



Kwantlen
UNIVERSITY COLLEGE

RESOURCE MANAGEMENT ACTION PLAN

Resource Management Action Plan - Background and Purpose

Vision

We are committed to being leaders in environmental sustainability in all aspects of our operations taking measures to minimize the impact of our post secondary institution on the environment. In our role as leaders we dedicate time and resources to encourage and educate as to the benefits and responsibility to participate in energy conservation and other sustainable initiatives.

History

Since inception Kwantlen University College has been an active and creative leader in developing a sustainable world and resource management has always been an integral part of that role. Almost 20 years ago we adopted a policy on waste management and the environment committing to 5 R's: reduced consumption; reusable products; recycling; reclaiming (materials and energy) from waste; and replacement of (environmentally) harmful products. That same policy saw a declaration and recognition of the need for "investigation, implementation and promotion of ... energy conservation...".

While recent energy conservation projects meant significantly lower emissions of health related pollutants and Greenhouse Gases we are also very aware of the fiscally sustainability requirements and benefits. With fiscal responsibility as a guide, the sum total of our projects has resulted in total avoided costs from the year 2000 of over \$2.1 million dollars (our annual avoided costs are over \$330,000 (compared to the year 2000) and consider labour, maintenance and utilities.

According to a national Benchmarking Initiative our present energy consumption per square meter puts us in the most efficient energy use bracket in Canada (Appendix F).

Planning

One of our most important principles at Kwantlen is that management of resources is a process of continuous improvement. That means when a project is done the program is not done. Continuous Improvement is a commitment to consistent effort in the proper management of our social and natural environment. It is appropriate for any individual, institution or corporation.

As our buildings take different functions, technologies change, the relative cost of energy increases and climate issues become more important, our obligation to society as a leader and a focus for solutions becomes imperative for the greater global good.

The continuous improvement model does not often present spectacular or showy changes or drastic reductions in bills, but over time shows steady and consistent long-term savings that are planned for maximum efficiency from both the capital and operating aspect.

This document is one important piece in the planning process that lays out a map of our goals, quantifies our avoided costs, and describes our plans for the future.

People Resources - Our Team

Importance

The best results come from an integrated team working towards clearly defined goals.

Internal People Resources

Role	Name	Title	Phone
Resource Mgt Champion	Skip Triplett	President	604-599-2080
Vice-President	Gordon Lee	Vice-President, Strategic Services	604-599-2099
Director of Facilities	Karen Hearn	Director of Facilities	604-599-2442
Physical Plant Manager	Dan Brown	Manager of Physical Plant	604-599-2446
Technical Analysis	Tom Knox	Facilities Analyst	604-599-2445

Contracted People Resources

Service	Name	Company	Phone
General Energy	Adrian Ryan	Cobalt Engineering	604-836-3542
Controls	Charles Thacker	Siemens	604-273-7733
Controls	Derek Dailey	Energrated Systems Ltd	604-574-7790
HVAC	Mark Dorini	MDT Systems	604-539-9180
HVAC	Pan Chou	Johnson Controls	604-438-3434
Elec - General	Darryl Handley	Comar Electric	604-941-7646
Elec - Hi Voltage Mtce	Cam Hite	Magna IV	604-944-6697

Resource Suppliers

Service	Name	Company	Phone
Electrical	Lindsay Smilgis	BC Hydro	604-453-6276
Natural Gas	Dennis Light	Terasen Gas	250-751-8351
Natural Gas - Broker	Steve Yollouz	ECNG	604-294-1828
Water		Varies by City	
Green Power rights	Louise Tremblay	BC Hydro	604-453-6314
Green Power rights	Orest Maslany	Ministry of Labour and Citizens Services	250-952-8631
See Appendix A for further detail on all accounts			

Leadership & Commitment

Support and leadership of senior management is a key element of a good resource management program and demonstrates that resource efficiency is important in an organization.

Key Motivations for Resource Management

- Developing and administering sustainability promotes stability in our operations and the community as a whole
- To demonstrate leadership in environmentally-sustainable thinking
- To show "Best Practices for Resource Conservation" in the University/College sector
- To provide a means of enhancing employee and student comfort
- To minimize negative environmental impact

Sustainability Goals - Principles and Overview

- Reduce energy consumption
- Reduce water consumption
- Reduce Greenhouse Gas Emissions
- Reduces waste sent to landfills
- Manage and operate facilities in ways that minimize negative effects on our ecosystem
- Promote and advance environmental sustainability
- Increase awareness and education opportunities on the importance of sustainability
- Share information and expertise on sustainability issues internally and externally
- Purchase electrical power from renewable sources

Policies supporting our Goals

Waste Management / Environment

Policy F13

Kwantlen has developed a policy on Waste Management and the Environment summarized as follows... "to help protect our environment and to encourage the effective, efficient and safe use of products and services, the University College is committed to the investigation, implementation and promotion of recycling, energy conservation and the use of environmentally sensitive products." The policy was developed in April 1991 and revised in February 2000. It is currently under review.

