March 2011

Energy Management Action Plan 2011

Facilities Department

Services

kwantlen.ca/facilities

Kwantlen
POLYTECHNIC
UNIVERSITY

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Table of Contents

ABOUT KWANTLEN

Established by the government of British Columbia in 1981, Kwantlen, now Kwantlen Polytechnic University, has four campuses located in the Metro Vancouver region of British Columbia. Kwantlen offers bachelor's degrees, associate degrees, diplomas, certificates and citations in more than 120 programs. More than 17,500 students annually attend Kwantlen campuses in Surrey, Richmond, Langley and Cloverdale.

Kwantlen Polytechnic University develops degree programs and other applied credentials to successfully meet the evolving needs of regional and global employment markets. Kwantlen currently offers several degrees, with more to come in the future. Kwantlen students have a unique opportunity to bridge certificate and diploma credentials into bachelor's degrees, creating the option of academic and professional enhancement of applied and technical programs.

OUR APPROACH

Our Vision for Energy Conservation

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.

Leadership and 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.

Continuous Improvement

One of our most important principles at Kwantlen is that management of environmental resources is a process of continuous improvement. That means when a project is done the program is not complete. Continuous improvement is the 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 ensures previous reductions are maintained and further opportunities are incorporated producing consistent long-term savings for maximum efficiency from both the capital and operating aspect.

This document provides our goals, quantifies our present savings and/or avoided costs, documents our achievements and describes our plans for the future.

Motivation

- To provide a means of enhancing student and employee comfort
- To show “Best Practices for Resource Conservation” in the University sector
- To demonstrate leadership in environmentally-sustainable thinking
- To minimize negative environmental impact

Goals

- Create a healthy and comfortable learning and work environment
- Reduce energy consumption
- Reduce greenhouse gas emissions
- 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

Mission and Mandate

Our “Mission and Mandate” guides us in environmental stewardship and sustainability and supports our goals as illustrated in the following excerpt:

Our University culture is based on critical inquiry, collegial debate, knowledge generation, freedom of expression, diversity, and environmental stewardship and sustainability. Yet we go farther: by recognizing the necessary integration of these principles as our foundation and our purpose.

Financial – Internal Considerations

Our goal is to achieve a 7 year or better simple payback on resource management projects. Longer paybacks are considered when there are also reductions in maintenance or other life cycle cost.

Financial – External Considerations

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

Standardized ekWh Units for Reporting

To more effectively benchmark our consumption we use units or either ekWh /m2 or eGJ/m2 to evaluate our energy consumption and determine suitable “Key Performance Indicators”.

Base Year

Energy reduction goals need to have a stable point of reference so they can be measured effectively. 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 from 2006 to 2009 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.

Due to the construction and changes in our buildings our base year used in setting past goals was established at the year 2000.

New mandatory goals established by the Government to increase energy efficiency and reduce greenhouse gas emissions (GHG) provide our new target base years. The base year for electricity is 2006 and the base year for reducing GHG emissions is 2007.

PROVINCIAL GOVERNMENT REQUIRMENTS

Executive Summary

The Government has established mandatory requirements to improve energy efficiency through the "Public Sector Energy Conservation Agreement" (PSECA) and to reduce greenhouse gas emissions through "Greenhouse Gas Reductions Targets Act" (Bill 44).

The Government has also established a funding program for energy efficiency projects that Kwantlen has been able to access through PSECA to implement several projects which have significantly reduced energy consumption and GHG emissions.

One challenge that we have in achieving these mandatory reduction targets is that we were early adopters of energy conservation initiates and have already performed significant work to reduce our energy consumption and GHG emissions. Another challenge in achieving these goals is the growth in size we have experienced recently. The reductions in energy use and GHG productions are measured based on overall reductions and do not have a mechanism to allow for organizational growth. What this means is that if Kwantlen was to double in size there is no means to recognize that consumption will go up a proportional amount even though the number of students served may have doubled.

Another approach to measure efficiency and emissions that would allow for growth would be to benchmark energy intensity per square meter and establish standards for sectors affected. This would be similar to how many miles per gallon a car uses which allows consumers to measure the efficiency of a car and to determine when a car is not achieving the "benchmarked" fuel efficiency and get it fixed.

Using energy and GHG intensity per square meter benchmark may also help establish mandatory consumption and emissions targets that would allow for organizational growth and identify organizations that need to make significant improvements in reducing energy and GHG reductions.

Public Sector Energy Conservation Agreement (PSECA)

The provincial government and BC Hydro have entered into a new Public Sector Energy Conservation Agreement to decrease electricity consumption in public sector buildings. The agreement will be in effect from 2008 through 2020 and applies to provincial government office buildings, Crown corporations, schools, universities, colleges, hospitals and social housing. Approximately $200 million will be invested in new technology, energy innovation and retrofits over the next 12 years.

Greenhouse Gas Reductions Targets Act (Bill 44)

Bill 44 makes greenhouse gas reductions a mandatory requirement for the government.

PSECA ENERGY SAVINGS GOALS

Overview of Goals

The PSECA goal requirements are summarized as follows:

- Reducing electricity 5% by 2011 from 2006 levels
- Reducing electricity by 14% by 2016 from 2006 levels
- Reducing electricity by 20% by 2020 from 2006 levels

Requirements to Achieve Goals

To achieve these requirements we need to reduce our consumption to these levels:

- 2011 Goal – reduce electrical consumption to 9,267,895 kWh per year
- 2016 Goal – reduce electrical consumption to 8,389,884 kWh per year
- 2020 Goal – reduce electrical consumption to 7,804,543 kWh per yea

Progress Achieving Goals

While we continue to implement energy conservation projects to reduce electrical consumption we continue to add buildings which increase consumption. We have added geo-exchange which is a greener and more efficient source of heating energy but this also increases electrical consumption. And, we continue to increase student enrollment which also increases electrical consumption.

