61% | 131 | 9,384 | " |

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

- The timing of implementation of projects;

- Availability of funding for energy projects; and
- Major changes in building use.

It should be noted that actual Electricity, Fuel and Overall Energy use and intensities in Fiscal Year 2020/21 were much lower than target due to pandemic and less occupancy in the campuses. In fiscal years 2021/22 and 2022/23 the campuses had more occupancy, but not fully occupied yet. For the future years, the targets are set based on the assumption that college will be fully occupied.

## 1.20 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:** Using the Holiday Shutdown checklist staff will conduct a shutdown review of your office prior to leaving for the holiday break.

  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** Energy efficient panel heaters will be replacing none energy efficient ones to save energy and reduce fire hazards.
- **Holiday Shutdown Campaign:** Using the Holiday Shutdown checklist staff will conduct a shutdown review of your office prior to leaving for the holiday break.

- Planned activities for **2019/20** included:
  - **Lights off Green on Campaign:** By designing and placing "Lights Off, Green On" stickers next to light switches across all our campuses, we aim to remind people to change their behavior and save energy.
  - **Holiday Shutdown Campaign:** Using the Holiday Shutdown checklist, staff will conduct a review of their offices before leaving for the holiday break.
- Planned activities for **2020/21** included:
  - **Covid - 19 Safe Energy Campaign:** We reminded people to reduce phantom power energy consumption through digital media and placed posters in building areas that were heavily used during the pandemic.
- Planned activities for **2021/22** included:
  - **Take the Stairs Campaign:** Targeting students and staff to use stairs whenever possible to reduce energy consumption and promote awareness of accessibility, considering social distancing and health and safety measures recommended by the province.
  - **Holiday Shutdown Campaign:** Using the Holiday Shutdown checklist, staff will conduct a review of their offices before leaving for the holiday break.
- Planned activities for **2022/23** included:
  - **Bundle Up + Space Heaters:** Encouraging staff to "heat your body before heating the room" to avoid increasing indoor air temperatures above 21°C during colder months and to request a space heater following the new VCC Space Heaters Operational Standard.
  - **Holiday Shutdown Campaign:** Using the Holiday Shutdown checklist, staff will conduct a review of their offices before leaving for the holiday break.

- **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.

- **2019/20:** Additional lighting upgrades at the Downtown campus were completed in March 2020. The annual energy savings was approximately 307,000 kWh. The project cost was $197,000, which was reduced to $144,000 after BC Hydro incentive.
- **2020/21:** Control upgrades at the Downtown campus were completed in March 2021. The annual energy savings was approximately 5,000 kWh. The project cost was $6,000, which was reduced to $5,000 after BC Hydro incentive.
- **2021/22:** The lighting system upgrade for the Downtown campus was to extend the existing DDC system to include lighting in common area hallways and corridors on the 3rd floor, which were operating continuously. Lighting in these areas were scheduled to turn off overnight. Estimated annual energy savings for this upgrade was approximately 11,400 kWh.

- **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.
  - **2020/21:** Lighting upgrades at the Broadway campus were completed in March 2021 that included installing LED lamps. The annual energy savings was approximately 61,000 kWh. The project cost was $112,000, which was reduced to $101,000 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.
  - **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.
  - **2020/21 –** Replace Standard Efficiency Motors with Premium Efficiency:

    In 2021, 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.
  - **2021/22 –** Add 7 Exhaust Fans to DDC:

    In January 2022, 7 exhaust fans serving floor 3 were added to the DDC system with weekly operation schedule to avoid their continuous operation. Estimated annual energy savings for this upgrade was approximately 12,300 kWh.

## 1.21 Progress on EMA priorities

VCC is in the process of assessing the progress they have made towards the EMA priorities identified in 2022. An update will be provided in next year's SEMP.

## 1.22 Planned Actions (Project List)

To enable VCC to achieve the reduction target outlined in Section 1.19, 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.