5 Year Maintenance / Renovations Plan

Policy F11

Kwantlen's policy and long-term plan on Maintenance and Renovations is intended to integrate with our Waste Management/Environment and Sustainability plan. Specific criteria to be considered in identification and assignment of projects within the Maintenance and Renovations Plan include increased operating efficiency and an improved working environment. The 5-Year Maintenance/Renovation Plan is also reviewed annually to add new projects, prioritize, and add a new fifth year. The policy was developed in January 1990, and had the last major revision in February 2000. It is currently under review.

Management Support

Management supporting activity	Date	Status
Created a corporate resource management policy	1991	Under review
Appointed an Energy / Utilities manager	1993	Ongoing
Pilot project for energy efficiency project by ESCO	2000	Completed
Prepared written employee communications program	2001	Ongoing
Prepared written external 'Success Stories' communications	2003	Ongoing
Assigned a budget for resource management projects	2003	Ongoing
Prepared a written employee training program	2003	Updated annually
Web Page creation and regular updates	2003	Ongoing

Planning & Reviews

Activity	Last Date
Resource Management Plan Review	Dec-07
Resource conservation opportunity review (previous and future)	Aug-07
Action Plan for Reducing Greenhouse Gas Emissions (VCR Plan Review)	Jun-06
Benchmarking Initiative and Review	Sep-07

Financial - Internal Considerations

Importance

Financial assistance enables implementation of a number of aspects: overall program planning and management; resource conservation measures; and assistance with education and awareness programs.

Project Approvals

Our goal is to achieve a 7 year simple payback on resource management projects. Longer paybacks are acceptable in selected other instances (eg.) when there are also reductions in maintenance or other Life Cycle cost or when a project may bring about improvements to our facilities or our learning environment.

Financial - External Assistance Resources

Importance

Much of the energy efficiency work we have performed has been paid by either avoided energy costs or by financial assistance from NRCan and BCHydro. As we continue to develop new energy savings it is important to review availability of outside funding to assist with evaluation, implementation, operation or promotion to these projects.

Funding Agency or Partners Listing

Funding Agency	Program	Detail
BC Hydro	Various	Product purchase; monitoring and evaluation; promotion
Terasen Gas	Boilers	Evaluate boiler operation and potential savings
NRCan	Energy Innovators	New projects

Purchasing

Importance

Purchasing practice helps set resource efficiency for future years. We recognize this and consider in purchases whenever applicable.

Policy Considerations - Resource Management Related

Activity	Status
Policy requirement to be resource efficient	Yes
Energy Efficiency requirements included in contract language for service contracts	Yes
Life Cycle costing where applicable	Yes

Communications

Importance

Communication of goals & results is a prime component of our resource management plan to help achieve further energy efficiency savings and gain support from our internal and external audience.

Communication Media

Media Type	Into/Ext	Name	Associations	Phone
Print	Internal	Peter Chevrier	Connections	604-599-2286
Internet	Internal	Donna Hrynkiw	My Kwantlen	604-599-2319
Internet	Internal	Donna Hrynkiw	Noticeboard	604-599-2319
Awards	External		NRCAN	
Awards	External		VCR	
Promo	External	Dennis Light	Terasen Gas	250-751-8351
Promo	External	Lindsay Smilgis	BC Hydro	604-453-6276

Education and Awareness

Importance

Training and awareness is an important component of our resource management program

Training and Awareness

Detail	# Affected	Year
1/2 hour session for cleaners (every 4 months)	18	2002 & ongoing
3 hour sessions for FSG's	21	2002
Energy Efficiency awareness posters		2001/02
Energy efficiency included in Security contract		2002 & ongoing
Energy efficiency Included in Cleaning contract		2002 & ongoing
Notification of fixture switching configuration for users		2003
Awareness information and sign off sheet to Cleaners		2003 & ongoing
Rotate FSG training 1 campus 2 hours every week	16	2003
Developed EEF project master case study		2003
Development of success stories		2003 and ongoing
RETSscreen Training - Facilities Analyst		2004
Leed training for Dan/Tom/Craig		2004
Stickers available for delamped fixtures		2005
Green roof training course		2005
Training on in-house poster preparation (from Powerpoint) and printing		2006
Working with our Utilities on advertising promotes their organization and ours		2006
Web Page Development		2006 & ongoing
Provide energy consumption information to FSG's (Facilities Support Staff)	21	2006 & ongoing
Purchased test frame for recycling stations to hold promotional (8" x 10") pieces		2007
Awareness information and sign off sheet to Security guards		2007 & ongoing
Stickers for computer monitors regarded 'sleep' mode		Reviewing
Encouraging sustainability program / related course or modules symbiosis		Reviewing
Reviewing new (energy related) electronic online training online for staff		Reviewing
Training Facilities employees - new bldgs @Surrey Campus and new Cloverdale Campus		2007
Reviewing Additional FSG BMS training (online course from local Bldg Association)		Reviewing

Information and Data Collection

Importance of Data Collection

Measuring energy consumption before project implementation and then afterwards is a key aspect of project work in order to verify performance results and confirm anticipated energy savings are being delivered.