Another issue that affects our ability to reduce our electrical consumption from PSECA's 2006 base year is that we were early adopters of improving energy efficiency and we completed significant work from 2000 to 2006 which resulted in significant reductions in electrical energy use by 2006.

These factors make achieving the PSECA goals challenging as PSECA does not make any allowance for an organization to increase building sizes or utilization so these factors are not considered in measuring results achieving the PSECA goals. And, it is noteworthy that while we have not achieved the PSECA target for consumption we have significantly improved our energy efficiency when we measure it on energy density per square meter basis that does allow for increased utilization and growth.

Year	Electric kWh per Year	kWh % Comparison to 2006 levels	Campus total M2	% increase in Camps M2	Energy Density kW/M2	% more efficient from 2006 levels per M2
2000	12,091,954		81,202		149	
2006	9,755,679	0%	82,432	0%	118	0%
2007	10,727,111	9% increase	90,304	9% increase	119	1%
2008	10,180,064	4% increase	95,524	14% increase	107	9%
2009	10,814,359	10% increase	100,313	18% increase	108	9%
2010	10,746,063	9% increase	100,313	18% increase	107	9%

BILL 44 GREENHOUSE GAS REDUCTION GOALS

Overview of Goals

We intend to use our energy efficiency work and reductions in energy consumption towards supporting the government into achieving the Bill 44 Greenhouse Gas Reduction Goals which are summarized as follows:

- By 2012 – 6% below 2007 levels
- By 2016 – 18% below 2007 levels
- By 2020 – 33% below 2007 levels
- By 2050 – 8-% below 2007 levels

SMARTTool

Carbon reporting is performed by uploading our consumption information to an internet website "Smartool" which records consumption of energy and related consumables which are associated with Greenhouse gas emissions. Smartool then calculates Kwantlen's carbon emissions which must be offset by purchasing carbon offsets. The purchase of these carbon offsets is defined as a transaction charge currently valued at $25 per tonne of C02e and will apply to emissions for 2010 and onward.

Carbon Taxes

In addition to the transaction charge for each tonne of C02e there is also a carbon tax of $10 per tonne of C02e which has been added to our invoices as of July 2010 for natural gas purchase.

Total Cost impact

The cost impact on Kwantlen for the transaction charge of carbon offsets and the carbon tax is $35 per tonne of GHG in 2010.

Progress Supporting Achievement of these Goals

Year	GHG from Energy per Year	% Comparison to 2007 levels	Campus total M2	% increase in M2	Energy Intensity eGJ/M2	% more efficient from 2007 levels
2007	2710	0%	90,304	9% increase	.97	0%
2008	2604	4% reduction	95,524	14% increase	.88	9%
2009	2579	5% reduction	100,313	18% increase	.85	13%
2010	2319	14% reduction	100,313	0% increase	.80	17%

OUR TEAM

Key Personnel

Our people and their commitment to energy conservation are one of our greatest resources in having an effective energy management program succeed.

Name	Title
David Atkinson	President
Gordon Lee	Vice-President, Finance and Administration
Karen Hearn	Executive Director, Facilities
Scott Gowen	Director, Supply and Business Services
Christine Monroe	Manager, Supply and Business Services
Dan Brown	Manager, Physical Plant, Facilities
Dan Hall	Facilities Technologist, Facilities
Iain Hunter	Operations Manager, Facilities
Don Smith	Assistant Operations Manager, Facilities
Charles Kincade	Facilities Supervisor, Facilities
Shawn Cahill	Facilities Supervisor, Facilities
Sam Mann	Facilities Supervisor, Facilities
Maurice Bedard	Maintenance Coordinator, Facilities
Maggie Fung	Executive Director, IET
Sukey Samra	Associate Director, IET

Collaboration

An effective energy management program needs to include as broad a range of participants as possible. Our program needs to consider and include our students, employees and the public who use our facilities.

Partnering and aligning Kwantlen with our external goods and services providers and organizations which help by providing funding increases our knowledge base and provides assistance in implementing our program. These partners include but are not limited to BCHydro, NRCan, Teresen and PSECA.

Key External Organizations

The organizations and agencies listed below have played a key role and provided resources to help with Kwantlen's energy efficiency program.

Organization	Current Contact Person
BCHydro	Ron Mastromonaco
NRCan	
Teresen	
PSECA	
Province of B.C.	

BCHydro Power Smart Partners Express Program

Power Smart Partners Express (PSP) and former Power Smart incentive program (PIP) have provided funding to assist with purchasing more energy efficient products when practical to do so.

BCHydro Funded Energy Manager

The EMA One to Five assessments completed in 2008 identifies potential energy savings that could be achieved if appropriate staffing support is available. Kwantlen has been approved to receive $100,000 for energy manager funding from BCHydro in 2011 to address the issues noted in the EMA.

Total external funding received to date

Organization	Description of funding	Year	Value
NRCan	Efficiency project by Vestar	2002	$263,000
BCHydro	EPoints and other project specific funding	2003 – 2008	$90,458
CBIP	Cloverdale project	2007	$48,000
BCHydro	Energy Audit	2008	$72,000
PSECA	HVAC/Lighting upgrade at Langley and Surrey	2009	$457,596
Province of B.C.	Library mechanical retrofit	2009	$1,200,000
Province of B.C.	Geothermal	2009	$450,000
BCHydro	Funding to hire an Energy Manager	2011	$100,000
BCHydro	PSP and PIP project incentive funding	2010	$23,515
		Total	$2,704,569

OUR HISTORY

History

Since inception Kwantlen has been an active and creative leader in developing a sustainable world and our resource management has always been an integral part of that role. Twenty 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.