**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
- Adding lighting systems to DDC (Direct Digital Control)
- Demand response and dimming control for corridors, classrooms, and offices

**Continuous Optimization of DDC System**

- Recommissioning Downtown and Broadway campus buildings to re-assess building performance after Round 1 is complete (6 years after the conservation measures that were implemented in 2017/18)

**Electrification**

- Replacing gas-fired domestic hot water heaters with heat pumps
- Replacing gas-fired kitchens' make-up air units with heat pumps (serving culinary arts school)
- Replacing gas-fired kitchens' equipment with induction units

**Renewable Energy**

- Installing Photovoltaic panels on Broadway Buildings A and B

Table 12: Summary of Potential Energy Savings Projects – Three Fiscal Years

| Fiscal Year | 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 ($) | Projected Total Cost incl. Incentive ($) |
|---|---|---|---|---|---|---|---|---|---|
| 2023/24 2024/25 2025/26 | Behavioral Change Program | VCC | Mar-25 | 60,000 | 0 | $3,600 | $9,000 | $3000 | $6,000 |
| 2023/24 | Dimming Controls for Corridors | BWY | Mar-24 | 7,300 | 0 | $700 | $25,000 | $0 | $25,000 |
| " | Lighting Upgrades Controls | BWY | Mar-24 | 1,400 | 0 | $100 | $5,000 | $0 | $25,000 |
| " | Dimming Controls for Classrooms | BWY-B | Mar-24 | 30,000 | 0 | $1,800 | $65,000 | $0 | $65,000 |
| 2023/24 2024/25 | Continuous Optimization investigation | DTN | Mar-25 | - | - | - | $40,000 | $40,000 | $0 |
| " | Continuous Optimization Investigation | BWY | Mar-25 | - | - | - | $40,000 | $40,000 | $0 |
| 2025/26 | Continuous Optimization Implementation | DTN | Mar-26 | 158,000 | 200 | $12,100 | $24,000 | $0 | $24,000 |
| " | Continuous Optimization Implementation | BWY | Mar-26 | 115,300 | 500 | $13,400 | $26,000 | $0 | $26,000 |
| | **Total** | | | **372,000** | **700** | **$31,700** | **$234,000** | **$83,000** | **$171,000** |

*Table 13: Summary of Potential Electrification Projects – Three 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/Clean BC Incentive ($) | Projected Total Cost Incl. Incentive ($) |
|---|---|---|---|---|---|---|---|---|---|
| 2024/25 | Culinary School Induction Equipment | DTN | Mar-24 | -111,000 | 570 | $1,000 | TBD | TBD | TBD |
| 2024/25 & 2025/26 | Kitchens' Make-up Air Units Replace with Heat Pumps | DTN | Mar-26 | -249,000 | 3,230 | $24,000 | TBD | TBD | TBD |
| | **Total** | | | **-460,000** | **5,300** | **$34,000** | **TBD** | **TBD** | **TBD** |

*Table 14: Summary of Energy Savings Projects-*

| 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 |

| 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 ($) | Projected Total Cost Incl. Incentive ($) |
|---|---|---|---|---|---|---|---|---|---|
| | 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 |