Data Collection Methods

Metering

- * Utility meters
- * Building automation system meters
- * Lighting loggers
- * Temperature and Humidity

Data Administration Systems

- * Monitoring and Verification of energy consumption and baseline adjustment
- * Facilities utilization changes - FTE reporting

Consumption vs Cost as a means of comparison

Using consumption rather than cost data is very important to determine our success at achieving our goals. Three graphs below provide further explanation.

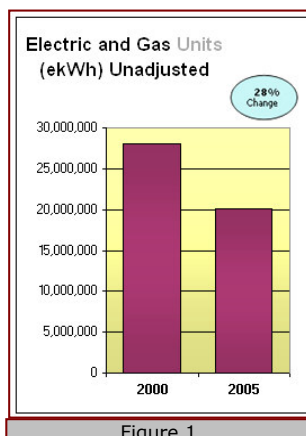


Figure 1

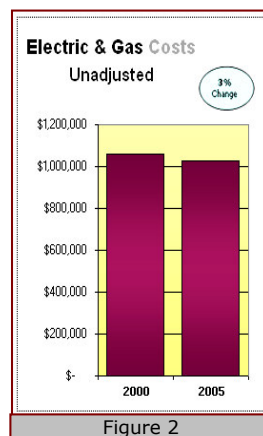


Figure 2

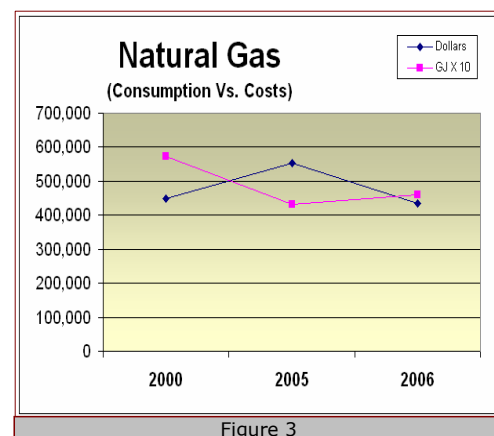


Figure 3

Figure 1 - Our electric and natural gas consumption in **ekWh** has been reduced by almost **30%** from our base year of 2000 to 2005

Figure 2 - Shows costs were only reduced by **3%** from 2000 to 2005 (Figure 2) as the price of energy has gone up.

Figure 3 - Shows significantly reduced natural gas consumption but much higher costs which were the result of an increase in gas prices

Due to these factors it is important to measure the success of achieving our energy savings goals using a standard unit of consumption rather than how much money was spent.

Base Year

Energy reduction goals need to have a stable point of reference so they can be measured effectively and this is called a "Base Year". At Kwantlen there have been significant changes in technology and building area due to new construction and also changes in our operations which complicate selecting a suitable base year.

There was minor construction in late 2005 and significant construction in 2006 which had a major influence on our consumption and current overall size. Construction increases consumption on a one-time basis, and is a difficult, time-consuming and potentially inaccurate event to include in a database for monitoring and evaluation.

As part of establishing new goals with this plan we are also resetting our base year from 2001 to 2000 which provides a more stable point of reference.

Standardizing to ekWh for Reporting

Many of our new building additions will be electrically heated (geo-exchange or ground-source heat pumps). This will increase our electrical consumption but make even greater natural gas reductions, and achieve a **net savings in total resource use and costs**

Since we have met previously set energy resource targets by the end of 2005 (35% electrical and 20% gas reduction), our next goals are to recompile a new baseline beginning in 2008, convert to a more consistent benchmark of **ekWh / m²** and reconfigure previously stated goals for electricity and gas to these units.

This is also consistent with the Federal Office of Energy Efficiency Benchmarking Initiative and a better reflection of resource use and evaluation in present Climate Change directives.

