Strategic Energy Management Plan

University of Northern British Columbia

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1. INTRODUCTION

UNBC is Canada's Green University™. The continued relevance of this branding requires that the university engage in "green" and sustainable activities in every aspect of our operations. Energy use is readily identified as an aspect of being green. The student community, faculty and wider public all equate energy use with sustainability. Furthermore, public education campaigns have addressed the environmental impacts of energy use, and the need to curtail energy waste. News media coverage of the oil sands, and electrical generation options (nuclear, coal fired plants, large scale hydro-electric, wind, run-of-river etc.) has raised the level of public awareness regarding energy sources. There is a growing lobby for green or renewable energy sourcing, to which the university is also subjected.

The university has set leadership in renewable energy as a key part of the University Plan. The new Bioenergy facility is an important part of this plan. It was designed to offset 85% of the natural gas used for heating the core campus buildings, and achieved an 89% reduction in the first full year of operation. This addresses the majority of the university heating requirement; the next steps will address the remaining heating needs, and electrical supply.

In March of 2008 the University of Northern British Columbia participated in an Energy Management Assessment sponsored by BC Hydro. This was a review of university policies, procedures and practices related to energy usage and conservation. One of the identified action items was to designate a staff person to be responsible for energy management issues and coordinating conservation initiatives. An Energy Manager was hired in June 2010, with funding for the position provided by BC Hydro. In January 2012 the Energy Manager transitioned into the role of Assistant Director of Facilities and an Energy Technician role was created. This new role will carry out the implementation of the energy management plan as outlined in this report.

Energy management is an important part of the shift towards renewable energy. Demonstrating leadership in the renewable field will only happen through concerted effort, and execution of a well structured plan. The Assistant Director of Facilities will be instrumental in developing that plan. Accurate data on current and historical consumption patterns is required to size and design renewable energy infrastructure. The Energy Technician will facilitate the collection and reporting of energy performance data.

Energy management is important to help keep costs at a minimum and ensure that every available dollar goes into education.

1.1 Energy Manager Program

The BC Hydro Energy Manager program provides funding to public sector organizations to hire or designate someone as an Energy Manager. This funding is available for up to five years, and covers a portion of the salary. Annual renewal of the funding is contingent upon meeting the following requirements:

- Submit a Strategic Energy Management Plan
- Complete quarterly presentations to both UNBC and BC Hydro

This report fulfills the requirements of BC Hydro Energy Manager program, while providing background and context for the energy conservation activities at UNBC.

1.2 Purpose Statement

UNBC aims to reduce its energy consumption by 10% by 2015. This is measured using energy consumption per square meter of building space; additional buildings increase the consumption ot the university, and are the primary driver of our overall usage. Based on the consumption in the 2009/2010 fiscal year, our conservation target for FY2012 is 1,086,000 kWh. Achieving this target will require the participation and engagement of students, faculty and staff (to embrace conservation behaviours), facilities staff (to operate efficiently and eliminate waste) and the senior administration (to support the programs and allocate funding).

2. OUR ORGANIZATION

The Univesity of Northern British Columbia was established in 1990 by the UNBC Act. The Prince George campus was constructed between 1992-1994, and opened by Her Majesty Queen Elizabeth on August 15, 1994. The Bank of Montreal donated a downtown building to the University in 2005. A Terrace campus building was added in 2006, and the Quesnel River Research Centre came under the UNBC banner in 2002.

2.1 Organizational Profile

People

Sector Post-Secondary Education

Number of People 825 Faculty and Staff
4183 Occupants (students, daycare participants)

Campus Sites Prince George (16 buildings)
Downtown Bank of Montreal Building
Terrace Campus
Quesnel River Research Centre (4 buildings)

Operations

Energy Management Issues / Obstacles

- Organizational capacity – staff to carry out work scope
- Facilities staff changeover
-

Core Business Metrics

- Full Time Equivalent Students
- Gross Square Meters
- Classroom Hours
- Research Dollars

Annual Cycle

Business Year	April 1 - March 31
Budget Cycle	April 1 - March 31
Maintenance Cycle	April 1 - March 31

	2011/12	2012/13	2013/14*	2014/15*
Maintenance Budget [1]	$1,372,059	$1,430,121	$1,488,000	$1,488,000
Energy Efficiency Projects Budget	$118,000	$174,000	$181,000	$200,000
Utilities Budget [2]	$2,893,131	$2,909,878	$2,968,000	$3,027,000
Operations Budget [3]	$62,773,519	$64,073,376	$64,146,519	$64,210,000
Other Incentives				
Capital Budget [4]	$91,350	$ 241,000	$ -	$ -

** Denotes projected budget amounts.*

[1] "Building Renovations/Maintenance & Grounds" in the University budget
[2] "Utilities" in the University budget
[3] Total of "Labour" and "Other Operating Expenditures"
[4] "Annual Capital Allowance"

The Energy Efficiency Projects budget is the actual amount spent in 2011/12. The amount listed for subsequent years is based on the projected spend from the Energy Conservation Revolving Loan described in section 5.3.

The capital budget listed above is the Annual Capital Allowance provided by the Provincial Government. It is used for capital improvements to extend the life of the physical plant, increase campus life safety and security, and for projects to reduce greenhouse gas emissions. This has been drastically reduced in recent years, from $1.4 million to $241,000 for this year. This is a challenge for funding energy efficiency projects; the University has responded by creating the Energy Conservation Revolving Loan, and will allocate savings from the utilities budget towards future projects.

The Operations budget of the University has been frozen for the current fiscal year. This constrains the Other Operating Expenditures, as labour costs include annual increases. All operating costs, including utilities, are being monitored very closesly for any savings opportunities.

2.2 Energy Management Scope

The energy management portfolio includes all facilities where UNBC has direct operational control. This permits changes to the operating procedures, equipment upgrades, and other capital expenditures. Many of the regional operations of UNBC are housed at facilities operated by other institutions; while behaviour based conservation initiatives may be addressed to the staff at these sites, the facilities do not fall within the scope of the energy management program.

2.3 Facility Profile

The Prince George campus includes the majority of the UNBC facilities. Only three other sites are included in the energy management scope: the Terrace campus, the BMO Centre in downtown Prince George, and the Quesnel River Research Centre near Likely.

The Prince George campus is supplied with electrical and natural gas accounts at the Power Plant. Distribution within the core campus is handled internally, with sub-meters installed in each of the individual buildings. Several facilities within the Prince George campus are served with separate utility accounts.

Facility Profile (Apr 2011 – Mar 2012)

	Number of People	Size Gross m^2	Annual Energy Consumption kWh	Annual Energy Cost	Energy Intensity kWh/ m^2	Energy Intensity per Employee kWh/person
Power Plant	4	1253	1,440,023	75,669	1,449	360,006
Northern Health Sciences Centre	489	4,468	5,643,121	204,693	1,436	11,540
Teaching Laboratory	746	7,921	8,905,097	319,439	1,124	11,937
Research Laboratory	669	7,581	7,451,789	273,641	949	11,139
Enhanced Forestry Laboratory	10	931	847,569	42,418	915	84,757
Bioenergy	2	1,046	806,842	61,139	774	403,421
Conference Centre	194	3,253	2,014,807	75,822	619	10,386
Agora	378	8,556	4,964,609	172,766	606	13,134
Administration	568	9,162	3,758,498	170,441	410	6,617
Library	505	11,754	4,362,166	176,096	371	8,638
Terrace Campus	130	1,314	476,542	36,032	363	3,666
Quesnel River Research Centre	4	812	249,360	22,075	307	62,340
Teaching and Learning Centre	337	10,130	3,080,602	121,561	304	9,141
Northern Sports Centre	330	13,485	3,450,932	183,630	256	10,457
Downtown BMO Centre	40	1,320	327,161	20,439	248	8,179
Residences	465	14,850	3,188,994	153,471	215	6,858
Daycare*	70	639	131,219	5,460	205	1,875
Total	**4,941**	**98,475**	**51,099,332**	**2,114,792**	**524**	**10,342**

* Daycare energy consumption does not include electrical.

Note that the energy values in the above table include both heating (natural gas or wood) and electricity.

When evaluated on the basis of energy intensity per square meter, the plant and research laboratory facilities are the most energy intensive. Buildings that include laboratory spaces are not permited to recirculate indoor air for safety reasons, so 100% outdoor air is drawn in and conditioned (heated or cooled) year round. This raises the energy intensity of these buildings significantly.

The Agora and Conference Centre have long operating hours, and incur a higher energy consumption as a result. The Administration building houses the campus servers, which consume a significant amount of electricity.

Energy use per person varies considerably between UNBC facilities, but is not viewed as a significant measure of building performance and will therefore not be examined further in this report.

2.4 Key Performance Indicators

Key performance indicators are the variables identified as the drivers of energy consumption. Typically there is some overlap between the energy consumption indicators and the measures used to gauge the success or growth of the organization. Floor area is one way of quantifying the size of the University, and it also directly relates to the amount of energy consumed. The number of students is the prime measure of the size of an institution, but it has less of an impact on the energy use. The annual weather (as measured by heating degree days) is the single largest driver of energy use for a northern campus such as UNBC. This is not a key performance indicator in the traditional sense as ther is no direct control over it, but it is an important factor when reviewing energy consumption.