The energy conservation projects we have implemented have resulted in significant and ongoing cost avoidance for energy expenses and reductions in our greenhouse gas emissions. Our total cost avoidance for energy from 2000 to 2010 is estimated to be $2,330,057. Considering our total energy consumption for calendar year 2010 was $1,193,690 this is a significant level of cost avoidance as it roughly translates to two of the last ten years energy being free.

Summary of Past Achievements

Description	Year
▪ Completed construction of ISH research lab at Langley campus which has many energy savings features such as radiant heating and cooling as well as a heat recovery system to reclaim heat from lab exhaust air.	2009
▪ Completed construction of additions to Arbutus and Surrey Main buildings which are LEED buildings	2008
▪ Completed construction of Cloverdale Campus which achieved LEED gold	2007
▪ Completed addition to Fir building which was built to LEED standards and has radiant heating and cooling as well as natural ventilation.	2006
▪ Purchase of Green Power Certificates ▪ Epoint project adoption (local Electric Utility Conservation Program) ▪ Power Smart Certification ▪ Add electrical metering on the Cedar Building at Surrey to manage and monitor electrical loads more effectively ▪ Gold Champion Level Reporter with VCR ▪ Begin process of writing "Success Stories" to describe and share information on energy efficiency projects with others. ▪ Develop training manual for FSG's in Facilities department which includes training on energy conservation. ▪ Create web page	2003
▪ Commits to implement a "Sustainable Resource Management Program" ▪ Commits to a program of continuous improvement. ▪ Makes a further commitment to reduce energy and greenhouse gas emissions by 5% from 1994 levels – a further 139 tonnes of CO_2e. ▪ Full implementation of energy and greenhouse gases monitoring program and annual reporting to the VCR. ▪ Commits to introduce "green procurement" policies that include greenhouse gas management policies, resource management policies and water conservation.	2002

▪ Signed an Energy Services Agreement with Vestar Ltd. to implement the energy efficiency project at the Langley, Richmond and Surrey Campuses (owned facilities) ▪ Amalgamated the 1996 targets into a new target to reduce electricity at its 3 owned campuses by 1.85 million kWh, natural gas by 6,842 GJ and CO_2e by 420 tonnes	2000
▪ Agreed to be a "Pilot Project" to assist the B.C. Government develop the Green Buildings BC – Retrofit Program. ▪ Received permission from the BC Ministry of Finance and Corporate Relations to finance a $2 million Multi-Year Energy Services Contract. ▪ Developed an Eco-Efficiency Action Plan for its three owned campuses (Langley, Richmond and Surrey) ▪ NRCan's Office of Energy Efficiency approved Energy Innovators ^{PLUS} Incentive to support project. ▪ Committed to annual reporting to VCR and to implement a Community Communications, Employee Awareness and a Facility Manager/Operator Training Program.	1999
▪ Issued an Expression of Interest for an Energy Conservation Project as part of its commitment to reduce energy by 10% by 1999. ▪ Started negotiations with the BC Government for permission to enter into an Energy Conservation Project.	1997
▪ Committed to reduce energy by 10% by 1999	1996
▪ Joined the Energy Innovators Initiative ▪ Registered with Canada's Climate Change Voluntary Challenge and Registry (VCR)	1995
▪ Assigned responsibilities for energy management to Physical Plant Manager	1993
▪ Implement "Waste Management/Environment" policy F.13	1991
▪ Implement "Operations: 5-Year Maintenance/Renovations plan" policy F.11	1990

Awards and Recognition

Award Description	Awarded by	Year
BCHydro Power Smart Leader (only 13 in province)	BCHydro	2010
BCHydro Power Smart Leader (only 7 in province)	BCHydro	2009
Excellence in Energy Management (only post-secondary to have achieved)	BCHydro	2008
LEED gold achieved for Cloverdale Campus project		2007
Power Smart Certified Energy Efficiency Leader designation (only 9 in the province)	BCHydro	2004
Power Smart Partner Excellence Award	BCHydro	2003
Leadership Award under the Colleges and Universities sector (for 2002) for outstanding environmental efforts and for being the top Canadian post-secondary Institution in "going green."	VCR Inc	2002
Designated BCHydro Power Smart Partner	BCHydro	2002

TRAINING AND AWARENESS

Training Activities

A brief summary of key training activities is listed in the table below. Training ensures we use up to date methods to evaluate and implement energy savings opportunities and that there are ongoing reminders of activities necessary to maintain energy savings levels.

Actions	Year Started	Status
Attend BCHydro PowerSmart Forum – Dan/Karen	2010	Complete
Attend BCHydro PSP Express workshop – Dan	2010	Complete
Attend BCHydro lighting redesign workshop – Dan	2009	Complete
Attend BCHydro continuous optimization seminar – Dan	2009	Complete
Attend BCHydro energy manager training seminar – Dan	2009	Complete
Attend BCHydro utility rate design seminar – Dan	2009	Complete
Attend ½ day BCHydro energy manager conference – Dan	2008	Complete
LEED training for Karen	2008	Complete
Participate in BCHydro "EMA" one to five assessment	2008	Complete
Energy efficiency requirements included in security contract	2007	Complete
Turn off the lights reminder sign off sheet to Security	2007	Every 4 Months
Training Facilities employees on new buildings	2007	Complete
Provide energy consumption information to supervisors	2006	Ongoing
Stickers available for delamped fixtures	2005	Ongoing
LEED training for Dan and Craig	2005	Complete
LEED training for Dan/Tom/Craig	2004	Complete
Turn off the lights reminder sign off sheet to cleaners	2003	Every 4 Months
Developed ESCO pilot project case study to share experience	2003	Complete
Development of success stories	2003	Ongoing
Energy efficiency requirements included in cleaning contract	2002	Complete
Energy awareness training for cleaners	2002	Every 4 Months
Training for Kwantlen Facilities FSG's	2002	Ongoing
Energy Efficiency awareness posters/Stickers	2001	Ongoing

Awareness Presentations

Kwantlen takes awareness very seriously and the table below summarizes key presentations related to energy conservation and sustainability which have been primarily presented by Kwantlen's Executive Director of Facilities, Karen Hearn.