Key Information on Area and Consumption

Energy Consumption - Totals for all campuses

Year	kWh	GJ	ekWh / M ²
1994	16,636,512	62,940	529
2000	12,115,354	57,279	388
2001	11,332,211	55,019	368
2002	8,894,622	51,328	330
2003	8,460,731	45,750	295
2004	8,266,127	43,499	278
2005	7,863,080	41,216	267
2006	7,939,239	40,990	264
2007			
2008			
2009			
2010			

All values adjusted for area, weather, occupants, etc. relative to year 2000

Campus Area (2007)

Campus	Area Sq/M	Comments
Newton	3,577	Reflects Bldg 3 and Unit 7 only, from 2007 on
Surrey	23,178	Additions to Bldgs A&C not included
Richmond	17,965	
Langley	17,612	
Cloverdale	17,203	Opened 2007
TOTAL	79,535	

Construction History

Campus	Year	Comments
Newton	1980	Campus in operation
Surrey	1990	Campus Constructed
Richmond	1992	Campus Constructed
Langley	1993	Campus Constructed
Cloverdale	2006	Campus Constructed

Major Renovation/Additions History

Campus	Year	Comments
Richmond	1995	Added 425 Sq M Lecture Theater
Surrey	1999	Added 6,667 Sq M Bldg G
Newton	2004	Printshop to Surrey/equipment upgraded

Conversion Tables

Resource	Units	Equivalent GJ	Equivalent kWh	CO ₂ per Unit
Electricity	kWh	0.0255	1	0.00022068
Natural Gas *	GJ	1	277.8	0.04992

* Energy contents are at 100% combustion efficiency

** Does not include municipal energy consumption for transmission/purification/discharge

Relevant Metric - Identification

Resource metrics for our organization
ekWh per Square Meter
ekWh per FTE
kWh per Square Meter (normalized to base Deg. Day)
GJ per Square Meter (normalized to base Deg. Day)

Sustainability Past Goals, Future Goals and Methodology

Background

In 2004 we set a goal to reduce our electrical consumption 35% by Jan 2006 from our 2001 levels. By the end of 2005 we had achieved our electrical consumption goal.

We also committed to ensuring the new Cloverdale Campus was designed and built as energy efficiently as possible. We were successful with our goals of energy efficiency for Cloverdale Campus which is targeted for LEED Gold and is expected to be 30% more energy efficient than a conventional building.

Current Situation

We have changed the base year used for comparison from 2001 to 2000 which had fewer disruptions in our operations and provides a more stable point for comparison

We have determined future goals need to be measured using universal units of energy (ekwh) and measurement (square meter) due to changes in technology and building area as a result of construction and to facilitate evaluation.

Our Goal and Measurement of Performance

Our **Electrical saving** goal is to reduce our consumption 45% by 2010 from our 2000 levels. This is a reduction from 168 kWh/M2 to 92.4 kWh/M2.

Our **Natural gas savings** goal is to reduce our consumption 25% by 2010 from our 2000 levels. This is a reduction from 219 ekWh to 164 ekWh.

Our **ekWh consumption** will have gone from 387 ekWh/M2 in 2000 to 256 ekWh/M2 by 2010. This is a 34% reduction.

Once we achieve this goal we will be using 50% less ekWh per M2 than we were using in 1994.

How we will achieve our Goals

Further evaluate and implement opportunities identified in this plan in Appendix D

Add or change to our list of opportunities to determine most effective work

Audit our Facilities to identify new or emergent opportunities

Research, identify and evaluate new technologies

Evaluate and fine tune the systems in newly constructed buildings to achieve greater efficiencies

Continue awareness training with contractors and employees

Evaluate effectiveness of maintenance programs and to ensure equipment is operating efficiently

Perform cyclical maintenance improvements to replace equipment / systems at the end of their life cycle

Follow a program of continuous improvement and strategic maintenance upgrades

Explore alternate funding sources such as grants and incentives as a resource for retrofit projects

Cost to Achieve these Goals

Our estimated cost for strategic maintenance upgrades to reach our goal by the end of 2010 is \$371,114 (Appendix D)

Commitment

In many resource management plans there is a sign off section which indicates commitment to implementing the work identified in the plan. This plan has no sign off section because actively managing resource usage and reducing our environmental impact is really just part of good management practice and is what makes Kwantlen sustainable.

Kwantlen will commit to ongoing investment in replacing items when they reach the end of their useful life with more energy efficient alternatives and ongoing continuous improvement to reduce energy consumption.

