FY2025 Strategic Energy Management Plan

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1. OVERVIEW

As Canada's Green University™, the University of Northern British Columbia (UNBC) is committed to minimizing its environmental impact and operating costs by reducing energy consumption through energy efficiency projects, student and staff engagement, and energy awareness campaigns. Not only are we bound to this through social responsibility, but from a strategic priorities standpoint:

> ***Our Vision: Leading a Sustainable Future***
>
> - UNBC Strategic Plan 2023-2028

The cornerstone of UNBC's energy management program is renewable and efficient energy systems that are of particular interest to northern and remote communities. Through the expansion of an award-winning bioenergy system, and the ongoing efforts of the Energy Management (EM) team, UNBC has achieved a 40% reduction in electricity use, a 70% reduction in natural gas consumption (and associated greenhouse gas emissions), and a 40% reduction in utility costs compared to 2010 baseline levels.

The EM program at UNBC has been strongly supported by BC Hydro for the past 15 years. They currently provide 50% of the funding for a dedicated Energy Manager, as well as incentives to implement energy efficiency, energy conservation, and low carbon electrification projects. BC Hydro has contributed over $1.78 million to UNBC's EM program, which has facilitated numerous projects that have helped to save roughly $5.9 million in electricity costs. Alongside implementation of projects, we will continue to engage the UNBC community through the Energy Wise Network to maximize conservation and awareness efforts.

Overall, UNBC has achieved an almost 20% reduction in energy use since 2010. In addition, compared to 2007 baseline levels, UNBC's GHG emissions have reduced by 70% as of 2023, primarily due to the Bioenergy Plant offsetting the consumption of natural gas. Through the EM program, and the switch from fossil fuels to bioenergy, UNBC has avoided the purchase of roughly $10.5 million worth of energy since 2010. Add to that the over $2.6 million brought in through incentives and salary reimbursements, and UNBC's commitment to sustainable operations can be valued at over $13.1 million.

2. ENERGY MANAGEMENT AT UNBC

The energy management portfolio includes all facilities where UNBC has direct operational control. This enables 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, the Wood Innovation Research Lab (WIRL) 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, while accommodating roughly 95% of the population.

2.1. ENERGY CONSUMPTION AND COST

UNBC uses a mix of different energy sources, primarily electricity, bioenergy, and natural gas. Diesel and propane represent less than 1% of the total UNBC energy consumption and cost. Fuel for vehicles and mobile equipment is not included within the scope of the energy management program. Table 1 lists the actual consumption and cost for each utility based on invoiced amounts.

Table 1 – FY2024 Utility Breakdown

	Annual Consumption		Annual Consumption		Annual Cost
Electricity	11,919,663	kWh	11,919,663	kWh eq	$1,072,069
Bioenergy (Hog Fuel)	3,530	bdt	18,482,437	kWh eq	$264,100
Natural Gas	33,189	GJ	9,219,118	kWh eq	$416,608
Bioenergy (Pellets)	245	bdt	641,677	kWh eq	$9,911
Propane	7,207	L	51,052	kWh eq	$8,613
Total			40,313,947	kWh eq	$1,771,301

Figure 1 shows the breakdown of energy consumption from Table 1 for FY2024. Electricity accounted for 29% of total energy consumption, and heat generated from hog fuel (sawmill wood waste), natural gas, and wood pellets accounted for the remaining 71%. Bioenergy (hog fuel and pellets) accounted for more than twice as much as natural gas. The Prince George campus operates two bioenergy systems: a 4.4 MW Bioenergy Plant that uses hog fuel to make hot water for the main campus district heating loop; and a 0.4 MW Pellet Plant that uses wood pellets to produce low-temperature water for on-campus student housing, the Daycare, and the Enhanced Forestry Lab (EFL). Natural gas is used to back up the bioenergy systems on the Prince George campus, and to heat buildings not served by the district heating loops.

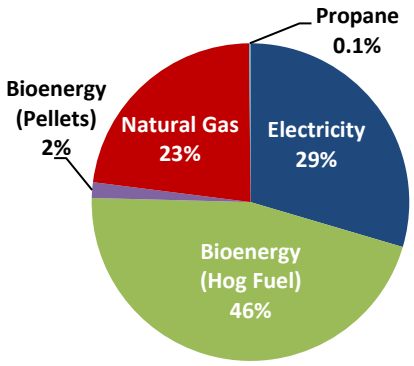

Figure 1 – FY2024 Energy Use Breakdown

Although electricity accounted for only 29% of the energy consumption, it represented 61% of total energy costs, due to the relatively high marginal rate of electricity, see Table 2. At the Prince George Campus, electricity costs about 1.5 times the cost of natural gas per unit of energy, and more than 4 times the cost of hog fuel. This, however, is based on primary energy and does not take into account efficiency losses when converting natural gas or bioenergy into useable heat.

Table 2 – FY2024 Marginal Energy Rates

Energy Source	Account	Marginal Rate (¢/kWh)
Electricity	Prince George Campus	6.07
	Bioenergy Plant	6.16
	Northern Sport Centre	6.16
	QRRC	9.41
	WIRL	9.84
	Terrace	9.84
Natural Gas	Prince George Campus	4.00
	Northern Sport Centre	3.76
	EFL	4.63
	Bio Plant	4.63
	Agora	4.63
	WIRL	4.63
	Terrace	7.05
Bioenergy (Hog Fuel)	Prince George Campus	1.43
Bioenergy (Pellets) [1]	Prince George Campus	1.54

[1] Only includes cost of delivery, as pellets are donated to UNBC.

2.1.1. BIOENERGY AND DISTRICT HEATING

The Prince George Campus has two district heating systems:

1. The main district heating (Main DH) system, which serves 9 buildings, anchored by the Bioenergy Plant and backed up by the natural gas boilers in the Power Plant, and
2. The Low-temperature district heating (Low-temp DH) system, which serves 4 buildings, anchored by the Wood Pellet Plant and backed up by the Main DH.

The Low-temp DH system was commissioned in September 2016, and the Wood Pellet Plant was re-commissioned in November 2016. The Low-temp DH system delivers heat to both student residence buildings, the Daycare Centre, and the Enhanced Forestry Lab.

The two DH systems are integrated at the Bioenergy Plant allowing the new Low-temp DH system to use excess capacity from the Bioenergy Plant as back-up. If capacity from the Bioenergy Plant is not available, the extra heat is provided by the back-up natural gas boilers in the Power Plant.

A fuel breakdown for the Main DH and Low-temp DH systems for FY2024 is shown in Figure 2. In total, 2,310 GJ of wood pellets were used by the Wood Pellet Plant, 66,500 GJ of hog fuel was used by the Bioenergy Plant, and 25,230 GJ of natural gas was used by the natural gas boilers. Bioenergy continues to provide the majority of heating energy. This is a result of the increased operating time of the Bioenergy Plant and fewer equipment breakdowns. With continued preventative maintenance, the Bioenergy Plant's operating time is expected to be more consistent in the future and that should further reduce the use of natural gas.

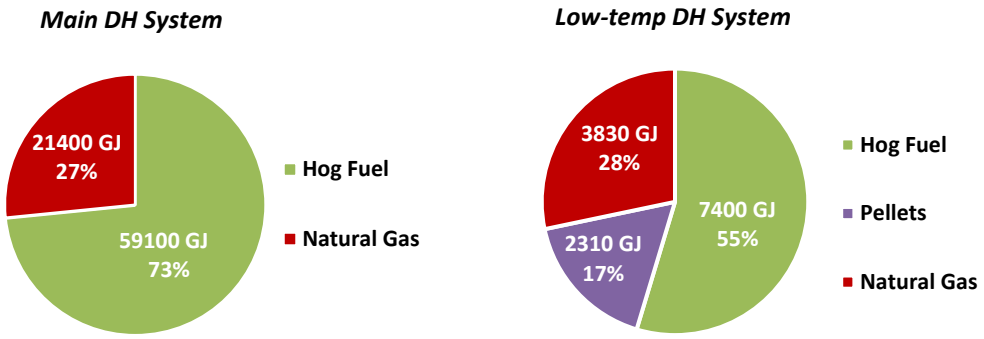

Figure 2 – FY2024 District Heating Fuel Breakdown

2.1.2. ENERGY CONSUMPTION AND INTENSITY BY BUILDING

In 2012, UNBC installed sub-meters throughout the Prince George Campus to measure electricity, hot water, chilled water, natural gas, and domestic water at the building level. The sub-metered data allows us to monitor energy consumption, identify areas of improvement, and verify savings from implemented projects.

Figure 3 shows the breakdown of energy consumption by building. The energy sources include electricity, the Main DH system, cooling from the central chillers, direct natural gas combustion, the Low-temp DH system, and propane.