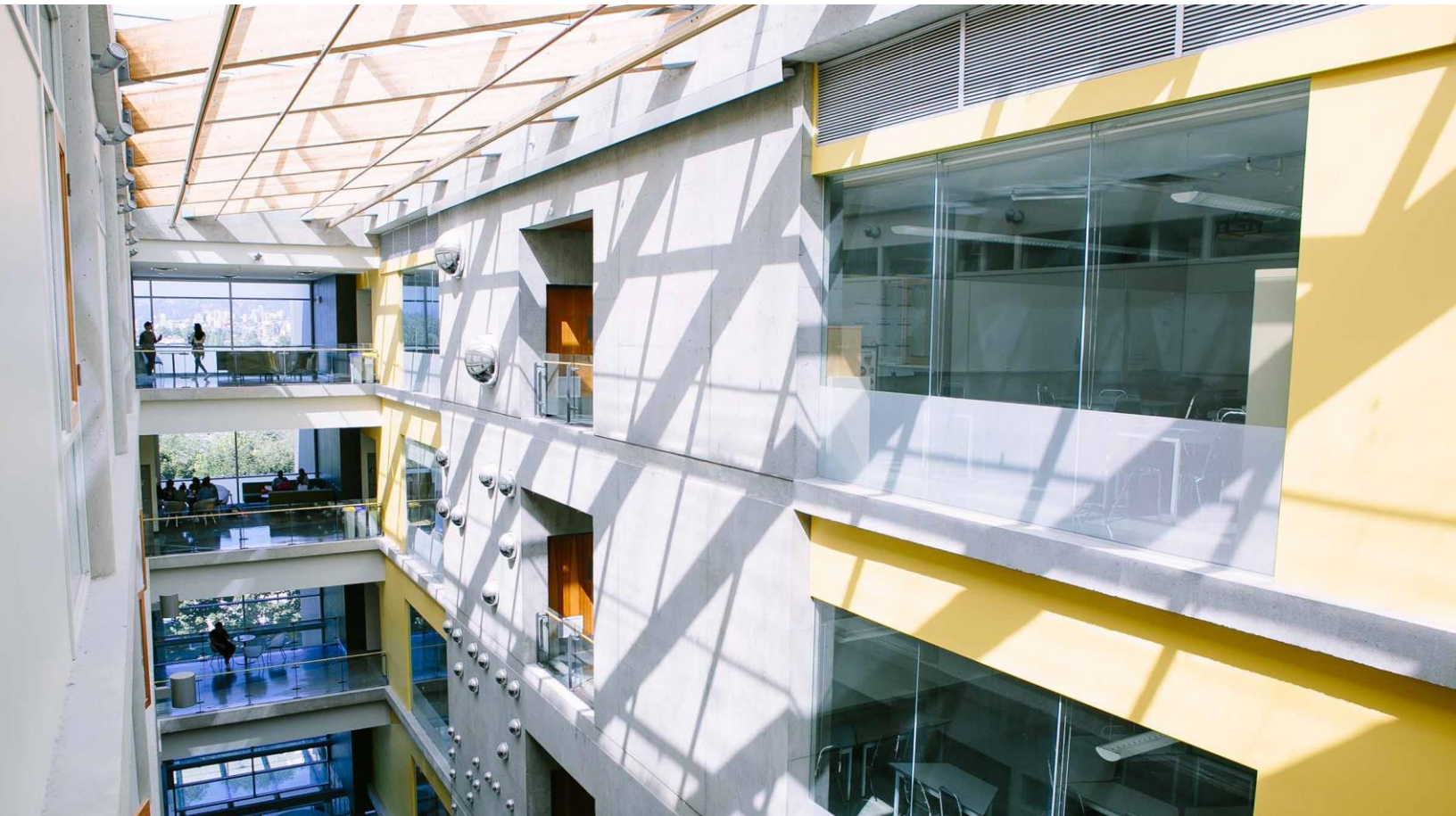
| FY | Project | Location | Projected Completion Date | Potential Electrical Savings (kWh) | Potential Other Fuel Savings (GJ) | Potential Total Savings (Energy + Operational) ($) | Total Cost ($) | BC Hydro/ Fortis BC Incentive ($) | Projected Total Cost Incl. Incentive ($) |
|---|---|---|---|---|---|---|---|---|---|
| | 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** |
| 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 1st Floor Heat Pumps (29) to DDC and Add Occupancy Sensors for 8 Classrooms & Boardrooms | 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 |
| 2019/20 | Behavioral Change Program | VCC | Ongoing | 20,000 | 0 | $1,200 | $3,000 | $1000 | $2,000 |
| | Lighting Upgrades - LED Lamps | DTN | Mar-20 | 307,000 | 0 | $37,000 | $197,000 | $53,000 | $144,000 |
| | **Sub-Total** | | | **327,000** | **0** | **$38,200** | **$200,000** | **$54,000** | **$146,000** |

