



2018 CARBON NEUTRAL ACTION REPORT

Prepared by Facilities Services



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TABLE OF CONTENTS

OVERVIEW	1
I. EMISSIONS AND OFFSETS, 2018.....	5
2018 Greenhouse Gas Emissions	
Offsets Applied to be Carbon Neutral in 2018	
II. ACTIONS TAKEN TO ACCOMPLISH OUR 2018 GHG REDUCTIONS	6
Infrastructure Projects	
Training, Presentations, and Participation at Events	
III. FUTURE ACTIONS PLANNED FOR 2019	8
IV. KPU’s COMMITMENT TO SUPPORT CARBON REDUCTION, SUSTAINABILITY, AND ENERGY CONSERVATION	9

2018 Carbon Neutral Action Report

Kwantlen Polytechnic University

This Carbon Neutral Action Report for the period January 1st, 2018 to December 31st, 2018 summarizes our emissions profile, the total offsets purchased to reach net-zero emissions, the actions we have taken in 2018 to reduce our greenhouse gas emissions, the results of actions taken, and our plans to continue efforts toward reducing emissions in 2019 and beyond.

OVERVIEW

Kwantlen Polytechnic University (KPU)'s 2018 Carbon Neutral reporting period saw a reduction in Green House Gas (GHG) emissions of 6.8% since 2017. This is a return towards annual energy reductions after challenges in 2017 where the University experienced setbacks in energy reduction due to major capital construction activity at the Richmond and Surrey campuses, as well as a leaking underground boiler hot water supply pipe at the Surrey campus. With the repairs of the underground piping, the finalization of construction activity at the Richmond Wilson School of Design and the start of optimized building operations, and the final stages of Surrey Spruce construction, KPU's energy reduction strategy is showing progress again.

KPU's 2018 reductions are a welcome return, however, the campuses faced challenges with above normal use of classrooms and common areas due to an influx of new students, expanding hours of operation in some areas, and increased classroom and lab use on weekends, evenings, and during the summer semester.

KPU is moving to resource itself adequately to develop and implement a Strategic Utility Management Plan, expanding its ongoing pursuit of energy efficiency and GHG reducing upgrades to mechanical, electrical and building controls systems. The practice of continuously improving the efficiency of these systems continues to be a core part of all renovations, major capital construction, and major mechanical system renewals and upgrades. In 2018 KPU continued to strategically invest in leading-edge automated building controls and software solutions that will provide future optimized individual zone controlling and equipment operation. Additionally, significant design and planning were completed to replace major mechanical infrastructure (chillers and electrical vault infrastructure) with high-efficiency modern equipment in the next few years at the Langley and Richmond campuses. Future design-ready projects will include the boilers at Surrey and Richmond.

Capital Renewal/Deferred Maintenance funding from the Province has provided KPU with a significant opportunity, in recent years, to initiate high efficiency, major infrastructure replacement projects that will see strong energy reduction potentials for years ahead. KPU is making deliberate strategic decisions to target these type of projects while funds are available and is focusing staffing and resources to support, plan and execute these projects to successful completion. This is important Ministry funding as significant improvements are needed to meet legislated GHG reduction targets. The next legislated target KPU faces is the 33% reduction of GHG emissions from the 2007 benchmarking level by the end of 2020. KPU will need to target its natural gas consumptions strategy deeply to achieve legislated reduction thresholds. The incentives are even higher when considering that annual carbon offset pricing to maintain carbon neutrality will see increases of \$5/ton to a \$50/ton total by the end of 2022. KPU's current offsets are valued at \$63,577; in 2022 these offsets would cost the university \$127,154.

From a global perspective, KPU recognizes that organizations need to greatly reduce their impact on the natural environment. **Vision 2023** defines KPU as a “learning ecosystem rooted in a culture of sustainability, creativity, and quality that inspires our people and our communities.” As outlined in Vision 2023, Sustainability will be achieved through a series of actions in which we will:

- Embrace all cultures and promote a renewed, authentic approach to Indigenization.
- Foster environmental sustainability through our offerings, research and operations.
- Integrate planning to ensure KPU operations are aligned with our resources, thus sustaining quality and institutional health.