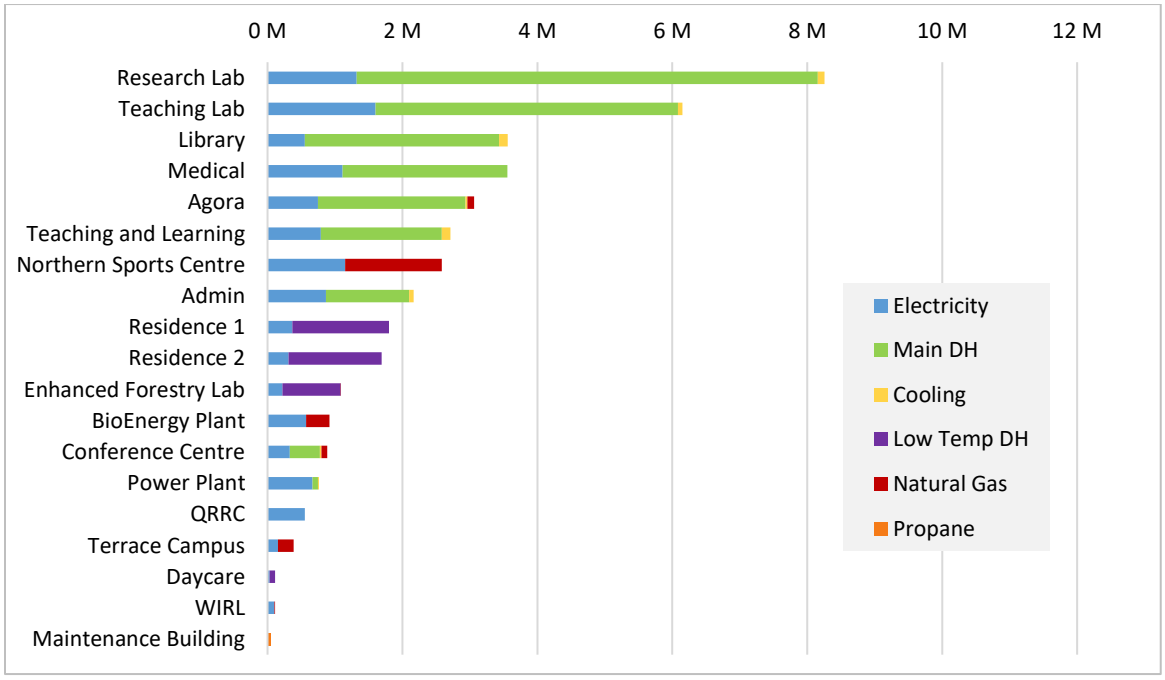

Figure 3 – FY2024 Annual Energy Breakdown (kWh_{eq}/year)

For information on how heat is generated for the two district heating systems, reference Section 2.1.1.

Though Figure 3 shows the magnitude of the energy used by each building, it does not account for the size of the buildings. In order to determine performance of the buildings relative to one another, we correct for floor area and group them according to function; see Table 3 below.

The term 'energy intensity' may also be referred to as Building Energy Performance Index (BEPI) or Energy Use Intensity (EUI) – both are measured in units of energy use per area such as ekWh/m^2 or GJ/m^2. In 2023, Energy Star Portfolio Manager, a Canadian utility usage and energy benchmarking software, reported the median BEPI at Canadian colleges/universities to be 1.04 GJ/m^2, or 289 ekWh/m^2. Though this benchmark is current, it does not distinguish between the different building functions (laboratories, administrative, etc.), whether an institution is research intensive or not, or account for variances in climate. All of these factors can make comparing any BEPI challenging. With this difficulty in cross-institutional comparison in mind, UNBC can instead be compared against its own track record.

By evaluating the information in Figure 3 and Table 3, one can see that laboratory buildings are the largest consumers of energy both in terms of total energy and BEPI. They account for 47% of UNBC's annual energy consumption, but only 21% of the total floor space. This high demand is a result of lab buildings operating 24 hours/day and conditioning 100% outdoor air – since recirculation of air is prohibited.

Despite its small footprint, the EFL traditionally has a very high BEPI as a result of significant heating requirements (year-round operating greenhouse) for the small space, and poor insulation due to the amount of single-pane glass. Energy efficiency measures continue to be implemented to improve this. Recent examples include the completion of a lighting upgrade in November 2019 and heating control valve installation in March 2022.

Table 3 – FY2024 Energy, Green House Gas (GHG), and Cost Intensity by Building

	Building Area	Annual Consumption	Annual Cost	Energy Intensity	GHG Intensity	Cost Intensity
	m^2	kWh/yr	$/yr	ekWh/ m^2/yr	kg $CO2_{eq}$/ m^2/yr	$/$m^2$/yr
Laboratories						
EFL	931	1,084,566	$93,180	1,165	49	$100
Medical	4,468	3,555,271	$126,170	796	29	$28
Research Lab	7,581	8,257,428	$203,603	1,089	45	$27
Teaching Lab	7,921	6,151,647	$197,897	777	29	$25
Subtotal	**20,901**	**19,048,912**	**$620,849**	**911**	**36**	**$30**
Industrial						
Bioenergy Plant	1,046	917,412	$67,141	877	64	$64
Power Plant	1,253	759,556	$60,216	606	8	$48
WIRL	921	112,916	$14,269	123	3	$15
Subtotal	**3,220**	**1,789,884**	**$141,626**	**556**	**25**	**$44**
Administrative						
Conference Centre	3,253	886,009	$40,288	272	12	$12
Agora	8,556	3,063,394	$97,707	358	15	$11
Teaching & Learning	10,130	2,709,451	$101,182	267	9	$10
Library	11,754	3,561,703	$93,396	303	12	$8
Terrace Campus	1,314	386,064	$36,305	294	33	$28
Childcare Centre	639	113,982	$9,756	178	7	$15

QRRC	812	553,328	$57,377	681	7	$71
Admin	9,161	2,163,814	$96,410	236	7	$11
Subtotal	**45,619**	**13,437,745**	**$532,420**	**295**	**12**	**$12**
Recreation/Accommodation/Other						
NSC	13,485	2,582,698	$182,752	192	20	$14
Residence 1	7,425	1,801,220	$153,897	243	10	$21
Residence 2	7,425	1,690,026	$144,331	228	10	$19
Maintenance Bldg	352	52,602	$8,631	149	33	$25
Subtotal	**28,687**	**6,126,545**	**$489,611**	**214**	**15**	**$17**
Total	**98,427**	**40,403,086**	**$1,784,506**	**410** [1]	**18** [2]	**$18** [3]

[1] This is an average Energy Intensity calculated via Total Annual Consumption divided by Total Building Area.

[2] This is an average GHG Intensity calculated via Total CO_2 Emissions divided by Total Building Area.

[3] This is an average Cost Intensity calculated via Total Annual Cost divided by Total Building Area.

In FY2024, the overall BEPI for UNBC decreased slightly to 410 kWh/m^2/yr from 424 kWh/m^2/yr in the previous year – a 3% decrease. This is despite the continued use of the Bioenergy Plant, which has a lower efficiency than the natural gas boilers. As a result of the continued use of the Bioenergy Plant, the GHG intensity did not increase compared to FY2023. Despite total energy usage reducing, total energy cost increased when compared to FY2023 due to increasing energy rates. However, the effect was lessened by using bioenergy, which has a lower cost than natural gas.

2.2. ENERGY MANAGEMENT BUDGET

Partial funding for the EM program at UNBC is provided by BC Hydro. Up to $60,000 of the Energy Manager salary is funded by BC Hydro's Energy Manager Program. In addition, UNBC regularly applies for incentive funding from BC Hydro to help implement electricity efficiency projects. UNBC also receives funding from the Ministry of Post-Secondary Education and Future Skills Carbon Neutral Capital Program (CNCP) to implement greenhouse gas reduction projects. The remainder of the project funding comes primarily from UNBC's Energy Conservation Revolving Loan Fund and Routine Capital funding.

2.2.1. 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 an energy reduction 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.

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 FY2024, the Loan Fund facilitated $2.98 million of spending towards energy efficiency projects. A summary of the Loan Fund cash flow can be seen in Figure 4. The implemented projects have saved roughly $4.65 million in utility costs, with net utility savings of approximately $2.5 million after loan repayments.

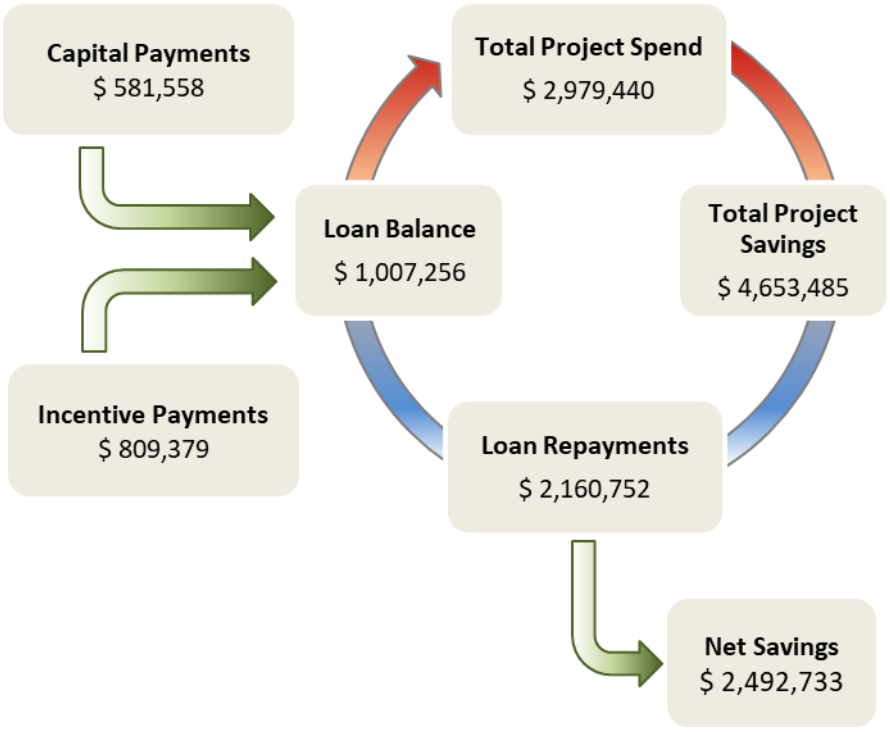

Figure 4 – Revolving Loan Summary at End of FY2024

2.3. ENERGY COMMITMENTS AND TARGETS

UNBC's Energy Policy sets a commitment for the university to continuously reduce energy consumption (electrical and thermal) and fossil fuel consumption every year. In partnership with BC Hydro, UNBC also sets annual electricity savings targets. In FY2024, this was 300,000 kWh and in FY2025, also 300,000 kWh. In addition, the 2025-2035 UNBC Sustainability Plan sets out an institutional target to reduce GHG emissions by 85% compared to 2007 baseline levels by 2035.

