

2022 PSO
Climate
Change
Accountability
Report





2022

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Foreword from President and Vice Chancellor Geoff Payne

At UNBC, we have embedded sustainability across our institution. It is reflected in our values, goals, research, teaching, and our work. An example of this is our success in reducing our GHG emissions, which were 60% lower in 2022 than our 2007 baseline, meeting the province's overall target for 2040, as well as its building and communities sector target for 2030. This reduction, despite a growing physical footprint, is a testament to the university's commitment to continue striving towards a sustainable future.

Yet we know there is much more to be done. Last year we commissioned a Green University Strategic Task Force to review sustainability across the institution and to envision where we could take it in the future. Based on multiple consultations and engagement, not only within UNBC but with regional community members as well, the Task Force made recommendations that we are already acting on. Those recommendations will continue to inform the development of UNBC's sustainable strategy, including aligning UNBC's vision for sustainability with the United Nations Sustainable Development Goals.

Sustainability remains a key pillar in our institutional strategic planning. I continue to be encouraged by the sustainability initiatives of students, faculty, and staff. Despite the challenges we face, UNBC remains well placed to lead by example in our operations, teaching, and research, and to share and collaborate with others here in the North and beyond.

Declaration Statement

This PSO Climate Change Accountability Report for the period January 1, 2022 to December 31, 2022 summarizes our greenhouse gas (GHG) emissions profile, the total offsets to reach net-zero emissions, the actions we have taken in 2022 to minimize our GHG emissions, and our plans to continue reducing emissions in 2023 and beyond.

By June 30, 2023, the University of Northern British Columbia's final 2022 Climate Change Accountability Report will be posted to our website at www.unbc.ca

Emission Reductions: Actions & Plans

Stationary Sources

Actions Taken to Minimize Emissions

Stationary energy use in buildings is the most significant contributor of emissions at UNBC. In 2022, building energy use contributed to more than 96% of total emissions. As in previous years, UNBC continued to implement measures in 2022 to reduce emissions from stationary sources. One of the most impactful projects completed in 2022 was the second phase of Round 2 of the Continuous Optimization program. Undertaken in partnership with BC Hydro, the Continuous Optimization program involves investigating existing building systems to identify and implement opportunities for energy savings. The first round of the program took place between 2013 and 2017, tackling nine of the largest buildings at the Prince George campus. Eight of those nine buildings were then selected for a second round of the program. In this second round, the second set of buildings completed in 2022 included the Charles J. McCaffray Hall (Administration Building) and the Charles Jago Northern Sport Centre. A total of 21 existing measures were reconfirmed and seven new measures implemented, including controls optimization, equipment scheduling, and new installations and upgrades. In total, from this second phase completed in 2022, it is expected that electricity savings will be approximately 541,850 kWh per year and fuel savings over 3,000 GJ per year, ultimately leading to an emissions reduction of approximately 186 tonnes of CO₂.



Figure 1:
Upgraded Agora Heat Exchanger System



Figure 2:
Heat Pump Hybrid Domestic Hot Water Heater

Another major effort in the pursuit of increasing energy efficiency and reducing emissions is the multi-year series of heat exchanger upgrade projects that UNBC is undertaking. In 2022, comprehensive upgrades were completed for two heat exchanger systems in the Agora building (Figure 1), following on from upgrades completed in previous years, including in the Power Plant, Charles J. McCaffray Hall, Teaching & Learning Centre, Dr. Donald Rix Northern Health Sciences 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 2022, UNBC also installed its first heat pump hybrid domestic hot water heater (Figure 2) to replace an existing heat exchanger that was being served by the district heating system. This will offset some use of natural gas during peak heating periods and is a pilot project to test the effectiveness and suitability of this equipment.

An important success in 2022 has been the improved and more consistent operation of the Bioenergy Plant after major maintenance issues in recent years. Since it began operating in 2011, the Bioenergy Plant at UNBC (Figure 3) has been the most important factor in reducing emissions, supplying up to 85% of the peak heating demand of the Prince George campus, which otherwise would be supplied by combustion of natural gas. Through both the Bioenergy Plant and the smaller pellet boiler that supplies heat to a number of small buildings through the winter, UNBC has been able to reduce its annual building emissions consistently by more than 60% compared to the 2007 baseline level. Major maintenance issues, especially in 2019, had a detrimental effect on emissions reduction as the Bioenergy Plant had to be shut down for prolonged periods, resulting in increased use of the natural gas boilers. However, after significant efforts, including the replacement of the boiler, these maintenance issues have now been largely resolved. The Bioenergy Plant is operating optimally again and in 2022, it was crucial in reducing emissions to 60% lower than the 2007 baseline level.