Awareness presentations help Kwantlen share energy savings ideas and the results of our project work with others to help them implement successful energy conservation projects.

Description of Presentations	Date	Presenter
PCAPPA Presentation "How to Create a Successful Partnership with your Service Provider"	Sep 2010	Karen Hearn
Tradeline Presentation in Toronto "Getting Small Specialized Lab Areas Right"	May 2010	Karen Hearn
BC Psychology Articulation "Sustainable University Architectural Design"	May 2010	Karen Hearn
Bunting Coady Architect (BCA) Luncheon Series: "Building Green: An Owner's Experience"	Apr 2010	Karen Hearn
2011 Lean Facility Lifecycle Conference: "Lifecycle-driven Sustainability Investments Fund Core Business Mission - KPU"	Mar 2011	Karen Hearn
IFMA "Building Green: An Owner's Experience"	Mar 2010	Karen Hearn
Presentation at 2009 Power Smart Forum "How to Identify, Quantify & Monitor Energy Conservation Measures within Your Facility"	Oct 2009	Karen Hearn
Presentation at the Facilities Asset Management Conference "Achieving Excellence in Energy Management to Reduce Cost and Protect the Environment"	Sept 2009	Karen Hearn
Presentation "Dare to Lead" at Royal City Builder's Awards	Sept 2009	Karen Hearn
Presentation "Sustainability" to Bill Burgess's GEOG students	Jan 2009	Karen Hearn
Presentation "Continuous Improvement Programs" to Environmental Managers Association of BC	Apr 2008	Tom Knox
Presentation "Master Planning & Environmental Sustainability" to Kwantlen's Board of Governors	Jun 2008	Karen Hearn
Presentation "Master Planning & Environmental Sustainability" to Gordon Lee, Facilities Management Team, Facilities Supervisors	Jul 2008	Karen Hearn
Presentation "Achieving Excellence in Energy Management" to the Environmental Managers Association of BC (EMA)	Nov 2008	Karen Hearn
Presentation "Master Planning & Environmental Sustainability" to Kwantlen's Design Students	Sept 2008	Karen Hearn
Presentation "Green Sustainable Building Controls" to BACnet International Conference	Sept 2008	Karen Hearn & ECS
Presentation "Sustainability for You" to Rotary	Aug 2007	Karen Hearn
Presentation "Sustainability" to Environmental Protection Technology Advisory Committee	Apr 2007	Karen Hearn

Presentation "Trends in Large Educational Buildings: Sustainable Design" at The Campus of the Future, A Meeting of the Minds	Jul 2006	Karen Hearn, BCA &UBC
Presentation "Our 'Sustainability' Vision and the Evolution of Power Smart" to BC Hydro Customer Panel Presentation	Jun 2006	Tom Knox
Presentation "Top 10 Trends in Large Educational Buildings: Sustainable Design" to SCUP - Pacific Regional Conference	Jun 2006	Karen Hearn, BCA &UBC
Presentation "Trends in Planning Educational Facilities" to the Society of Colleges & University Planning	Jan 2006	Karen Hearn & ECS
Presentation "Sustainability - Eyes Wide Open" to Facilities Administrators Conference	Nov 2005	Karen Hearn & BCA
Presentation "Experiences in Energy Efficiency"	Feb 2004	Karen Hearn

RECORD OF IMPROVEMENTS AND CHANGES

The following is a summary of energy efficiency work completed from 2000 to 2010.

Description	Source of Idea	Estimated Annual Savings	Campus	Year
Convert compact fluorescent lights in hallway to 2x4 fluorescent tubes	Charles Kincade	2680 kWh	L	Feb 2011
Add VFD and programming for conference center demand ventilation	Consultant	5,808 kWh 128 GJ	R	Jan 2011
Add kitchen hood controls and VFD's	Energy Audit	49,734 kWh 128 GJ	R	Jan 2011
Removed unnecessary track lights in boardroom	Karen Hearn	5,180 kWh		Aug 2010
Add occupancy sensors to washrooms	Dan Brown	11,718 kWh	R	July 2010
Split automatic lighting control zones in south "hockey stick" hallway to improve control	Derrick Daley		C	June 2010
Pole lamp conversion from 175 watt metal halide to 85 watt compact fluorescent. Avoids deferred maintenance to replace capacitors and ballasts	Dan Brown	52,968 kWh	L	May 2010
Install one additional condensing boiler on spare boiler pad: PSECA project (in progress Dec 2009)	Energy Audit	2425 GJ	L	Feb 2010
Install washroom occupancy sensors	Energy Audit	34,914 kWh	S	Jan 2010
Remove one old 6,000,000 million BTU boiler and replace with two condensing boilers : PSECA project	Energy Audit	4,139 GJ	S	Dec 2009
Replace electric motors on AHU 1E, AHU- 1G (supply, return, exhaust), AHU-2G (supply, return, exhaust) with high efficiency: PSECA project	Energy Audit	32,550 kWh	S	Dec 2009
Replace 52-90 watt flood lights in conference centre with 67 watt lights of comparable light output which also have a longer life reducing maintenance costs.	Maurice Bedard		S	Oct 2009
Retro fit pneumatic VAV box control to DDC, add demand ventilation to large areas with variable occupancy and rebalance.	Dan Brown		R	Sept 2009
Relamp parking below main building to 25 watt tubes.	Sam Mann		R	Aug 2009
Switch to "Daytime Cleaning" and turn off all lights and equipment at closing time.	Karen Hearn		C-L-R-S	Aug 2009
Install "Melink" kitchen exhaust control to reduce kitchen hood exhaust air flow and make up fan air	Energy Audit	15,497 kWh	S	Aug 2009