Compared to 2007 baseline levels, UNBC's GHG emissions have reduced by approximately 70% as of 2023, primarily due to the Bioenergy Plant offsetting the consumption of natural gas. This meets the 2030 BC provincial target of 40% reduction as set in the Climate Change Accountability Act. The longer term provincial reduction targets are 60% by 2040 and 80% by 2050. To help meet these targets, the Province also established 2030 emission reduction targets for four sectors, including "buildings and communities" set at 59-64%. UNBC has already met this sectoral target. To further reduce emissions, deep building retrofits, including envelope upgrades, are anticipated in the coming years, in addition to other initiatives like low carbon electrification and heat recovery.

UNBC commits to aggressive energy conservation through advanced technological and material improvement to all of our campuses. Furthermore, continued community engagement for our students, staff, and faculty will play a major role in knowledge sharing and empowering everyone to participate. Through the energy management program, and with BC Hydro's ongoing support, UNBC will endeavor to remain a responsible and accountable leader in sustainability.

3. ENERGY INITIATIVES

The energy management program keeps a detailed list of past and future conservation projects to meet its energy reduction targets. The list is updated and prioritized regularly to address the operational issues and requirements of the campuses from which they arise. In addition, projects

are planned and scheduled based on internal capacity and the availability of funding. A full list of completed and current projects and studies is included in the appendices.

The following sections of the report detail the multi-angled approach UNBC takes in energy management, as well as community engagement and training. There are many ways to affect change in an organization, so by tackling the issue of UNBC's resource consumption through various avenues, we give ourselves the greatest chance for success.

3.1. ENERGY WISE

UNBC is an active participant in the BC Hydro Energy Wise Network. As a network member we host an engagement campaign for our campus community each year, promoting energy use awareness and conservation. In FY2024, UNBC carried out an engagement campaign focused on reducing energy usage for space heating. The campaign used an online form where participants could pledge to lower their thermostat settings and provide feedback on space heating.

3.2. ENERGY MANAGEMENT ASSESSMENT (EMA)

UNBC completed its most recent Energy Management Assessment (EMA) on November 27, 2023. The EMA is typically carried out every two years and is designed to help evaluate the current state of an energy management program, identify gaps and opportunities for improvement, and establish the activities needed to reach a desired future state. This was UNBC's seventh EMA and was facilitated by CLEAResult. It was attended by representatives from BC Hydro and UNBC, including the UNBC Vice-President of Finance and Administration and Associate Vice-President of Administration. Overall, a rating of 94% was determined based on assessing each of the applicable areas shown in Figure 5.

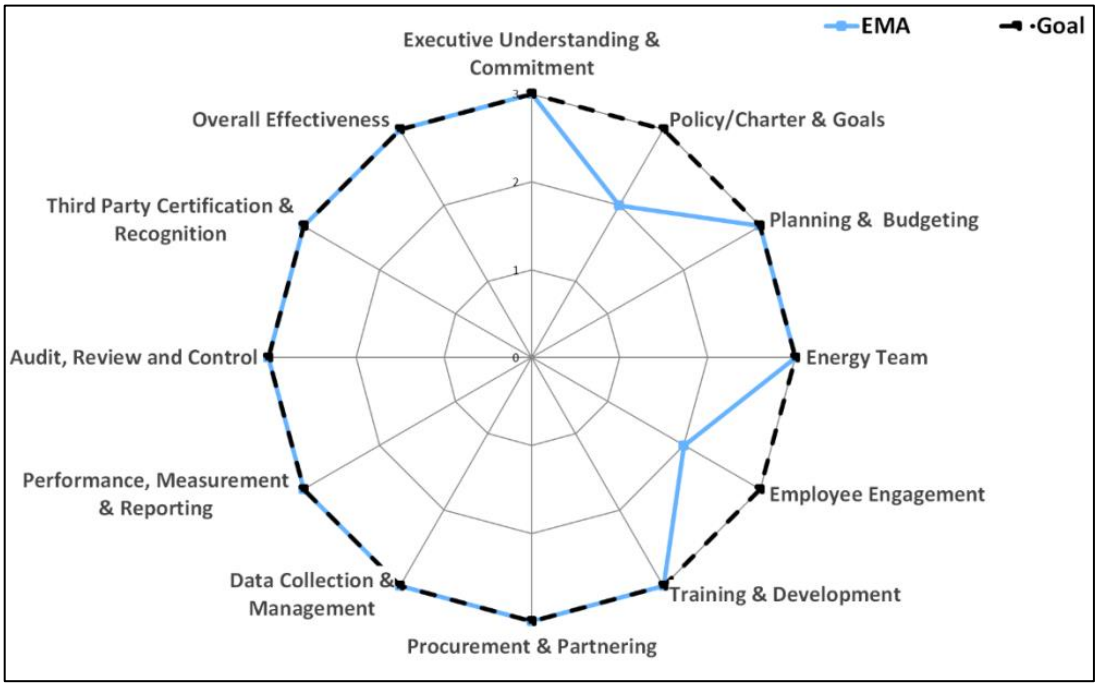

Figure 5 – 2023 Energy Management Assessment Analysis for UNBC

The rating of 94% was an improvement on the previous rating of 91% in 2021. There was an assessed improvement in the area of Executive Understanding and Commitment, but still room for improvement in the areas of Policy/Charter & Goals, as well as Employee Engagement.

Overall, it was found that UNBC has implemented a well-structured and energy conservation-oriented culture. There is strong support from senior leadership and a tight-knit team with demonstrated ability to implement projects and work cross-functionally with other departments. The EMA report also noted that UNBC has been proactive in implementing measures identified during the previous EMA to further improve the energy management program.

Various opportunities were identified that could potentially help to improve the energy management program. These mainly revolved around improving engagement of the university community. Potential suggested actions include integrating sustainability review into onboarding; establishing a recognition process for sustainability contributors; and utilizing different communication methods to reach a wider audience within the university. Since the renewal of the Sustainability Office in January 2024, many of these actions have already been implemented to improve engagement across campus.

3.3. CONTINUOUS OPTIMIZATION

UNBC enrolled in the BC Hydro Continuous Optimization (C.Op.) Program in 2012. At the outset of the program and with the help of Prism Engineering, 9 different buildings were identified on the Prince George campus as having significant energy and cost saving opportunities. A plan was developed to deliver upgrades and retrofits to key systems, equipment, and controls in each of the 9 buildings over 3 Phases, starting with the buildings that had the highest savings potential. We are referring to this as Round 1 of C.Op.

In FY2019, C.Op. Phase 3/Round 1 fully wrapped up with the completion of the Q4 Coaching Reports for the Conference/NUSC, Library, and Teaching & Learning buildings. The total savings were calculated to be approximately $140,000/year, as a result of these efforts for the 9 buildings in Round 1 of C.Op.

In FY2020, Round 2 of C.Op. was proposed by BC Hydro for customers who had gone through Round 1 and for whom it had been at least 5 years since the completion of the buildings in a given phase. As such, UNBC qualified to revisit the buildings that participated in Round 1, Phase 1. These buildings include Agora, Research Lab, and Teaching Lab. Investigations into the continued functionality of previously instituted measures, as well as any new possible measures, were completed in FY2021.

In FY2022, the second phase for Round 2 was successfully carried out. This included two buildings: the Northern Sport Centre and the Charles J. McCaffray Hall (Administration Building). The third phase of Round 2 was completed in FY2023. This included three buildings: the Conference Centre, Library, and Teaching and Learning building. The comparatively smaller Medical building was also put through a second round of C.Op. in FY2025, with significant new savings found, and so all buildings now that went through Round 1 have also completed Round 2. As in the case of Round 1, Round 2 consulting was provided by Prism Engineering, with guidance and collaboration from the UNBC EM team, thus providing continuity to the process.

3.4. LED LIGHTING RETROFITS

The Prince George campus continues to receive extensive lighting upgrades to replace linear fluorescent fixtures with new LED fixtures. The most recent upgrades took place in the Teaching Lab and Northern Sport Centre buildings in 2024. Lighting upgrades being planned for the future include the Teaching and Learning Centre and remaining sections of other buildings. Additionally, lighting continues to be upgraded as part of space renovations where applicable. In certain areas, networked lighting controls are also being implemented as part of the upgrades, to further improve energy savings.