| 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 ($) | Projected Total Cost Incl. Incentive ($) |
|---|---|---|---|---|---|---|---|---|---|
| 2020/21 | Lighting Upgrades - LED Lamps/Controls | BWY | Mar-21 | 61,000 | 0 | $4,000 | $112,000 | $11,000 | $101,000 |
| | Lighting Upgrades - Controls | BWY | Mar-21 | 5,000 | 0 | $300 | $6,000 | $1,000 | $5,000 |
| | Installing VFDs for 12 AHUs Fan Motors | BWY | Mar-21 | 118,500 | 0 | $7,000 | $110,000 | $0 | $110,000 |
| | Add 2nd & 3rd Floor Heat Pumps to DDC and Add Occupancy Sensors | DTN | Apr-21 | 175,000 | 0 | $10,500 | $120,000 | $0 | $120,000 |
| | **Sub-Total** | | | **359,500** | **0** | **$21,800** | **$348,000** | **$12,000** | **$336,000** |
| 2021/22 | Install VFD for Cooling Towers | DTN | May-21 | 53,400 | 0 | $5,200 | $45,400 | $0 | $45,400 |
| | Adding Lighting and Exhaust Fans to DDC | DTN | Jan-22 | 23,700 | 0 | $2,000 | $35,200 | $0 | $35,200 |
| | **Sub-Total** | | | **77,100** | **0** | **$7,200** | **$80,600** | **$0** | **$80,600** |
| **Total 7 Years** | | | | **2,571,250** | **3,000** | **$267,800** | **$2,320,200** | **$284,350** | **$2,034,850** |

*Table 15: Summary of Electrification 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/ Clean BC Incentive ($) | Projected Total Cost Incl. Incentive ($) |
|---|---|---|---|---|---|---|---|---|---|
| 2020/21 | Domestic Hot Water Heating Heat Pump | BWY-B | Mar-21 | -58,000 | 800 | $4,500 | $132,000 | $22,000 | $110,000 |
| 2022/23 | Domestic Hot Water Heating Heat Pump | BWY-A | Oct-23* | -69,500 | 913 | $4,400 | $146,000 | $24,000 | $122,000 |

*This project was supposed to be completed by Mar 2023, however due to some complications in implementation, it will be completed



# 5. Future Targets: VCC's Path to Net Zero

This section 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:

## 1.23 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 48% reduction by end of FY 2021/22 in this category and there are still opportunities to reduce further energy and emissions via energy efficiency.

## 1.24 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. At Broadway campus - Building B, the gas-fired domestic hot water heaters were replaced with electrical heat pumps

in 2021. Currently, domestic hot water heaters at Building A, which use natural gas are being replaced with electrical heat pumps.

## 1.25 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:

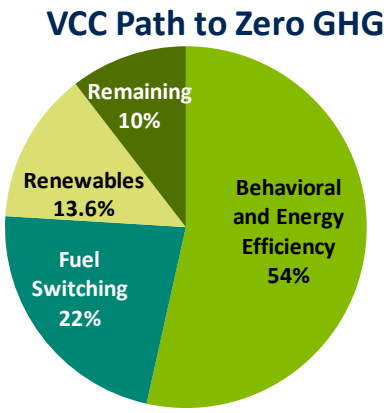



*Figure 12: Breakdown of GHG Reduction*

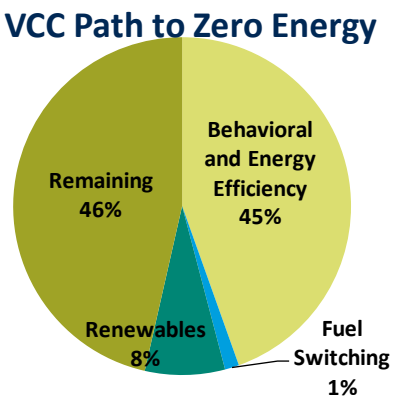



*Figure 13: Breakdown of Energy Reduction*

Lists of the projects associated with achieving the reductions displayed in Figure 14 and 13 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.