flow. Includes optic sensors to see smoke and heat detectors to sense cooking: PSECA project.		318 GJ		
Install "Melink" kitchen exhaust control to reduce kitchen hood exhaust air flow and make up fan air flow. PSECA project.	Energy Audit	20,430 kWh 144 GJ	L	Aug 2009
Replace weather-stripping on main doors	Tom Knox		S-L-R	July 2009
Relamp all hallway 24 hour tubes to 25 watts	Karen Hearn		S-L-R	July 2009
Relamp hallways (except Arbutus, Birch and Surrey Main and new bldgs at Surrey) to 30 watt tubes	Karen Hearn		S-L-R	July 2009
Replace 50 Halogen spot lights which highlight the 2nd floor hallway glass tiles with LED	Maurice		L	June 2009
Created program to control lights using occupancy sensor in classrooms Cedar rooms 1040, 1045, 1050, 1055, 1060, 1075, 2045, 2060, 2065 and 2075	Maurice		S	June 2009
Enable washroom occupancy sensors	Charles Kincade	4,425 kWh	L	May 2009
Add time schedule controls to atrium entrance heaters and kitchen hood system	Shawn Cahill		R	May 2009
Add motion sensors to classrooms at in Bldg G	Maurice Bedard		S	Feb 2009
Turn off sprinkler room electric heater	Sandra Hoffman		L	Jan 2009
Upgrade t12 to t8 for misc. lights at Surrey in washrooms C176-C253-C254, mechanical room's c1x1-c2x1 and Britco storage Bldg.	Shawn Cahill		S	Jan 2009
Implement master damper control to separate ventilation control from fan system control. Allows building warm up with no ventilation	Dan Brown		S-L-R	2008
Retro fit pneumatic VAV box controls to DDC	Dan Brown		R	2008
Program night lighting at Cloverdale to shut off in Atrium when cleaners are in by adding two light fixtures above stairs and two below.	Tom Knox		C	Aug 2008
Move out of Newton Campus and set heating systems on Bldg 3 to minimum settings			N	2009
Add piping insulation in greenhouse to improve occupant comfort and improve energy efficiency	Tom Knox		L	2007
Add Geo-exchange to Surrey Campus as part of new building additions to Bldg A and C.	Karen Hearn			2007
Incorporate natural ventilation and radiant heating/cooling and heat recovery to new building additions to Bldg A, C and D	Consultant			2007
Add control (C02) sensor to MP room	Tom Knox		S	2004

Optimize main electrical vault voltage (pilot with BCHydro)	Tom Knox		S	2004
Lower parking lot light wattage	Tom Knox		S-L-R	2004
Convert HID to CF (Marine type Wall lights)	Tom Knox		L	2004
Add light switch to mechanical room 245	Tom Knox		S	2004
Install fan heaters in horticulture labs to avoid replacing buried underground heating line and improve energy performance	Tom Knox		L	2004
Relocate print shop from Newton to Surrey and optimize for energy efficiency	Scott Gowen		S	2003
Install new hot water tank to supply domestic hot water and allow main boilers to be turned in summer months	Dan Brown		R	2003
Turn off incandescent gym lights 100hrs/wk using a key switch	Tom Knox		S	2003
Install new lighting system in Atrium to reduce energy consumption, reduce maintenance costs and increase light levels. Funded 100% by BCHydro	Tom Knox		R	2003
Add CO control for 2 Parkade exhaust fans	Tom Knox		R	2003
Add photo control for Atrium fixtures and north entrance lights	Tom Knox		R	2003
Add control for accent lighting and forest lighting to turn off when closed	Tom Knox		S	2003
Add photo control/keys for 2nd floor lights	Tom Knox		L	2003
Add photo control/keys for the following Bldgs: Birch - upper central, Main – 2nd skylight, Fir – 3rd skylight, Cedar – 1st floor hallway,	Tom Knox		S	2003
Convert exterior lighting from incandescent to compact fluorescent	Tom Knox		S	2002
Change Auditorium lights (incandescent to fluorescent).	Tom Knox		L	2002
Change incandescent to compact fluorescent	Vestar		L-N-R-S	2002
Add vend misers to additional vending machines	Vestar		L-N-R-S	2002
Pilot project (with Vestar) to perform significant retrofit work to improve energy efficiency. Work included major lighting retrofit and upgrades to HVAC and mechanical systems. Value approx 1.4 million and savings targets were estimated at $200,000 per year.	Ric Kelm		L-S-R	2002

FACILITIES DESCRIPTIONS

Occupancy and Usage

All campuses are open 7:30 to 22:30 Monday to Friday with the Surrey and Richmond Campuses open until 23:00. Campus hours for the weekend and holidays are listed in the table below.

	Saturday	Sunday	Holidays
Cloverdale	Closed	Closed	Closed
Langley	8:30 – 16:30	Closed	Closed
Richmond	8:00 – 16:00	13:00 – 17:00	Closed
Surrey	8:00 – 17:00	13:00 – 17:00	Closed

Building Size History

The table below indicates Kwantlen's increase in built space from 1994 to present in square meters.