To that end, along with the numerous curricular offerings, KPU strives for efficient and sustainable outcomes in all its service delivery; examples include: green procurement practices and product selections such as enhanced recycled paper content; a comprehensive waste management program; technological solutions for meeting rooms and office PC's (the addition of cameras) to reduce the need for travel between campuses; promoting alternative transportation such as an intercampus shuttle, bike lockers, bike repair stations, and showers.

KPU strives to reduce consumption of water, electricity and natural gas so that KPU is a leader to others in our sector and the community.

Energy Conservation is a core consideration when completing new expansions, renovating buildings, upgrading ageing infrastructure, and optimizing daily operations. This has led KPU to consistently focus on sustainability. From 2007 to 2018, KPU has increased in space by 20.2% while decreasing our carbon footprint by 10.6% over the same period.

Continued partnerships contribute to KPU's energy conservation success. These efforts have been achieved through the support of our many partners, including design professionals, service technicians, building operators, BC Hydro, NRCan, the Province of British Columbia and more. Much

of the energy efficiency work we have performed has been funded by either future avoided energy costs, or from financial assistance from NRCan, BCHydro, and, our most valued partner, the Province of British Columbia.

Emissions and Offset Summary Table:

KPU GHG Emissions and Offset for 2018 (tCO_{2e})	
GHG Emissions created in Calendar Year 2018 <i>(from SMARTTool Homepage):</i>	
Total Emissions (tCO _{2e})	2423
Total Offsets (tCO _{2e})	2422
Adjustments to GHG Emissions Reported in Prior Years <i>(from SMARTTool Homepage):</i>	
Total Emissions (tCO _{2e})	0
Total Offsets (tCO _{2e})	0
Grand Total Offsets for the 2018 Reporting Year <i>(from SMARTTool Homepage):</i> <i>(This is the total of emissions that must be offset for Reporting Year 2018)</i>	
Grand Total Offsets (tCO _{2e})	2422
Total Offset Investment <i>(2,422 X \$25/tCO_{2e})</i>	\$63,577

In accordance with the requirements of the *Greenhouse Gas Reduction Targets Act* and *Carbon Neutral Government Regulation*, Kwantlen Polytechnic University (**the Organization**) is responsible for arranging for the retirement of the offsets obligation reported above for the 2018 calendar year, together with any adjustments reported for past calendar years. The Organization hereby agrees that, in exchange for the Ministry of Environment and Climate Change Strategy ensuring that these offsets are retired on the Organization’s behalf, the Organization will pay within 30 days, the associated invoice to be issued by the Ministry in an amount equal to \$25 per ton of offsets retired on its behalf plus GST.

	June 03, 2019
Signature	Date
Jon Harding, CPA, CA	Vice President, Finance & Administration
Name (please print)	Title

I. EMISSIONS AND OFFSETS, 2018

Green House Gases consist of a variety of gaseous compounds that trap heat within the earth's atmosphere and create global warming. Historically quantities of these gases have existed in consistently stable quantities that were environmentally balanced to meet planetary life sustainability needs. It's been estimated that since the beginning of the industrial age, carbon dioxide levels alone have increased by about 42%. This has led to increased heat retention and continually rising global temperatures.

The B.C. Provincial Government's Bill 44 targets carbon dioxide producing activities to compel pursuit of reductions and requires the purchase of Carbon Offset credits at \$25 per ton of CO₂equivalent (tCO_{2e}) (calculated using scientifically determined energy consumption quantity conversion equations), to generate funding for support of carbon reduction projects that reduce atmospheric GHG levels. Beginning in 2018, the cost of Carbon Offset credits will start to increase annually by \$5 per ton to increase the economic incentive for reductions. Thus 2018 Carbon Offset credits will be \$30 each, and in 2019 \$35 each, and so on. Provincially legislated targets have been set to reduce GHG emissions from 2007 levels, 6% by 2012, 18% by 2016, 33% by 2020, and 80% by 2050.