Table 1 Key Performance Indicators

	Totals				
	2011/2012	**2010/11**	**2009/10**	**2008/09**	**2007/08**
Floor Area (average gross, m^2)	98,827	97,404	98,129	97,780	80,074
Students (Headcount Nov 1)	3,625	3,622	3,675	3,701	3,618
Weather (Heating Degree Days)	3,918	4,208	3,909	4,433	4,148

Floor area is computed as the average across all months of the gross campus area. Adjusting energy use for floor area yields a measure of the efficiency of the campus buildings; as new buildings are constructed the energy intensity in kWh/m^2 can still be compared against historical consumption levels.

Student numbers are based on the enrolment on November 1 of each year. An increase in enrolment would be expected to cause an increase in energy consumption. This is particularly the case when additional courses cause the normal operating hours of campus buildings to be extended. Measuring full time equivalent (FTE) enrolment does not account for differences in energy intensity of various programs or disciplines. The level of detail is insufficient to identify changes in energy usage between buildings. A more detailed measure of building occupancy (such as student/faculty contact hours) is being examined for future energy reporting.

Heating degree days are a measure of the amount of heating required as the weather changes. An average daily temperature that is one degree cooler than the reference temperature results in one heating degree day. The reference temperature used for UNBC is 15.5° C, implying that this is the temperature at which no heating would be required by the campuses.

UNBC is a research intensive university, and the facilities include a research laboratory building, a teaching laboratory, and building for the Northern Medical program. Research activity is a key measure of University performance, and research dollars awarded would be the natural performance measure. However, this does not take into account the wide range of energy intensity across research programs.

3. OUR COMMITMENT

The University of Northern British Columbia is committed to responsible energy use for all University owned and operated facilities while supporting its mandate of teaching and research. It is acknowledged that students, staff and faculty all have a role to play in fostering a culture of energy conservation. To control costs and reduce the impact on the environment, UNBC will aim to reduce energy consumption and switch to renewable fuel sources.

3.1 Energy Policy

UNBC has adopted an Energy Policy to reinforce the commitment to responsible energy use. The full text of this policy is included in the Appendix; the vision and goals are articulated here in more detail.

The vision stems from our Green University strategy, as described below.

- **To maximize energy efficiencies of present UNBC energy systems**

  As a relatively new campus, built with energy efficiency in mind, UNBC has highly efficient systems. Not content to rest on its laurels, UNBC will continue to optimize operating practices, and seek out opportunities to increase the energy efficiency of infrastructure systems.

- **To replace fossil fuel sources with renewable energy sources**

  Renewable energy sources available to all campuses will be examined, and harnassed where feasible to support the research and teaching activities for which the University exists.

- **To develop sustainable energy demonstration and research facilities of particular value to northern and rural communities**

  The research activites of UNBC place a special emphasis on relevance to the wider community of which the University is a part. Northern and rural communities face unique challenges, but are also often provided with significant renewable energy opportunities. UNBC will build on its history of integrating research, education and facility operations.

3.1.1 Reduction Targets

UNBC recognizes that utility rates are likely to increase, and that fossil fuel energy sources have a significant greenhouse gas contribution. To control costs and reduce the impact on the environment, UNBC will reduce energy consumption, and switch to renewable fuel sources wherever possible.

3.1.1.1 Overall Consumption

The electrical and thermal energy consumption of all UNBC campuses will be reduced by 10% by 2015 (relative to 2009/10).

Both electrical consumption and natural gas consumption will be reduced by 10%. Electrical reduction will be calculated based on the energy intensity in kWh per square meter of building space. Any campus expansion will only influence this reduction by the amount that the new space is above or below the average energy intensity for the overall campus. Energy intensity values will also be normalized for variations in enrolment and weather.

3.1.1.2 Fossil Fuel Reduction

UNBC consumes fossil fuels (natural gas, propane and diesel) for space heating at a number of sites. Fossil fuel consumption is not deemed to be sustainable, so the University will reduce its consumption by 80% by 2015 (relative to 2009/10).

The baseline consumption will be the 2009/2010 fiscal year, with consumption in subsequent years being corrected for weather, enrolment and campus square footage.

The aim is to reduce fossil fuel consumption at all campuses, but the performance will be measured on an aggregate basis. The Bioenergy facility at the Prince George campus is expected to reduce the fossil fuel consumption of the entire University by 69%. Conservation projects that reduce the amount of thermal energy required will contribute to both this reduction target and the overall energy reduction target listed above.

The combustion of fossil fuels represents the major source of greenhouse gas (GHG) emissions for the University. By switching thermal energy needs to non-fossil based energy sources the University will dramatically reduce its GHG emissions.

3.1.2 Renewable Sources

Renewable energy sources will be explored at all campuses, as each site presents unique opportunities.

As the University progresses towards being a leader in renewable energy, it is recognized that the first steps on this journey involve sub-metering metering to understand the current energy picture, and the application of conservation initiatives to reduce the energy requirements such that they can match the available renewable energy.

3.2 Sustainability Policy

The vision, objectives, and strategies contained in the UNBC Green Strategy, Phase 1 (2009-2011) are designed to guide all UNBC activities relative to sustainability over the two-year period from 1 July 2009 to 30 June 2011. The full text of this policy is included in the Appendix.

UNBC is located in one of the world's most magnificent natural settings – naturally beautiful British Columbia. It is also situated in the midst of one of Canada's major centers of resource extraction – timber, minerals, oil & gas, and fish. It is also situated in an area experiencing environmental degradation – local air quality, water pollution, solid waste disposal, ecosystem degradation, and climate change.

As a result of the confluence of natural setting, resource extraction, and environmental degradation, UNBC has naturally emerged as a small but powerful leader in teaching and researching the full scope of human-environment interaction, and putting what we learn into practice to achieve sustainability. This is the foundation upon which we, as Canada's Green University, will continue to build.

3.2.1 UNBC's Green University Vision

Our vision is:

- To make UNBC a sustainable campus
- To engender a 'spirit of sustainability' in the UNBC community
- To make the UNBC campuses models of sustainability for communities and organizations in Northern British Columbia
- To improve on our national and international reputation for excellence in teaching and research in the area of sustainability.

4. UNDERSTANDING OUR SITUATION

UNBC operates in a northern climate with cold winters and long hours of summer sun. The winter months are when campus occupancy is highest, it is also when the heating and lighting loads are greatest.

Campus facilities are mainly served with both electrical and natural gas from the provincial grids. A new Bioenergy facility was completed at the Prince George campus; this provides most of the space heating for the main campus from waste wood. This has resulted in a dramatic reduction in fossil fuel consumption by the university.

4.1 Energy Consumption and Costs

The table below lists the actual consumption and cost for each of the University utilities, based on invoiced amounts.

Utility *(Apr 2011 – Mar 2012)*	Consumption	Unit	Costs $	Costs %
Electricity	18,866,000	kWh	1,261,000	56%
Natural Gas	44,000	GJ	506,000	22%
Bio Fuel	3,800	BDT	348,000	15%
Water and Sewer	92,000	m^3	145,000	6%
Propane	4,500	L	4,000	
Diesel (Plant)	2,700	L	N/A	
Total			**2,264,00**	

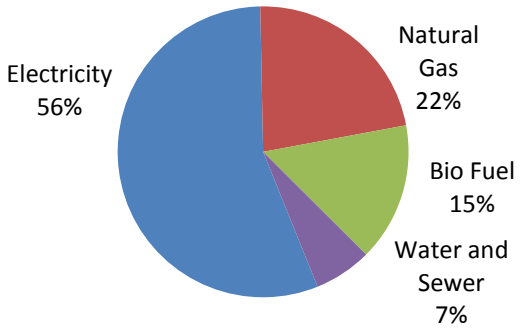

Figure 1 Utility Cost Breadown for Apr 2011 - Mar 2012

Diesel is used for the emergency electrical generators, and as a back-up fuel for the natural gas boilers in the Power Plant. Propane is used to heat the Maintenance Shop on the Prince George campus. Fuel for vehicles and mobile equipment is not included within the scope of the energy management program.

Bio fuel was added to the utility mix in November 2010 when the new Bioenergy facility came online. Waste wood (hog fuel) is purchased from a local sawmill, and trucked to the campus. The moisture content of the fuel varies with wood species, beetle killed wood, and percentage of bark; the billing is based on the theoretical dry weight of wood delivered, measured in Bone Dry Tonnes (BDT).

Figure 2 shows the monthly breakdown of consumption and demand charges for electrical billing. The cost is relatively constant throughout the year, with air conditioning load bringing up the consumption in what would otherwise be the lower summer months. This is aggregate electrical data, and includes all of the utility accounts that fall within the scope of energy management at UNBC.

