Strategic Energy Management Plan

UNBC

University of Northern British Columbia

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1. INTRODUCTION

As Canada's Green University™, the University of Northern British Columbia is committed to "green" and sustainable activities in every aspect of our operations. Using energy efficiently and employing clean, renewable energy is considered by many to be a critical part of being "green". With raised awareness of the environmental impacts of energy use, UNBC is committed to minimizing our environmental impact by reducing energy consumption through energy efficiency projects, student engagement, and awareness campaigns; and showcasing renewable and efficient energy systems that are of particular interest to northern and remote communities.

With the increasing electricity rates in British Columbia, the importance of the Energy Management Program at UNBC is highlighted. Without electricity reduction efforts, UNBC would see an 18% increase in electricity costs in the five years leading up to 2020. Continuing with the planned energy conservation projects, the impact of the rate increase will be minimized over the next 5 years.

1.1 Energy Management at UNBC

UNBC recently completed its 6^{th} year of the BC Hydro Energy Manager program. The Energy Manager program provides funding to public sector organizations to hire or designate an Energy Manager. Funding covers up to 75% of the cost of the Energy Manager salary and benefits, and is contingent upon meeting a number of requirements including meeting a specified energy savings target, submitting a Strategic Energy Management Plan, and completing quarterly presentations to UNBC and BC Hydro.

The UNBC energy portfolio covers all UNBC owned and operated facilities including the Prince George Campus, Terrace Campus, Quesnel River Research Centre, and BMO Centre in downtown Prince George, a total of 22 buildings. Over the past 6 years, the Energy Manager Program has been valued at roughly $2,100,000, bringing in $525,000 in incentives and $487,000 in salary reimbursements, and saving $1,088,000 in electricity costs through project and program implementation.

1.2 Energy Commitments and Targets

UNBC has developed a new Energy Policy, currently in the approval process, to replace the previous policy in place since 2011. New energy targets have also been established, which set the following goals:

1. Reduce electrical and thermal energy consumption (combined) by 25% by 2020
2. Reduce fossil fuel consumption for heating by 85% by 2020

Target assessment is based on a comparison with the 2009/2010 baseline, and comparisons are corrected for variations in building floor space and weather. The baselines are corrected for building space and variations in weather.

The BC Hydro Power Smart base savings target for FY2016 was 1,200,000 kWh through energy efficiency projects implemented by March 2016. Target achievement not only involved implementing energy efficiency projects, but required the participation, engagement, and support of students, faculty, staff, and senior administration.

2. ENERGY MANAGEMENT AT UNBC

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. In total, the energy management scope covers 22 buildings over four sites: the Prince George Campus, Terrace Campus, BMO Centre in downtown Prince George, and the Quesnel River Research Centre (QRRC). Of the 22 buildings, 16 are located at the Prince George Campus and account for 98% of the total energy consumption and house roughly 95% of the population.

2.1 Total Energy Consumption and Cost

UNBC uses a mix of different energy sources, primarily electricity, bioenergy, and natural gas. Table 1 lists the actual consumption and cost for each utility based on invoiced amounts.

Table 1 - FY2016 Utility Breakdown

	Annual Consumption		Annual Cost
Electricity	16,226,184	kWh	$1,253,517
Bioenergy (Hog Fuel)	4,386	bdt	$292,693
Natural Gas	24,879	GJ	$213,448
Bioenergy (Pellets)	0	bdt	$0
Propane	6,112	L	$4,896
Total			**$1,829,065**

Diesel and propane represent less than 1% of the total UNBC energy consumption and cost. 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.

Electricity accounts for 40% of our total energy consumption, but 69% of our total energy cost, due to the relatively high marginal rate of electricity. Since the marginal rate of electricity is two to five times greater than natural gas (depending on the natural account), and eight times greater than bioenergy, UNBC has focused primarily on electricity-reduction projects.

A detailed breakdown of energy consumption and costs for each building is included in Section 4.1.

2.2 Energy Management Budget

The FY2016 budget for the Energy Management program is $502,100 which includes $108,100 for the Energy Manager salary and expenses, and $393,400 for energy projects. The utilities are paid from the General Operating Fund.

Up to $75,000 of the Energy Manager salary and expenses is funded through BC Hydro for completing standard and bonus deliverables outlined in the Energy Manager contract. The remaining $33,700 is funded by the General Operating Fund.

Project funding is provided from a number of different sources as outlined in Table 2. The funding can be further broken down into internal funding and external funding. Internal funding from the Northern Sport Centre, UNBC's Energy Conservation Revolving Loan Fund and the UNBC 25th Anniversary Fund accounts for $214,900. The remaining $178,500 is from outside sources including BC Hydro, the Ministry of Advanced Education Carbon Neutral Capital Project (AVED CNCP) Fund, and the Pacific Institute for Climate Solutions.

Table 2 – FY2016 Project Funding Breakdown

Funding Source	Funding Amount
Northern Sport Centre	$105,400
UNBC's Energy Conservation Revolving Loan Fund	$85,200
UNBC 25th Anniversary Fund	$24,300
BC Hydro Incentive Rebates	$118,900
Carbon Neutral Capital Project Funding	$54,600
Pacific Institute for Climate Solutions	$5,000
Total	**$393,400**

2.2.1 UNBC's Energy Conservation Revolving Loan Fund

The Energy Conservation Revolving Loan Fund (Loan Fund) was created in 2012 when $250,000 was made available to fund energy efficiency upgrade projects. After a project is implemented, a portion of the energy cost savings are used to repay the loan, and then used to provide a sustainable source of funding for the energy management program including future upgrade projects and eventually the Energy Manager salary.

Most energy projects are financed through the UNBC Energy Conservation Revolving Loan Fund, with incentives, and outside funding being added to the fund as they are received.

By the end of FY2016, the Loan Fund will have facilitated $900,000 of spending towards energy efficiency projects. Income to the fund includes $320,000 of loan repayments from utility budgets, $290,000 in incentives from BC Hydro, and special project funding of $210,000 from the Northern Sport Centre and Northern Medical Program. Since only a portion of the energy cost savings are used to repay the Loan Fund, the net cost savings resulting from the Loan Fund projects will be roughly $100,000 over four fiscal years.

3. ENERGY INITIATIVES (3-YEAR PLAN)

Energy reduction targets are outlined both in the UNBC Energy Policy and the BC Hydro Power Smart Energy Manager contract deliverables. The UNBC Energy Policy and Targets provide long-term overall energy reduction goals, while the BC Hydro Energy Manager contract deliverables, outlined in section 3.1, provide annually updated electricity reduction goals.

The previous UNBC Energy Policy aimed for a reduction of energy consumption by 10% over a 5-year period from 2010 to 2015. The revised Energy Policy is in the process of being approved, with updated target recommendations of:

1. Reducing overall energy use by 25% by 2020
2. Reducing fossil fuel consumption by 85% by 2020

As part of the Energy Manager requirements, UNBC participated in an Energy Management Assessment (EMA) on September 29, 2015. The EMA action items are outlined in Appendix F, and have been used to guide the development of the updated Energy Policy.

3.1 FY2016

The FY2016 Energy Manager contract with BC Hydro Power Smart required project implementations totalling 1,200,000 kWh of annual electricity savings by March 2016. In FY2016 we completed projects with total electricity savings of 1,300,000 kWh as summarized in Table 3.

Table 3 - FY2016 Energy Projects Summary

Committed Projects	Electricity Savings (kWh)	Heat or Gas Savings (GJ/year)	Utility Cost Savings ($/year)	Project Cost ($)	Incentive ($)	Simple Pay Back (years)
C.Op NSC	452,800	1,900	$51,600	$46,500	0	0.9
C.Op Admin	143,600	900	$15,700	$13,700	0	0.9
C.Op Medical	97,600	800	$11,600	$14,000	0	1.2
Workplace Conservation Awareness	354,400	1,200	$33,900	$2,500	$2,500	0
C.Op Phase 3 Investigation	0	0	0	$50,500	$50,500	0
Street Lighting	167,000	0	13,400	$161,200	$45,160	5.5
NSC Lighting	86,000		6,900	$58,900	$20,700	5.3
Conference Centre Air Handler	0	800	3,500	$15,000	0	1.5
Solar PV (Conference Centre)	5,000	0	400	$31,100	0	4.5
Total	**1,306,400**	**5,600**	**$137,000**	**$393,400**	**$118,900**	**2.0**

A full list of completed projects and studies is included in Appendix B.

3.1.1 Continuous Optimization Program

UNBC is enrolled in BC Hydro's Continuous Optimization (C.Op) program for energy monitoring and retro-commissioning of existing buildings. The program at UNBC includes nine buildings over a period of six years. As part of the C.Op program, BC Hydro provides funding for a contractor(Prism Engineering for UNBC), to examine existing buildings and recommend low-cost operational improvements to building HVAC and lighting control systems. After measures have been recommended, we are responsible for covering the cost of implementing the projects. To date we have successfully completed the implementation phase in three of our nine enrolled buildings (the Agora, Teaching Lab, and Research Lab).

In FY2016, we implemented energy conservation measures in three additional buildings: the Northern Sport Centre, the Administration Building, and the Medical Building. The measures in these three buildings are expected to save 694,000 kWh of electricity, 1,900 GJ of natural gas, and 1,700 GJ of district heat annually. At a total implementation cost of $72,400, the simple payback is less than 1 year.

Additionally, Prism Engineering is investigating our final three buildings for savings opportunities: the Library, Conference Centre, and Teaching & Learning Building.