2018 Greenhouse Gas Emissions

The Green House Gas Emissions Targets identified 2007 as the base year for all institutions. In 2007, KPU generated building emissions of 2,710 tCO_{2e}.

KPU's 2018 total emissions from all sources for Offsets were **2,422** tCO_{2e}, producing a 177 tCO_{2e} or 6.8% decrease from 2017 emission levels. In 2017, KPU reported only a 4% reduction from our base year (2007), however, 2018 demonstrates a reduction of 10.6% from 2007 base totals. Looking at 2018 energy density (i.e. tCO_{2e}/gross square meter) as compared to energy density in 2007, KPU is 28.6% more efficient despite the growth in campus space and activity.

Annual Fugitive Emissions generated by equipment using Hydrochlorofluorocarbon (HCFC) refrigerants remained well below 1% of our total emissions and were not reported in 2017, as permitted under regulatory guidelines.

Offsets Applied to be Carbon Neutral in 2018

KPU has been a Carbon Neutral organization since 2010 with an annual purchase of carbon offsets. The previous three years are highlighted for Carbon Emissions (tCO_{2e}) and costs (\$) for Offset Purchases, including GST:

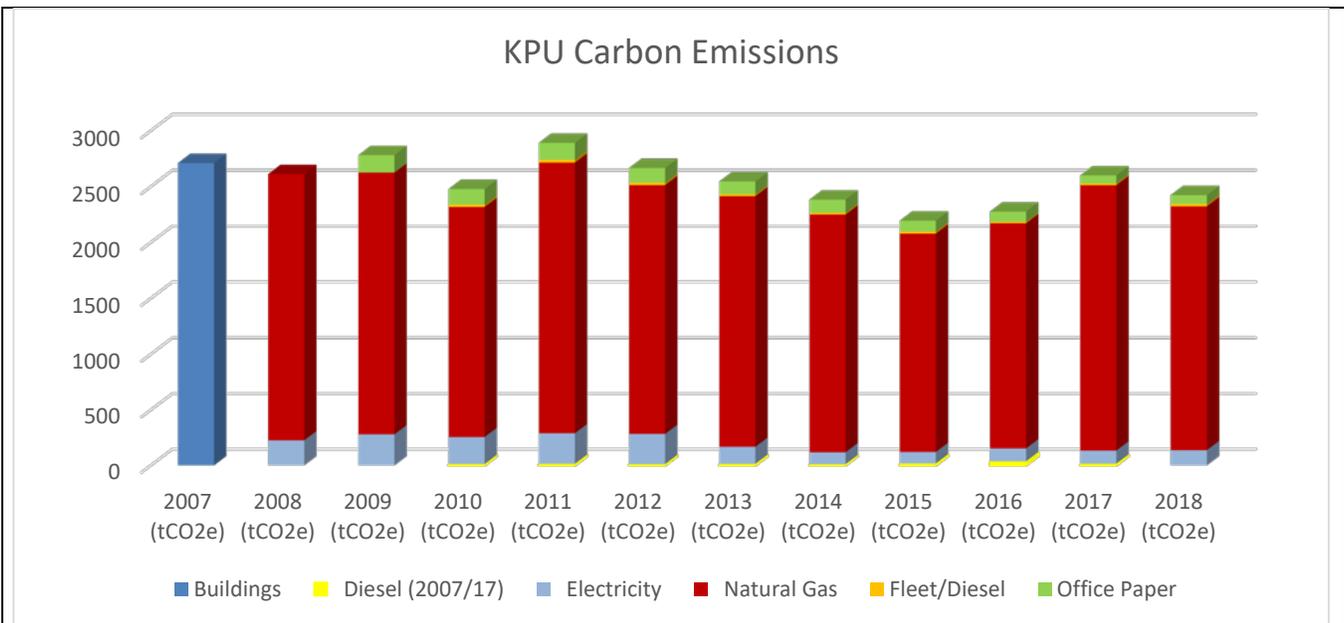
2016	2,275 tCO _{2e} with an annual offset cost of \$57,723
2017	2,599 tCO _{2e} with an annual offset cost of \$68,224,
2018	2,422 tCO _{2e} with an annual offset cost of \$63,577