Figure 3:
Bioenergy Plant

After the closing of Pacific Bioenergy in Prince George in 2022, UNBC needed to find a new source of pellets for its pellet boiler. An agreement was reached with Premium Pellet in Vanderhoof who are now donating their pellets to the university when needed, with only the delivery cost being incurred by UNBC.

Plans to Continue Reducing Emissions

As of March 2023, UNBC has wrapped up the second round of the aforementioned BC Hydro Continuous Optimization program. The third and final phase of buildings was completed. It is expected that these projects will result in significant electricity and fuel savings, which should result in a reduction of associated emissions in 2023. Additional energy savings projects being planned in the next year include LED lighting upgrades and a project to cool the server room using chilled water from the district cooling system.

As part of the ongoing initiative to upgrade our heat exchanger systems, multiple systems are being upgraded in the Agora building in the summer of 2023. These upgrades will provide several energy efficiency improvements, thereby reducing energy usage and emissions. 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 return temperature of the main district heating loop is anticipated to decrease, which should eventually allow for low temperature heat recovery.

UNBC continues to investigate various low carbon electrification opportunities to further displace the use of natural gas. This includes the potential conversion of domestic water heating from natural gas boilers to electrically powered heat pumps at the Northern Sport Centre (NSC). The NSC is not connected to the bioenergy district heating system and currently relies only on natural gas for its heating needs, thus providing a potential opportunity for low carbon electrification. Similarly, as the Maintenance Building currently uses propane for its space heating, a new heat pump system will also be investigated to replace the propane system.

Careful planning and implementation of maintenance activities for the Bioenergy Plant will help in ensuring its continued reliable operation, thereby limiting the use of natural gas for heating. Efforts in the last few years have been successful in significantly improving the operation of the plant after major maintenance issues, and this is intended to continue in the coming years.

Longer term plans to reduce emissions include investigating and implementing opportunities for heat recovery in the Bioenergy Plant and the primary district heating loop, which could have a significant effect on reducing energy consumption. The university is also working on projects to improve energy usage in the chilled water system, through

the potential use of a fluid cooler and variable speed drives on the chillers. Additionally, the Passive House standard that has been adopted for new buildings will also be investigated for application in retrofits of existing buildings, such that their energy demand and consequent emissions can also be minimized.

Mobile Sources

Actions Taken to Minimize Emissions

Fleet emissions in 2022 represented approximately 3% of total emissions. The overall UNBC fleet is comprised of 31 vehicles. Of those, there are only five non-research fleet vehicles, one of which is a fully electric Nissan Leaf (Figure 4) that is used by the Facilities Department. The Nissan Leaf is the main light-duty vehicle for travelling on the main campus and within Prince George. Research fleet vehicles are independently procured and maintained by their respective owner research groups and faculty.

In 2022, after encountering issues with the new Siemens Level 2 charging stations installed in 2021, UNBC completed warranty replacements for all three stations. The charging stations have since operated without issue and are frequently used by the UNBC community. They are freely accessible and users only have to pay for parking. The charging stations support the use of electric vehicles by the university and wider community of Prince George, while also providing a scenic charging destination for those driving through the city.

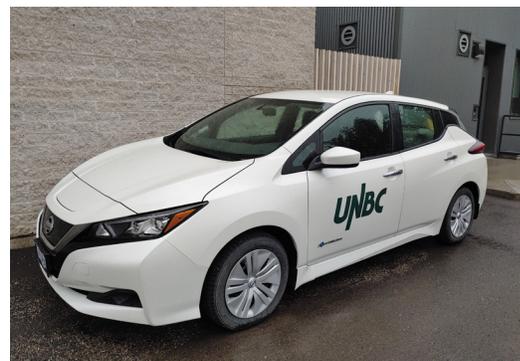


Figure 4:
UNBC Facilities Electric Vehicle

Plans to Continue Reducing Emissions

As fleet vehicles are replaced, UNBC will review alternative zero emissions options where feasible in order to further reduce fleet emissions, as was done successfully in the case of the Facilities Nissan Leaf. This will require collaboration between departments including the user groups and the Purchasing department, and may need to take the form of a zero emissions fleet procurement policy, setting out a standard process for fleet vehicle replacement that prioritizes zero emission vehicles. There are already opportunities being identified wherein zero emission vehicles may be a viable replacement for certain vehicles reaching end of life. However, it should be noted that the majority of fleet vehicles are research vehicles that tend to travel to remote locations and typically need to be able to store and tow heavy equipment, as well handle rough terrain. The improvement of charging infrastructure in remote areas and increased availability of affordable zero emission vehicles that can meet these requirements will be important in enabling a faster conversion to a zero emission fleet. In addition, with the increasing adoption of electric vehicles by the UNBC community and anticipated increase in electric fleet vehicles, further planning will need to be carried out on the long term strategy for charging electric vehicles on campus. The Facilities department is also looking into electric versions of maintenance equipment, such as utility vehicles, where feasible, to replace existing equipment that reaches end of life.