3.5. HEAT EXCHANGER UPGRADES

Another energy efficiency initiative that UNBC is undertaking is a multi-year series of heat exchanger upgrade projects. In FY2022, a comprehensive upgrade was completed for the heat exchanger systems in the Dr. Donald Rix Northern Health Sciences Centre (Medical Building), following on from upgrades completed in previous years, including in the Power Plant, Charles J. McCaffray Hall (Administration Building), Teaching & Learning Centre, and the Conference and Northern University Student Centre. The main intent of these projects is to replace aging inefficient heat exchanger systems with newer more efficient systems. This entails replacing large inefficient plate-and-frame heat exchangers with smaller more efficient brazed plate heat exchangers. Additionally, this often involves replacing multiple large inefficient fixed speed pumps with fewer and smaller variable speed drive pumps. The redesigns can also include decoupling systems so that they can be run independently, such that equipment can be shut down when not needed. These optimizations, large and small, ultimately improve the efficiency of each system that is upgraded, thereby resulting in reduced energy consumption.

In FY2023, two heat exchanger systems were upgraded in the Agora building (rooms 7-004 and 7-165). Three additional Agora systems were upgraded in FY2024 (rooms 7-402, 7-405, and 7-408), with preliminary design work already underway for future upgrades in the Agora and Power Plant. Further similar upgrades in other buildings, including the energy intensive Research Laboratory, are planned to be completed in the coming years. One of the positive byproducts of the upgrades is that the temperature of the main district heating loop is anticipated to decrease, which should allow for more heat recovery opportunities.

3.6. LOW CARBON ELECTRIFICATION

The purpose of low carbon electrification (LCE) at UNBC is to decrease carbon emissions while still providing cost effective and efficient energy services to the campuses. Predominantly hydroelectrically generated electricity presents an opportunity to reduce the carbon intensity of heating demands if it is used as an enabler for low carbon heating. Merely converting heating loads from natural gas to electric resistive heating is neither cost effective nor sensible from an energy best use perspective.

UNBC has reduced its carbon emissions by approximately 70% compared to 2007 baseline levels, through adoption of two biomass heating systems. Although not intended as electrification initiatives, these have increased the electrical demand of the University by about 900,000 kWh annually.

The remaining carbon intensive energy services include heating at the NSC and Terrace campus, diesel for backup electricity generation, and the vehicle fleet.

Currently a number of small LCE projects are being worked on, primarily looking at using heat pumps for domestic hot water (DHW) heating. As an example, a hybrid heat pump hot water heater has been installed in the Agora to replace an existing ineffective heater that used glycol heated by the district heating system. Similar replacements are planned for other DHW heaters in the Agora. A more substantial DHW heat pump system is also being planned for the Northern Sport Centre, where gas-fired boilers are currently used. Additionally, a hybrid heat pump system with propane backup was installed at the standalone Maintenance Building to replace the previous propane-only furnace.

These comparatively small projects will help inform the planning and design of larger and more complex electrification projects in the future. One such example would be a full-scale implementation of an air source heat pump installation to reduce the natural gas consumption of the NSC by 90%. This would be coupled with aggressive heat recovery and conversion to hydronic heat distribution within the building to enable future incorporation of district heating, geo-exchange

or other renewable heating options. At present this project is cost-prohibitive; however, we anticipate additional work to revise the efficiency of the design and implementation. The goal of 90% reduction in natural gas consumption would equate to reducing gas consumption by about 5200 GJ/year and avoiding 258 t CO2e/yr.

3.7. FY2024

In FY2024, UNBC completed three significant projects that provided electricity savings. This included an LED lighting upgrade in the south area of the Teaching Lab building. In addition, a cooling coil was installed in the server room to offset the use of aging air conditioning units that had high power consumption. The coil is supplied with chilled water from the district cooling system and is used when the ambient outside air temperature is too high for free cooling. The existing two district cooling centrifugal chillers were also outfitted with new variable speed drives known as Adaptive Frequency Drives (AFDs) to provide better energy efficiency and help prolong equipment life. A fourth project was also completed in the previous fiscal year but with energy savings evaluated for FY2024. These savings are related to pump upgrades that were part of the heat exchanger system upgrades completed in Agora rooms 7-004 and 7-165.

Table 4 – FY2024 Project List

Project	Electricity Savings	Project Cost	Cost Savings	Payback
	(kWh/y)	($)	($/yr)	(y)
Teaching Lab South LED Lighting Upgrade	21,142	97,000	1,258	77
Server Room Cooling Coil Upgrade	47,353	30,000	2,818	11
Adaptive Frequency Drive (AFD) Upgrade for Chillers	40,619	710,000	2,417	294
Agora Pump Upgrades (7-004 and 7-165)	9,736	150,000	579	259
Subtotal	118,850	987,000	7,072	140

Note: cost savings and payback are for electricity savings only. Other economic impacts such as avoided maintenance, equipment replacement, and equipment failure costs are not factored into this calculation.

3.8. FY2025

Table 5 shows various projects implemented in FY2025 for electricity savings. This included LED lighting upgrades for the remainder of the Teaching Lab building, and for the basketball and squash courts in the Northern Sport Centre. A second round of Continuous Optimization was also completed for the Medical building, which was the remaining building that had not gone through a second round yet.

Table 5 – FY2025 Project List

Project	Electricity Savings	Project Cost	Cost Savings	Payback
	(kWh/y)	($)	($)	(y)
Teaching Lab North LED Lighting Upgrade	116,661	525,000	7,081	74
NSC Basketball and Squash Courts LED Lighting Upgrade	149,307	130,780	9,063	14
C.Op. Round 2 - Medical Building	178,035	6,404	13,455	0.5
Subtotal	444,003	662,184	29,599	22

Note: cost savings and payback are for electricity savings only. Other economic impacts such as avoided maintenance, equipment replacement, and equipment failure costs are not factored into this calculation.

3.9. FY2026

Table 6 shows various projects being planned for implementation in FY2026 for electricity savings. This includes a major LED lighting upgrade for the Teaching and Learning Centre. Coil cleaning for air handling units across campus is also planned to reduce fan energy usage. In addition, a number of upgrades are planned for the district cooling system, including commissioning of a new fluid cooler and installation of variable speed drives on the chilled water pumps.

Other energy related infrastructure projects being planned for FY2026 include the removal or upgrade of the heat exchanger connecting the Bioenergy Plant and Power Plant; replacement of flow meters; installation of a capacitance bank at the WIRL building; as well as smaller lighting and mechanical system upgrades. In addition, UNBC will be looking into rolling out more demand response measures, similar to those successfully implemented at the Northern Sport Centre. In FY2026, it is also expected that the first phase of the BC Hydro EV Charging Hub at the Northern Sport Centre will be completed.

Other long-term projects being considered include flue-gas heat recovery for the Bioenergy Plant, cooling tower replacement or upgrade, campus heat balancing, building envelope upgrades, a LCE retrofit of the Northern Sport Centre, and further heat exchanger upgrades.

Table 6 – FY2026 Project List

Project	Electricity Savings	Project Cost	Cost Savings	Payback
	(kWh/y)	($)	($)	(y)
Teaching and Learning Centre LED Lighting Upgrade	120,000	500,000	7,284	68
Coil Cleaning	100,000	30,000	6,070	5
District Cooling System Upgrades	100,000	100,000	6,070	16
Subtotal	320,000	630,000	19,424	32

Note: cost savings and payback are for electricity savings only. Other economic impacts such as avoided maintenance, equipment replacement, and equipment failure costs are not factored into this calculation.

4. ENERGY PERFORMANCE

To assess energy performance, we compare monthly energy consumption for each utility account to a FY2010 baseline. Baselines were developed comparing the FY2010 utility data to the degrees of heating and/or degrees of cooling required based on the outdoor air temperature. Outdoor air temperature is the largest driver of energy consumption at UNBC. Occupancy is a driver for the two Residence buildings but has proven to be less significant for the other buildings.

Figure 6 shows the annual energy intensities compared to the FY2010 baseline intensity which corrects for variations in weather. Overall, UNBC has achieved a 17% reduction in energy use compared to the FY2010 baseline. Figure 6 also shows how UNBC has reduced its natural gas consumption by 70% compared to the FY2010 baseline. The natural gas reduction started in FY2011 when the 4.4 MW Bioenergy Plant was commissioned and started providing heat to the Prince George Campus. The Bioenergy Plant now meets, on average, 85% of the annual heating requirements of the buildings connected to the main district heating loop.