KPU spent \$587,421 to purchase carbon offsets for 22,454 tons of carbon emissions during the period 2010 to 2018 including GST.

II. ACTIONS TAKEN TO ACCOMPLISH OUR 2018 GHG REDUCTIONS

KPU’s 2018 carbon emissions for buildings as calculated by the Provincial Government SMARTTool were 2,422 tCO_{2e}, producing a 10.6% reduction in emissions from the comparative 2007 buildings emission level.

The first complete reporting year for buildings and paper in the SMARTTool reporting system was 2009. In that year, KPU’s total carbon emissions for offsets were **2,781 tCO_{2e}**. KPU total carbon emissions for offsets for 2018 were **2,422 tCO_{2e}**. This produced a **12.9% reduction** in emissions from 2009.



- 2007: Internal energy records; buildings only (Base Year)
- 2008: Implementation of Smartool for Bill 44 legislation passed in 2007
- 2009: Buildings and paper now included
- 2010-current: Fleet and building diesel now included in calculations

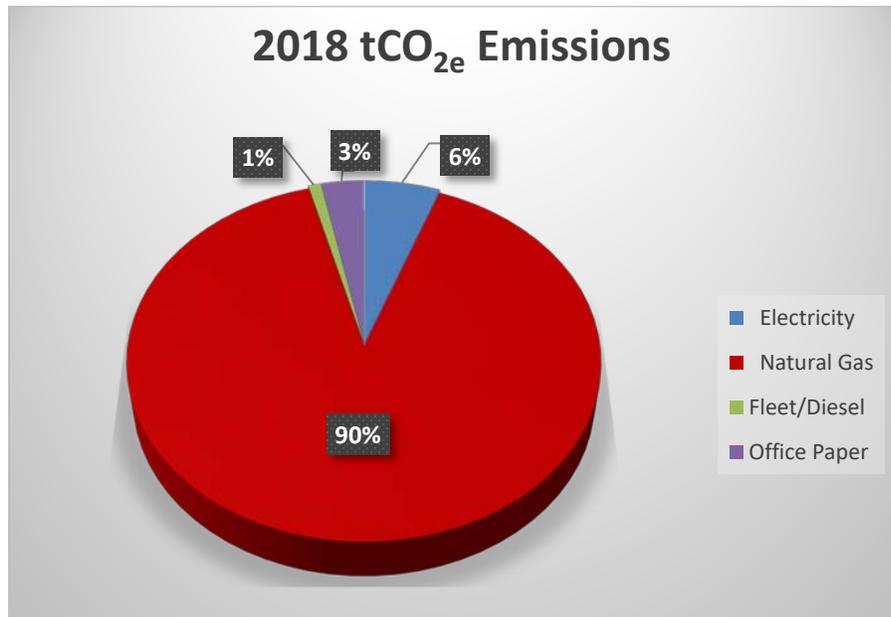
During 2018, KPU implemented building system controls upgrades in buildings at the Surrey campus to continue to build on energy conservation successes, and explore additional options for savings opportunities. Engineering assessments were undertaken to examine technological advancements and identify sustainable solutions for improving energy efficiencies while preserving or improving service delivery effectiveness. Sustainability is a key element of KPU, and was evidenced by the diverse range of events sponsored by the university, or attended by members of the Faculty, Staff and Student Body.