3.1.2 Prince George Campus Exterior Lighting Retrofit

In fall 2015 we replaced all of the street lighting, parking lot lighting, and most of the lighting on the exterior of the buildings around the Prince George campus and Northern Sport Centre with energy efficient LED fixtures. Each street and parking lot light was connected to a central dimming system. The dimming system allows for dimming of individual fixtures to provide the optimal level of lighting on the streets and in the parking lots. In addition, the dimming schedule further reduces the light output of the fixtures in the late evening and early morning when much of the campus is unoccupied.

Project funding is provided by BC Hydro ($65,877), the AVED CNCP ($44,700), the Northern Sport Centre ($58,900), and the UNBC Loan Fund ($50,600). Based on utility savings alone, the simple payback for the street lighting project is just over 5 years. Additional savings of roughly $3,000 per year will be realized due to the decreased maintenance of replacing burnt out lamps in the old fixtures, lowering the simple payback to 4.7 years.

3.1.3 Conference Centre Air Handler Hot Water Conversion

The Conference Centre air handler that served the Thirsty Moose Pub kitchen was one of the last remaining natural gas fired air handlers on the Prince George campus. This project converted the pub air handler to use hot water from our district heating system instead of natural gas, using an existing unused chilled water coil to supply hot water (glycol). In order to provide heat, we disconnected the chilled water piping, and connected it to our glycol system. We commissioned a small 100% outdoor air handler (AHU3) and used excess capacity on a larger air handler (AHU2) to achieve greater energy savings and reduced installation costs by reusing the glycol piping that fed AHU3.

Funding for this project was provided by the AVED CNCP ($9,900) and the UNBC Loan Fund ($5,100). Utility cost savings of roughly $3,500 per year are achieved by switching from natural gas to lower cost district heating. Additional electricity and heat will be saved from decommissioning the 100% outdoor air AHU3. The simple payback for this project is less than 1.5 years after incentives.

3.1.4 Conference Centre Solar Photovoltaics

The Facilities Department received $24,300 of funding from the UNBC 25th Anniversary Fund and $5,000 from the Pacific Institute for Climate Solutions (PICS) to install a solar photovoltaic system on the roof of the Conference Centre. School District 57 donated 16 panels that were previously installed on the Highglen Montessori School until a fire in April 2013 shut down the school and rendered the panels unused. In addition to the 16 donated panels, we purchased 11 panels, 9 of which were installed on the roof and 2 that are to be used in classroom demonstrations as part of an educational program under development. The system of panels is expected to produce roughly 5,000 kWh per year of electricity, worth $400 a year. Real-time electricity generated by each panel can be viewed at the following link: http://10.7.252.17.

3.1.5 Workplace Conservation Awareness

In FY2015, UNBC was accepted into the BC Hydro Workplace Conservation Awareness (WCA) Program. The goal of the program is to promote knowledge and awareness, inspiring conservation and leadership, and generating the support of staff, faculty, and students required to save energy. In January 2015, we started working with Prism Engineering to develop a WCA program that will help us improve our communication and awareness around energy conservation while working towards our EMA targets.

As part of WCA, we rolled out a Residence Challenge to promote sustainable living in the residences. Each suite could complete a certification checklist by committing to specific energy conservation actions such as turning off lights, turning down thermostats, and taking shorter showers. The Residence Challenge ran from September to November, 2015, and resulted in gas and electricity savings of 5% and 10 % respectively.

The UNBC Green Team was started in the fall of 2015 to help with energy conservation awareness and initiatives. The first task of the Green Team was the Lights Off campaign, where the UNBC community was asked to post photos to Instagram, Twitter, or Facebook of themselves turning off lights around campus. The Green Team also coordinated the Sweater Day and Earth Hours campaigns, and participated in UNBC's annual Green Day. The Green Team is comprised of members from across the main campus, listed in Appendix F.

3.2 FY2017

A list of projects for FY2017 including C.Op, lighting upgrades to the utilidor and Power Plant, and the Residence 1 baseboard upgrade can be seen in Table 4. All project costs indicated in Table 4 are available from the Loan Fund.

Table 4 - FY2017 Project List

Committed Projects	Electricity Savings (kWh)	Heat or Gas Savings (GJ/year)	Utility Cost Savings ($/year)	Project Cost ($)	Incentive ($)	Simple Pay Back (years)
C.Op - Phase 2 - Handoff	0	0	0	$10,500	$10,500	0.0
C.Op - Phase 2 - Coaching	0	0	0	$12,975	$12,975	0.0
COp - Phase 3 - Conference Centre Implementation	61,500	1200	$12,300	$19,100		1.6
COp - Phase 3 - Library Implementation	406,400	2800	$53,600	$39,400		0.7
COp - Phase 3 - T&L Implementation	159,100	2000	$25,700	$35,200		1.4
Utilidor Lighting Controls	46,000	0	$3,700	$21,000		5.7
Power Plant Lighting retrofit	33,000	0	$2,600	$29,000		11.2
Residence 1 Baseboards	326,000	-1534	$22,000	$100,000		4.5
T8 mag ballast LED retrofit	45,600	0	$5,000	$40,000		8.0
Total	**1,077,600**	**4,466**	**$124,900**	**$307,175**	**$23,475**	2.3

In FY2017, we will complete the C.Op implementation phase for our final three buildings. Savings estimates will be adjusted once the investigation report is received and approved in early 2016.

FY2017 will see the initiation of the Sustainable Communities Demonstration Project (SCDP), where the low-temperature hot water loop that was installed in the fall of 2014 will be commissioned to deliver heat from the Pellet Plant to the Residences, Daycare and Greenhouse. As part of the SCDP, we are aiming to replace the electric baseboard heaters in Residence 1 with hot water radiators. The Loan Fund has allocated $100,000 to help with the costs of converting the baseboards of Residence 1 in FY2017, and will allocate the same amount for the baseboard conversion in Residence 2 in FY2018.

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3.3 FY2018

In FY2018, we will complete the final handoff and coaching phases of the C.Op program. As the Loan Fund will be well established in the sixth year of operation, there will be the opportunity to start funding larger projects such as flue-gas heat recovery at the Bioenergy Plant, and HVAC system redesign for our server rooms in the Administration building. Furthermore, $100,000 has been allocated from the Loan Fund for projects to be determined.

Table 5 lists the projects to be completed in FY2018, where all of the funding is available from the Loan Fund.

Table 5 - FY2018 Project List

Committed Projects	Electricity Savings (kWh)	Heat or Gas Savings (GJ/year)	Utility Cost Savings ($/year)	Project Cost ($)	Incentive ($)	Simple Pay Back (years)
C.Op - Phase 3 - Handoff	0	0	0	$8,250	$8,250	0.0
C.Op - Phase 3 - Coaching	0	0	0	$10,350	$10,350	0.0
Server room HVAC	72,000	0	$7,200	$130,000		18.1
EFL Grow-light retrofit	31,040	0	$2500	$32,000		12.8
Bioenergy Flue-gas Heat Recovery	0	6,350	$20,974	$200,000		9.5
T8 mag ballast LED retrofit	114,000	0	$12,400	$100,000		8.0
Res 2 baseboards	310,000	-1459	$22,000	$100,000		4.5
Power Plant/Bioenergy Controls Optimization	tbd	tbd	tbd	tbd		
Total	**413,040**	**4,891**	**$65,074**	**$580,600**	**$18,600**	8.6

4. ENERGY SAVINGS AND PROJECTIONS

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.

The first energy targets at UNBC were: a 10% reduction in electricity use, a 10% reduction in heating, and an 80% reduction in natural gas consumption from 2010 to 2015. The second set of targets are a 25% overall reduction in energy use, and an 85% reduction in natural gas consumption by 2020, compared to 2009/2010. The new targets allow for switching between fuel types to reduce operating costs without affecting the energy reduction target. If separate targets were maintained for electricity and heat reductions, projects such as the baseboard heating conversion would see a major decrease in electricity and a major increase in heating use.

4.1 Key Performance Indicators

Key performance indicators (KPIs) are the identified variables that drive energy consumption. UNBC has examined a number of potential performance indicators, with the goal of choosing those that most accurately reflect the factors that affect our energy usage. Floor area, weather, and building occupancy are typical indicators that have proven useful for normalizing data to allow for fair comparisons.

Floor area quantifies the size of the University, and directly relates to the amount of energy we consume. This has been our chosen method of inter-building comparison and has proven very helpful in determining where to prioritize energy reduction efforts.

The annual weather, as measured by heating degree days (HDD) and cooling degree days (CDD), is the single largest driver of energy use for a northern campus such as UNBC. All comparisons of energy data on campus over differing time periods require that outside temperature is taken into account.

Occupancy has been considered as a performance indicator but is not universally applicable to all campus buildings. It is included in setting energy baselines for specific buildings such as the residences where occupancy data affects energy usage. However, occupancy data for the rest of campus does not play a role in determining energy intensity nor would it be helpful in determining where to focus energy reduction efforts.

In 2012, sub-meters were installed at the Prince George campus to measure electricity, gas, district heating, and district cooling loads for individual buildings. This has allowed us to: rank buildings based on energy performance; compare buildings against national averages; identify buildings with higher than normal energy use; and monitor building performance over time. The energy intensity of each building is reported in Figure 1, broken down into electricity, gas, chilled water, and bioenergy intensity.