	Cloverdale	Newton	Lang - M	Lang - H	Richmond	Surrey	Total M2
1994		14,327	16,654	3,107	20,129	17,447	71,664
1995		14,327	16,654	3,107	20,554	17,447	72,089
1996		14,327	16,654	3,107	20,554	17,447	72,089
1997		14,327	16,654	3,107	20,554	17,447	72,089
1998		14,327	16,654	3,107	20,554	17,447	72,089
1999		14,327	16,654	3,107	20,554	26,185	80,827
2000		14,327	16,654	3,107	20,554	26,185	80,827
2001		14,327	16,654	3,107	20,554	26,185	80,827
2002		14,327	16,654	3,107	20,554	26,185	80,827
2003		14,327	16,654	3,107	20,554	26,185	80,827
2004		14,327	16,654	3,107	20,554	26,185	80,827
2005		14,327	16,654	3,107	20,554	26,185	80,827
2006		14,327	16,654	3,107	20,554	27,415	82,057
2007	18,559	4,015	16,654	3,107	20,554	27,415	90,304
2008	18,559	4,015	17,029	3,107	20,554	32,635	95,899
2009	18,559	4,015	17,143	3,107	20,554	36,935	100,313
2010	18,559	4,015	17,143	3,107	20,554	36,935	100,313

Campus Information

Cloverdale	
Address:	5500 180th Ave, Surrey
Year Facility was built:	2006
Size of Facility:	18,559 m2
Last energy audit:	
Number of and Type Buildings:	1 main building, 1 barn
Utilization:	Classrooms, offices, shops
Last significant energy retrofit:	
Summary of Systems:	Central boiler heating, Central chiller cooling, T8 lighting, VSD fans and pumps, constant volume fans, central fan VAV fan systems, natural ventilation systems, radiant heating/cooling, DDC controls, central air compressor, emergency generator

Langley	
Address:	20901 Langley Bypass, Langley
Year Facility was built:	1993
Size of Facility:	20,250 m2
Number of and Type Buildings:	2 main bldgs with 2 levels, 1 (partially vacant)trades bldg, 2 Horticulture shops, 1 glass greenhouse, 4 poly greenhouses and 1 research lab added in 2009.
Utilization:	Classrooms, offices, shops, greenhouses
Last energy audit:	1999, 2008
Last significant energy retrofit:	2002, 2009 (condensing boiler, lighting)
Summary of Systems:	Central boiler heating, Central chiller cooling, T8 lighting, VSD fans and pumps, constant volume fans, central fan VAV fan systems, radiant heating/cooling, DDC and pneumatic controls, emergency generators

Richmond	
Address:	8771 Lansdowne Road, Richmond
Year Facility was built:	1992
Size of Facility:	20,554 m2
Number of and Type Buildings:	One multi-level building
Utilization:	Classrooms, offices, shops,
Last energy audit:	1999, 2008
Last significant energy retrofit:	2002, 2009 (controls)
Summary of Systems:	Central boiler heating, Central chiller cooling, T8 lighting, VSD fans and pumps, constant volume fans, central fan VAV fan systems, DDC and pneumatic controls, central lab air compressor, emergency generator

Surrey	
Address:	12666 72nd Avenue, Surrey
Year Facility was built:	1990 to 2009
Size of Facility:	36,935 m2
Number of and Type Buildings:	▪ Arbutus – original building 1990, new extension to the old building and renovated old bldg 2009 including radiant heat/cool, VRF heat/cool, Geoexchange -- (library, offices, learning labs, atrium, main computer room) ▪ Birch – constructed 1990 -- (cafeteria, kitchen, bookstore, shipping, boiler, electric vault) ▪ Surrey Main – constructed 1990--(facilities, purchasing, admin) ▪ Surrey Main – new building extension in 2008 includes radiant heat/cool, natural ventilation, Geo-exchange -- (classrooms, offices, atrium, registration) ▪ Fir – original building 1990 -- (classrooms, offices) ▪ Fir – extension added in 2006 to old bldg includes radiant heat/cool, natural ventilation -- (classrooms, offices) ▪ Spruce – original building 1990 -- (classrooms, offices) ▪ Yew – original building 1990 -- (chemical bunker) ▪ Cedar – original building 1999 -- (classrooms, offices, gym, conference centre)
Utilization:	Classrooms, offices, shops, studios
Last energy audit:	Sept 1999 and Dec 2008
Last significant energy retrofit:	2002, 2009 (condensing boiler, lighting)
Summary of Systems:	Central boiler heating, roof top cooling, Geoexchange heating/cooling, VRF heating/cooling, T8 lighting, VSD fans and pumps, central fan VAV fan systems, natural ventilation systems, radiant heating/cooling, DDC and pneumatic controls