Utility Account and Meter Listing

	Campus	Account	Contact	Phone	Serving	Service Address
G	Richmond	1179620	Dennis Light	250-751-8351	Main Campus	8771 Lansdowne Rd
E	Richmond	1944 3200 032	Lindsay Smilgis	604 453-6276	Main Campus	8771 Lansdowne Rd
W	Richmond	101170	Gordon Starchuck	604-244-1262	Main Campus	8771 Lansdowne Rd
G	Surrey	1179850	Dennis Light	250-751-8351	Main Campus	12666 - 72nd Avenue
E	Surrey	2073 1199 121	Lindsay Smilgis	604 453-6276	Main Campus	12666 - 72nd Avenue
W	Surrey	Tax Roll #	Finance Dept	604-591-4186	Main Campus	12666 - 72nd Avenue
W	Surrey	Tax Roll #	Finance Dept	604-591-4181	Main Campus	12666 - 72nd Avenue
G	Cloverdale	1515702	Dennis Light	250-751-8351	Farrier Bldg	5510 - 180th Street
E	Cloverdale	6216372	Lindsay Smilgis	604 453-6276	Main Bldg	5500 - 180th Street
W	Cloverdale		Finance Dept	604-591-4186		5500 - 180th Street
W	Cloverdale		Finance Dept	604-591-4181		5500 - 180th Street
G	Langley	1180023	Dennis Light	250-751-8351	Main Campus	20901 Langley Bypass
E	Langley	2134 2602 481	Lindsay Smilgis	604 453-6276	Main Campus	20901 Langley Bypass
W	Langley	40107	Murray Flack	604-514-2924	Main Campus	20901 Langley Bypass
W	Langley	40108	Murray Flack	604-514-2924	Main Campus	20901 Langley Bypass
G	Langley - HC	1180022	Dennis Light	250-751-8351	Hort Centre	20902 Langley Bypass
E	Langley - HC	2134 2600 531	Lindsay Smilgis	604 453-6276	Hort Centre	20902 Langley Bypass
W	Langley - HC	40109	Murray Flack	604-514-2924	Hort Centre	20902 Langley Bypass
W	Langley - HC	N/A "Rebate" meter	Murray Flack	604-514-2924	Hort Centre	20902 Langley Bypass
G	Newton	879065	Dennis Light	250-751-8351	Bldg 3	13468 - 77th Avenue
G	Newton	879066	Dennis Light	250-751-8351	Bldg 3	13468 - 77th Avenue-A
G	Newton	879070	Dennis Light	250-751-8351	Unit 7	13550 - 77th Avenue-7
E	Newton	2074 2503 564	Lindsay Smilgis	604 453-6276	Unit 7	13550 - 77th Avenue-7
E	Newton	2074 2501 692	Lindsay Smilgis	604 453-6276	Bldg 3	13468 - 77th Avenue-A
E	Newton	2074 2503 522	Lindsay Smilgis	604 453-6276	Unit 3	13550 - 77th Avenue-3
W	Newton	Tax Roll #	Finance Dept	604-591-4186	Bldg 3	13468 - 77th Avenue

Target Facilities Information Overview

Cloverdale Campus

Facility Address: 5500 180th Ave, Surrey
Year Facility was built: 2006
Size of Facility: 17,203 Sq M
Last resource audit:
Last major retrofit/upgrade:
 % of site retrofitted
Type of system: Central boiler plant heating, Central chiller plant cooling, T8 lighting, central fan systems
Annual: Reviews and upgrades to meet continuous improvement goals

Langley Campus

Facility Address: 20901 Langley Bypass, Langley
Year Facility was built: 1993
Size of Facility: 17,612 Sq M
Last resource audit: 1-Sep-99
Last major retrofit/upgrade: 30-Oct-02
 % of site retrofitted 95%
Type of system: Central boiler plant heating, Central chiller plant cooling, T8 lighting, central fan systems
Annual: Reviews and upgrades to meet continuous improvement goals

Newton Campus

Facility Address: 13468 - 77th Avenue (Bldg 3: Owned; Unit 7: leased)
Year Facility was built: 1979 to 1989
Size of Facility: 3,577 Sq M
Last resource audit: None
Last major retrofit/upgrade: None
 % of site retrofitted N/A
Type of system: Roof top heating/cooling, T12 lighting
Annual: Reviews and upgrades to meet continuous improvement goals

Richmond Campus

Facility Address: 8771 Lansdowne Road
Year Facility was built: 1992
Size of Facility: 17,965 Sq M
Last resource audit: 1-Sep-99
Last major retrofit/upgrade: 1-Feb-02
 % of site retrofitted 100%
Type of system: Central boiler plant heating, Central chiller plant cooling, T8 lighting, central fan systems
Annual: Reviews and upgrades to meet continuous improvement goals

Surrey Campus

Facility Address: 12666 - 72nd Avenue, Surrey
Operations Manager fax: 604-599-2440
Year Facility was built: 1990 to 2007
Size of Facility: 23,178 Sq M
Last resource audit: 1-Sep-99
Last major retrofit/upgrade: 1-Jun-02
 % of site retrofitted 70 %
Type of system: Central boiler plant heating, T8 lighting, combination roof top units/central fan systems
Annual: Reviews and upgrades to meet continuous improvement goals