Figure 1 shows our Enhanced Forestry Lab (greenhouse) as the most energy intensive per square meter, followed by our three lab buildings and our two power plants. These results are not surprising. The forestry lab is a free-standing greenhouse with glass walls/roof and a high heating demand. Lab buildings operate with 100% outdoor air, no air recirculation, and fume hood exhaust requirements. Many labs operate 24 hours a day under these conditions. In terms of electricity intensity the Power Plant and Bioenergy Facility belong to the group of buildings with industrial type energy intensity and use the most electricity per square meter. They operate 24 hours a day and contain as the boilers, pumps, conveyors, and augers which are required to produce heat and distribute it throughout campus, and as such shoulder a disproportionate portion of campus energy requirements.

In March 2015, the Research Lab, and Teaching Lab completed the Implementation Phase of Continuous Optimization (C.Op) where operational efficiencies such as night-time setbacks, weekend and holiday schedules, air exchange rate reductions, damper controls, and hot water pumping strategies were instituted. The implemented measures have already resulted in a significant reduction in energy intensity. Compared to last year, the Research Lab used 44% less energy and the Teaching Lab used 30% less energy, however it is important to note that this year was 13% warmer than last year.

In March 2016 the Administration building, the Medical building and the Northern Sports Centre completed the Implementation Phase of Continuous Optimization. Significant energy reductions to these buildings are expected over the course of the coming year as a result of the implementation. In the current fiscal year, the remaining three buildings (Library, Conference Centre, and Teaching & Learning) will complete C.Op implementation, and by March of 2018 the impact of the completed optimization project will be evident.

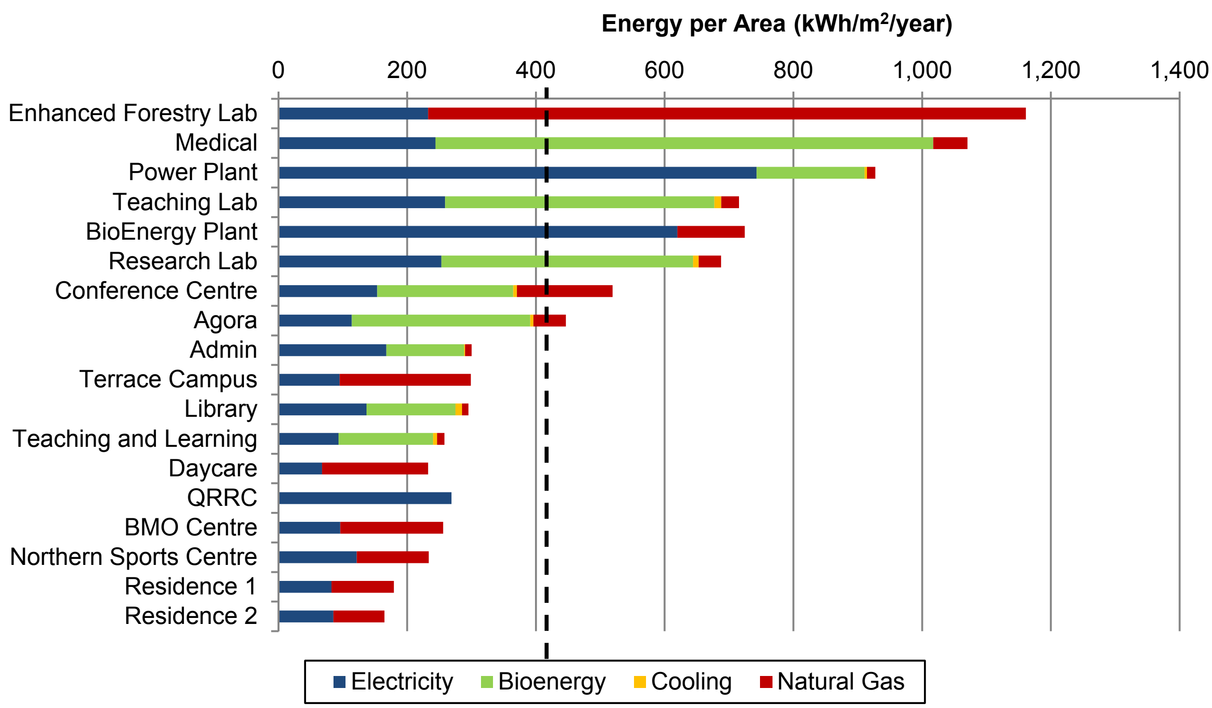

Figure 1 - Energy Intensity by Building 2015

Table 6 summarizes the annual energy consumption, energy intensity, cost intensity, and savings compared to last year for each building under the Energy Management program.

The average Building Energy Performance Index (BEPI) for UNBC is 403 kWh/year/m^2: a 13% reduction from last year. Significant savings were observed for the majority of the buildings mainly due to this year being warmer than last year. The Research Lab and Teaching Lab saw the largest reduction in energy intensity as they were part of the first phase of the C.Op implementation. In terms of poorly performing buildings, of special note is the Agora, where the cafeteria was renovated, and is now operating longer hours and 7 days a week. In addition to the increase in energy intensity seen in the Agora, the Administration building (which is connected to the Agora) also saw an increase in heating intensity after the cafeteria renovation.

Table 6 - Building Energy and Cost Intensity

	Building Area m2	Annual Consumption kWh/y	Annual Cost $/y	Energy Intensity kWh/m2/y	Cost Intensity $/m2/y	Savings From Last Year %
Research Lab	7,581	5,212,026	204,138	688	27	44%
Teaching and Learning	10,130	2,611,531	103,408	258	10	31%
Teaching Lab	7,921	5,667,366	221,598	715	28	30%
Daycare	639	148,586	7,373	233	12	26%
Library	11,754	3,469,100	159,647	295	14	20%
Conference Centre	3,253	1,688,815	67,677	519	21	18%
Residence 1	7,425	1,331,232	71,294	179	10	17%
Terrace Campus	1,314	392,836	31,957	299	24	16%
Residence 2	7,425	1,222,559	68,494	165	9	14%
Northern Sports Centre	13,485	3,147,428	181,976	233	13	14%
QRRC	812	218189	24501	269	30	11%
Enhanced Forestry Lab	931	1,080,975	50,574	1,161	54	5%
BMO Centre	1,320	337,842	24,065	256	18	5%
Power Plant	1,253	1,161,737	73,658	927	59	3%
BioEnergy Plant	1,046	757,657	57,976	724	55	1%
Maintenance Building	352	43,291	4,896	123	14	-6%
Agora	8,556	3,820,281	128,072	447	15	-16%
Admin	9,161	2,750,001	136,185	300	15	-17%
Medical	4,468	4,782,849	147,065	1,070	33	-18%
Total	**98,826**	**39,844,301**	**1,764,554**	**403**	**18**	**18%**

Compared to other institutions, the UNBC BEPI of 403 kWh/year/m^2 was significantly below the outdated 719 kWh/year/m^2 reported by Natural Resources Canada for Canadian universities and colleges in 2003. Though there are more recent Canadian BEPIs being reported, there has been little updated data for universities and colleges. Since the energy consumption of a building is highly dependent on the function of a building, it is important to compare buildings with similar functions. When looking at individual buildings, the Building Owners and Managers Association of Canada: Building Environmental Standards program (BOMA BESt) reported BEPI averages in 2012 for certified multi-unit residential buildings and office buildings at 205 and 331 kWh/m^2, respectively. When comparing to the BOMA BESt multi-unit residential buildings, both of our Residences fell below the reported averages. Our Administration and BMO buildings are our only buildings with primarily offices, and are both outperforming the BOMA BESt average for office buildings.

4.2 Electricity Savings

In FY2016, UNBC decreased electricity consumption by 1,269,424 kWh compared to last year. At the marginal rate of electricity these savings are worth $140,000, however, due to the 6% electricity rate increase, UNBC saved $48,887 on electricity. When compared to our electricity baseline, we saved 3,860,000 kWh worth of electricity over the past year; $390,000 in avoided cost savings. Figure 2 and Figure 3 show the overall electricity consumption and costs compared to baseline consumption over the past six years.

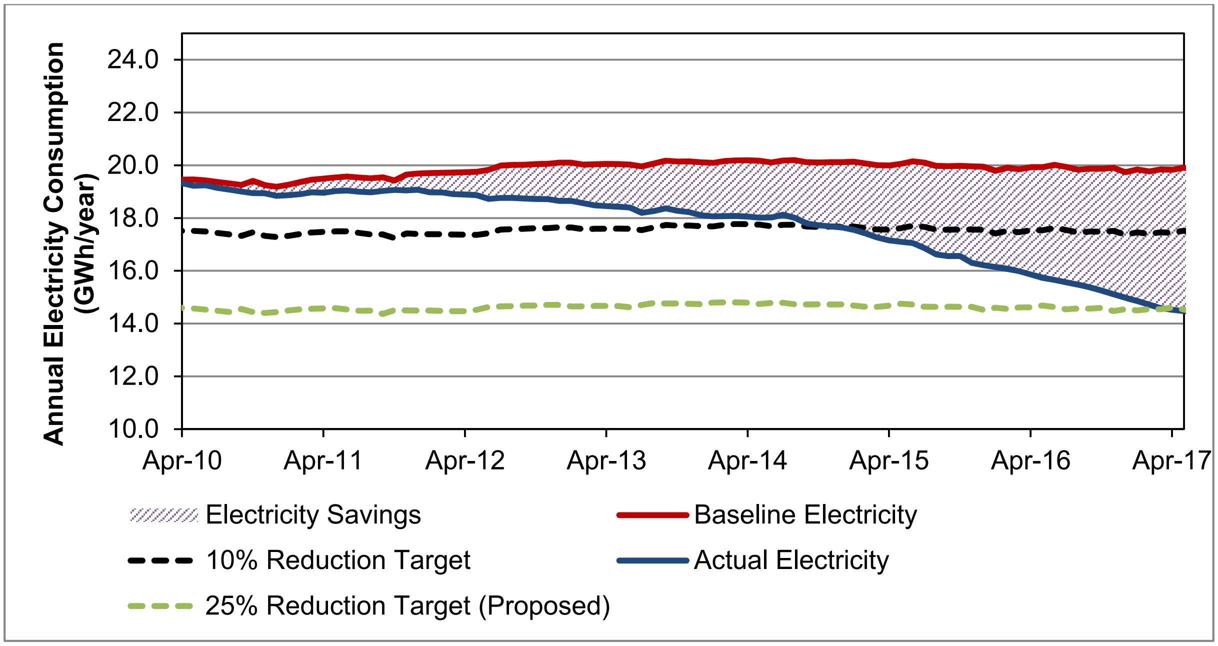

Figure 2 - Historical and Projected Annual Electrical Usage Compared to Baseline

Figure 2 demonstrates an overall reduction in electricity consumption over 6 years of 17%, and a projected reduction of 32% by 2020 if we are to implement the projects outlined in Section 3.