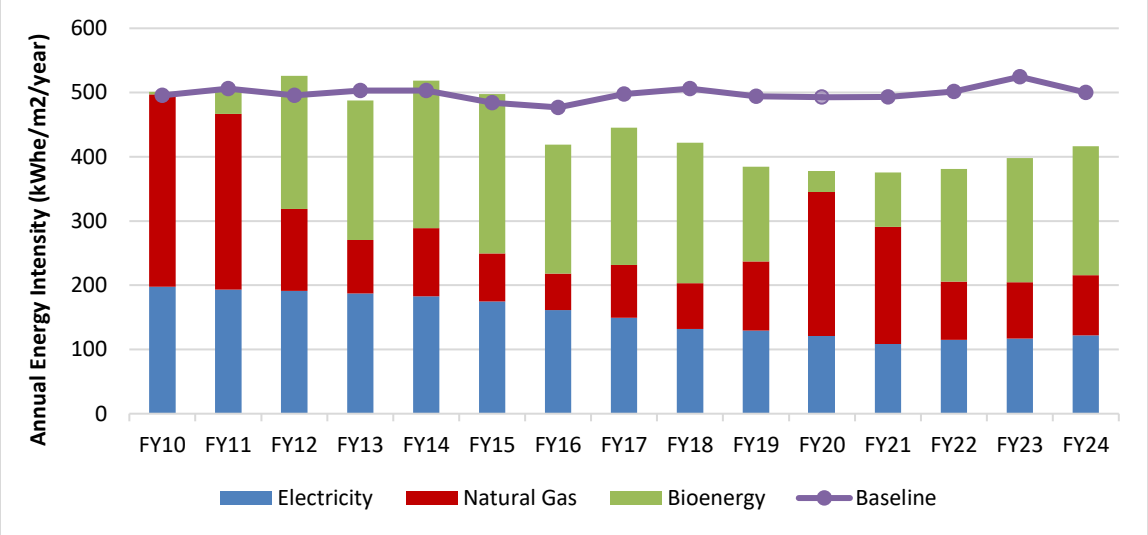

Figure 6 - Historical Energy Intensity by Financial Year

In FY2017, the Low-temp DH loop, anchored by the Wood Pellet Plant, was commissioned, displacing natural gas at the Neyoh Residence and the EFL greenhouse. In FY2018, the Keyoh Residence and Daycare centre were converted to hot water systems and connected to the Low-temp DH system.

By the end of FY2024, UNBC has seen an absolute reduction of 14% in utility costs since FY2010, as shown in Figure 7. When compared to the baseline, the cost reduction is 40%.

One of the core reasons for utility cost reduction has been the Bioenergy Plant. Hog fuel used by the Bioenergy Plant is lower in cost than natural gas. In more recent years, the lower-than-baseline energy costs can also be traced to two factors: (i) UNBC started purchasing natural gas for its two largest accounts from Shell Canada in FY2015, lowering the marginal rate on both, and (ii) there has been an extensive effort to reduce natural gas consumption through recommissioning building automation systems and various other energy management projects. The significant increase in natural gas prices is reflected in the noticeable rise in the baseline trend shown in Figure 7.

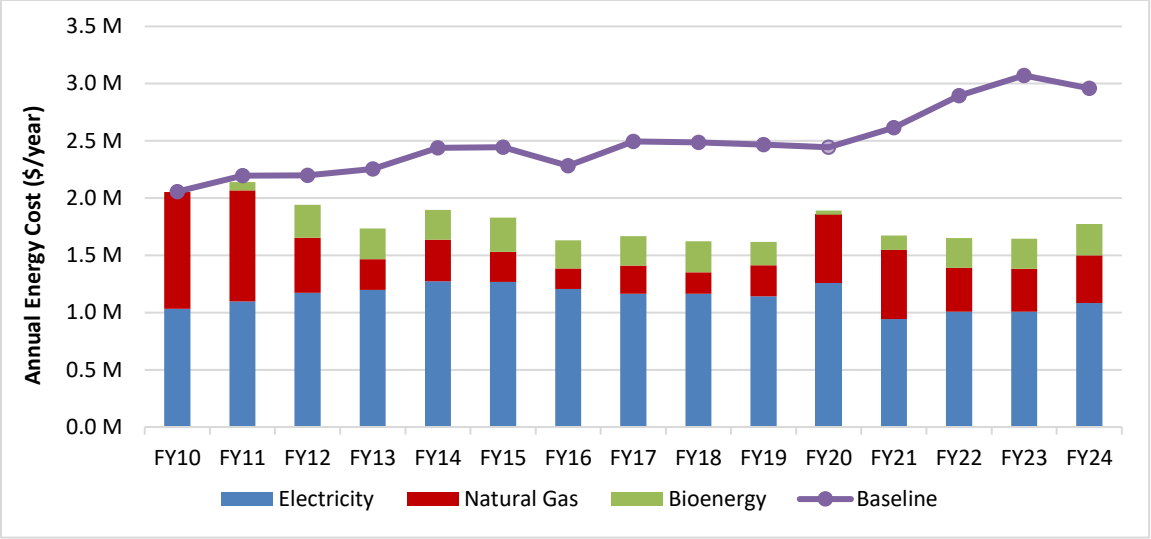

Figure 7 - Historical Energy Cost by Financial Year

4.1. ELECTRICITY SAVINGS

UNBC has reduced electricity consumption by 40% from the FY2010 baseline, as shown in Figure 8, equivalent to over $600,000 in annual savings. Consumption in FY2024 was 6% lower than in FY2019, the last financial year before the COVID-19 pandemic. As shown in Figure 8, our collective efforts on energy efficiency and conservation have resulted in the avoided purchase of $5.9 million worth of electricity since 2010.

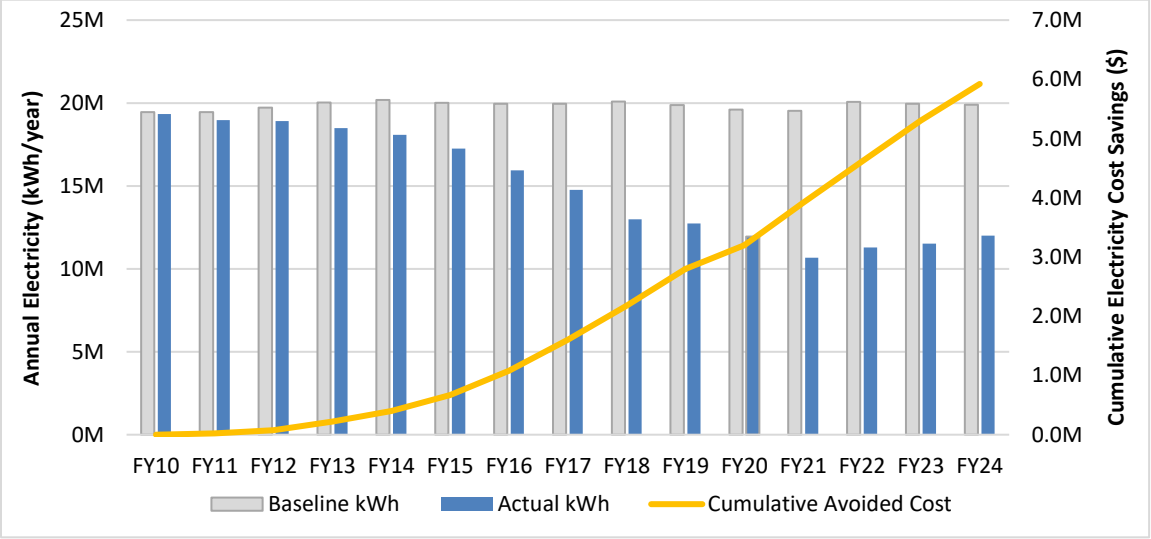

Figure 8 - Historical Electricity Consumption by Financial Year

4.2. HEAT SAVINGS

Since FY2010, UNBC has reduced natural gas consumption by 70% through the conversion to bioenergy on the Prince George Campus. However, with the start-up of the Bioenergy Plant the total purchased heat increased slightly as seen in Figure 9. The term *purchased heat* refers to the energy content of the purchased natural gas, hog fuel and wood pellets used to produce heat. Note an energy density of 18.8 GJ/bdt is used to calculate energy content of wood biofuel.

The reason for an increase in purchased heat is due to the difference in efficiencies between the Bioenergy Plant and the natural gas boilers. In FY2010, the natural gas boilers provided all of the heat to the Main DH loop, and ran relatively efficiently. As bioenergy has replaced the use of the natural gas boilers, when the boilers are needed as back-up, they operate at a lower firing rate resulting in a lower efficiency. In addition, the efficiency of the Bioenergy Plant is slightly lower than that of the natural gas boilers at full capacity, and can vary widely depending on the moisture content of the fuel, the time between boiler cleanings, and operator interventions.