The following factors or actions would have had an impact on KPU’s 2018 Carbon Emissions Reduction successes.

<p><i>Wilson School of Design; Occupancy; Richmond campus</i></p>	<p>With the end of construction of this 45,000 sq. ft. building, KPU began to see energy efficiencies that were not realized during the construction phases through 2016 & 2017. This would have translated to energy reductions.</p>
<p><i>End of Major Renovation; Spruce building, Surrey</i></p>	<p>The refurbishment of this 56,800 sq. ft. Science and Fine Arts building would have started to see energy savings as the building envelope was sealed up. Previous open construction activity during the winter with partial occupancy would have led to considerable energy loss. Upgrade of older mechanical systems should see future energy saving as well.</p>
<p><i>Automated Building Controls, Surrey</i></p>	<p>The ongoing installation of advanced building controls continues to pave the way for future significant energy savings in lighting, mechanical optimization, and individual zone controlling (unoccupied zone systems shut down).</p>
<p><i>Replacement of various fan systems, air supply units, and kitchen make-up air units.</i></p>	<p>The deferred maintenance program allows the university to replace aged and inefficient mechanical systems with newer, highly efficient units; these particular units run during all hours of operation.</p>
<p><i>Langley Computer Room Cooling System</i></p>	<p>Another deferred maintenance project that replaced obsolete water-cooled air conditioning systems with a modern and highly efficient roof top unit system.</p>
<p><i>Automated Building Controls Software; Kaizen CopperTree</i></p>	<p>The Kaizen software provides exceptional monitoring and reporting on the university’s energy consumption, equipment function, and opportunities for improved zone controlling. Ongoing monitoring and adjusting continue to be an important energy reduction strategy for building operators.</p>

III. FUTURE ACTIONS PLANNED FOR 2019

Of the 2,422 tCO_{2e} KPU produced in 2018, **2,186** tCO_{2e} were produced by burning natural gas. Improving efficiencies in heating systems and exploring alternative energy heating sources is key to achieving substantial GHG emissions reductions, to meet statutory targets.



<i>Langley Campus Chiller Replacement</i>	With design and tendering completed, the campus will see the replacement of an older, oversized, and inefficient chiller with one of the industry’s most efficient magnetic bearing chiller. The previous chiller could not meet low occupancy demands, and the operators were required to cool unoccupied zones to keep the chiller from tripping out.
<i>Richmond Main Electrical Vault Refurbishment</i>	A major refurbishment of the 26-year-old campus electrical systems should see efficiencies in the replacement of older and failing infrastructure with modern and more efficient equipment.
<i>Automated Building Controls Software; Kaizen CopperTree</i>	Leveraging the currently updated software, KPU will pilot a project for enhanced zone control in an academic building to provide maximum energy savings during unoccupied periods.
<i>Surrey Cedar Building; Air Supply systems</i>	Surrey’s Cedar building uses a very old and inefficient gas fired heating system for the air handling units. The units provide poor zone control and often discomfort for users. A strategy to improve heating effectiveness and better zone control should improve energy savings and occupant comfort for this building.

<p><i>Replacement of Obsolete Richmond Campus Automated Building Controls</i></p>	<p>The original controls for this 26-year-old campus do not provide the level of sophistication and performance seen on other campuses. Replacement of these obsolete systems through the deferred maintenance program will show tremendous energy savings opportunities for the campus for years to come.</p>
<p><i>Hiring of an Energy Manager</i></p>	<p>KPU is confirming joint funding with BC Hydro for an Energy Manager. This position will be critical in developing key energy reduction strategies, projects and exploring new avenues for funding. This dedicated position will be a core champion for the Carbon Neutral Program and overall Strategic Utility Management Plan.</p>
<p><i>Heating System Efficiency Improvements; Boiler replacements and Geo-Exchange Cooling Tower.</i></p>	<p>The feasibility of replacing ageing inefficient boilers with higher efficiency condensing boilers and heat distribution piping will be explored to increase system efficiencies. Geo-exchange systems will be fine-tuned to maximize system operational effectiveness and with opportunities for new geo-exchange fields being explored. Use of heat pumps sourced from geo-exchange fields, and air sourced heat exchangers, create opportunities to fuel switch heating systems from natural gas heating systems.</p>
<p><i>Lighting Retrofits; libraries, classrooms and hallways all campuses.</i></p>	<p>Significant success in the past with lighting retrofits and emerging new technologies in the sector have KPU exploring additional lighting retrofit projects. Use of new technologies available such as LED lighting create substantial opportunities for electricity conservation.</p>