Figure 3 shows the baseline, actual, and avoided costs of electricity since the start of the Energy Management program at UNBC, including the portion of savings that are used to repay the revolving loan. If our electricity consumption was to remain constant at our FY2010 baseline consumption, we would have spent an additional $390,000 on electricity in FY2016.

Over the past 6 years, $1,080,000 in electricity costs were avoided due to our reduction in electricity consumption. By the end of FY2019, the cumulative avoided purchase of electricity will exceed $2,600,000.

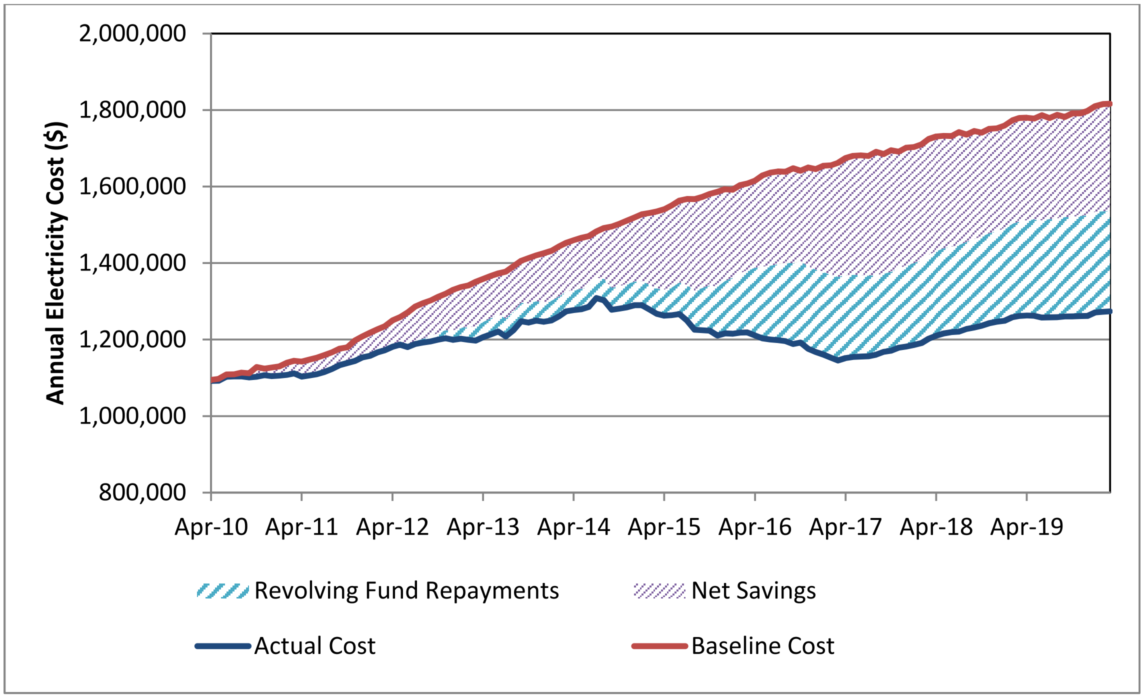

Figure 3 - Historical and Projected Annual Electricity Cost Compared to Baseline

4.3 Bioenergy and Natural Gas Savings

The baseline for heating was developed before the Bioenergy Plant came online in 2009/10 and takes into account the natural gas consumption as it relates to HDDs.

Figure 4 and Figure 5 show our annual heating breakdown and costs. The green shaded area indicates the bioenergy portion, and the red shaded area indicates the natural gas portion of our total heating.

Compared to last year, we have seen a 33% reduction in our natural gas consumption and a 18% reduction in our total heat consumption this year. This major reduction is primarily due to this year being roughly 13% warmer than last year. After correcting for weather, we have achieved a 5% reduction in heat compared to our baseline. Significant heat reductions were seen in the Research Lab and Teaching Lab where the C.Op implementation was completed in spring 2015.

Based on the projects identified in Section 3, we will achieve an 87% overall reduction in natural gas use, and an 18% reduction in heat consumption by FY2019.

Figure 5 shows significant cost savings from the switching from natural gas to bioenergy with the commissioning of the Bioenergy Plant in FY2011. Over the past 5 years, the Bioenergy Plant has helped UNBC avoid $2,828,000 worth of natural gas and carbon offset purchases.