Paper Consumption

Actions Taken to Minimize Emissions

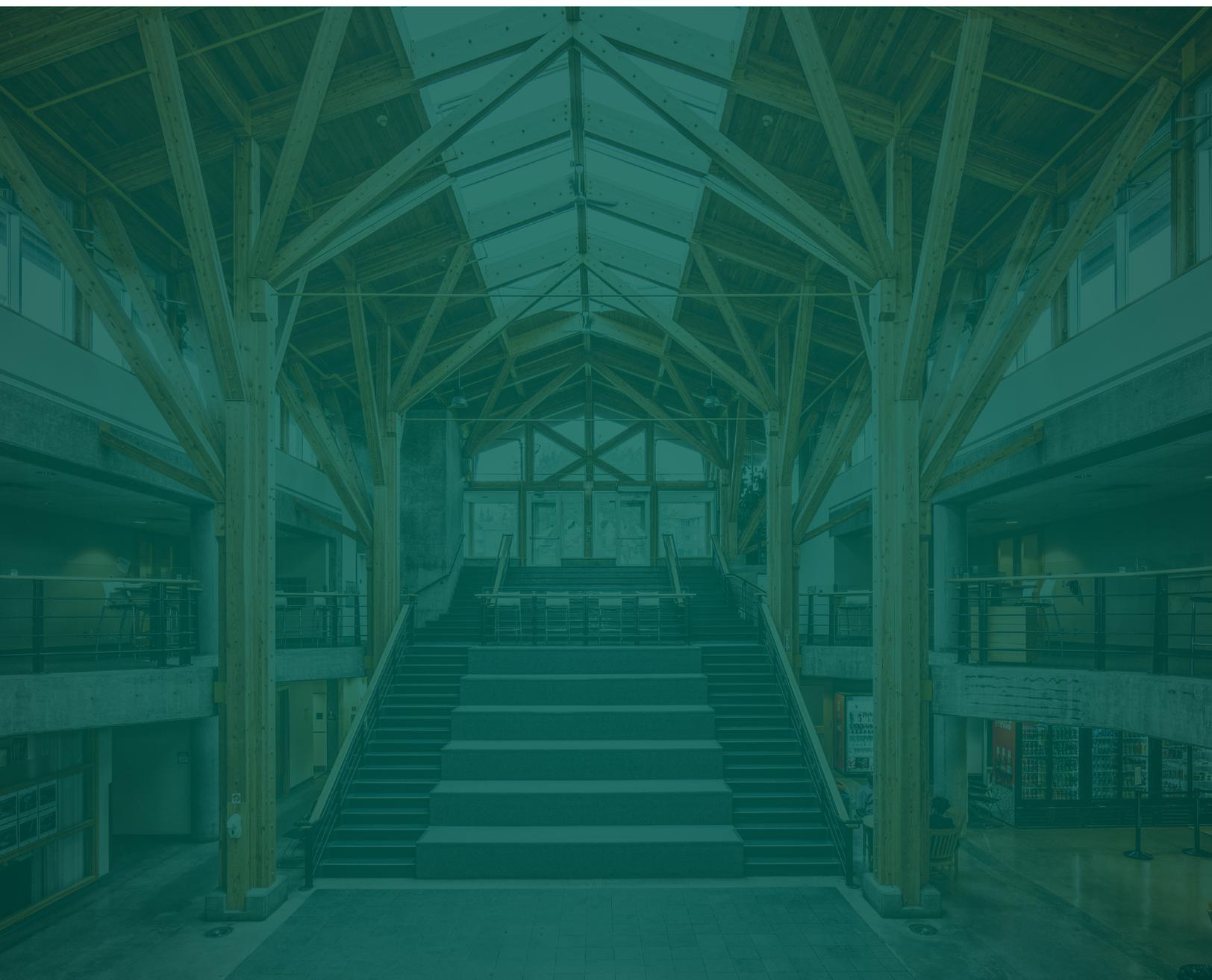
In 2022, paper emissions accounted for less than 1% of total emissions. At 12.8 tonnes of CO₂, 2022 was the lowest year for paper emissions since reporting began in 2010. It was a 32% reduction from the previous year, and a significant reduction from the high point of 79.8 tonnes in 2011. This is owing to a decrease in the overall use of paper and an increase in the amount of recycled and alternative fibre content in paper that is purchased, which continued in 2022.