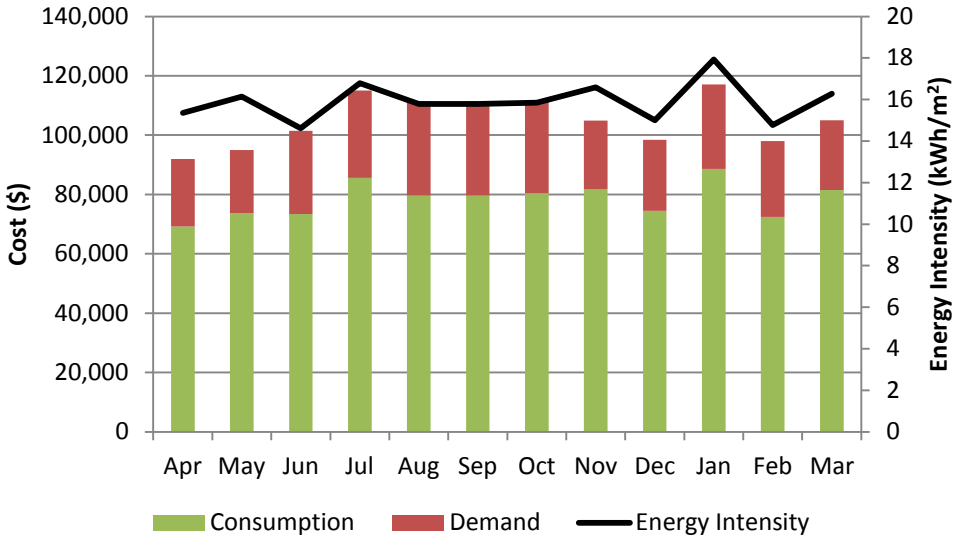

Figure 2 Aggregate Electrical Billing Summary (Apr 2011 - Mar 2012)

Figure 3 shows the monthly natural gas consumption and demand cost breakdown. The dramatic reduction in consumption from June onwards is due to the operation of the Bioenergy plant. This new plant was still being commissioned in April and May of 2011, and therefore the natural gas consumption for those months is typical of historical levels. The balance of the gas consumption is for the buildings not served by the district heating loop, and for the boilers under peak load.

The demand charges were reduced in November 2011 when the natural gas account for the Power Plant boilers was changed from Rate 5 to Rate 3. The demand charges under this rate are much lower, but the consumption rate is higher; the Bioenergy plant must offset 79% of the gas used to heat the core campus in order to break even on the new rate structure. The target offset is 85% and the plant may be able to provide over 90% offset, so this is deemed to be an achievable goal.

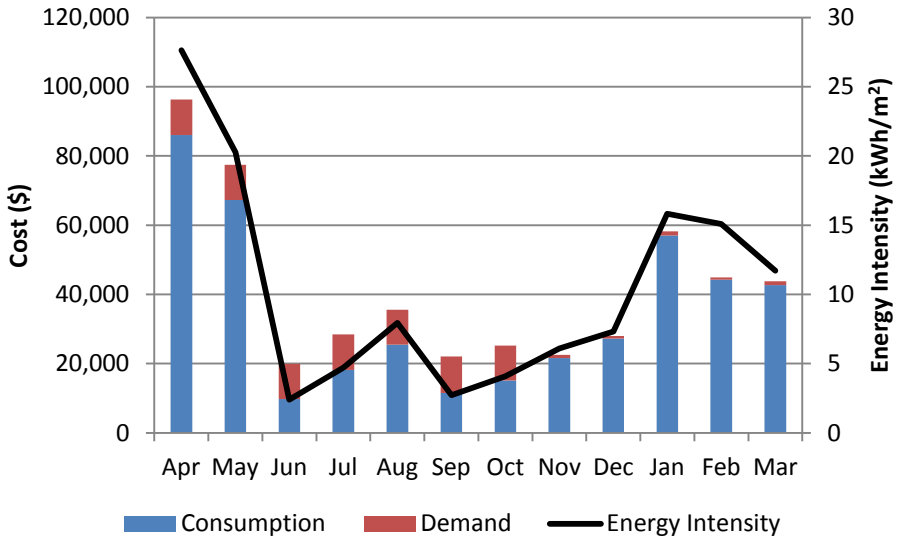

Figure 3 Aggregate Natural Gas Billing Summary (Apr 2011 - Mar 2012)

4.2 Savings Opportunity Assessment - Energy Consumption & Cost Intensity

The energy intensity of each building is reported in the figure below. This is an approximate breakdown, based on preliminary data from the building level sub-meters installed over the past year.

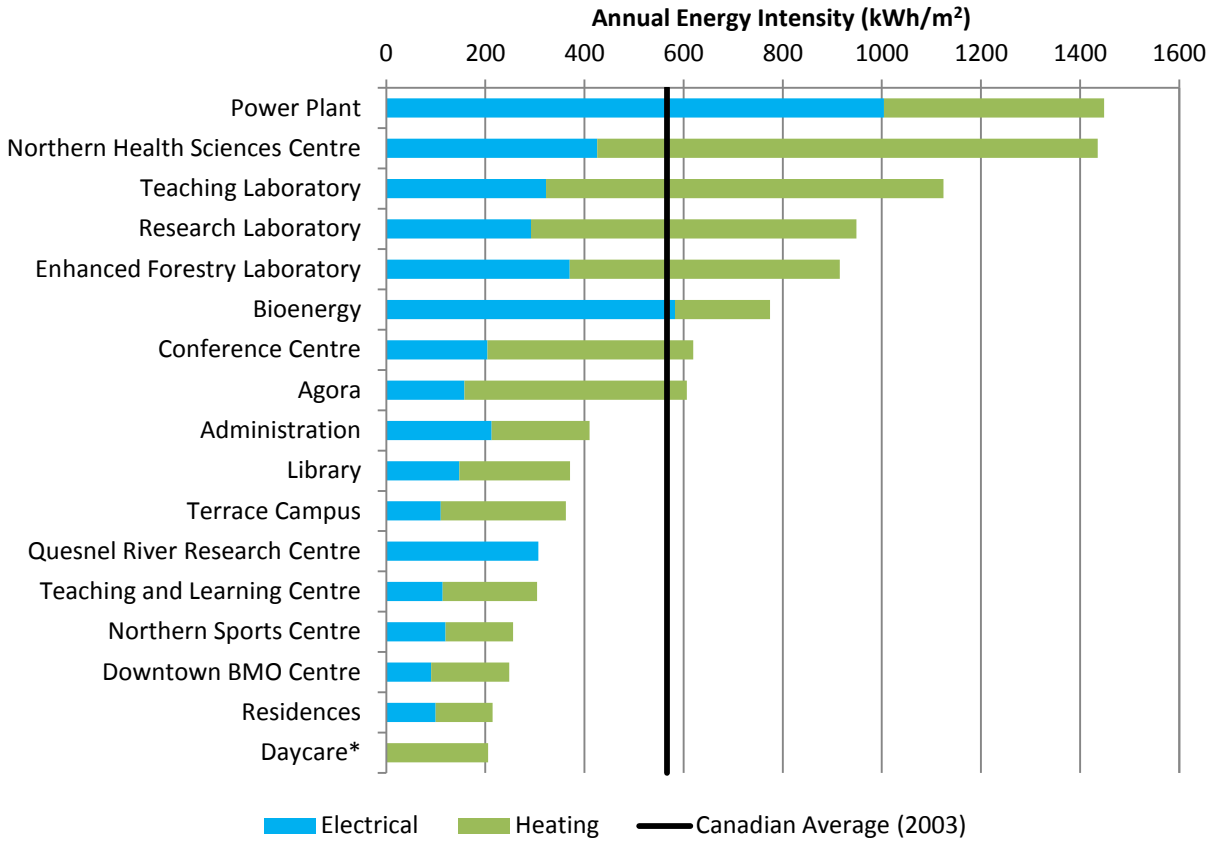

Figure 4 Energy Intensity by Building (Apr 2011 - Mar 2012)

The Power Plant electrical consumption includes the energy to provide air conditioning to the Prince George campus. The buildings with research laboratory space (Northern Health Sciences Centre, Teaching Laboratory and Research Laboratory) are the most energy intensive, primarily due to the requirement that 100% outside air be used for ventilation. These buildings do have heat recovery equipment installed to reduce the heat lost through this ventilation; a review of the effectiveness of these systems is anticipated as part of the energy management acitivites for the coming year.

The vertical line in the above figure is the Natural Resources Canada average intensity value for universities and colleges in Canada. Each of these buildings have different uses, and should be compared against separate baselines based on usage (i.e. apartments, offices, recreational complex). Such baseline data is not always readily available, though it is anticipated that an updated Statistics Canada survey conducted in 2010 may make more current and specific baseline information available.