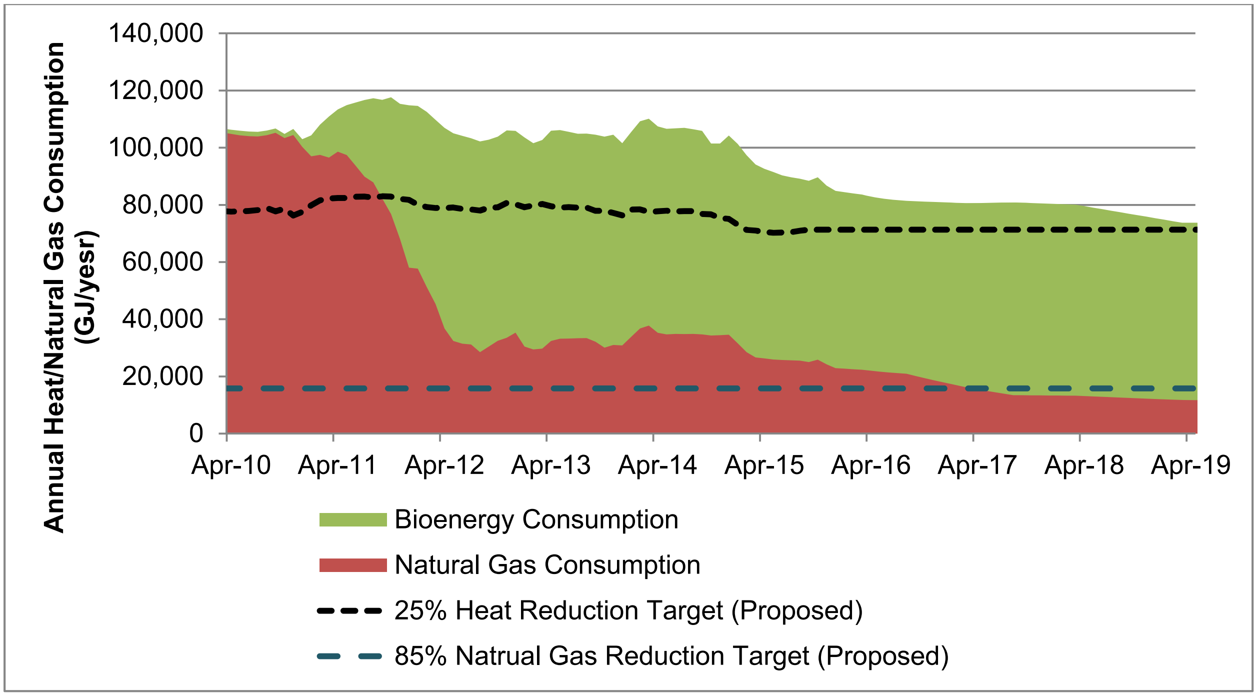

Figure 4 - Historical and Projected Annual Bioenergy and Natural Gas Consumption

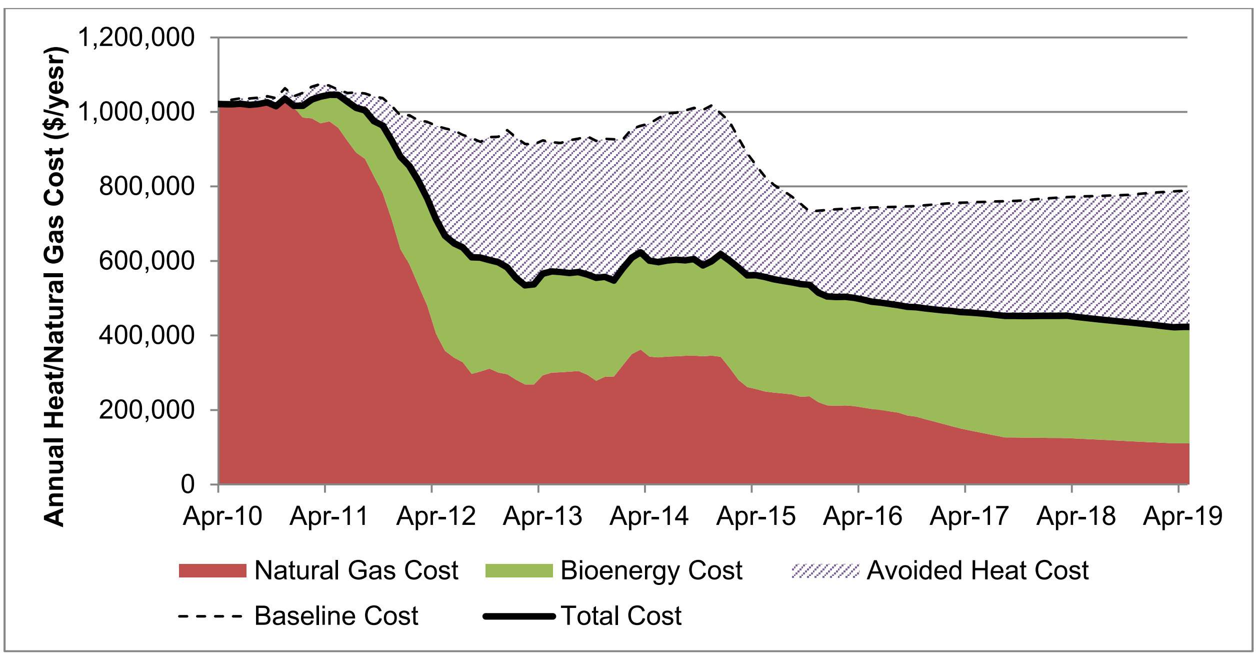

Figure 5 - Historical and Projected Annual Heat and Natural Gas Costs

4.4 Greenhouse Gas Reductions

As part of the public sector within the province of British Columbia, UNBC is required to purchase carbon offsets for non-biogenic greenhouse gas emissions associated with building energy consumption, mobile fleet fuel, and paper consumption. The University measures and reports its greenhouse gas emissions using SmartTOOL, through an initiative of the provincial government. Table 7 summarizes the annual carbon emissions reported from SmartTOOL.

With the commissioning of the Bioenergy Plant in 2011, UNBC has seen a 64% decrease in carbon emissions for offset (non-biogenic). It is important to note that emission factors are constantly being revised, leading to large discrepancies when comparing years. Most notably, a number of emission factors were changed in 2013: the electricity emission factor was lowered from 0.0069 to 0.0040 tCO_2e/GJ; and the emission factor for wood combustion was doubled from 0.047 to 0.096 $tBioCO_2/GJ$. The change in wood emission factor resulted in a major increase in total emissions compared to 2012.

Table 7 - Greenhouse Gas Emissions (t CO2e)

Source	2015	2014	2013	2012	2011	2010
Fuel Combustion	1,319	1,889	1,719	1,678	3,021	5,185
Biogenic Fuel Combustion	7,368	7,431	6,814	3,525	2,395	0
Electricity	189	178	260	461	470	473
Paper	37	67	60	63	80	40
Mobile	5	29	25	24	19	17
Mobile (Biogenic)	1	1	1	1	1	0
Total	**8,919**	**9,595**	**8,875**	**5,751**	**5,985**	**5,715**
Total (Biogenic)	**7,369**	**7,432**	**6,814**	**3,525**	**2,396**	**1**
Total for Offset	**1,550**	**2,163**	**2,061**	**2,226**	**3,589**	**5,714**

5. ENERGY MANAGER SUMMARY

Since the beginning of the Energy Management Program at UNBC in 2010, over forty energy projects have been completed totalling annual electricity savings of 2,500,000 kWh. To-date the implemented electricity projects have saved $400,000. Additional avoided electricity costs of $685,000 have been observed compared to the historical baseline, and can be attributed to building operation modifications and behavioural changes associated with having a visible Energy Manager in the UNBC community.

In addition to the avoided utility costs from reducing energy consumption, UNBC has received, primarily from BC Hydro, $840,000 in incentives and salary reimbursements for the Energy Manager position.

Figure 6 shows that the Energy Management Program has saved UNBC almost $2,100,000 in avoided electricity costs, incentive funding, and salary funding over the past six years.

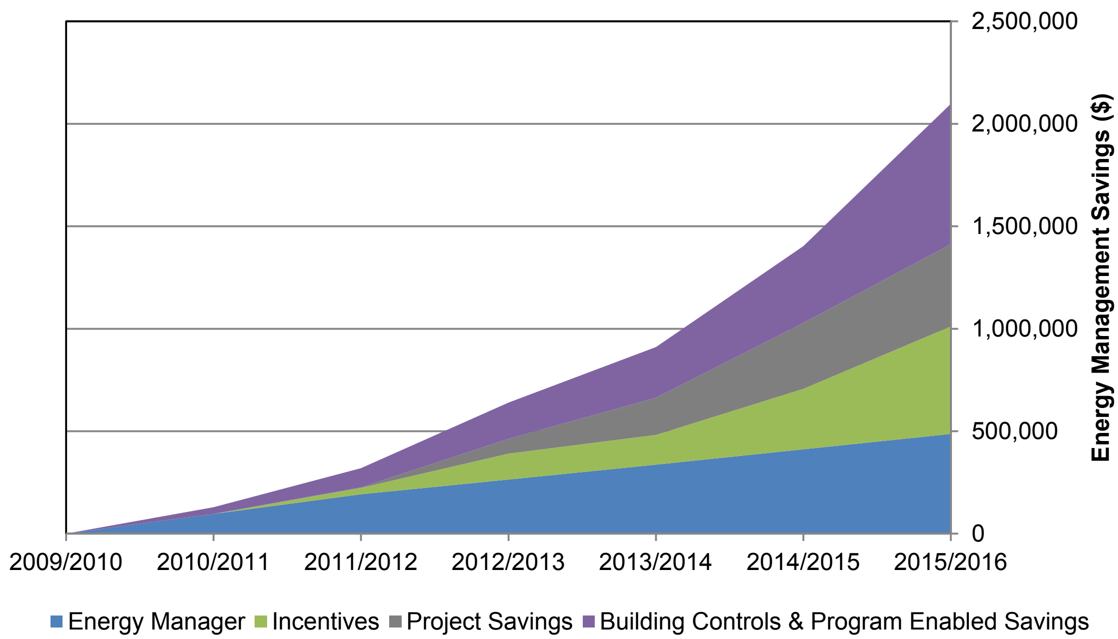

Figure 6 - Energy Management Savings Summary

With a major focus on electricity reduction projects, we have successfully met the electricity reduction targets outlined in the previous Energy Policy, and in the BC Hydro Power Smart Energy Manager contract. We have finalized new Energy Policy targets to be achieved by FY2020 that will focus primarily on utility cost reductions, namely a 25% reduction in energy consumption, and an 85% reduction in fossil fuel consumption compared to FY2010. With a continued focus on projects, we are also expanding our employee and staff engagement to reach these new targets.