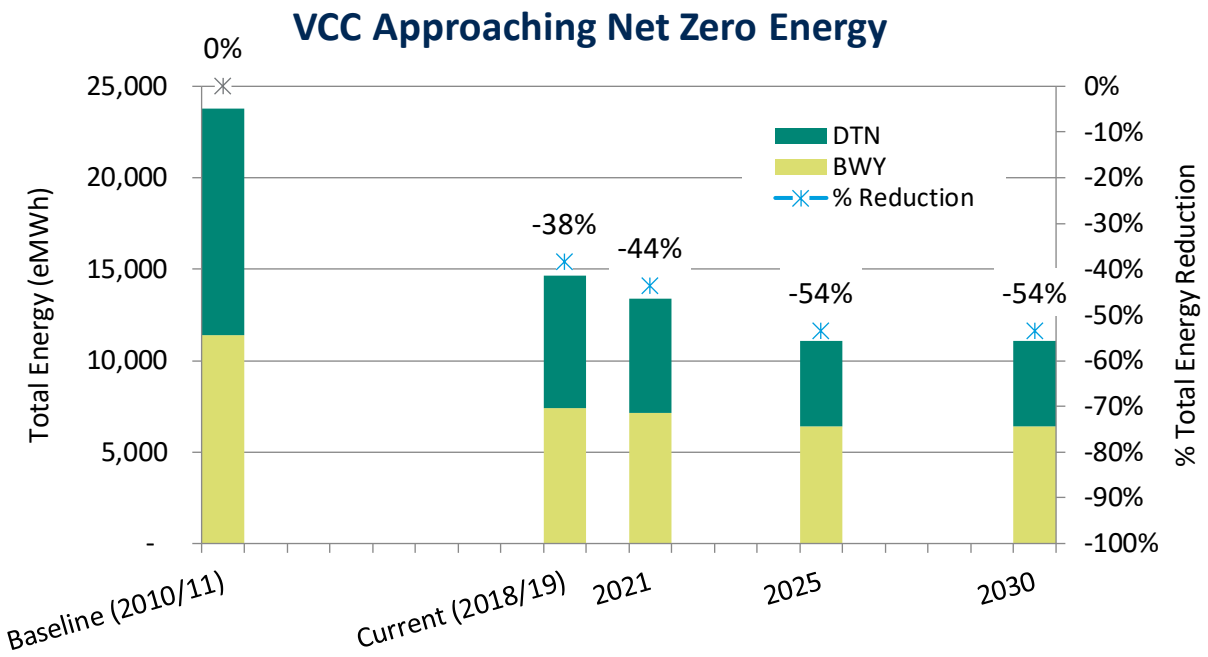



*Figure 14: Modelled GHG Reduction*

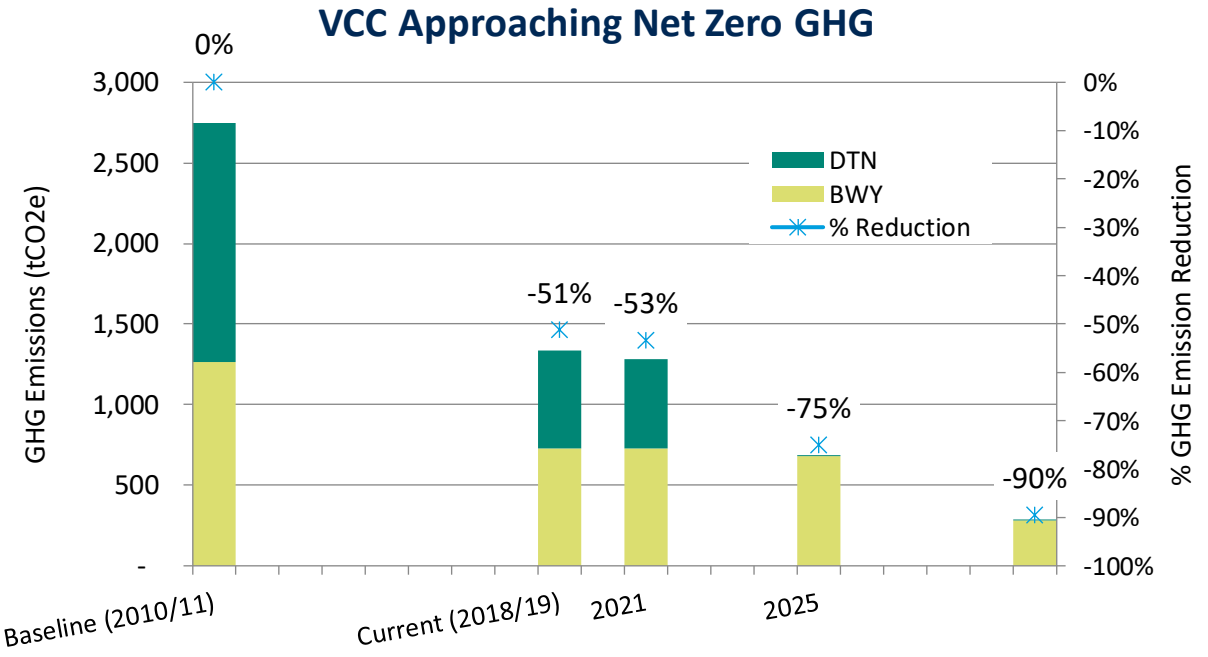



*Figure 15: Modelled Energy Reduction*

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 switching to a 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 the Neighbourhood Energy Utility (NEU) district energy system 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 Net 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

# 6. Appendix A: Stakeholders

**VCC's energy management team** takes the lead in our energy management efforts. Meeting monthly, the team reviews commitments, guidelines, procedures, and budgets, ensuring that VCC stays on track to meet GHG reduction targets. Additionally, discussions in these meetings increasingly focus on climate adaptation initiatives aimed at reducing risks associated with climate change.

**Sladjana Borovcanin**, MA, BID, Director, Facilities Management
**Ross McPherson,** FMP, PMP, Associate Director, Facilities Management
**Diana Cabrero Purata,** BMC RHFAC Professional, Manager of Environment and Sustainability
**Mani Minouei,** M.Sc, Manager Facilities Capital Project
**Steve Horn,** FMA, SMA, Facilities Manager, Downtown Campus
**Ron Singh,** Facilities Manager, Broadway Campus
**Stephen Burns,** Building Services Manager, Broadway Campus
**Joshua Johnson,** Building Services Manager, Downtown Campus

#### 1.25.1.1 VCC's Executive Support:

**Ajay Patel,** VCC's President & CEO

#### 1.25.1.2 VCC's Volunteers:

Environmental Sustainability Advisory Group (ESAG) is an official VCC 'green team', with a mandate to support VCC's commitment to environmental sustainability through the expansion of existing, and the introduction of new initiatives for climate justice and emergency management. Through the Chair, VP Administration and International Development, the ESAG advises the College's Senior Leadership team on matters