Table 2 Building Energy Performance Index – Electrical (Apr 2011 – Mar 2012)

	Baseline kWh/yr	Actual kWh/yr	Difference kWh/yr	Savings $/yr	Area m^2	BEPI Electric kWh/m^2
Power Plant	1,050,139	998,108	52,031	4,073	994	1004
Administration	2,047,286	1,945,851	101,436	7,941	9,162	212
Research Laboratory	2,411,163	2,291,699	119,464	9,353	7,852	292
Library	1,819,338	1,729,197	90,142	7,057	11,754	147
Conference Centre	698,978	664,346	34,632	2,711	3,253	204
Agora	1,361,790	1,294,318	67,472	5,282	8,188	158
Teaching Laboratory	2,687,366	2,554,216	133,149	10,424	7,921	322
Northern Health Sciences Centre	1,761,076	1,673,821	87,255	6,831	3,930	426
Teaching and Learning Centre	1,213,059	1,152,957	60,103	4,705	10,130	114
Enhanced Forestry Laboratory	360,676	342,806	17,870	1,399	926	370
Residences	1,490,389	1,480,681	9,708	-2,808	14,850	100
Northern Sports Centre	1,511,326	1,616,400	-105,074	-7,147	13,485	120
Downtown BMO Centre	132,476	120,000	12,476	981	1,320	91
Terrace Campus	165,754	144,600	21,154	2,222	1,314	110
Quesnel River Research Centre	218,990	249,360	-30,370	-1,193	812	307
Bioenergy	591,542	607,320	-15,778	-256	1,042	583
	19,521,346	18,865,680	655,666	51,576	96,933	195

Table 2 lists the electrical consumption for each of the metered buildings, and compares against the baseline consumption for each specific building. The specific energy consumption (in kWh of electrical energy per square metre of building) permits comparisons between the buildings. The buildings listed in italics are served by the main campus account; the breakdown of energy consumption for these buildings is pro-rated based on sub-meter data from only a portion of the year.

The actual consumption for the main campus account was below baseline for this year, indicating significant conservation. The Northern Sports Centre consumed more electricity than the baseline, likely due to extended hours of operation for large loads such as ventilation and lighting. Consumption at the Quesnel River Research Centre varies depending on the research being carried out at the facility in a given year; this year the consumption exceeded the baseline.

The model for the baseline electrical consumtion at the Bioenergy facility is still being developed. As industrial infrastructure, this facility does not adhere to the consumption patterns of the rest of the university.

4.2.1 Heating Intensity

Table 3 lists the heating demand for each of the UNBC facilities. The demand for the buildings in italics was calculated as a percentage of the total demand for the district energy heating loop. Building level metering has been installed, but the building specific information is not available for the entire reporting period. The available data has been used to establish a pro-rating for each of the buildings.

Table 3 Building Energy Performance Index – Heating (Apr 2011 – Mar 2012)

	Baseline kWh/yr	Actual kWh/yr	Difference kWh/yr	Savings $/yr	Area m^2	BEPI Heating kWh/m^2
Power Plant	386,763	391,607	-4,844	-516	994	394
Administration	1,586,425	1,606,292	-19,867	-2,116	9,162	175
Research Laboratory	4,516,099	4,572,655	-56,556	-6,023	7,852	582
Library	2,304,369	2,333,227	-28,858	-3,073	11,754	199
Conference Centre	1,181,920	1,196,721	-14,801	-1,576	3,253	368
Agora	3,212,230	3,252,457	-40,227	-4,284	8,188	397
Teaching Laboratory	5,558,276	5,627,884	-69,607	-7,412	7,921	711
Northern Health Sciences Centre	3,473,923	3,517,427	-43,505	-4,633	3,930	895
Teaching and Learning Centre	1,687,071	1,708,199	-21,127	-2,250	10,130	169
Enhanced Forestry Laboratory	711,331	504,764	206,567	8,212	926	545
Residences	1,629,384	1,708,313	-78,930	-13,376	14,850	115
Daycare	124,011	131,219	-7,207	-285	639	205
Northern Sports Centre	1,850,670	1,834,532	16,138	-11,788	13,485	136
Downtown BMO Centre	211,700	207,161	4,539	178	1,320	157
Terrace Campus	400,844	331,942	68,902	4,666	1,314	253
Bioenergy	176,118	199,522	-23,404	-924	1,042	191
	29,011,133	29,123,921	-112,788	-45,199	97,572	298

The energy input for the buildings served by the district energy system includes both natural gas and hog fuel. The cost of hog fuel is lower than natural gas per unit of energy, and the goal of the Bioenergy project has been to shift 85% of the district heating load over to hog fuel. The savings referenced in the table above include both natural gas and hog fuel costs, referenced to the baseline heat demand with 85% of the heat being provided by the Bioenergy facility. For this reporting period the system did not meet the 85% offset target, as it was still going through commissioning for the first few months (Section 5.5.1 outlines the performance of this system in more detail). This resulted in a negative savings of $31,900 for the district energy system, relative to the performance goals. If the target for bioenergy to offset gas is reduced to zero for the commissioning months of April and May, the savings is $3,600.

The Enhanced Forestry Lab features a wood pellet heating system which was not included in the above building energy calculations. The $8,200 savings from baseline is an approximation of the savings that resulted from this system.

The Residences experienced a billing error from FortisBC in Dec 2010-Feb 2011 which was corrected in the first few months of FY2011/12. The significant difference from baseline shown in Table 3 is a result of this correction.

5. OUR ACTIONS

UNBC has a history of responsible energy use. Facilities staff involved in plant operations and renovation projects are well versed in efficient operating practices and in the evolving energy efficient equipment landscape. The Energy Manager position was filled in June 2010; this has resulted in a renewed focus on tracking of energy use, developing an energy policy and conservation procedures, and planning efficiency upgrade projects.

5.1 Sub-metering

The first step in managing energy use is to understand where the current consumption is. To this end UNBC has installed sub-meters in buildings throughout the Prince George campus. Regional campuses are typically housed in a single building with independent utility accounts. Historical consumption can be measured from the billing history. The Prince George campus has main electrical and natural gas accounts that supply the Power Plant. This does not provide any consumption data for the individual buildings within the campus. The sub-meter installation will provide consumption data for:

- Electrical use (includes consumption, demand, and power factor)
- Heating water (a hot water district energy network heats the buildings)
- Cooling water (a chilled water district energy network cools the buildings)
- Natural gas (for the Agora cafeteria, and NUSC/Conference buildings)
- Domestic water

These sub-meters are all connected to the campus control system for automatic data logging. Consumption readings are taken on fifteen minute intervals to provide sufficient resolution for building performance dashboards and to support prompt detection of abnormal consumption patterns.

5.2 Energy Policy

The Energy Policy (outlined in Section 3.1and included in the Appendix) articulates the vision, goals and commitment of the University to responsible energy use. The long term goal is to obtain energy intensity reduction of 10% by the year 2015 (5 years) by implementing cost-effective energy management initiatives at all of our facilities.

Energy conservation procedures will be developed in support of the Energy Policy. These include:

- Lighting, heating and air conditioning procedures;
- Energy efficient purchasing procedures.

5.3 Energy Conservation Revolving Loan

UNBC has created a revolving loan fund to provide the capital required for energy efficiency upgrade projects. The aim is to establish a sustainable source of funding for the energy management program: upgrade projects and the Energy Manager salary (once the BC Hydro funding runs out) will be supported by this fund.

Project spending is expected to average $200,000 per year. The Energy Manager wages will be paid from the fund (costs over and above the BC Hydro contribution until the funding round ends, then the full cost thereafter). The average project payback is expected to be 4.8 years for the first five year window, with projected energy reductions of 12.5% in that time.

Initial funding consists of a $250,000 one-time investment in April 2011. The Continuous Optimization program funding (refer to section 5.4 below) would not be drawn from this fund, but the energy savings and cost reimbursements would be added to the initial fund investment. In this way the total investment would be $394,000 over the first four years.

Electrical energy cost savings will be re-invested into the Energy Conservation Revolving Loan Fund. The savings from each project will be validated after installation. The aggregate savings will be transferred from the utility accounts to the Loan Fund at the end of each quarter. Incentives from BC Hydro or FortisBC will also be returned to the revolving loan fund. Projected spending, savings and rebates are listed in table Table 4.

Table 4 Energy Conservation Revolving Loan Budget

Year	Committment	Project Budget	Savings	Reimbursement
2011/2012	250,000	84,000	0	5,000
2012/2013	0	203,000	58,000	75,000
2013/2014	139,000	164,000	89,000	30,000
2014/2015	5,000	82,000	87,000	0
	394,000	**533,000**	**234,000**	**110,000**

5.4 Continuous Optimization Program

UNBC is enrolled in BC Hydro's Continuous Optimization program for energy monitoring and retro-commissioning of existing buildings. The program at UNBC includes nine buildings over a period of six years. It provides a reference against which to measure energy savings, and focuses primarily on low cost operational improvements to a building's HVAC and lighting control systems.

Major elements of the program include:

- Energy management software: This system would aggregate campus meter data and display actual and predicted energy usage for each building;
- Re-commissioning consultant: A consultant conducts an audit of each building and identifies low cost changes that will improve the efficiency of the systems;
- Upgrade projects: Identified projects with less than two year simple payback will be implemented, with assistance from the consultant;
- Monitored savings: The energy software permits the actual energy savings to be computed, and the consultant returns to provide coaching on ensuring that the energy savings persist.

A program of re-commissioning represents the major opportunity for UNBC to reduce its energy consumption. The main campus infrastructure is reasonably efficient, and not yet nearing the end of its life.

The energy management software includes dashboards for occupant engagement, summary reports for management, and anomaly detection to notify facility operators. These analytics and reporting functions build on the metering that was installed with the Infrastructure Upgrade project and will provide the data to drive UNBC energy management moving forward.

The upgrade projects to be implemented under this program must have less than two year simple payback. Participation in the program provides a fully funded consultant to identify and develop these projects, and the verification required to ensure that the savings are realized.