APPENDIX A – COMPLETED PROJECT LIST

Project Name	Description	Electricity Savings (kWh/y)	Total Heat Savings (GJ/y)	Natural Gas Savings (GJ/y)	Total Cost Savings ($/y)	Total Project Cost ($)	Incentives ($)	Simple Pay Back (years)	Projected Completion Date
COp – Phase 2 – NSC Implementation	Optimize Northern Sports Centre building operations	482,800	1,900	1,900	51,600	46,500	0	0.9	Mar-16
COp – Phase 2 – Admin Implementation	Optimize Admin building operations	143,600	900	900	15,700	13,700	0	0.9	Mar-16
COp – Phase 2 – Medical Implementation	Optimize Medical building operations	97,600	800	800	11,600	14,000	0	1.2	Mar-16
Conference Centre Investigation	Investigation of Conference Centre high heat demand								Mar-16
COp – Phase 3 - Investigation	ECM's identified for Library, Conference Centre, Teaching & Learning building	0	0	0	0	50,500	50,500	0	Feb-16
Conference Centre Air Handler	Air Handler conversion from natural gas to hot water	0	800	800	3,500	15,000	9,900	1.5	Feb-16
Main Campus Street Lighting	Replace street lights and pathway lights with LEDs	167,000	0	0	13,400	161,200	89,900	5.5	Jan-16
NSC Street Lighting	Replace street lights and pathway lights with LEDs	86,000	0	0	6,900	58,900	20,700	5.3	Jan-16
Solar PV (Conference Centre)	Install solar PV panels on roof	5,000	0	0	400	31,100	29,300	4.5	Sep-15
NSC Wallpacks	Convert 150W wallpacks to LEDs	18,000		2000	13000		6.5		
Admin Daylight Harvesting	Connect Admin basement lighting to daylight sensor	2,800	0	0	224	0	0	0	Jul-15
Medical Humidifier Upgrade	Replace electric humidifier with high pressure injection and hot water from Bioenergy	492,000	-280	-74	47,185	150,766	74,941	1.6	Mar-15
COp - Phase 1 - Research Lab Implementation	Optimize Research Lab building operations	214,178	1,390	368	24,148	48,403	0	2.0	Mar-15
COp - Phase 1 - Teaching Lab Implementation	Optimize Teaching Lab building operations	264,035	3,916	1,037	40,878	31,278	0	1.8	Mar-15
COp - Phase 1 - Agora Implementation	Optimize Agora building operations	218,495	1,251	331	23,789	25,104	0	1.1	Mar-15
Power Plant AHU	Hardwire AHU with boiler operation	40,000	450	450	12,900	60,442	48,661	0.9	Mar-15
Teaching Lab Penthouse	Replace T12 fluorescent lighting with T8	1,022	0	0	90	800	110	7.7	Feb-15
Reef Fish Tank	Replace metal halides with LEDs	2,300	0	0	180	700		3.9	Jan-15
Chiller Operating Schedule	Optimize operating schedule (night shutdowns, september shutdown)	27,000	0	0	10,000	0	0	0	Oct-14
COp - Phase 2 - NSC Investigation	ECMs identified for NSC	0	0	0	0	20,665.45	20,330		Sep-14
COp - Phase 2 - Admin Investigation	ECMs identified for Admin	0	0	0	0	18,417.70	18,119	0.0	Sep-14
PHW BTU meter install	Install BTU meters on North and South hot water loops leaving Power Plant	0	0	0	0	16,000	0	0	Sep-14
Exterior Lighting - Agora/Medical Wallpacks	Replace 50W and 70W MH wallpacks with 13.5W LEDs	19,852	0	0	2,100	6,900	945	2.8	May-14
Teaching Lab Pot lights	Replace CFL/incandescent pot lights with LEDs	56,678	0	0	8,300	14,100	1,990	1.5	May-14
Bentley Pot Lights	Replace 2-pin CFL with screw-in LED and 4-pin LEDs	338	0	0	1,800	12,383	0	6.9	May-14
Administration Atrium Lighting	Replace high bay lighting with LEDs	6,090	0	0	600	0	0	0.0	Jun-14
Power Factor Correction	Connect CT to capacitor bank	0	0	0	10,700	200	0	0.0	Dec-13
C.Op - Phase 1 Investigation	ECMs identified for Agora, Teaching Lab, Research Lab, and Medical Building	0	0	0	0	60,242	60,242	0.0	Sep-13
Exterior Lighting (Bollards)	Replace exterior bollard lighting with LED/motion sensing models	7000	0	0	669	53,123	1,925	76.5	Sep-13
Agora Daylight Harvesting	Connect Agora lighting to daylight sensor to turn off all non-essential lighting during daylight	24600	0	0	2,500	0	0	0.0	Jun-13
Admin Daylight Harvesting	Connect Admin atrium lighting to daylight sensor to turn off all non-essential lighting during daylight	33000	0	0	3,400	0	0	0.0	Jun-13
Exterior Lighting (Globes)	Replace exterior globe lights with LED retrofit kits	59,000	0	0	6,000	53505	16,227	6.2	Oct-13
Low-flow showerheads	Replace showerheads in Residence with low-flow models	0	1,400	1,400	22,000	975	0	0.0	May-13
Lab Heat recovery	Recover heat from Medical Building and Lab 8: student independent study								Apr-13
QRRC lighting upgrade	Replace T12 fluorescent lighting with T8	7,752	0	0	730	5128.72	1257.86	5.3	Mar-13
EFL Lighting Retrofit	Replace T12 fluorescent lighting with T8	1,181	0	0	111	578	139	4.0	Jan-13
Canfor Theatre lighting -second round	Revisit the lighting provision for the lecture space	55,239	0	0	5,204	45,845	18,339	5.3	Dec-12
Warehouse lighting	Replace MH high bay fixtures in warehouse	43511	0	0	4,099	7201	2875	1.1	Dec-12
NSC Soccer field	Replace MH fixtures with impact resistant LED	130,598	0	0	12,302	125,188	40,000	6.9	Sep-12
Building energy displays	Install monitors outside Green Centre to display energy related data		0	0					Sep-12
NSC Field house relamp	New lamps for T5HO over field house	51,300	0	0	4,832	10,000	1,160	1.8	Aug-12
Coil Cleaning	Nalco coil cleaning initiative	224,610	0	0	21,158	23,523	9,684	0.7	Aug-12
NUSC Event Space LED	Replace incandescent lighting with LED	11,344	0	0	1,159	6,090	2,634	3.0	Jul-12
Terrace lighting upgrade	Replace T12 fluorescent lighting with T8	16,593	0	0	1,488	14,805	3,994	7.3	Apr-12
Utility meter installation	Install submeters for gas, electric, heat, cooling, domestic water		0	0					Jun-12
Residence Lighting - Common Areas	Replace T12 fluorescent lighting in residences with T8	14,414	0	0	1,358	17,216	3,208	10.3	Mar-12
Residence Lighting - Suites	Replace T12 fluorescent lighting in residences with T8, Incandescents with CFLs	250,930	0	0	23,638	61,547	24,090	1.6	Mar-12
TLC Atrium Daylight Harvesting	Connect TLC atrium lighting to daylight sensor to turn off all non-essential lighting during daylight	9,519	0	0	897				Mar-12
Theatre lighting	Replace incandescent lighting with LED	78,705	0	0	7,414	22,811	11,988		Apr-12
Medical AV Cooling	Install fans to take advantage of free cooling overnight	22,950	0	0	2,162	11,000	0	5.1	Apr-12
Admin Chiller	Replace water cooled centrifugal chiller with air cooled model	98,600	0	0	13,400	70,000	0	5	Mar-12
Ice Mountain	Store ice/snow for summer cooling		0	0					Nov-11
Canfor Theatre Lighting	Replace incandescent lighting in Canfor Theatre with LED	3,700	0	0	349	6,000	0	2	Aug-10
Terrace Boiler	Replace aging natural gas boiler for Terrace campus	0	300	300	5,400	45,000	0	8	Oct-10
Green Centre Lights	New Green University Center offices - LED lighting	1,240	0	0	117	640	0	5.5	Jan-11
Winter Garden Lights	Convert to Hi-Bay LED	2,630	0	0	248	640	0	2.6	Jan-11
District Energy Pump Study	Review system flow dynamics and pumping requirements for district energy water distribution loops	0	0	0					May-11
NUSC Event Space (Round 1)	Halogen to LED - testing 1 fixture	960	0	0	90	402	160	4.4	Mar-12
Rotunda Ramp	Halogen to LED	2,475	0	0	233	774	390	3.3	Aug-12
Rotunda Gallery	Halogen to LED	5,931	0	0	559	1,987	1,165	3.6	Aug-11
Agora North Entrance	Metal Halide to LED	999	0	0	94	476	244	5.1	Aug-11
Bookstore/Cafeteria Lighting	Replace halogen and incandescent lighting with LED	20,796	0	0	1,959	6,684	3,649		Aug-11
Thirsty Moose Lighting	Replace halogen and incandescent lighting with LED	6,034	0	0	568	2,235	1,582	1.1	Dec-10
Wind turbine	Preliminary investigation into installing wind generation on campus	0	0	0					Sep-11
Totals		**3,530,399**	**12,827**	**10,212**	**443,132**	**1,450,675**	**570,349**	**2.0**	

Behavioural/ Education Programs (If applicable)	Description	Electrical Svgs (kWh)	Heat Savings (GJ)	Total Utility Savings ($)	BC Hydro Incentive ($)	Date Started	% Complete	Projected Completion Date
Earth Hour 2015	Announce email, shut down lighting and air handlers, lighting audit (savings over 3 hours)	480		52		Mar-15	100	Mar-15
Sweater Day 2015	Social Media campaign, set point adjustment (savings over month)	0	350	2100	200	Feb-15	100	Feb-15
Residence competition	Two residence buildings compete to lower electrical consumption	2,400		150	0	Oct-10	100	Apr-11
Residence competition	Two residence buildings compete to lower electrical consumption	4,300		405	0	Oct-11	100	Nov-11
Wintergreen 2011	Promote turning off computer and HVAC during winter holidays	41,200		3,100	0	Dec-11	100	Jan-12
Wintergreen 2012	Promote turning off computer and HVAC during winter holidays	79,000	370	11,000	0	Dec-12	100	Jan-13
Wintergreen 2013	Promote turning off computer and HVAC during winter holidays	78,000	500	12,000	0	Dec-13	100	Jan-14
Wintergreen 2015	Promote turning off computer and HVAC during winter holidays	74,700	210	10,400	0	Dec-15	100	Jan-16
Workplace Conservation Awareness	Energy conservation staff engagement program	354,400	1200	33,900		Jan-15	67	Dec-16
Totals		**634,480**	**2630**	**73,107**	**200**			

APPENDIX B – POTENTIAL PROJECTS

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
2x4' 3xT8-mag LED retrofit (3 phases)	2x4' 3xT8(mag ballast) to linear LED	365,000		39800	320000		8.0	
Power Plant Lighting retrofit	Power Plant highbay lighting replaced with LEDs	33,000		3600	29000		8.1	
2x4' 3xT8-elec LED retrofit	2x4' 3xT8 (elect ballast) to linear LED	24,000		2600	33000		12.7	
Restroom Lighting Controls	Motion sensors in restrooms							Find suitable locations, and estimate savings
Stairway Lighting Controls	Motion sensors in stairwells							Estimate savings
Hallway Lighting Motion Sensors	Motion sensors in hallways							
Essential Lighting Review	Review current essential lighting and switch excess lighting to non-essential							Review lighting requirements for essential lighting
Server room HVAC	Replace 2 Liebert chillers in Admin server room	72,000		7,200	130,000		18.1	
Chiller Bypass	Install heat exchange to bypass chiller in shoulder seasons	100,000		24,900	120,000		4.8	Being studied by 5th year engineering design group
Residence Behavior	Community-based social marketing aimed at forming positive behaviors relating to energy and water use							Determine best way to engage residence occupants
Flue Gas Heat recovery Option 1 (Peak Heat)	Recover latent heat from Bioenergy flue gases into low temperature loop for peak building demand		800	8,800				Detailed engineering to build on work of Environmental Engineering Master's and undergraduate students
Flue Gas Heat recovery Option 2 (Peak Heat + Res Baseboards)	Recover latent heat from Bioenergy flue gases into low temperature loop for peak building heat and residence baseboards		2,100	23,100				
T&L Heat Recovery	Heat Recovery in T&L building							
District Heating Network Study	Study the district heating network to improve heating efficiency and reduce heat waste							Data and operations analysis
Ventilation Review	Review ventilation standards, and modify ventilation rates as appropriate							Review standards and current ventilation rates
EFL Grow Light Retrofit		31,040		2,500	32,000		12.8	
Research Lab Heat Recovery								
Library Archives AC/Dehumidification								
Totals		**625,040**	**2,900**	**112,500**	**664,000**	**0**	**5.9**	