Record of Improvements 2004 to 2006

Description	Campuses	Cost	GJ Savings/Yr	kWh Savings/Yr
Incandescent to compact in crawlspace	L	\$1,400		9,519
Change Auditorium lights (incandescent to fluor).	L	\$18,200		45,518
Change remaining incandescent to compact	L-N-R-S	\$3,500		47,902
Add vend misers to additional vending machines	L-N-R-S	\$8,000		46,800
Cozy Legs heater conversion Convert	L-R-S	\$5,000		3,600
Relocate printshop to Surrey. Optimize/reduce layout and new energy efficient units	S			17,825
Turn off incandescent gym lights 100hr/wk	S	\$4,000		28,080
Turn computer monitors off at night	S	\$100		4,006
Add control for Parkade exhaust fan(s)	R	\$800		28,205
Add photocontrol for Atrium fixtures	R	\$400		3,205
Add photocontrol N-entrance lights	R	\$400		3,846
Add control for accent lighting off after closed	S	\$500		8,462
Add control for forest lights off after closed	S	\$820		2,628
Add photocontrol/keys for 2nd floor lights	L	\$1,500		2,000
Add photocontrol/keys for Bldg B- upper central	S	\$620		7,692
Add photocontrol/keys for Bldg C- 2nd skylight	S	\$400		3,526
Add photocontrol/keys for Bldg D- 3rd skylight	S	\$440		3,846
Add photocontrol/keys Bldg G lights	S	\$1,500		2,110
Add control (CO2) sensor to MP room	S	\$800		6,410
Lower parking lot light wattage	S-L-R	\$8,000		192,720
Convert HID to CF (Marine type Wall lights)	L	\$3,700		14,423
Add switch to mech rm 245	S	\$300		8,013
Total		\$60,380		490,336

Appendix D

Opportunities to Achieve 2010 Goal

Cloverdale Campus

	Estimated Cost	Estimated Savings / Year		
		kWh	GJ	ekWh Total
Door Contacts for welding shop doors	\$2,964	1,800	55	17,079
Total	\$2,964	1,800	55	17,079

Langley Campus

	Estimated Cost	Estimated Savings / Year		
		kWh	GJ	ekWh Total
Replace weather-stripping	\$1,800		120	33,336
Review AHU operation at night	\$850	3,404	135	40,907
Occupancy sensors in washrooms	\$500	2,000		2,000
100% recirc during pre-occupancy	\$3,000		45	12,501
(est) Add CO2 sensors to classrooms	\$30,000		420	116,676
Total	\$36,150	5,404	720	205,420

Richmond Campus

	Estimated Cost	Estimated Savings / Year		
		kWh	GJ	ekWh Total
Replace/modify boiler - gas/draft restrictor	\$150,000		1,685	468,093
Replace weather-stripping	\$2,600		165	45,837
Review AHU operation at night	\$850	3,404	135	40,907
Occupancy sensors in washrooms	\$1,000	4,000		4,000
100% recirc during pre-occupancy	\$4,500		68	18,890
(est) Add CO2 sensors to classrooms	\$42,000		588	163,346
Add 35 additional DDC controls on VAV	\$50,000		220	61,116
Total	\$250,950	7,404	2,861	802,190

Surrey Campus

	Estimated Cost	Estimated Savings/Year		
		kWh	GJ	ekWh Total
Replace weather-stripping	\$2,700		180	50,004
Review AHU operation at night	\$850	3,404	135	40,907
Occupancy sensors in washrooms	\$1,000	4,000		4,000
100% recirc during pre-occupancy	\$4,500		68	18,890
(est) Add CO2 sensors to classrooms	\$60,000		840	233,352
(est) Improve lab fume hood controls	\$12,000		933	259,280
Total	\$81,050	7,404	2,156	606,433
All Campus Total	\$371,114	22,012	5,792	1,631,122

Approximate payback term anticipated to be 6 years

Other Opportunities

Cloverdale Campus

	Estimated Cost	Estimated Savings/Year		
		kWh	GJ	ekWh Total
Turn off parking lot lights when closed	\$1,200	6,570		6,570
Review AHU operation at night	\$850	3,404	135	40,907
(est) Increase efficiency of stairwell lighting	\$8,800	14,352		14,352
Total	\$10,850	24,326	135	61,829

Langley Campus

	Estimated Cost	Estimated Savings/Year		
		kWh	GJ	ekWh Total
Replace/modify boiler - gas/draft restrictor	\$150,000		1,685	468,093
Turn off parking lot lights when closed	\$3,000	16,425		16,425
Convert to 25 & 30 watt lighting where practical	\$18,000	69,000		69,000
(est) Increase efficiency of stairwell lighting	\$13,200	21,528		21,528
Voltage optimization for vault	\$4,350	87,000		87,000
Install control for exterior water pumps	\$400	2,433		2,433
Control recirc pumps on irrigation systems	\$500	2,954		2,954
Control header pumps in HC when boiler off	\$700	2,178	55	17,457
Move switch (HH to N side)	\$200	4,654		4,654
Total	\$190,350	206,172	1,740	689,544