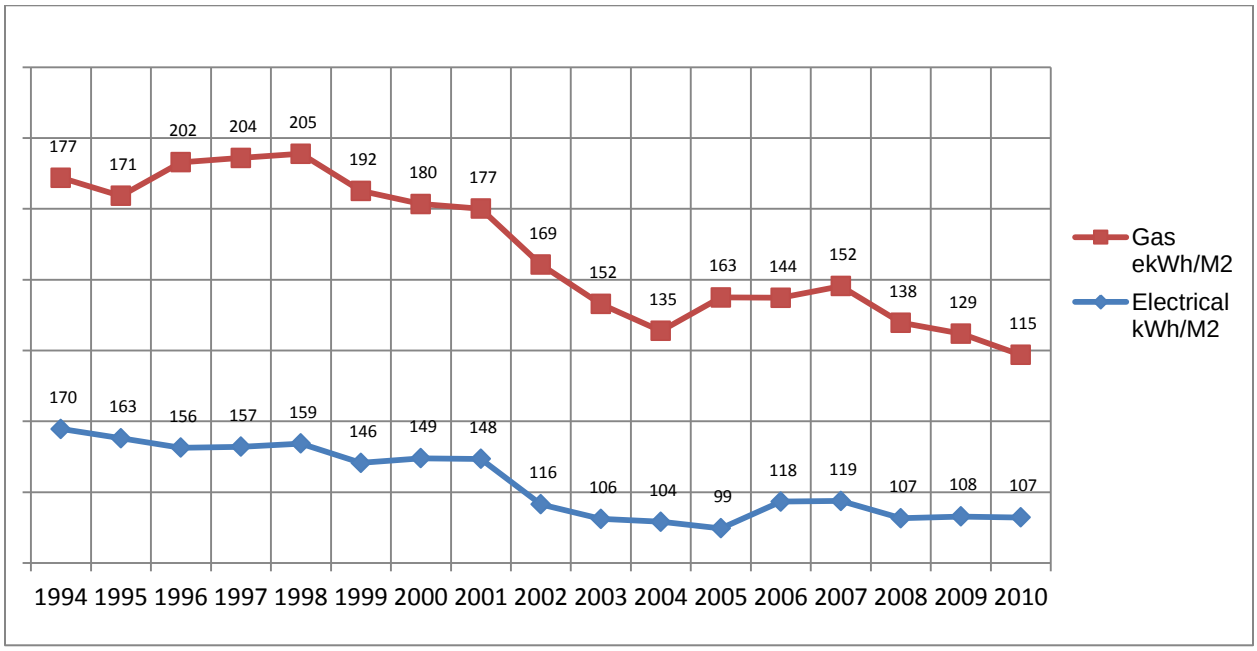
BENCHMARKING ENERGY CONSUMPTION

Energy Intensity per Square Meter

One key challenge as Kwantlen adds new buildings and grows is keeping track of our efficiency in a manner that evaluates growth and energy usage.

The simplest manner to do this is to measure energy intensity per square meter in equivalent kilowatts per square meter (ekWh/m2) and use this as a benchmark to evaluate our energy management program.

Energy Intensity – ekWh/M2



ENERGY EFFICIENCY BENCHMARKED BY CAMPUS

The table below provides additional information for each campus and benchmarks energy efficiency in ekWh units per M2 for each campus location for years 1994 to 2010.

This information is helpful to confirm our progress in reducing energy consumption and to identify opportunities for improvements.

	Total - ekWh/M2					
	Cloverdale	Langley	Langley H	Newton	Richmond	Surrey
1994		442		279	389	332
1995		403		275	387	322
1996		452		296	393	349
1997		469		317	376	348
1998		423		341	359	406
1999		433		330	352	315
2000		286	577	309	368	310
2001		284	687	303	370	291
2002		281	564	301	242	285
2003		266	443	294	207	255
2004		249	422	209	204	258
2005		237	396	229	207	246
2006		246	397	248	277	257
2007	179	233	437	278	314	303
2008	173	216	427	140	281	270
2009	180	241	439	124	259	247
2010	168	237	489	Closed	244	228

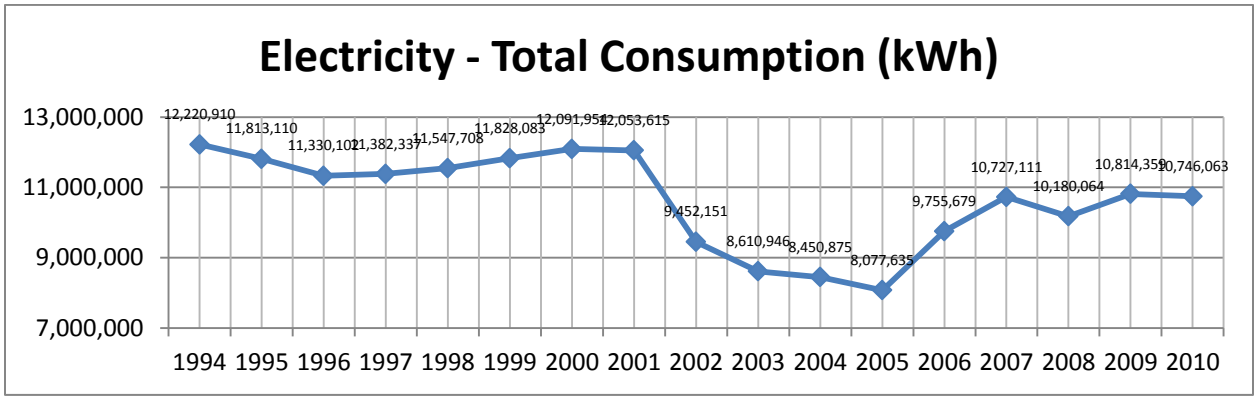
Note: Newton became unoccupied as of the end of Feb 2009

ENERGY USE COMPARED TO BUILDING AREA

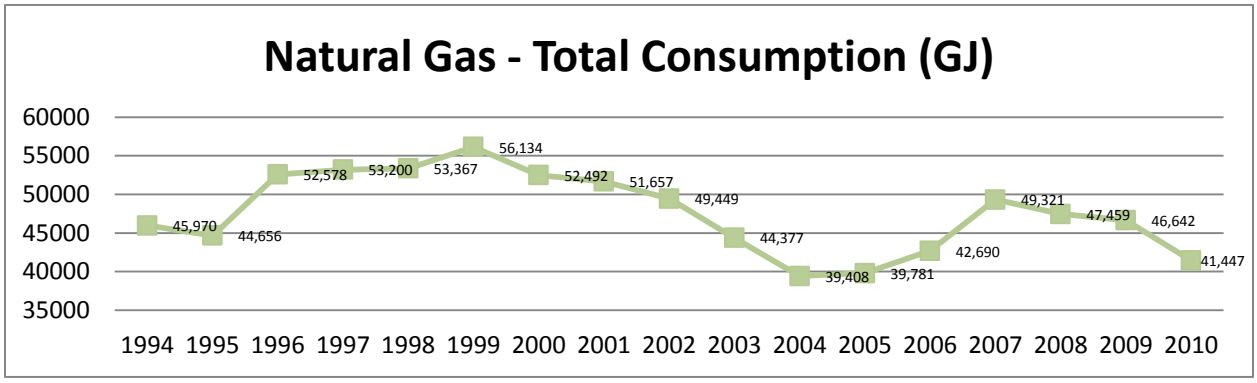
Overview

Comparing energy consumption to building area is helpful in evaluating the results of our program.