of environmental responsibility and generates ideas for initiatives that promote and support environmental responsibility within the college and college community. Environmental Community Action Team (ECAT) was an official 'green team' of the college, with a mandate to act as an advisory group of Operations Council. To create a direct pathway with the Senior Leadership team, ECAT was dissolved and ESAG re-established in 2022.

**Vacant,** Student Union Vancouver Community College (SUVCC) Representative
**Ian Humphreys,** VP Administration & International Development
**Skye Richards,** VCCFA Representative, Instructor of Mathematics
**Kalli Cartwright,** Director Commercial Services
**Daniel Rohloff,** CUPE 4627 Representative, Graphic Designer, Marketing
**Trevor Maddern,** Director Procurement
**Diana Cabrero Purata,** Manager Environment and Sustainability
**Emily Drew,** Registered Sign Language Interpreter, Interpreting Services
**Erin Vickars,** Department Assistant, Culinary
**KJ Hills,** Department Head, College and Career Access
**Sladjana Borovčanin,** Director Facilities Management
**Van Khanh Tran,** Coordinator, VP Administration (Recording Secretary)

### 1.25.1.3 VCC Energy Management Consultants:

**Prism Engineering,** Majid Pishvaei, PEng, CEM
**Robert Greenwald,** PEng
**Adam Franklin,** Peng
**Taniell Hamilton**

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

| Contact Info | | | | |
|---|---|---|---|---|
| **Name** | **Title** | **Organization** | **Email** | **Phone** |
| Sladjana Borovčanin | Director, Facilities Management and Planning | VCC | sborovcanin@vcc.ca | 778-783-5045 |
| Diana Cabrero Purata | Manager of Environment and Sustainability | VCC | dcabreropurata@vcc.ca | 236-993-7714 |
| Ron Mastromonaco | Key Account Manager | BC Hydro | Ron.Mastromonaco@bchydro.com | 604-699-9418 |
| Jason Lee | Program Manager | BC Hydro | Jay.Lee@bchydro.com | 604-364-1835 |