Richmond Campus

	Estimated Cost	Estimated Savings/Year		
		kWh	GJ	ekWh Total
Turn off parking lot lights when closed	\$2,000	10,950		10,950
Convert to 25 & 30 watt lighting where practical	\$17,000	82,800		82,800
(est) Increase efficiency of stairwell lighting	\$17,600	28,704		28,704
Voltage optimization for vault	\$6,250	125,000		125,000
(est) Improve lab fume hood controls	\$10,000		933	259,280
Rewiring to reduce night lighting	\$5,118	45,513		45,513
Replace MH fixtures	\$7,400	15,600		15,600
Totals	\$65,368	308,567	933	567,847

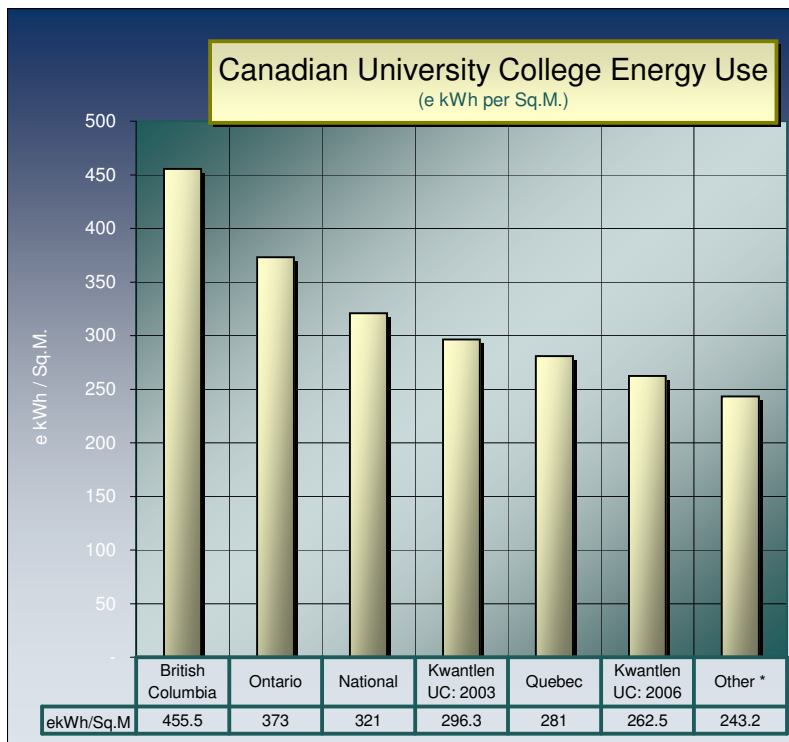
Surrey Campus

	Estimated Cost	Estimated Savings/Year		
		kWh	GJ	ekWh Total
Replace/modify boiler - gas/draft restrictor	\$150,000		2,022	561,712
Turn off parking lot lights when closed	\$3,000	16,425		16,425
Convert to 25 & 30 watt lighting where practical	\$17,000	82,800		82,800
(est) Increase efficiency of stairwell lighting	\$22,000	35,880		35,880
Rewiring to reduce night lighting	\$18,000	30,000		30,000
Entrance ceiling lights replace with wall mount	\$340	600		600
Conference centre lobby to photocell	\$624	1,248		1,248
Gym conversion lighting	\$13,832	36,400		36,400
Replace Bldg G courtyard lights with overhead fixt.	\$950	4,672		4,672
Turn off exterior floodlights Bldg-G noncourtyard	\$1,000	4,380		4,380
Total	\$226,746	212,405	2,022	774,117


All Campus Total

\$493,314	751,470	4,830	2,093,336
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Benchmark Data for Energy Consumption



Data from NRCan benchmarking initiative - note below



Office of Energy Efficiency
Industrial, Commercial and
Institutional Programs

**Energy Innovators:
Benchmarking Executive
Summary for College
Finance Officers**

**A Good Practice:
Background on Benchmarking**

This executive summary is part of the Benchmarking Pilot Project undertaken by Natural Resources Canada's Office of Energy Efficiency. Benchmarking is a highly useful tool for colleges as it facilitates the identification of cost savings. This executive summary allows finance officers and other administrators to get an idea of how their college's energy performance compares to those of other colleges at the national and regional levels. The results are meant to be used as an eye-opener to help you identify potential opportunities to save money.

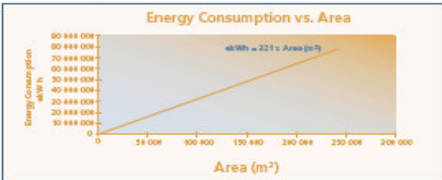
This document provides you with step-by-step instructions to calculate your college's energy consumption and savings. By breaking down energy consumption and spending into separate components and then seeing how your college's energy intensities compare with those of other similar colleges, it will be easier for you to pinpoint what is causing higher consumption and spending. Once problem areas have been identified, you can fix them by applying best practices. This, of course, leads to dollar savings for your college and a cleaner environment for everyone. A more detailed benchmarking analysis is described in *Benchmarking Guide for Facility Managers and Benchmarking Guide for College Finance Officers*.