Approved Projects

Project Name	Description	Electrical Svgs (kWh)	Other Fuel Svgs	Total Svgs (Energy + Operational)	Total Cost	BC Hydro Incentive	Simple Pay Back	Status			Projected Completion Date
Residence 2 Baseboards	Replace electric baseboards in Res 2 with hot water units	310,000	-1,459	22,000	100,000		4.5				Aug-17
T8 mag ballast LED retrofit phase 1	2x4' 3xT8(mag ballast) to linear LED	45,600		5,000	40,000		8.0				
Power Plant/Bioenergy Controls Optimization	Control NG boiler startup/shutdown to minimize NG use										
Utilidor Lighting Controls	Switch portion of lighting to non-essential, and add occupancy sensors	46,000		5,000	21,000		4.2				
Power Plant lighting		33,000		2,600	29,000		11.2				
Totals		**434,600**	**-1,459**	**34,600**	**190,000**	**0**	**5.5**				

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
Sustainable Communities Demonstration Project - Phase 1a	Connect EFL, Residences and Daycare to Bioenergy plant, using excess capacity from pellet boiler or flue gas heat recovery to provide hot water.	-100,000	6,580	80,000	2,000,000		25.0		Oct-12		Aug-16
Residence 1 Baseboards	Replace electric baseboards in Res 1 with hot water units	326,000	-1,534	22,000	100,000		4.5				Aug 16
Continuous Optimization - Phase 3 Implementation	Optimize building systems for Conference, Library, T&L	405,000	600	45,000	163,160	82,000	1.8		Jul-14		Mar-18
Main Campus Extra Exterior Lighting		53,000	0	4,400	15,000	8,000	1.6				Aug 2016
Heating and Cooling Policy	Implement heating and cooling policy and control strategy to maintain temperature band and minimize heating and cooling waste							Draft policy written, requires occupant consultation and review			Dec 2016
Chiller Free cooling	Bypass chiller in shoulder months to provide free cooling to campus							Studied by 5th year Engineering Students	Sep-14		Nov 2018
Botanical Gardens Pump Control	Add scheduler to pump, and tune VSD	8,000		800	500	0	0.6	Purchasing electrical equipment	Sep-12	60	Mar-14
Totals		**692,000**	**5,646**	**152,200**	**2,278,660**	**90,000**	**14.4**				

APPENDIX C – COMPLETED STUDIES BY BUILDING

Building	UNBC Energy Audit MCW Aug-09	Utility Data Management Prism Engineering May-12	Energy Management Information System Pulse Energy Jun-12	HVAC Coil Cleaning NALCO Aug-12	COp Phase 1 Prism Sep-13	COp Phase 2 Prism Aug-14	COp Phase 3 Prism Jul-15	BMO Boiler Replacement Study Prism Feb-16	Student Studies/Projects
Administration	□	□	□	□		□			
Agora	□	□	□	□	□				
Bioenergy		□	□						Flue Gas Heat Recovery Study
BMO building								□	
Conference Centre	□	□	□	□			□		
Daycare	□	□	□						
EFL	□	□	□						
Library	□	□	□	□			□		
Maintenance	□								
Medical	□	□	□	□	□				Heat Recovery Study Humidifier Study
NSC		□	□			□			
Power Plant	□	□	□	□					District Piping Network Study Renewable Energy Feasibility Study Ice Storage Study Thermal Storage Study
QRRC		□							
Research Lab	□	□	□	□	□				Heat Recovery Study
Residence	□	□	□						Energy Use Survey
Teaching Lab	□	□	□	□	□				Heat Recovery Study
Teaching & Learning	□	□	□	□			□		
Terrace	□	□							

APPENDIX D – ENERGY TEAM AND STAKEHOLDERS

Name	Title	Email	Phone Number	Organization
David Claus	Assistant Director, Facilities Management, Energy Manager	david.claus@unbc.ca	250-960-5590	UNBC
Amanda Drew	Energy Technician	amanda.drew@unbc.ca	250-960-5790	UNBC
Shelley Rennick	Director, Facilities Management	shelley.rennick@unbc.ca	250-960-6413	UNBC
Kevin Ericsson	Chief Engineer	kevin.ericsson@unbc.ca	250-960-7059	UNBC
Dale Martens	Assistant Chief Engineer	dale.martens@unbc.ca	250-960-6449	UNBC
Aaron Olsen	Maintenance and Project Supervisor	aaron.olsen@unbc.ca	250-960-6411	UNBC
Kyrke Gaudreau	Sustainability Manager	kyrke.gaudreau@unbc.ca	250-960-6623	UNBC
Belinda Larisch	Acting Energy Technician	belinda.larisch@unbc.ca	250-960-5790	UNBC

APPENDIX E – UNBC GREEN TEAM MEMBERS

The Green Team is comprised of members from across the main campus, including staff, professors, and students representing a variety of departments, disciplines, and buildings. Membership includes the following individuals:

Kyrke Gaudreau, Carleigh Benoit, Nicole Neufeld, Benjamin Bryce, Alex Aravind, Amelia Kaiser, Kristen Kieta, Hossein Kazemian, Gail Fondahl, Loraine Lavallee, Lenna Shelest, Michael Allchin, Raychill Snider, Wyatt Klopp, Diane Collins, Jane Liang, Brooke Boswell, Belinda Larisch, and Amanda Drew.

APPENDIX F - ENERGY MANAGEMENT ASSESSMENT (EMA) RECOMMENDED ACTIONS

		Tasks List
1.0 Policy		
	In support of current energy conservation expectations, confirm with the new executive leadership team the organizational commitment to a clear scope, charter and long-term goal for the energy management program.	
	1.1	Work with the executive energy sponsor and UNBC leadership to obtain clarity around the long-term strategy for the organization
		>Ensure understanding of evolving organizational strategic plans
		> Identify areas of current organization strategy with strong links to energy
		>Define the linkages between the overall organizational strategy and energy conservation that can be the basis for energy reduction goals
	1.2	Establish clarity around the scope and long-term goals of the energy conservation program
		>Understand the components that make up the energy conservation strategy
		>Understand the measurable goals of the energy conservation strategy
	1.3	Quantify energy savings from specific measures implemented and initiatives conducted to date
		>Specify numerous projects and activities undertaken to date
		>Specify the financial benefits as well as public image benefits
		>Segregate hardware change-out related savings from operational / behavioral related savings
	1.4	Outline the additional benefits possible by having a quantified, long term goal specifically for energy conservation
		>Include financial benefits to organization
		>Include positive impact to UNBC image
	1.5	Review sample energy policy statements created by other organizations
	1.6	Work with executive energy sponsor to establish a multi-year quantitative goal for the energy conservation program
		>Ensure correlation and integration with the overall UNBC business plan
		>Lay out a clear charter, scope and responsibilities associated with the energy management initiative
Q1	1.7	Update the energy policy (or energy conservation mission statement) with the long-term goal based on a percentage reduction to energy intensity and execution timelines that pertain directly and exclusively to energy conservation
		>If part of a broader sustainability policy, include a separate commitment statement and goal specifically aimed at energy conservation
		>Consider a revised metric for the new long-term energy goal based on energy intensity (ie, kWh/sqm or kWh/student FTE)
		Tasks List
2.0 Targets / Reporting		
	Set energy intensity reduction targets for each key site or operating area that cascade up to the overall annual reduction target that is set for each year of the long-term goal in the energy management program mission statement.	
	2.1	Utilize energy intensity metrics that are relevant to the organization (ie, kWh/sqm, kWh/student FTE, etc) for use in setting EnPIs
	2.2	Use existing understanding of opportunities to develop an overall annual energy reduction target for each year of the energy management mandate time horizon
		>Utilize savings projections from results of technical audits conducted
		>Isolate savings expected through retrofit projects from controllable operational and/or behavioral activities
		>Bottom Up based on identified savings opportunities in specific areas
		>Top down based on desired reduction from overall current usage
	2.3	Identify potential key sites or operating areas to assign separate EnPIs
	2.4	Use evolving understanding of site and system opportunities to establish EnPIs per key site that build up to the overall program annual target