IV. KPU’S COMMITMENT TO SUPPORT CARBON REDUCTION, SUSTAINABILITY, AND ENERGY CONSERVATION

Energy conservation is a strength with KPU’s energy consumption being dramatically less than the average for regional post-secondary institutions. KPU extends its conservation focus by embedding it within business practices, academic offerings, and building operations.

Since being formed as Kwantlen College in 1981 and over the course of its evolution to becoming Kwantlen Polytechnic University, KPU followed environmental stewardship practices and aimed to be a dynamic and inspirational leader in creating a more sustainable world. When the institution was first formed to serve the South-Fraser region of the Lower Mainland of BC, it consisted of several pre-existing facilities that were previously owned or leased by Douglas College. During the 1990s new buildings were constructed in Surrey, Langley and Richmond, to increase space for delivery of educational services. Then in 2006, the Cloverdale Tech campus was opened to replace the ageing

Trades campus in Newton which consisted of mostly leased buildings. Sustainability was a driving design factor for each of these new construction buildings. Additionally, in 2000, KPU implemented internal energy conservation efforts and was able to reallocate the cost savings from the lower energy consumption to other initiatives. This placed KPU as a leader in sustainability efforts by making it one of the lowest energy per square meter of space institutions in the Province.

However, when Bill 44 legislation was passed in 2007, the targets were set as percentage reductions, based on reducing GHG emission levels from 2007 levels, which were already much lower than many others who had not yet initiated conservation efforts. Multiply this by the fact that the institution continues to grow and add new construction space to meet the growing community demands for educational services while expecting to reduce energy consumption and resulting GHG emissions, and KPU faces a steeper uphill climb every year to meet provincially mandated targets. Strategies to shed our dependency on natural gas will be required as we face increased energy demands resulting from construction and renovations, as well as increased energy demands from increased space (Wilson School of Design, Spruce expansion and in 2019 the addition of the Civic Plaza Campus), hours of occupancy, and new or expanding programs such as Brew Instructional Lab, Horticulture Greenhouse production, Trades training, and expanding Science program delivery.

Comparing the level of GHG emissions produced by the organization without factoring in the increases in operational building space needed to meet increasing demands for services, creates an increasingly difficult challenge to meet legislated GHG emission targets such as 40% by 2030/ 60% by 2040/ and 80% by 2050.

If KPU's GHG emission levels were to be considered in relation to total square meter space, a different picture would emerge that would provide a more equally comparative key performance indicator to measure the success of GHG reduction efforts. For instance, in 2007, KPU produced 0.03001 tCO_{2e} per gross square meter (gsm) of campus space. In 2018 the comparable key performance indicator was 0.02140 tCO_{2e} per gsm, representing a **28.61% decrease** in GHG emissions per gsm of university space.

While we can look at our emissions per square foot as comfort that KPU is making great efforts to model energy conservation and sustainability in its core practices, we must work within the current reality of a model that only looks at total emissions produced. Careful and deliberate energy modelling and planning will be required for future growth to ensure we can achieve future GHG targets. Alternate fuels and energy sources need to be embedded in retrofits, future capital expansions, and core operational function.

Visit KPU's webpage on [Sustainability and Energy](#) for further details, including archived records of KPU's previous Carbon Neutral Action reports (CNAR) and other valuable resources.