The Components: Step-by-Step Instructions to Calculate Your College's Energy Intensities

1. Calculate the total floor area of your college in square metres. _____ m²
2. Determine your college's annual energy consumption and costs. Convert the annual energy consumption into equivalent kWh (e kWh) to get the total annual energy consumption for your college.

Electricity	_____ kWh	_____ e kWh	\$ _____
Natural gas	_____ m ³ x 37.2 / 3.6 = _____	_____ e kWh	\$ _____
Oil	_____ L x 38.65 / 3.6 = _____	_____ e kWh	\$ _____
Other	_____	_____ e kWh	\$ _____
Total:		_____ e kWh	\$ _____
3. Calculate your college's energy intensities.
Total e kWh/m²: _____ \$/m²: _____
4. Compare your college's energy intensities to other colleges nationally and regionally using the graph and table below.


Compare: See How Your College Performs in Relation to the Benchmarks



Region	e kWh/m ²	\$/m ²
National	321.0	13.5
Ontario	373.0	15.0
Quebec	281.0	12.7
British Columbia	455.5	12.6
Other*	243.2	12.7


* Includes Atlantic and Prairie provinces.
Note: Average benchmarks are based on limited data and should be used only as estimates.

For more information on the Pilot Benchmarking Program, please contact the following:
Natural Resources Canada • Office of Energy Efficiency • Energy Innovators Initiative • 580 Booth Street, 18th Floor
Ottawa ON K1A 0E4 • Tel.: (613) 995-6950 • Fax: (613) 947-4121 • Web site: <http://oee.nrcan.gc.ca>



Natural Resources Canada
Office of Energy Efficiency

Ressources naturelles Canada
Office de l'efficacité énergétique



Communication and Awareness Records

Articles and Photographs

Name	Date	Detail
Kwantlen Connections	Apr-01	Kwantlen lights the way to Savings
Vancouver Sun	Apr-03	Photo of Dan & Karen accepting VCR Leadership Award – Business Section
Kwantlen Connections	Apr-03	Kwantlen leads Canada in going Green
Surrey NOW Newspaper	Apr. 15, 2003 approx	Copy not obtained
Surrey Leader or Van. Province	Apr. 15, 2003 approx	Copy not obtained
BC Business	May-03	The Power of Business – Insert in BC Business
BC Hydro Brochure – Billing Mail out	July 2003 approx	Copy not obtained
ACCC Website	Fall 2003	
ACCC Technical Training Concept – Renewables	Nov-03	Cover photo of Langley campus, 1 para. Mention of Kwantlen awards and savings
BC Business	May-04	Certified Customer award article
Green Power News	Nov-05	GPC's purchase of 100% of Hort. Field Labs
The Power of Business	May-06	"Expanding space & Services While Maintaining the Highest Levels of Energy Efficiency"
Surrey NOW Newspaper	Apr-07	"New Trades Campus Built with Environment in Mind"
Vancouver Sun	Apr-07	"Kwantlen University College Saves Enough Electricity to Light Over 1,100 homes"

Awards

Name	Date	Detail
Energy Innovators Initiative	25-May-03	NRCan
VCR Gold Reporting Status Achieved	25-May-03	VCR Inc
VCR Leadership Award	March, 2003	VCR Inc
Power Smart Partner Excellence Award	May-03	BC Hydro
Power Smart Certified Customer	May-04	BC Hydro
Power Smart Customer	May-02	BC Hydro
CBIP (Cloverdale)	Feb-07	NRCan
Silver & Gold Champion Level Reporting Standards	2003 / 2004	VCR Inc

Presentations

Name	Date	Detail
Buildex 2004	Feb-04	Karen – Experiences in Energy Efficiency
Society of Colleges & University Planning – Long Beach CA	Mar-06	Karen - Trends in Large Educational Buildings – Sustainable Design
Society of Colleges & University Planning – Hawaii	Jul-06	Karen - The Campus of the Future 2006
Facilities Administrators Conference	Fall 2005	Karen – Sustainability – Eyes Wide Open
BCH Customer Panel Presentation	Jun-06	Tom – Our (Sustainability) Vision and the Evolution of Power Smart
Rotary Board – White Rock	Aug-07	Karen - Sustainability
EPT Advisory Committee	Apr-07	Sustainability
BCAPT	Oct-07	Karen - Strategies Utilized to Reduce Energy Consumption

Other

Name	Date	Detail
20 Year Conservation Potential: Review Panel – BC	2006/2007	Tom - External Panel Member