All of the paper procured by UNBC in 2022 was from alternative fibre sources. This was comprised of 3,200 units (1 unit = 500 sheets) of Sugar Sheet paper which is sourced from waste fibre generated from sugar cane processing.

The continued transition from paper to digital processes at UNBC, such as the introduction of a digital leave form system, has contributed to reducing paper emissions. The increased use of virtual instead of in-person meetings has also reduced the usage of paper materials for meetings. Tools such as PaperCut for printing also provide a mechanism for all individual users to monitor their paper usage and limit unnecessary printing.

Plans to Continue Reducing Emissions

UNBC will continue to prioritize the procurement of paper with recycled content and from alternative fibre sources, with the aim of reducing the overall emissions intensity of paper consumption. In addition to procurement practices, paper consumption will also be reduced through the continued transition from paper-based to digital workflows; a number of such projects are already underway and being implemented by the UNBC Information Technology Services department.



2022 GHG Emissions and Offsets Summary Table

University of Northern British Columbia 2022 GHG Emissions and Offsets Summary

GHG Emissions for the Period January 1 - December 31, 2022	
Total BioCO ₂	5,409
Total Emissions (tCO ₂ e)	7,524
Total Offsets (tCO ₂ e)	2,115
Adjustments to Offset Required GHG Emissions Reported in Prior Years	
Total Offsets Adjustment (tCO ₂ e)	0
Grand Total Offsets for the 2022 Reporting Year:	
Grand Total Offsets (tCO ₂ e) to be Retired for 2022 Reporting Year	2,115
Offset Investment (\$)	\$52,875

Retirement of Offsets

In accordance with the requirements of the Climate Change Accountability Act and Carbon Neutral Government Regulation, University of Northern British Columbia (the Organization) is responsible for arranging for the retirement of the offsets obligation reported above for the 2022 calendar year, together with any adjustments reported for past calendar years (if applicable). The Organization hereby agrees that, in exchange for the Ministry of Environment and Climate Change Strategy (the Ministry) ensuring that these offsets are retired on the Organization's behalf, the Organization will pay within 30 days, the associated invoice to be issued by the Ministry in an amount equal to \$25 per tonne of offsets retired on its behalf plus GST.

Climate Risk Management

The Facilities department continues to work on projects that were prioritized during a risk assessment process that included climate related risks, such as wildfires, disruptions to campus water supply, and potential situations that would require campus evacuation. Various actions were identified, including the replacement of critical underground domestic water valves (a multi-year initiative that is underway), and the ongoing work on wildfire risk mitigation in the forested areas of the Prince George campus. UNBC has also partnered with the City of Prince George on flooding risks related to Shane Lake dam and the Shane Creek watershed.

Forest management to mitigate wildfire risks is an ongoing and constant priority for the university, which has only been further emphasized in the wake of more frequent and severe wildfires in recent years. To prepare for wildfire smoke, the Facilities department has reviewed outdoor air flushing programming and capabilities. Additional spare air filters are also secured each fire season due to more frequent replacements being required.

Severe heat waves are another climate risk identified for UNBC. Start-up prep and maintenance of the chilled water system has taken on additional importance. Localized individual AC units have also received similar attention to ensure they are functioning well. Additionally, mechanical cooling is included in the specification for all new buildings, largely as a provision for current and future climate change impacts. The rising peak summer temperatures will also inform the investigation into the replacement or upgrade of the existing cooling towers, and any other central chilled water system upgrades. As has been observed in recent years, preparing for and reacting to increasingly severe climate events does incur additional costs, including in the form of increased utility costs (e.g. high electricity use for chillers during a heat wave) and increased maintenance costs (e.g. cost of additional spare filters due to wildfire smoke).

Recent years have also shown the value of having back-up systems. For example, when the Bioenergy Plant had unplanned prolonged shutdowns due to maintenance issues in 2019 and 2020, existing natural gas boilers were used to maintain heating on campus. Similarly, in the event of power outages, diesel generators automatically start up to power emergency circuits. For emergency situations in which most students and staff cannot go to the campus, COVID-19 has proven that the university is still able to function and deliver most of its core services remotely using communication technologies like video conferencing.