# 7. Appendix B: Baseline Energy Use; Account Histories (table and charts samples)

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 16: 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

# 8. Appendix C: EMA Results

| ACTION PLAN | |
|---|---|
| **Topic** | **Action** |
| **PLAN** | |
| Executive Involvement | Encourage executive sponsors to promote success stories and work towards engaging more employees on energy efficiency and sustainability. |
| Planning & Budgeting | Work with the Environmental Sustainability Advisory Group (ESAG) to establish a formal process for funding energy/GHG reduction projects. This could start with identifying short and long-term projects to help prioritize budget allocation. |
| | Include GHG cost forecasting in business case calculations for energy reduction projects. This will likely increase the prevalence of electrification, thereby avoiding carbon tax. |
| **CHECK** | |
| Performance, Measurement & Reporting | Consider displaying the identified KPIs in crucial viewing areas. The visuals can encourage employees and students who use the facilities to save energy. Additionally, visible displaying helps form a more robust culture around sustainability. |
| **ACT** | |
| Third Party Certification & Recognition | Investigate environmental/energy certifications beyond those required by the government and weigh the value of pursuing them. Even if the decision is not to pursue certification, the standards can be helpful in guiding energy management decisions. |
| Overall effectiveness | Prioritize low-cost/no-cost measures. Given the district's size, small changes to setpoints, schedules, etc., can lead to a significant level of energy savings while avoiding capital investment. |
| | Work with the ESAG to set energy and sustainability goals and plan for the college. |

| FUTURE IMPROVEMENTS AND SUSTAINABILITY | |
|---|---|
| **Topic** | **Action** |
| **PLAN** | |
| **Policy/Charter & Goals** | With the help of the ESAG, establish new energy/GHG reduction goals and formalize them in the policy. This could be done from scratch or as an update to an existing energy/environmental policy document. |
| | With the help of HR, develop a 1-page document for new employees to update their knowledge around energy conservation and sustainability. Include links for the reader to explore relating to VCC values and how energy conservation fits in with those values. |
| **DO** | |
| **Energy Team** | Consider creating a cross-functional Energy Team with a target of awareness and engagement. Potential team member segments could include student union, marketing, HR, staff, etc. |
| | Invite additional stakeholders to an energy team meeting and/or EMSS meetings. |
| | Consider having one of the members of the energy team on the ESAG. This will lead to more frequent information sharing and support goal alignment between the two groups. |
| **Employee Engagement** | Collaborate with the ESAG to plan for a campus engagement campaign to increase awareness of energy conservation. Some examples include building energy conservation challenge, turn-off campaign, sweater day, lunch and learn, alternative transportation day, etc. |
| | Look into methods of quantification for employee engagement campaigns. This may offer a better understanding of which campaigns are most effective for VCC. |
| **Training & Development** | Periodically include the "energy moment" element in staff meetings and consider training staff on specific energy topics. This will help upskill and increase awareness. Continue conservation communication in the Digest newsletter. |
| | Invite energy team members to the BC Hydro sessions. |
| | Once it becomes safe to do so, consider sending staff to climate, sustainability, and energy conferences to expand and update their knowledge. |
| **Procurement & Partnering** | Investigate revising the procurement process to evaluate purchases with low environmental impact at a higher value. This could also include GHG future costing, which will increase the rate of electrification. |
| **CHECK** | |
| **Data Collection & Management** | Continue to assess gas and water data granularity needs and consider upgrading metering as new technology becomes available. |
| **ACT** | |
| **Audit, Review & Control** | Review SOPs and consider updating them specifically for the energy-efficient operation of equipment. This can start with the most significant energy users in the portfolio and then expand to the remaining equipment. |