5.5 Quarterly Goals and Objectives

The energy management goals are two-fold: to reduce energy consumption, and to save money on utilities. The two are linked, but the amount spent on utilities is dependent on both consumption and utility rates.

This past year UNBC realized a 0.5% reduction in total electricity consumption (over the previous year). During this period the Bioenergy plant came fully online, and is now 3.2% of the total consumption. If the Bioenergy electrical consumption is held constant between the two years there is a 2.9% reduction in total electricity consumption.

The additional consumption from Bioenergy and an 8% increase in electrical rates resulted in a net cost increase of $73,793 for electricity purchases year over year. It is necessary to take into account weather variations, rate changes and historical consumption levels to compare actual costs against what would have been spent had consumption not been reduced. This is what is reported as avoided costs in Table 5 below. BC Hydro has introduced a new rate structure to encourage conservation; organizations which reduced their consumption relative to historical baselines receive a credit at a higher rate than the basic cost of electricity. This past year the main campus account was credited $64,900 for reducing consumption.

Table 5 Quarterly Electrical Savings

	Previous Years Quarterly Consumption (kWh)		Actual Savings					Total Savings
Quarter	2010/11	2011/12	kWh	% Reduction	$ †	Actual Cumulative Savings	Avoided Costs	Total Cumulative Savings
Q1 Apr-Jun	4,475,320	4,555,680	(81,360)	-1.8%	$ (10,624)	$ (10,624)	$ 11,860	$ 11,860
Q2 Jul-Sep	4,845,640	4,779,440	66,200	1.4%	$ (23,260)	$ (33,883)	$ 1,884	$ 13,744
Q3 Oct-Nov	4,657,000	4,688,560	(31,560)	-0.7%	$ (19,003)	$ (52,886)	$ 14,246	$ 27,989
Q4 Jan-Mar	4,983,440	4,841,000	142,440	2.9%	$ (20,907)	$ (73,793)	$ 23,718	$ 51,708
Total	18,961,400	18,865,680	95,720	0.5%	$ (73,793)	$ (73,793)	$ 51,708	$ 51,708

† *Actual savings are measured against the same time period in the previous year. A rate increase in April 2011 resulted in a higher electricity cost (negative savings) despite a reduction in actual energy consumption.*

Actual savings represents the actual dollar impact on the budget, but does not account for variations in weather or campus utilization.

Avoided cost takes into account the primary drivers of energy consumption, and is therefore a measure of the dollars saved through conservation efforts.

It is possible to model the university's energy consumption: energy use is primarily driven by the weather, but also influenced by the key performance indicators listed in Table 1. A baseline predictor of energy use is such a model fit against historical data from a period of "normal" operations. A baseline model for each energy utility account provides a prediction of how much energy would have been consumed had there been no conservation efforts. This permits a calculation of the energy savings that takes into account variations in the weather, enrolment and other factors. The energy savings multiplied by the marginal cost of additional energy yields the value of the costs avoided through the conservation measure.

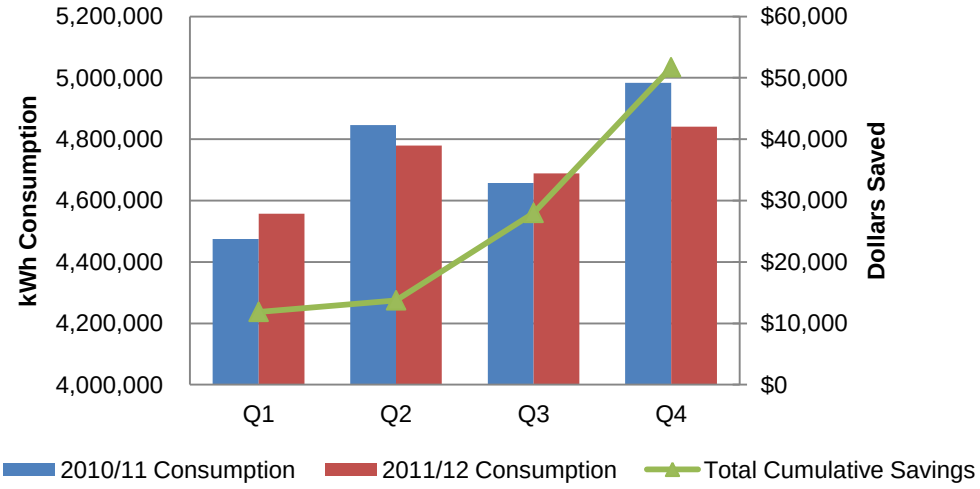

Figure 5 Annual Electrical Utility Summary Electrical Savings over 1 year

5.5.1 Bioenergy and Natural Gas Savings

UNBC has undertaken two biomass heating projects in recent years. The first was a wood pellet boiler to heat the Enhanced Forestry Laboratory, and the second is a Bioenergy facility to offset the campus heating load. The Bioenergy system gasifies hog fuel and uses a flue gas boiler to transfer heat to hot water, and on to the existing Power Plant. The campus district energy loop then distributes hot water to the core campus buildings.

Table 6 lists the target and actual heat provided to the district heating system. In the first fiscal year of operation the Bioenergy system produced 78% of the heat for the core campus. This is less than the 85% design target, but the reporting period includes the commissioning time for the new installation. The total shutdown duration was 69 days for this year, compared with 14 days anticipated under normal operation.

For the one year period beginning May 18, 2011 (after the commissioning challenges were resolved) the Bioenergy facility provided 89% of the heat to the district heating system, exceeding the target of 85%.

Table 6 District Energy Heating Annual Performance (Apr 2011- Mar 2012)

	Actual	Target	
Heat from Bioenergy to campus district heating	53,938 GJ	56,731 GJ	(85% of baseline)
Total campus district heating demand	69,459 GJ	66,742 GJ	(Baseline)
Fraction of heat produced from Bioenergy	78%	85%	
Days shutdown	69	14	

Figure 6 compares the actual gas consumption over the past year against the baseline predicted by heating degree days. The shaded area is the baseline heat demand computed from historical levels and the outdoor air temperature. Grey shading indicates periods when the Bioenergy system was offline, typically for maintenance. In April and May of 2011 there was an issue with the feed auger, which was resolved on May 18, 2011. A planned shutdown in August was extended by one week due to a computer failure during the shutdown. A second shutdown in November went according to schedule.

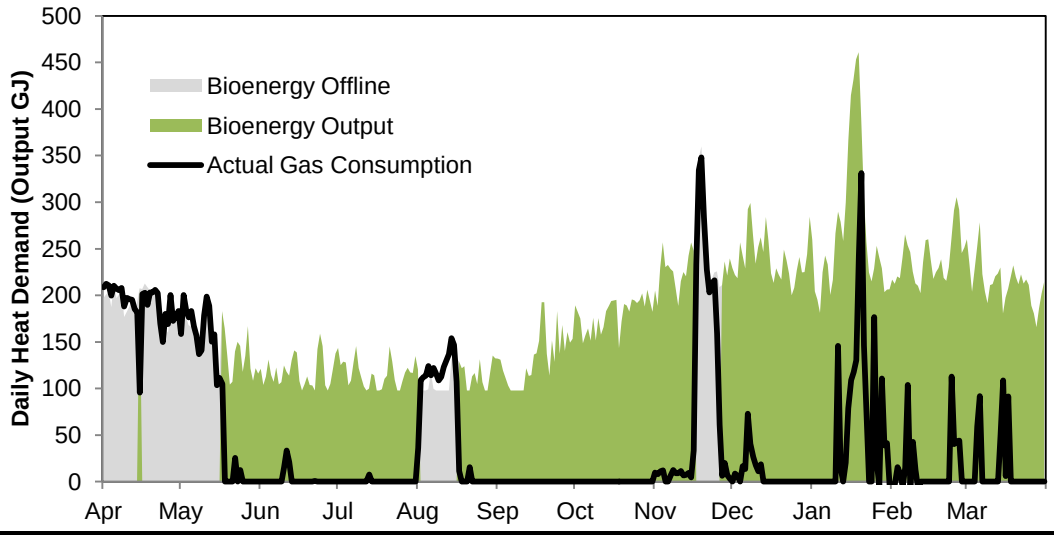

Figure 6 Annual District Heating Input by Source (Apr 2011-Mar 2012)

The operating budget for the Bioenergy system is drawn from natural gas savings. Costs that must be covered include hog fuel, operator salaries, building utilities and maintenance. A detailed report on these costs is not available at this time, but is anticipated in the coming months. Tabulation of natural gas (and hog fuel) consumption by quarter will be included in next year's version of this report.

5.5.2 Greenhouse Gas Reductions

As part of the public sector within the province of British Columbia, UNBC is required to be carbon neutral. The University measures and reports its greenhouse gas emissions using SmartTOOL, through an initiative of the provincial government. This captures direct emissions from fuel combustion, indirect emissions through purchased electricity, and office paper. The reporting period for SmartTOOL is per calendar year, so that is what will be listed within this report (note that all other figures in this report relate to the fiscal year starting April 1).

The University is required to purchase carbon offsets from the Pacific Carbon Trust to reduce the net greenhouse gas emissions of the Univesity to zero. These offsets currently cost $25/tonne.