		>Utilize savings projections from results of technical audits conducted
		>Align with available funding and resources
		>Define "targets" as the level of performance below the current "expected level" metrics based on the desired percent reduction at each site
		>For example, if the "expected level" metric is 3000 kWh/sqm and the desired reduction is 10%, then the "target" should be 2700 kWh/sqm
		>Isolate savings expected through controllable operational and/or behavioral activities from retrofit projects for use in "stretch" targets
		>Bottom Up based on identified savings opportunities in specific areas
		>Top down based on desired reduction from overall current usage
	2.5	As possible, construct energy trend analysis templates by overlaying operating parameters onto collected energy use data
		>Time based energy profiles per metered point
		>Analyze for unnecessary coincidental demands
		>Analyze for energy consumption variance from expectation during specific time periods
	2.6	Develop data capture and information distribution plan
		>Establish a methodology for capturing operating data needed for normalizing energy use data, for example: operating hours, square footage, student FTE, weather, etc.
	2.7	Capture EnPI actual versus expected and target to determine ongoing performance
Q2	2.8	Develop standard format for EnPI reporting by key site
	2.9	Present energy intensity performance reports as agenda item in operations and/or site meetings
	2.10	Develop an acknowledgement program for sites reaching or exceeding targets as a motivational tool
		>Name top performing sites in quarterly newsletter
		>Name top improving sites in quarterly newsletter
		>Present an annual (or period) top performer and most improvement award (ie, plaque, banner, etc) that the winner can display for the year (or period)
	2.11	Develop response procedure for out-of-variance conditions identified
		>Augment report format to include documentation of corrective action taken on out of tolerance conditions
Q3	2.12	Identify persistent out of tolerance conditions
Q4	2.13	Target persistent out of tolerance conditions for further energy reduction possibilities
		Tasks List
3.0 Plans / Actions		
	Utilize current understanding of opportunities for savings from capital projects, operational opportunities, and behavioral initiatives to develop a more comprehensive SEMP that correlates potential savings from both capital and non-capital opportunities to consumption reduction targets.	
	3.1	Review current long term strategy for the organization
		>Ensure understanding of the conservation goals in the energy policy
	3.2	Continue to regularly maintain a list of potential activities and/or capital projects to reduce energy costs or improve energy management
		>Seek ideas from staff, industry case studies, and/or comparative analysis with other entities in the industry
		>Utilize results of recently conducted technical evaluations of energy using systems
		>Conduct Follow up investigations in key areas as necessary to obtain investment grade project economics
		>Opportunities should look beyond capital and hardware change out projects to include operational changes, modifications to maintenance practices, employee awareness communication initiatives, formal training for staff, energy data capture and reporting needs, etc.
	3.3	Identify organizational drivers with strong links to energy and prioritize key activities and projects based on those factors
		>Capital requirement
		>Financial investment criteria
		>Non-financial benefits (public positioning, etc)
		>Impact on employee bandwidth and available resources
		>Ease of implementation

		>Correlation with other organizational objectives
Q1	3.4	In addition to capital asset and retrofit projects, ensure comprehensive planning approach covers all key aspects of energy management
		>Including operation and maintenance protocol; training and resourcing issues; awareness activities; information management and dissemination; procurement guidelines; performance measurements; etc
	3.5	Compile multi-year capital plan for approved energy projects and initiatives
		>Plan should correlate with key objectives of the UNBC Master Plan
		>Plan should depict how each project and activity will contribute to the established energy reduction "stretch" targets for each year of the multi-year plan
		>Plan should depict how each annual plan roles up to the multi-year energy intensity reduction target
		>Plan should identify each key organizational activity and capital project, outline the steps to implementation, and call out the required resources, budget, timeline, and responsible party
		>Improve definition of outer-year components of current multi-year SEMP as possible
		>Utilize the BC Hydro SEMP template as necessary
	3.6	Utilize SEMP as a pivot tool to engage senior business unit managers in clear, interactive negotiation regarding the resource allocation and investment levels (labor and capital) needed to implement the projects and activities necessary to achieve the desired energy reduction targets set by management
	3.7	Obtain approval from senior management for the final multi-year, comprehensive energy plan
	3.8	Execute multi-year, comprehensive plan
Q2	3.9	Monitor and report on progress against the multi-year plan and objectives over time
		Tasks List
4.0 Teams / Committees		
	Leverage site (or departmental) energy coordinators to improve broader participation in the energy conservation program. Ensure operating and maintenance procedures instruct personnel to make appropriate adjustments in energy-using equipment aimed at maintaining proper conditioned spaced conditions while optimizing consumption patterns.	
	4.1	Identify key sites that could be made responsible for energy use issues
	4.2	Identify specific personnel responsible for coordinating site energy issues (ie, site energy coordinators)
		>Consider available bandwidth
		>Consider current energy-related skill set
		>Consider current level of authority
	4.3	Ensure site coordinator understanding of established energy conservation targets
		>Understanding of overall UNBC target
		>Understanding of site contribution to overall UNBC target
		>Understanding of behavioral component of the established site target
		>Understanding of behavioral contributions that will contribute towards meeting the established target
	4.4	Ensure acceptance by the site coordinator for the behavioral portion of energy target
	4.5	Communicate to organization the new role of personnel responsible for coordinating site energy issues
Q2	4.6	Identify major energy-using systems for each site
	4.7	Identify potential energy efficient operations and maintenance parameters for key energy-using areas or systems
		>Based on established level of service
		>Examples include exercising / cleaning HVAC air dampers to prevent seizing / rusting; boiler tuning; etc
	4.8	Review current operating procedures and planned maintenance activities for key energy using systems from an energy efficiency perspective
		>Note practices that may already occur on an informal basis
		>Look beyond efficiently meeting demand and isolate operational, maintenance, and behavioral practices that control load demand
		>Consider operational and maintenance changes resulting from implementation of energy audit findings
		>Consider results from participation in the BC Hydro Continuous Optimization Program
Q3	4.9	Conduct studies aimed at the identification of common behavioral issues requiring targeted training for personnel
		>For example, noted instances of equipment remaining in manual override for unnecessarily extended periods

		>Leverage resources already planned to conduct evaluations of operational issues in conjunction with technical audits to be performed
	4.10	Modify current operating and maintenance practices as necessary to include energy efficiency issues
	4.11	Establish an opportunities register to log energy waste conditions that cannot be immediately corrected
		>Clarify process for communication of identified energy waste conditions
		>Communicate to employees the process for communicating energy waste conditions to operations personnel
		>Communicate to operations personnel expectations for correcting waste conditions
		>Use opportunities log as a source for planning the implementation of energy conservation and retrofit capital projects
	4.12	Create check-lists that personnel can use to monitor and control specific actions required for managing energy consumption
		>End-user checklists can focus on behavioral issues associated with the day-to-day equipment over which they have control
		>Maintenance personnel check-lists can focus on operational and maintenance protocol for large utility systems and equipment
	4.13	Support changes in operating and maintenance practices with training and regular communication
Q4	4.14	Review on-going performance based on updated instructions
		>Obtain input from maintenance personnel and adjust instructions as needed
		Tasks List
5.0 Employee Awareness / Training		
	Improve the effectiveness of executive management in monitoring the progress of the energy management initiative against planned expectations, in addressing obstacles and competing priorities, and in allocating resources as necessary.	
	5.1	Work with the executive energy sponsor and UNBC senior management to obtain clarity around the long-term strategy for the organization
		>Ensure understanding of evolving organizational strategic plans
		> Identify areas of current organization strategy with strong links to energy
		>Define the linkages between the overall organizational strategy and energy conservation that can be the basis for energy reduction goals and activities
	5.2	Ensure correlation and integration with the overall UNBC Master Plan
		>Determine specifically how each of the key components of the SEMP tie to a particular and pertinent element of the UNBC Master Plan
	5.3	Identify how achieving the stated long-term goal of the SEMP will contribute to the realization of the broader goals contained in the UNBC Master Plan
	5.4	As necessary, adjust the multi-year SEMP to improve correlation with and contribution toward the UNBC Master Plan
Q1	5.5	Formalize the executive energy sponsor and institutional requirement for regular reporting on the energy management program progress towards the stated annual targets and long-term goal of the multi-year SEMP
	5.6	Consider utilizing current quarterly management meetings required by the BC Hydro Energy Manager Program to deliver the required institutional reporting and increase executive participation
	5.7	Shift the focus of Energy Manager Quarterly Meetings from presentations made to BC Hydro to opportunities for direct engagement of UNBC executives
		>Although BC Hydro in attendance, target the presentation content to UNBC executives vs BC Hydro
Q2	5.8	Focus more attention on selectively inviting key executives from key operating areas to specific quarterly progress meetings
		>Identify when participation from specific executive managers is key to address the priority agenda items tabled for a certain meeting and take time to invite them directly to that meeting

Energy Manager: Please complete appropriate year below

- Note: All areas (in your contract Year) must be covered in order to receive 4th quarter payment

Year 2 +: Strategic Energy Management Plan requirements

6 Critical Elements must be included in the Strategic Energy Management Plan	**Page number where the element is addressed in the SEMP**	**Energy Manager evaluation**	**PSE Agrees**
1) A purpose statement which answers the following questions:		☐	☐
☐ a) What is your kWh reduction target?	1		
☐ b) What is the Key Performance Indicator for your organization?	8		
☐ c) Who do you need to engage to make your plan successful?	1,6		
2) A table that compares all your building in your portfolio		☐	☐
☐ a) BEPI- updated to the current year	9-10		
☐ b) Explanation of Top 10 worst performing buildings	8-9		
3) Explain what the opportunities are to become more efficient.		☐	☐
☐ a) Project List	4-7,16-18		
☐ b) Initiative List: Behavioural and Organizational	4-6, 17		
☐ c) Studies: Outline which buildings have had studies completed.	19		
4) Outline the budget to implement projects		☐	☐
☐ a) If No Budget? Can't forecast your budget? You must explain why not and what you intend to do about getting a budget.	2-3		
5) Conclusion: How is your plan doing?		☐	☐
☐ a) Outlined kWh saved	11-12		
☐ b) Outlined GHG tons saved	12-14		
☐ c) Outlined total dollars saved to the organization	1,11-13		
☐ d) Outlined avoided cost	11-13		
☐ e) Outlined total dollars saved	11-13		
☐			
6) Senior Management Support		☐	☐
☐ a) Approval of the SEMP : Signature on the SEMP	Cover Page		
	(Final SEMP)		

Tracking:

	2nd Q Draft SEMP Submitted Date	Date PSE Coaching Comments Returned to EM	4th Q SEMP submitted date	Reviewed and Coaching comments returned to EM: Date	*If EM needed to resubmit :date	If PSE reviewed: Date
Energy Manager						
PSE						