The two most recently constructed UNBC buildings have both been Passive House certified, and all future new buildings are expected to meet the same standard. This strategy will be beneficial for the university's resilience to a changing climate. Passive House buildings are more resilient to both higher and lower temperature extremes. They require less energy to operate and are slower to lose or gain heat in the case of a power outage. The Facilities Management Building, a Passive House certified building completed in 2021, is intended to act as an emergency control centre for the campus since it is the most resilient building. As a longer term measure, UNBC will also investigate adopting the same Passive House strategies in potential retrofits of other existing buildings.

Other Sustainability Initiatives

There are a number of ongoing initiatives at UNBC that support sustainability, including the following:

- UNBC is one of four research universities in British Columbia that hosts program coordinators for the Pacific Institute for Climate Solutions (PICS). Through PICS, UNBC collaborates with other universities on shared climate related initiatives.
- UNBC has been part of BC Hydro's Energy Management program since 2010. Through this program, BC Hydro helps to fund the Energy Manager position as well as a variety of energy conservation projects and campaigns. This includes the Energy Wise Network program, through which UNBC organizes an energy conservation campaign every year for students, staff, and faculty.
- The Facilities department continues to provide tours to interested visitors of the Bioenergy Plant and pellet boiler, as well as more recently the new Passive House certified buildings. In addition, the Energy Manager or Facilities Director will provide guest lectures or collaborate with the academic departments for research or coursework.

- UNBC established a recycling program in 1992, which today includes an in-house recycling centre to collect and compact its recyclables, allowing for comprehensive collection of materials. UNBC also offers recycling receptacles for batteries as well as a drop-off bin for recyclable electronics. Additionally, during demolition on renovation projects, the Facilities team preserves as much reusable material like furniture, insulation, and lighting as possible so that it can be reused where needed in the future.
- UNBC maintains a Green Fund that provides seed grants for innovative research, education, and civic engagement projects that promote sustainability at UNBC. The program was started in 2009 through a levy on parking fees. It has funded over \$150,000 worth of projects.
- The Energy Conservation Revolving Loan Fund is maintained by the Energy Manager and provides funds to implement energy efficiency projects. Energy cost savings are used to repay the loan and fund future energy projects. The fund was created in 2012 when \$250,000 was made available for energy project funding. To date, projects worth a total of \$3 million have been funded.
- To promote cycling to campus, UNBC offers secure covered bike storage, six stand-alone high-security bike lockers, a bike repair station, shower facilities, and lockers for cyclists. In addition, all UNBC undergraduate and graduate students participate in the U-Pass transit program, which offers a discounted rate for unlimited access to public transit. For those commuting by car, UNBC also supports a carpooling program with a discounted parking permit.
- In partnership with the Feed BC program, UNBC Food Services supports local agriculture and food businesses through local food production, procurement, and active student engagement.
- As an additional sustainability benefit of the Bioenergy Plant, bio-ash resulting from the process is collected and used as a fertilizer at a local farm, through a permit from the BC Ministry of Environment and Climate Change Strategy, thereby diverting it from simply being landfilled.

Success Stories

The Continuous Optimization program, supported by BC Hydro, has continued to be very beneficial in reducing energy usage and consequent emissions at UNBC. In 2022, UNBC concluded the second round of Continuous Optimization for the second phase of buildings: the Charles J. McCaffray Hall (Administration Building) and the Charles Jago Northern Sport Centre. A number of existing measures were verified and confirmed, while several new energy efficiency measures were implemented. By reducing electricity and fuel usage, it is expected that the measures for these two buildings alone will reduce emissions by 186 tonnes of CO₂ annually. In addition, the cost savings will be approximately \$80,000 annually in avoided utility costs. The Continuous Optimization program is a great example of the success UNBC has had working closely with BC Hydro since joining the Energy Management program in 2010.

2022 has also been a successful year for bioenergy at UNBC. After various maintenance challenges in recent years that resulted in significant downtime, the Bioenergy Plant operated more consistently in 2022. This in turn resulted in a 60% reduction in GHG emissions when compared to the 2007 baseline. This is a testament to the hard work of UNBC's power engineering team over recent years, who operate and maintain the plant and district energy systems. A related bioenergy success in 2022 was the agreement reached with Premium Pellet in Vanderhoof to donate pellets to UNBC for its pellet plant (Figure 5). The UNBC Research and Innovation department worked collaboratively with the Facilities department to establish this new partnership.



Figure 5:
UNBC Pellet Plant

Executive Sign-off



Signature

Rahim Somani

Name (please print)

May 30, 2023

Date

Vice-President, Finance and Administration

Title

If you have an idea of how UNBC can further reduce its GHG emissions or if you have a success story to share, please contact Energy Manager Sahil Dino at sahil.dino@unbc.ca