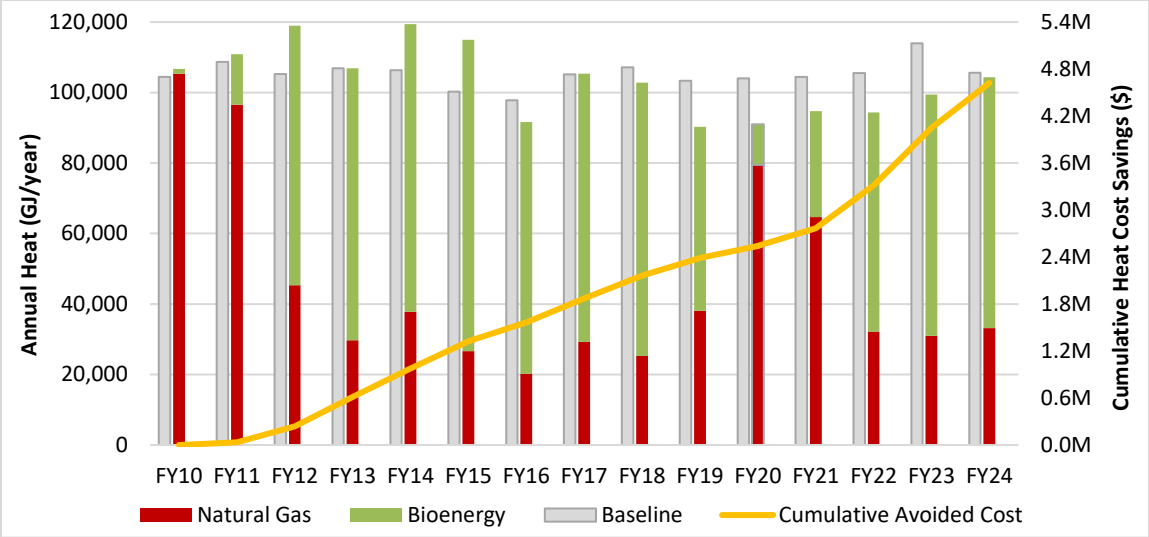

Figure 9 - Historical Heat Consumption by Financial Year

Comparing FY2024 to FY2012 when the Bioenergy Plant came fully online, we have seen a 12% decrease in purchased heat, equivalent to roughly 14,650 GJ. As a result of continued use of the Bioenergy Plant in FY2024, natural gas consumption reduced by 58% when compared to FY2020. This shows that the Bioenergy Plant has now returned to more stable operation after the major maintenance downtime a few years ago when the boiler had to be replaced.

In summary, the Bioenergy Plant has enabled UNBC to cut heating costs by over $4.6 million since it was commissioned. The hog fuel used by the Bioenergy Plant is roughly 36% of the cost of natural gas per unit of energy and therefore still more economically viable than natural gas. As can be seen in Figure 9, the recent significant increase in natural gas prices has in turn led to a sharp rise in cumulative savings, since we are able to use bioenergy for most of our heating needs instead of natural gas.

As the EM program continues to identify and deliver savings and efficiency improvements to our natural gas and bioenergy heating systems, we will continue to see the cumulative savings grow.

5. SUMMARY

Over the past 15 years, the UNBC EM program has brought in $1,693,500 in incentives, $944,400 in salary reimbursements, and has implemented 6.94 million kWh/yr worth of electricity conservation projects and 10,600 GJ/yr worth of natural gas conservation projects. When these savings are added to those attributed to the Bioenergy and Wood Pellet Plants, UNBC has saved a total of $10,545,000 in utility costs.

Figure 10 shows the breakdown of the $13,183,000 value of UNBC's Energy Management program and funding partnerships with BC Hydro, Fortis BC, and the Carbon Neutral Capital Program.

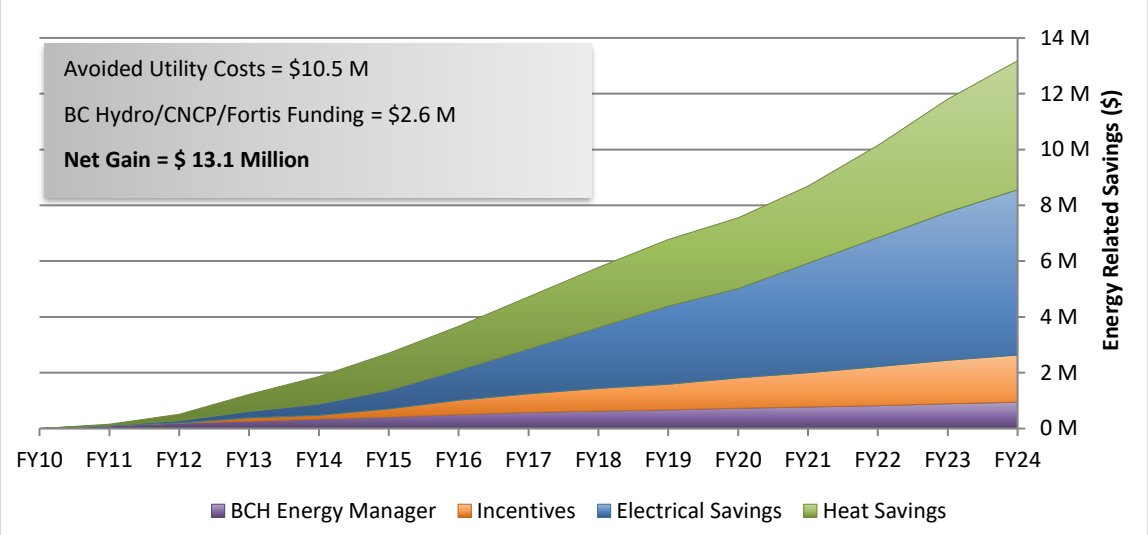

Figure 10 - Energy Management and Utility Savings

APPENDIX A – COMPLETED PROJECT LIST

	Project	Campus	BC Hydro Project Number	Electricity Savings (kWh/y)	Electricity Demand Savings (kW/month)	Natural Gas Savings (GJ/y)	District Heat Savings (GJ/y)	Cost ($)	BC Hydro Incentive ($)	Fortis Incentive ($)	CNCP Funding ($)	Revolving Loan Contribution ($)	Total Savings Last year ($)	Total Savings to-date ($)	Completion Date
1	Canfor Theatre Lighting (Round 1)	Main	-	3700	1	0	0	6000	0	0	0	0	401	3667	10-Aug
2	Terrace Boiler Replacement	Terrace	-	0	0	300	0	45000	0	0	0	0	5219	49885	10-Oct
3	Green Centre Lighting	Main	-	1240	0	0	0	640	0	0	0	0	135	1212	11-Jan
4	Wintergarden Lights	Main	-	2630	1	0	0	640	0	0	0	0	245	2234	11-Jan
5	Agora North Entrance Lighting	Main	PSPX110586	999	0	0	0	476	218	0	0	0	60	568	11-Apr
6	Rotunda Gallery Lighting	Main	PSPX110587	5931	1	0	0	1987	1165	0	0	0	553	4954	11-May
7	Rotunda Gallery Ramp Lighting	Main	PSPX111364	2475	1	0	0	774	390	0	0	0	231	2068	11-May
8	Admin Chiller for electrical vault	Main	-	98600	11	0	0	70000	0	0	0	0	7569	66917	12-Mar
9	T&L Daylight Harvesting	Main	-	9519	2	0	0	0	0	0	0	0	862	7442	12-Mar
10	Medical AV free cooling	Main	-	22950	3	0	0	11000	0	0	0	0	1762	15464	12-Apr
11	NUSC Event Space	Main	PSPX110510	11344	7	0	0	6090	2474	0	0	6090	1710	13650	12-Jun
12	NSC Soccer Field and Gym	NSC	SUCH12-1103	182000	56	0	0	135188	41160	0	0	0	19533	157886	12-Sep
13	Agora Daylight Harvesting	Main	-	24600	6	0	0	0		0	0	0	2295	17473	13-Jun
14	Admin Daylight Harvesting	Main	-	33000	8	0	0	0		0	0	0	3079	23218	13-Jul
15	Workplace Conservation Campaign	Main	BCH-02090	304636	0	0	0	5311	4935	0	0	0	33641	140212	16-Jan
16	Workplace Conservation Campaign	NSC	BCH-02090	32222	0	0	0	0	0	0	0	0	3612	15055	16-Jan
17	Workplace Conservation Campaign	QRRC	BCH-02090	4303	0	0	0	0	0	0	0	0	480	2000	16-Jan
18	Workplace Conservation Campaign	Terrace	BCH-02090	2821	0	0	0	0	0	0	0	0	325	1353	16-Jan
19	Workplace Conservation Campaign	Bio	BCH-02090	13240	0	0	0	0	0	0	0	0	1484	6186	16-Jan
20	NSC C.Op	NSC	BCH-03368	-	0	-	0	27028	0	0	0	22702	-	288266	16-Mar
21	Energy Wise FY2017	Main	BCH-03654	0	0	0	0	270	267	0	0	0	0	0	16-Apr
22	Terrace exterior lighting (PSPX)	Terrace	PSPX111693	504	0	0	0	162	77	0	0	162	53	212	16-Apr
23	BMO Boiler Replacement	BMO	-	0	0	0	0	0	0	4050	0	0	0	0	16-Oct
24	Daycare Heating System conversion	DC	-	0	0	400	-400	-	0	0	0	0	243	972	17-Aug
25	Power Plant Boiler Bypass/DHW Tank	Main	-	0	0	0		98184	0	0	0	0	2800	16094	17-Sep
26	Residence Lighting	Main	SUCH11-965	284000	0	0	0	61547	24090	0	0	61547	15947	183502	12-May
27	Residence Lighting	Main	PSPX112054	14414	0	0	0	17216	3208	0	0	17216	9048	104117	12-Jul
28	Thirsty Moose Lighting	Main	PSPX101130	6034	2	0	0	2311	1412	0	0	0	0	5478	11-Sep
29	Bookstore/Cafeteria Lighting	Main	PSPX100434	20796	7	0	0	6684	3258	0	0	6684	1959	22542	11-Dec
30	Terrace Campus lighting upgrade	Terrace	PSPX153073	16599	0	0	0	14805	3994	0	0	14396	1489	16762	12-Jun
31	NUSC Event Space (Round 1)	Main	PSPX111455	960	1	0	0	402	160	0	0	0	1069	12030	11-May
32	Lecture Theatre Lighting	Main	PSPX113112	78705	26	0	0	22811	11988	0	0	22811	7414	83159	12-Jun
33	EFL Cold Storage Lighting	Main	PSPX130081	1181	0	0	0	578	139	0	0	0	111	1187	13-Jan
34	QRRC Lighting Upgrade	QRRC	PSPX112392	7752	3	0	0	5129	1258	0	0	5129	741	7787	13-Mar
35	Coil Cleaning	Main	SUCH12-1077	195000	39	0	0	23523	9684	0	0	23523	0	92751	12-Aug