The reporting framework for provincial greenhouse gas emissions includes CO_2 emissions from wood as carbon neutral. They are included in the overall emissions totals, but are not assessed as an offset requirement.

Table 7 Greenhouse Gas Emissions

		2011	2010
Scope 1 (Direct) Emissions	Mobile Combustion (Fleet)	19	17
	Stationary Combustion	5,363	5,186
Scope 2 (Indirect) Emissions	Purchased Energy	470	470
Scope 3 (Office Paper) Emissions	Office Paper	5	15
	Total Emissions, Calendar Year	**5,857**	**5,689**
	Carbon Neutral or Offset Exempt	**2,349**	**1**
	Total for Offsets	**3,508**	**5,688**

Energy Manager Program Results

5.6 Annual Goals and Objectives

The 2009/2010 fiscal year was selected as the baseline training period for all of the UNBC energy accounts. Energy savings and avoided costs will be measured against the baseline consumption predicted by this model.

Electricity utility costs have increased for each of the past four years. This is due to increased energy rates in each of the years, and a consumption increase in the first year. Thus the actual dollars saved is negative in Table 8.

For FY2010/11 (first year with an Energy Manager in place) the overall consumption decreased by 2.4%, but a rate increase of over 8% resulted in a slightly higher overall electrical expenditure ($69,742 higher than the previous year).

In FY2011/12 the avoided costs increased to $51,708 due to continued conservation efforts. The overall consumption decreased by 0.5%, although rate increases again resulted in a net increase in electrical expenditures. The addition of the Bioenergy plant increased the campus consumption by 457,000 kWh over the previous year, so the comparison of total consumption between the two years shows a much smaller reduction than was achieved through conservation efforts.

Table 8 Annual Electrical Savings

	Actual Savings						Total Savings
	Total kWh Consumption	kWh Comparison from previous year	% Reduction	$ Saved	Actual Cumulative Savings	Avoided Costs	Total Cumulative Savings
2008/09	19,583,640	(855,240)	(4.6)%	$(104,894)	$(104,894)	$(11,275)	$(11,275)
2009/10	19,428,120	155,520	0.8%	$(46,335)	$(151,228)	$(85)	$(11,361)
2010/11	18,961,400	466,720	2.4%	$(69,742)	$(220,632)	$25,466	$14,105
2011/12	18,865,680	95,720	0.5%	$(73,793)	$(294,425)	$51,708	$65,813

Figure 7 below shows the cumulative difference between actual electricity costs and the costs which would have been incurred had consumption been equivalent to the baseline 2009/2010 year.

This is a cumulative savings chart, so it is the slope of the line that indicates whether energy consumption is above or below average. A positive slope indicates actual energy costs that are above normal, while a negative slope indicates avoided costs. For fiscal year 2008/2009 the costs were higher than baseline (positive slope to the curve), while fiscal year 2010/2011 reversed that trend.

Figure 7 highlights the increasing total cumulative savings in the years that the Energy Management program has been in place at UNBC. In addition to the $65,800 in avoided costs, UNBC has claimed $53,700 worth of incentives from BC Hydro.

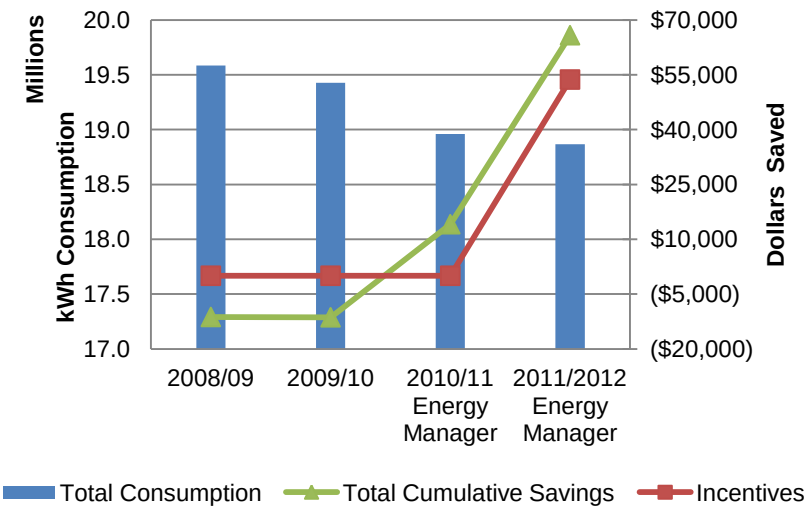

Figure 7 Energy Manager Results

5.7 Annual Energy Intensity by Key Performance Indicators

UNBC's energy reduction target is an intensity target: it is based on energy consumption per square meter, with corrections for weather and enrolment. The policy intensity identified in the table below is what UNBC conservation performance will be measured against.

Table 9 Annual Electrical Intensity by KPI

	Total kWh Consumption	Electrical Intensity (kWh/m^2)	Policy Intensity (kWh/m^2)	Notes
2007/08	18,728,400	19.50		
2008/09	19,583,640	16.69		Completed T&L Building and Northern Sports Centre
2009/10	19,428,120	16.56		
2010/11 Energy Manager	18,961,400	16.10	16.23	Policy is 10% reduction by 2015
2011/12 Energy Manager	18,865,680	15.91	15.90	Bioenergy fully operational
2012/13			15.56	
2013/14			15.23	
2014/15			14.90	

In FY2011/12 the actual electrical intensity of 15.91 kWh/m2 was slightly higher than the target of 15.90 kWh/m2. The University remains on track to achieve the reduction targets set for 2015.

Figure 8 provides a graphical representation of the same data. The bars indicate consumption in million kWh. The baseline year of 2009/2010 has identical target and actual consumption amounts; the target consumption in 2010/2011 accounts for the specific weather of that year.

Target consumption amounts for future years are based on the average weather over the past three years, and assume no significant changes in enrolment or increase in campus area.

The actual energy consumption in 2007/2008 was much higher than target, if the 2009/2010 consumption is used as a baseline. This indicates that the operating mode of the campus has increased in efficiency in the intervening years.

The significant drop in energy intensity between 2007/2008 and 2008/2009 is due to the completion of the Teaching and Learning Building and the Northern Sports Centre. These two buildings increased the energy consumption of the campus, but the additional area caused a reduction in the overall energy use per square meter. This illustrates how new construction with a lower energy use per square meter than the existing campus average will reduce the overall campus energy intensity and help in achieving the established reduction targets.

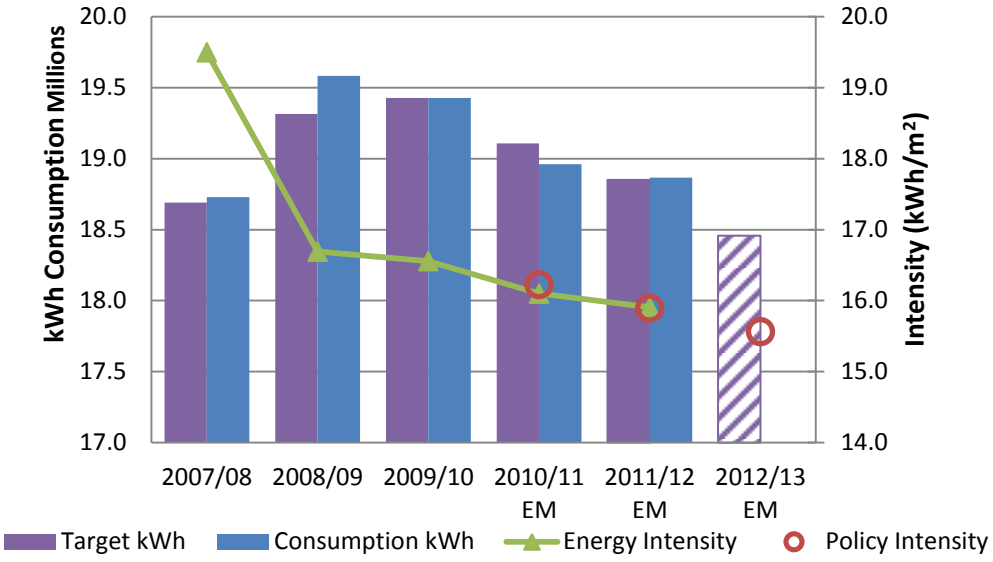

Figure 8 Annual Energy Target

5.8 Communication Plan

This Strategic Energy Management Plan has been developed primarily for the purpose of documenting and reporting on the energy management program at the University of Northern British Columbia. The initial version is for submission to BC Hydro as part of the requirements for their continued funding of the Energy Manager.

However, it is recognised that the information in this report could be useful to a much wider audience. The initial version will be circulated to the UNBC President's Executive Council for information. It is anticipated that the document will then be re-published as an UNBC Energy Management Update. This version will be posted to the University website and made available to all stakeholders and the general public.

A plan such as this one is never truly complete, and this document will be revised and updated for subsequent years of the UNBC Energy Management Program.