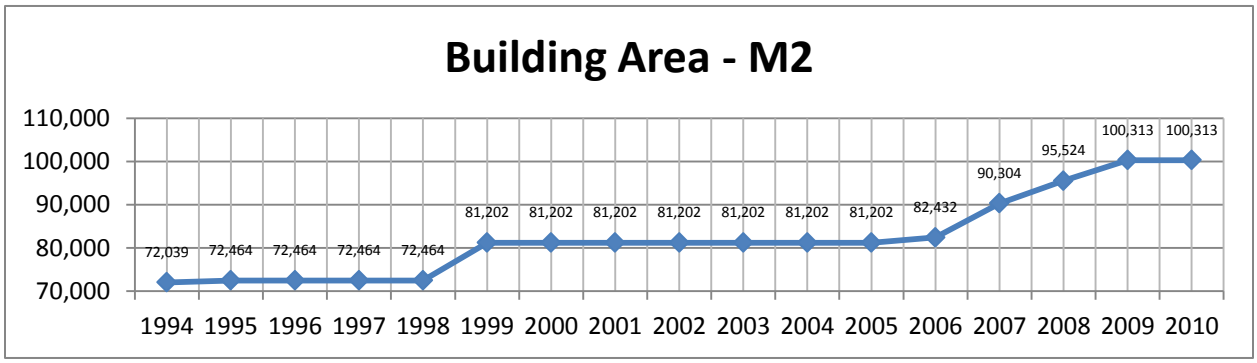
Electricity



Natural Gas



Building Size



RESULTS OF OUR ENERGY EFFICIENCY PROGRAM

Energy Consumption from 2000 to 2010

The table below provides consumption and energy intensity summary from 2000 to present. Kwantlen's building size has been steadily increasing and the energy consumption has been steadily decreasing as a result of efforts to reduce energy consumption.

This is best illustrated by noting that in 2010 the size of our campuses floor area in M2 is 20% larger than in the year 2000 and while our electrical consumption is 12% less and our natural gas is 21% less than our year 2000 consumption levels.

	Area	Electric	Gas		Total	Energy Density			
	M2	kWh	GJ	ekWh	ekWh	Electric KWh/M2	Gas ekWh/M2	Total ekWh/M2	Total eGJ/M2
2000	80,827	12,091,954	52,492	14,582,389	26,674,343	150	180	330	1.19
2001	80,827	12,053,615	51,657	14,350,398	26,404,013	149	178	327	1.18
2002	80,827	9,452,151	49,449	13,736,932	23,189,083	117	170	287	1.03
2003	80,827	8,610,946	44,377	12,328,042	20,938,988	107	153	259	0.93
2004	80,827	8,450,875	39,408	10,947,459	19,398,334	105	135	240	0.86
2005	80,827	8,077,635	39,781	11,051,023	19,128,658	100	163	237	0.85
2006	82,057	9,755,679	42,690	11,859,265	21,614,944	119	145	263	0.95
2007	90,304	10,727,111	49,321	13,701,485	24,428,596	119	152	271	0.97
2008	95,899	10,180,064	47,459	13,183,999	23,364,063	106	137	244	0.88
2009	100,313	10,814,359	46,642	12,957,009	23,766,068	108	129	237	.85
2010	100,313	10,746,063	41,447	11,513,899	22,259,962	107	115	222	.80

Results for our 2010 plan

In reviewing our energy consumption records we have underperformed on our electrical goals most likely due to increased utilization and over performed on natural gas goals.

Electricity

Our goal was a reduction of 101,056 kWh and our result was a reduction of 68,296 kWh.

Natural Gas

Our goal was a reduction of 991 GJ and our result was a reduction of 5195 GJ.

GHG

Our GHG emissions from energy use have been reduced by 14% from the 2007 base year established by the government in "Bill 44".

OUR PLAN FOR 2011

Executive Summary

Kwantlen has been a leader in reducing energy consumption since the 1990's having achieved significant reductions in the amount of electricity and natural gas consumed. Over the past five years Kwantlen has undergone dramatic growth with an increase in the number of students served, an increase in our built space, and increased operating hours. These factors are affecting our energy consumption and creating challenges in finding ways to further reduce energy consumption.

This plan takes advantage of operational and technological opportunities to meet these challenges in order to reduce energy consumption and greenhouse gas emissions to meet government requirements.

The total estimated energy savings if all these projects are is performed is 535,965 kWh per year in electrical savings and 1792 GJ per year in natural gas savings.

Planned Projects

The table below summarizes planned project work for 2011.

Campus	Description	Savings kWh/YR	Savings GJ/Yr	Tonnes GHG	Cost Estimate
All	Hire an Energy Manager for a one year term. **Note** – this will be funded by BCHydro	214,386	856	42	$86,000
All	Add interval meters to monitor instantaneous natural gas and electrical use to help maintain existing savings and identify potential areas for new energy savings measures.	214,386	856	42	$88,000
All	Lighting and HVAC upgrades to more energy efficient technology through several projects.	107,193	0		$155,000
	Totals	**535,965**	**1792**	**84**	**$329,000**

Signatures

To carry out this plan in 2011/12 Kwantlen will provide funding of $243,000 and we already have a commitment from BCHydro for $88,000 to pay for the energy manager.

President	David Atkinson
Vice President	Gordon Lee
Executive Director, Facilities	Karen Hearn