	Project	Campus	BC Hydro Project Number	Electricity Savings (kWh/y)	Electricity Demand Savings (kW/month)	Natural Gas Savings (GJ/y)	District Heat Savings (GJ/y)	Cost ($)	BC Hydro Incentive ($)	Fortis Incentive ($)	CNCP Funding ($)	Revolving Loan Contribution ($)	Total Savings Last year ($)	Total Savings to-date ($)	Completion Date
36	Canfor/Warehouse	Main	SUCH12-1112	99000	22	0	0	53046	21214	0	0	0	9302	100286	12-Dec
37	Exterior Lighting - globes	Main	BCH-00377	66000	0	0	0	106629	18152	0	0	42936	6310	63632	13-Nov
38	Teach Lab Pot lights/Agora exterior	Main	BCH-01166	59000	13	0	0	26433	2935	0	0	26433	7464	70038	15-Feb
39	Teaching Lab Penthouse Lighting	Main	PSPX142369	1022	0	0	0	781	105	0	0	781	79	687	15-Feb
40	Reef Tank Lighting	Main	-	2300	0	0	0	1664	0	0	0	700	191	1658	15-Feb
41	Teaching Lab C.Op	Main	BCH-02088	-	0	0	-	72290	0	0	0	72290	-	219048	15-May
42	Research Lab C.Op	Main	BCH-02086	-	0	0	-	58598	0	0	0	58598	-	126452	15-May
43	Agora C.Op	Main	BCH-02087	-	0	0	-	59694	0	0	0	59694	-	124701	15-May
44	Medical Humidifier	Main	BCH-01716	476000	66	0	-280	151240	74941	0	0	151240	47185	401270	15-Feb
45	Power Plant AHU controls	Main	-	40000	6	450	0	68430	0	25811	48661	19769	6708	57615	15-Mar
46	Conference Solar PV	Main	-	5000	5	0	0	30287	0	0	0	5986	400	3234	15-Sep
47	Main campus streetlights/wall packs	Main	BCH-02693	167000	0	0	0	164188	45160	0	44700	118107	13360	104684	16-Jan
48	NSC Exterior lighting	NSC	BCH-02694	86000	0	0	0	60027	20717	0	0	60027	6880	53909	16-Jan
49	Terrace Exterior Lighting	Terrace	-	4896	0	0	0	9073	0	0	0	1811	432	3241	16-Apr
50	Main campus wall packs	Main	BCH-03047	53000	0	0	0	20411	8073	0	0	10515	4240	30389	16-Aug
51	Neyoh Heating System Conversion	Main	Program Enabled	386700	69	3000	-4500	500000	0	0	0	100000	0	24938	16-Aug
52	Neyoh Heating System Conversion	Bio	Program Enabled	-37200	-4	0	0	0	0	0	0	0	-2870	-11480	16-Aug
53	Conf/NUSC Air Handler HW conversion	Main	-	0	0	846	-816	6368	0	0	6368	0	1774	13750	16-Jan
54	Residence Low-flow showerheads	Main	-	0	0	1400	0	696	0	0	0	696	0	45567	13-Jul
55	Corner Store Reno	Main	PSPX153444	1230	0	0	0	2047	333	0	0	0	98	705	16-Aug
56	Admin Lighting Upgrade	Main	Program Enabled	118000	17	0	0	103498	0	0	40952	0	8260	54403	17-Mar
57	Library Lighting -1st Floor	Main	BCH-04148	139000	46	0	0	70409	20013	0	35385	33242	9764	60214	17-Aug
58	Conf/NUSC Lighting	Main	BCH-04149	69000	12	0	0	52659	10768	0	29978	20354	5294	32648	17-Aug
59	D.C./Research Lab/PP Highbays	Main	BCH-04147	81000	14	0	0	36040	11394	0	0	12826	5670	33178	18-Jan
60	Soccer Field lighting controls	NSC	BCH-04240	55000	3	0	0	28288	8119	0	0	28288	3850	22773	17-Oct
61	Power Plant/Utilidor Lighting	Main	BCH-04146	94000	11	0	0	34718	9612	0	0	15699	6580	37821	18-Jan
62	Recycling Room Lighting	Main	PSPX170052	1030	0	0	0	878	0	0	0	504	72	414	18-Feb
63	Keyoh Heating System conversion	Res	BCH-04873	366000	67	2000	-3500	100000	0	0	0	0	17606	108578	18-Jun
64	Library - Wavelinks Lighting	Main	BCH-04866	122000	47	0	0	195000	21713	0	65385	173287	6935	35969	19-Jan
65	Library - Medical Lighting	Main	BCH-04867	64000	31	0	0	77000	11517	0	0	65483	13665	64396	18-Jul
66	Agora Lighting	Main	BCH-05420	135000	65	0	0	279000	23522	0	32692	222786	11452	45809	20-Feb
67	Research Lab Lighting	Main	BCH-05431	187000	82	0	0	395000	59734	0	32693	302573	17874	71495	20-Feb
68	Admin Lighting	Main	BCH-05405	71000	28	0	0	119500	12603	0	0	106897	4908	19632	20-Feb
69	EFL Lighting	Main	BCH-05406	77000	15	0	0	60000	13950	0	0	46050	4043	16172	20-Feb
70	Medical C.Op	Main	BCH-02089	48000	0	0	207	1284	0	0	0	0	8779	66599	16-Mar
71	Admin C.Op	Main	BCH-03370	-	0	0	-	-13627	0	0	0	5119	-	94924	16-Mar
72	Conf/NUSC C.Op	Main	BCH-04062	-	0	0	-	12542	0	0	0	4838	-	62269	17-Sep

	Project	Campus	BC Hydro Project Number	Electricity Savings (kWh/y)	Electricity Demand Savings (kW/month)	Natural Gas Savings (GJ/y)	District Heat Savings (GJ/y)	Cost ($)	BC Hydro Incentive ($)	Fortis Incentive ($)	CNCP Funding ($)	Revolving Loan Contribution ($)	Total Savings Last year ($)	Total Savings to-date ($)	Completion Date
73	Library C.Op	Main	BCH-04061	-	0	0	-	31479	0	0	0	12303	-	231148	17-Sep
74	T&L C.Op	Main	BCH-04063	-	0	0	-	34700	0	0	0	20128	-	123495	17-Sep
75	Server Room HVAC - free cooling	Main	BCH-04865	111000	8	0	0	70672	20654	0	35385	49346	10340	31020	20-Sep
76	Primary Heating Loop - SPR	Main	-	35000	tbd	0	0	2000	0	0	0	2000	3150	9450	20-Jul
77	Bioenergy Plant Lighting	Main	-	9700	tbd	0	0	3000	0	0	0	3000	620	1860	21-Mar
78	C.Op Round 2 - Agora	Main	BCH-06549	251744	0	0	1438	1200	11050	0	10000	1200	32468	97406	21-Mar
79	C.Op Round 2 – Research Lab	Main	BCH-06378	319661	0	0	1196	23900	12050	0	10000	23900	44341	133023	21-Mar
80	C.Op Round 2 – Teaching Lab	Main	BCH-06550	512332	0	0	3423	117500	12300	0	10000	117500	82414	247242	21-Mar
81	Air Handling Unit – coil cleaning	Main	-	-	-	0	0	25000	0	0	0	25000	-	-	20-Oct
82	C.Op Round 2 - NSC	Main	BCH-07265	409825	11	2217	0	3100	21700	-	0	3100	63398	126796	22-Mar
83	C.Op Round 2 - Admin Building	Main	BCH-07266	132029	2	0	817	6300	14700	-	0	6300	16811	33622	22-Mar
84	C.Op Round 2 - Conference Centre	Main	BCH-08046	82665	0	0	1793	9300	5200	-	0	9300	14202	28404	23-Mar
85	C.Op Round 2 - Library	Main	BCH-08047	393639	18	0	2446	4200	17000	-	0	4200	36618	73236	23-Mar
86	C.Op Round 2 - T&L Building	Main	BCH-08048	149224	14	0	1859	4900	14700	-	0	4900	19214	38428	23-Mar
87	Teaching Lab South Lighting Upgrade	Main	-	21142	-	-	-	97000	-	-	75385	-	1258	1258	24-Mar
88	Server Room Cooling Coil Upgrade	Main	-	47353	-	-	-	30000	-	-	-	-	2818	2818	24-Mar
89	AFD Upgrade for Chillers	Main	-	40619	-	-	-	710000	-	-	-	-	2417	2417	24-Mar
90	Agora Pump Upgrades (7-004 & 7-165)	Main	-	9736	-	-	-	150000	-	-	-	-	579	579	24-Mar
	Total			**6,944,802**	**844**	**10,613**	**3,683**	**$4,832,098**	**$633,806**	**$29,861**	**$477,584**	**$2,229,966**	**$681,025**	**$4,810,120**	