5.9 Planned Actions (Project List)

Potential Projects

Project Name	Description	Potential Electrical Svgs (kWh)	Potential Other Fuel Svgs	Potential Total Svgs (Energy + Operational)	Projected Total Cost	Potential BC Hydro Incentive	Projected Simple Pay Back	Next Steps
Humidifier upgrade	Displace electric heating with hot water from Bioenergy	350,000		22,925	80,000	30,000	2.2	Student to investigate in Fall 2012
Chiller optimization	Review setpoints for chillers and cooling tower	50,000		3,275	2,000		0.6	Preliminary system review and scope definition
NSC Soccer field	Replace MH fixtures with impact resistant LED	136,000		19,070	147,000	42,000	5.5	Project approval and BC Hydro application
NSC Field house relamp	New lamps for T5HO over field house	51,300		5,000	10,000	3,000	1.4	Project approval and BC Hydro application
Canfor Theatre lighting -second round	Revisit the lighting provision for the lecture space	49,600		4,900	55,500	20,000	7.2	Submit BC Hydro application, prepare purchasing documentation
Lab Fume Hood Review	Turn off fume hoods when not required - consolidate off-hours use	32,600	365	12,640	16,200		1.3	Discuss with lab personnel, review HVAC code requirements
Building Systems Scheduling	Optimize night setback hours for all buildings on campus	450,000	2,855	38,806	124,300		3.2	Review current building schedules
Residence Occupancy	Install occupancy sensors to reduce heating when unoccupied	430,000		25,800	200,000		7.8	Review with Residence Life personnel
Utilidor Lighting Controls								Develop project design
T8 Magnetic Ballasts	Convert campus T8 magnetic ballasts to electronic	138,600		15,000	100,000	33,000	4.5	Identify scope and costs
Totals		1,688,100	3,220	147,416	735,000	128,000	4.1	

Approved Projects

Project Name	Description	Est Electrical Svgs (kWh)	Est Other Fuel Svgs	Est Total Svgs (Energy + Operational)	Est Total Cost	Est BC Hydro Incentive	Simple Pay Back	Next Steps	Est Start Date
Coil Cleaning	Nalco coil cleaning initiative	243,188		15,900	22,750	7,000	1.0	Awaiting BC Hydro application approval	Jun-12
QRRC lighting upgrade	Replace T12 fluorescent lighting with T8	6,600		500	9000	1600	14.8	Tender purchase, install	Nov-12
Warehouse lighting	Replace MH high bay fixtures in warehouse	7695		580	4356	1473	5.0	Purchasing documentation and order material	Jul-12
Totals		257,483	9,600	16,980	36,106	10,073	1.5		

Projects In Progress

Project Name	Description	Electrical Svgs (kWh)	Other Fuel Svgs	Total Svgs (Energy + Operational)	Total Cost	BC Hydro Incentive	Simple Pay Back	Status	Date Started	% Complete	Projected Completion Date
NUSC Event Space LED	Replace incandescent lighting with LED	12,304	0	1,200	6,279	3,021	2.7	Awaiting installation	Aug-11	80	Jul-12
Atrium Daylight Harvesting	Install daylight sensor and turn off atrium lighting during daylight hrs	76,200	0	11,440	17,200		1.5	Install sensor, review switching capabilities	Oct-11	30	Aug-12
Building energy displays	Install monitors outside Green Centre to display energy related data							Needs utility data feed	Aug-11	90	Dec-12
Totals		88,504	0	12,640	23,479	3,021					

Past/Completed Projects

Project Name	Description	Electrical Svgs (kWh)	Other Fuel Svgs	Total Svgs (Energy + Operational)	Total Cost	BC Hydro Incentive	Simple Pay Back	Status	Date Started	% Complete	Projected Completion Date
Terrace lighting upgrade	Replace T12 fluorescent lighting with T8	16,000		1,600	10,033	3,537	4.1	Awaiting contractor installation schedule	Aug-11	100	Apr-12
Utility meter installation	Install submeters for gas, electric, heat, cooling, domestic water							Completing final meter programming	Jul-10	98	Jun-12
Utility Data Management	Prism Engineering to provide data analytics				9,000			Awarded, configuring software	Aug-11	100	May-12
Residence Lighting	Replace T12 fluorescent lighting in residences with T8	298,414	0	36,822	87,900	29,052	1.6	Installation nominally complete	Aug-11	95	Mar-12
Theatre lighting	Replace incandescent lighting with LED	63,195		4,771	17,714	9,965		Installation nearly complete	Dec-11	98	Apr-12
Medical AV Cooling	Install fans to take advantage of free cooling overnight	22,950		2,190	11,000		5.0	Requires final configuration and setup	Nov-11	100	Apr-12
Admin Chiller	Replace water cooled centrifugal chiller with air cooled model	98,600	9600 Gal	13,400	70,000	0	5	Complete	Sep-11	100	Mar-12
Ice Mountain	Store ice/snow for summer cooling							Students complete feasibility study	Sep-11	100	Nov-11
Canfor Theatre Lighting	Replace incandescent lighting in Canfor Theatre with LED	3,700	0	3,600	6,000	0	2	Complete	Aug-10	100	Aug-10
Ring Road Streetlights								Review complete - need to evaluate options			
Terrace Boiler	Replace aging natural gas boiler for Terrace campus	0	300	300	45,000	0	150	Complete - requires parameter tuning	Aug-10	100	Oct-10
Green Centre Lights	New Green University Center offices - LED lighting	1,240		80	640		8.0	Complete	Nov-10	100	Jan-11
Winter Garden Lights	Convert to Hi-Bay LED	2,630		170	640	0	3.8	Complete	Dec-10	100	Jan-11
District Energy Pump Study	Review system flow dynamics and pumping requirements for district energy water distribution loops							Complete - requires further attention	Jan-10	100	May-11
Bookstore Lighting								Complete		100	Aug-11
Thirsty Moose Lighting	Replace halogen and incandescent lighting with LED	6,800		500	3200	2000	2.4	Complete		100	Dec-10
Wind turbine	Preliminary investigation into installing wind generation on campus							Thorough report on renewable energy options			Sep-11
Totals		513,529	300	63,433	261,127	44,554	3.4				

Behavioural/ Education Programs (If applicable)

Project Name	Description	Electrical Svgs (kWh)		Total Svgs (Energy + Operational)	BC Hydro Incentive	Objectives	Date Started	% Complete	Projected Completion Date
Residence competition	Two residence buildings compete to lower electrical consumption	2,400		150	0	Raise conservation awareness in residences; reduce consumption	Oct-10	100	Apr-11
Residence competition	Two residence buildings compete to lower electrical consumption	TBD			0	Raise conservation awareness in residences; reduce consumption	Oct-11	100	Nov-11
Wintergreen	Promote turning off computer and HVAC during winter holidays	41,200		3,100	0	Save energy and raise awareness	Dec-12	100	Jan-12
Totals		43,600		3,250					

5.10 Energy Studies

The University commissioned MCW Custom Energy Solutions Ltd to perform a comprehensive energy study in 2009. The buildlings included within this study are listed in Table 10 below. The information in these studies has helped to inform the capital planning for energy efficiency upgrades.

Table 10 Building Energy Studies

Building	Consultant	Date	Continuous Optimization
Power Plant	MCW	Aug 2009	
Administration	MCW	Aug 2009	Phase 2
Research Laboratory	MCW	Aug 2009	Phase 1
Library	MCW	Aug 2009	Phase 3
Conference Centre	MCW	Aug 2009	Phase 3
Agora	MCW	Aug 2009	Phase 1
Teaching Laboratory	MCW	Aug 2009	Phase 1
Northern Health Sciences Centre	MCW	Aug 2009	Phase 1
Teaching and Learning Centre	*Under construction in 2009*		Phase 3
Enhanced Forestry Laboratory	MCW	Aug 2009	
Residences	MCW	Aug 2009	
Daycare	MCW	Aug 2009	
Northern Sports Centre	*Under construction in 2009*		Phase 2
Downtown BMO Centre	MCW	Aug 2009	
Terrace Campus	MCW	Aug 2009	
Bioenergy	*Constructed in 2010*		

UNBC has also enrolled in the BC Hydro Continuous Optimization program, which includes a consultant to review building operations. The nine buildings included in this pogram are also identified in Table 10.