APPENDIX B – FY2025 PROJECTS

	Project	Campus	BC Hydro Project Number	Estimated Electricity Savings (kWh/y)	Estimated Electricity Demand Savings (kW/month)	Estimated Natural Gas Savings (GJ/y)	Estimated District Heat Savings (GJ/y)	Budget Cost ($)	BC Hydro Incentive ($)	Fortis Incentive ($)	CNCP Funding ($)	Revolving Loan Contribution ($)	Anticipated Cost Savings ($/yr)	Payback (y)	Expected Completion Date
91	Teaching Lab North LED Lighting Upgrade	Main		116661				525000			130770	314230	7081	74	25-Mar
92	NSC Basketball and Squash Courts LED Lighting Upgrade	Main		149307				130780				130780	9063	14	25-Mar
93	C.Op. Round 2 - Medical Building	Main	BCH-11336	178035		502		6404	6300				13455	0	25-Mar
	Total			**444,003**	**0**	**502**	**0**	**$ 662,184**	**$ 6,300**	**$ -**	**$ 130,770**	**$ 445,010**	**$ 29,599**	**22**	

Note: cost savings and payback are for electricity savings only. Other economic impacts such as avoided maintenance, equipment replacement, and equipment failure costs are not factored into this calculation.

APPENDIX C – FY2026 PROJECTS

	Project	Campus	BC Hydro Project Number	Estimated Electricity Savings (kWh/y)	Estimated Electricity Demand Savings (kW/month)	Estimated Natural Gas Savings (GJ/y)	Estimated District Heat Savings (GJ/y)	Budget Cost ($)	Expected BC Hydro Incentive ($)	Fortis Incentive ($)	CNCP Funding ($)	Revolving Loan Contribution ($)	Expected Annual Utility Savings ($/y)	Payback (y)	Expected Completion Date
94	Teaching and Learning Centre LED Lighting Upgrade	Main		120000				500000					7284	69	26-Mar
95	Coil Cleaning	Main		100000				30000					6070	5	26-Mar
96	District Cooling System Upgrades	Main		100000				100000					6070	16	26-Mar
	Total			**320,000**	**0**	**0**	**0**	**$630,000**	**$0**	**$0**	**$0**	**$0**	**$19,424**	**32**	

Note: cost savings and payback are for electricity savings only. Other economic impacts such as avoided maintenance, equipment replacement, and equipment failure costs are not factored into this calculation.

APPENDIX D – COMPLETED STUDIES

	Study	Campus	BC Hydro Project Number	Cost ($)	BC Hydro Incentive ($)	Revolving Loan Contribution ($)	CNCP Funding ($)	Completion Date
1	Renewable energy study	Main	-	5,000	0	0	0	11-Sep
2	Ice Mountain study	Main	-	0	0	0	0	11-Nov
3	Anaerobic Digester study (ENVS417)	Main	-	0	0	0	0	12-Dec
4	Medical Humidifier study (PHYS402)	Main	-	0	0	0	0	12-Dec
5	Lab Heat Recovery study (ENSC499)	Main	-	0	0	0	0	13-Apr
6	C.Op Investigation - Research Lab	Main	COP10-416	16,028	15,768	16,028	0	13-Oct
7	C.Op Investigation - Agora	Main	COP10-419	15,891	15,587	15,891	0	13-Oct
8	C.Op Investigation - Teaching Lab	Main	COP10-420	16,442	16,175	16,442	0	13-Oct
9	C.Op Investigation - Medical	Main	COP10-421	12,922	12,713	12,922	0	13-Oct
10	C.Op Investigation - Admin	Main	COP10-415	18,418	18,119	18,418	0	14-Aug
11	C.Op Investigation - NSC	NSC	COP10-414	20,665	20,330	20,665	0	14-Aug
12	C.Op Handoff - Research Lab	Main	COP10-416	2,643	2,600	2,643	0	15-Jul
13	C.Op Handoff - Agora	Main	COP10-419	2,562	2,520	2,562	0	15-Jul
14	C.Op Handoff - Teaching Lab	Main	COP10-420	2,562	2,520	2,562	0	15-Jul
15	Bioenergy Heat Recovery study (ENVS417)	Main	-	0	0	0	0	15-Dec
16	C.Op Investigation - Library	Main	COP10-417	19,740	19,420	19,740	0	16-May
17	C.Op Investigation - Conference/NUSC	Main	COP10-418	11,482	11,295	11,482	0	16-May
18	C.Op Investigation - T&L	Main	COP10-422	14,861	14,620	14,861	0	16-May
19	C.Op Handoff - Medical	Main	COP10-421	4,361	4,290	4,361	0	16-Jul
20	C.Op Handoff - Admin	Main	COP10-415	2,767	2,723	2,767	0	16-Jul
21	C.Op Handoff - NSC	NSC	COP10-414	2,863	2,817	2,863	0	16-Jul
22	C.Op Coaching - Research Lab	Main	COP10-416	3,384	3,329	3,384	0	16-Nov
23	C.Op Coaching - Agora	Main	COP10-419	8,484	4,312	8,484	0	16-Nov
24	C.Op Coaching - Teaching Lab	Main	COP10-420	6,616	4,308	6,616	0	16-Nov
25	Boiler Power/Plant Controls Study	Main	-	24,433	0	0	24,433	17-Mar

	Study	Campus	BC Hydro Project Number	Cost ($)	BC Hydro Incentive ($)	Revolving Loan Contribution ($)	CNCP Funding ($)	Completion Date
26	C.Op Handoff - Library	Main	COP10-417	4,792	4,714	4,792	0	17-Aug
27	C.Op Handoff - Conference/NUSC	Main	COP10-418	2,858	2,811	2,858	0	17-Aug
28	C.Op Handoff - T&L	Main	COP10-422	3,615	3,556	3,615	0	17-Aug
29	C.Op Coaching - NSC	NSC	COP10-414	5,578	5,488	5,578	0	17-Dec
30	C.Op Coaching - Admin	Main	COP10-415	4,023	3,958	4,023	0	17-Dec
31	C.Op Coaching - Medical	Main	COP10-421	1,799	1,770	1,799	0	17-Dec
32	C.Op Coaching - Library	Main	COP10-417	4,396	4,325	4,396	0	18-Aug
33	C.Op Coaching - Conference/NUSC	Main	COP10-418	3,507	3,450	3,507	0	18-Aug
34	C.Op Coaching - T&L	Main	COP10-422	3,507	3,450	3,507	0	18-Aug
35	Cooling Tower Review	Main	BCH-04450	11,690	1928	0	11,690	18-Mar
36	EFL Optimization	Main	BCH-04450	11,385	1928	11,385	0	18-Mar
37	NSC Heat Pump	Main	BCH-05207	10900	5451	5449	0	19-Jul
	Total			**$ 280,174**	**$ 216,275**	**$ 233,600**	**$ 36,123**	

APPENDIX E – COMMERCIAL ENERGY MANAGER LCE PROJECT FORECAST

Sector	Public or Private	Customer Name	Region	Description of Measure	Standard LCE Measure Name	New or Retrofit	Electrical Consumption (kWh/y)		Average Monthly Demand (kW)			Nat Gas Consumption (GJ/yr)		GHG Reduction	Annual Cost Saving $						Total Capital Cost	Incremental relative to Baseline	Non Energy Benefits	Measured Life/Persistence	Payback
							Current	Incremental (+/-)	Current	Incremental (+/-)	Months	Current	Incremental (+/-)	Tonnes CO2e/yr	Electric	Demand	Gas	Maintenance or others savings (annual)	GHG Offsetting Costs	TOTAL	$	$	(eg thermal comfort, noise reduction, air quality etc.)	In years	In years
Education - Adv	Public	UNBC	North	Pilot project - heat pump on Northern Sports Centre	HVAC Air-to-Air Heat Pump (ductless or minisplit)	Retrofit	1,182,600	140,000	228	16	6	6,032	-1500	-73	$ 7,784	$ 1,076	-$ 11,145	$ -	-$ 1,833	-$ 4,118	$ 72,000	$ 72,000		18	17.5
Education - Adv	Public	UNBC	North	Northern Sports Centre Low Carbon Heating Conversion	HVAC Air-to-Air Heat Pump (ductless or minisplit)	Retrofit	1,182,600	130,000	228	40	6	6,032	-5200	-258	$ 7,228	$ 2,690	-$ 38,636	$ -	-$ 6,448	-$ 35,166	$ 1,472,000	$ 1,472,000		18	41.9
Education - Adv	Public	UNBC	North	Northern Sports Centre - DHW Heat Pump System	DHW Air-to-Water Heat Pump Water Heater	Retrofit	1,182,600	30,300	228	11	12	6,032	-350	-17	$ 1,685	$ 1,480	-$ 2,601	$ -	-$ 428	$ 136	$ 60,000	$ 60,000		15	-442.4