6. APPENDIX

Number of stakeholders	18 individual groups identified	
Energy Manager	David Claus	
Executive Support	George Iwama	(President)
	Mark Dale	(Provost)
	Eileen Bray	(VP Administration and Finance)
	Rob van Adrichem	(VP External Relations)
Energy Committee	Energy Sub-Committee of the Green University Planning Committee	

6.1 List of Stakeholders:

Groups		
Name	Title	Organization
George Iwama	President	UNBC
John Young	Dean of CASHS	UNBC
Daniel Ryan	Dean of CSAM	UNBC
Eileen Bray	Vice President Admin and Finance	UNBC
Rob van Adrichem	Vice President External Relations	UNBC
Shelley Rennick	Director, Facilities Managment	UNBC
UNBC Students		UNBC
Potential Professors		UNBC
Ron Mastromonaco	Key Account Manager	BC Hydro
Douglas Taber	Commercial Account Manager	FortisBC
Greg Stewart	President	Sinclar Group Forest Products
John Yap	Minister of State for Climate Action	BC Government
Maomi Yamamoto	Minister of Advanced Education	BC Government
Scott MacDonald	Chief Executive Officer	Pacific Carbon Trust
UNBC Faculty		
UNBC Staff		
Northern Residents		
General Public		

6.2 List of Energy Volunteers

Individuals

Name	Title	Organization
Shelley Rennick	Director, Facilities Management	UNBC
Kevin Ericsson	Chief Engineer	UNBC
Dale Martens	Assistant Chief Engineer	UNBC
Aaron Olsen	Maintenance and Project Supervisor	UNBC
Kyle Aben	UNBC Pacific Institute for Climate Solutions Site Coordinator	UNBC/PICS

6.3 Baseline Energy Use: Electrical Account Histories

6.3.1 Main Campus Account

Month	Energy Charge $	Demand Charge $	Power Factor Charge $	Other $	Taxes $	Total Charges $
Mar-12	56,899.33	19501.37	0	140.84	9,184.98	85,726.52
Feb-12	50,743.88	21371.93	0	43.86	8,659.16	80,818.83
Jan-12	61,900.96	23889.72	0	99.40	10,306.81	96,196.89
Dec-11	53,248.17	19917.05	0	97.01	8,791.47	82,053.70
Nov-11	58,252.17	19414.77	0	155.96	9,338.75	87,161.65
Oct-11	56,928.55	25277.59	0	25.79	9,867.83	92,099.76
Sep-11	109,843.74	50693.69	3,132.64	88.56	19,651.04	183,409.67
Aug-11	No invoice					
Jul-11	55,914.00	25277.59	1,584.54	55.82	9,939.83	92,771.78
Jun-11	52,841.94	22740.21	0	36.93	9,074.29	84,693.37
May-11	52,091.23	17625.84	0	102.61	8,378.37	78,198.05
Apr-11	49,045.33	19873.06	0	-29.39	8,266.68	77,155.68
Mar-12	56,899.33	19501.37	0	140.84	9,184.98	85,726.52

6.3.2 Northern Sports Centre Account

Month	Energy Charge $	Demand Charge $	Power Factor Charge $	Other $	Taxes $	Total Charges $
Mar-12	6,316.25	1479.91	0	200.60	959.61	8,956.37
Feb-12	5,887.72	1505.89	0	190.16	910.05	8,493.82
Jan-12	5,873.31	1702.66	0	195.86	932.62	8,704.45
Dec-11	6,042.46	1540.53	0	194.89	933.35	8,711.23
Nov-11	6,465.82	1497.23	0	205.15	980.18	9,148.38
Oct-11	6,911.76	2649.01	0	244.72	1,176.66	10,982.15
Sep-11	6,769.10	2649.01	0	240.96	1,159.09	10,818.16
Aug-11	7,720.50	2934.79	213.22	277.79	1,337.56	12,483.86
Jul-11	6,883.33	2501.79	0	240.51	1,155.08	10,780.71
Jun-11	5,738.05	2345.91	0	207.60	994.99	9,286.55
May-11	6,614.41	1417.04	0	206.73	988.58	9,226.76
Apr-11	5,201.30	1306.76	0	167.64	801.08	7,476.78

6.3.3 Quesnel River Research Centre Account

Month	Energy Charge $	Demand Charge $	Power Factor Charge $	Other $	Taxes $	Total Charges $
Mar-12	1,635.10	90.20	0	22.03	209.68	1,957.01
Feb-12	1,752.32	153.34	0	23.76	231.53	2,160.95
Jan-12	1,784.29	108.24	0	24.38	230.03	2,146.94
Dec-11	1,677.73	148.83	0	23.00	221.95	2,071.51
Nov-11	1,276.61	58.63	0	18.47	162.45	1,516.16
Oct-11	1,326.08	36.08	0	19.10	165.75	1,547.01
Sep-11	1,390.02	49.61	0	19.27	175.07	1,633.97
Aug-11	1,475.26	72.16	0	20.51	188.15	1,756.08
Jul-11	1,453.95	76.67	0	20.72	186.16	1,737.50
Jun-11	1,379.36	148.83	0	20.32	185.82	1,734.33
May-11	1,627.93	118.27	0	22.06	212.20	1,980.46
Apr-11	1,568.35	117.04	0	20.49	204.70	1,910.58

6.3.4 Terrace Campus Account

Month	Energy Charge $	Demand Charge $	Power Factor Charge $	Other $	Taxes $	Total Charges $
Mar-12	1,067.33	0	0	32.19	131.94	1,231.46
Feb-12	1,161.50	4.51	0	34.65	144.08	1,344.74
Jan-12	1,255.68	18.04	0	38.11	157.42	1,469.25
Dec-11	1,004.54	3.71	0	29.95	124.58	1,162.78
Nov-11	1,161.50	0	0	35.30	143.62	1,340.42
Oct-11	889.44	0	0	27.94	110.09	1,027.47
Sep-11	1,088.26	103.73	0	35.88	147.34	1,375.21
Aug-11	722.02	54.12	0	24.91	96.13	897.18
Jul-11	1,299.44	76.67	0	40.67	170.01	1,586.79
Jun-11	931.30	49.61	0	30.22	121.34	1,132.47
May-11	945.62	0	0	29.17	116.98	1,091.77
Apr-11	953.12	0	0	29.28	117.89	1,100.29

6.3.5 Downtown BMO Building Account

Month	Energy Charge $	Demand Charge $	Power Factor Charge $	Other $	Taxes $	Total Charges $
Mar-12	2,128.50	0.00	0	64.23	263.13	2,455.86
Jan-12	2,403.37	0.00	0	71.67	297.00	2,772.04
Nov-11	859.86	0.00	0	27.76	106.51	994.13
Oct-11	732.48	0.00	0	24.01	90.78	847.27
Sep-11	676.67	0.00	0	22.42	83.89	782.98
Aug-11	767.36	0.00	0	25.45	95.14	887.95
Jul-11	697.60	0.00	0	23.14	86.49	807.23
Jun-11	809.22	0.00	0	25.73	100.19	935.14
May-11	706.69	0.00	0	23.52	87.62	817.83
Apr-11	644.97	0.00	0	21.22	79.95	746.14
Mar-12	2,128.50	0.00	0	64.23	263.13	2,455.86
Jan-12	2,403.37	0.00	0	71.67	297.00	2,772.04

6.3.6 Bioenergy Facility Account

Month	Energy Charge $	Demand Charge $	Power Factor Charge $	Other $	Taxes $	Total Charges $
Mar-12	4408.84	441.98	0	126.97	597.33	5,575.12
Jan-12	4616.64	455.51	0	133.26	624.65	5,830.06
Dec-11	3529.72	360.80	0	102.58	479.17	4,472.27
Nov-11	3801.45	338.25	0	109.57	509.91	4,759.18
Oct-11	3813.61	306.68	0	108.71	507.48	4,736.48
Sep-11	3357.69	306.68	0	97.11	451.38	4,212.86
Aug-11	3595.67	306.68	0	103.64	480.72	4,486.71
Jul-11	3516.35	306.68	0	101.46	470.94	4,395.43
Jun-11	2779.32	374.33	0	84.35	388.56	3,626.56
May-11	2845.99	354.41	0	85.94	394.36	3,680.70
Apr-11	2062.86	447.26	0	67.69	309.34	2,887.15
Mar-12	4408.84	441.98	0	126.97	597.33	5,575.12

6.4 Current Business Practice Gaps

The most recent Energy Management Assessment was conducted on May 20, 2011. This was an opportunity to review progress made to date and identify areas for future action within the context of Energy Management at UNBC. The original EMA was performed in March 2008.

1. Policy
   - Establish a formal incentive program that rewards actions from individuals or teams that contribute toward energy efficiency and/or meeting established targets.
     - UNBC has introduced a President's Excellence Award for Sustainability that recognizes indivuduals who have contributed to enhancing the sustainability of the institution. The award in the first year that this award was offered went to an individual who has been instrumental in advancing energy efficiency throughout the campuses.
2. Targets / Reporting
   - Set energy intensity parameters and consumption reduction targets for all key departments that cascade up to the overall annual reduction target.
     - Overall intensity targets have been set, along with the corresponding absolute reductions required to achieve those intensities. Projects have been identified that will provide the required level of energy savings, and are broken down based on campus sites.
3. Plans / Actions
   - Improve the baseline understanding of energy consumption and opportunities for savings for each major utility system.
     - Baseline models have been refined for each utility, plus Continuous Optimization and utility tracking companies have been contracted to produce baselines as part of their automated utility reporting for UNBC.
   - Utilize the improved understanding to develop project implementation plans that correlate potential savings from projects and activities to the established consumption reduction targets.
     - Projects have been identified that will provide the required level of energy savings, and are broken down based on campus sites.
4. Teams / Committees
   - Increase broader participation in the energy conservation initiative by establishing energy coordinators in all key departments.
     - Convened a President's Task Force on Energy to examine renewable energy generation opportunities for UNBC. This group also ghighlighted the need for aggressive conservation activities prior to implementing renewable generation.
     - Identified individuals within departments and regional campuses who could serve as energy coordinators for their respective areas of the campus.
5. Employee Awareness / Training
   - Proactively deliver regular energy intensity reports to key site and department personnel for use in examining variances from established targets.
     - Energy performance is discussed at weekly Facilities Operations meetings. Contracted for automated energy consumption and cost reporting services.