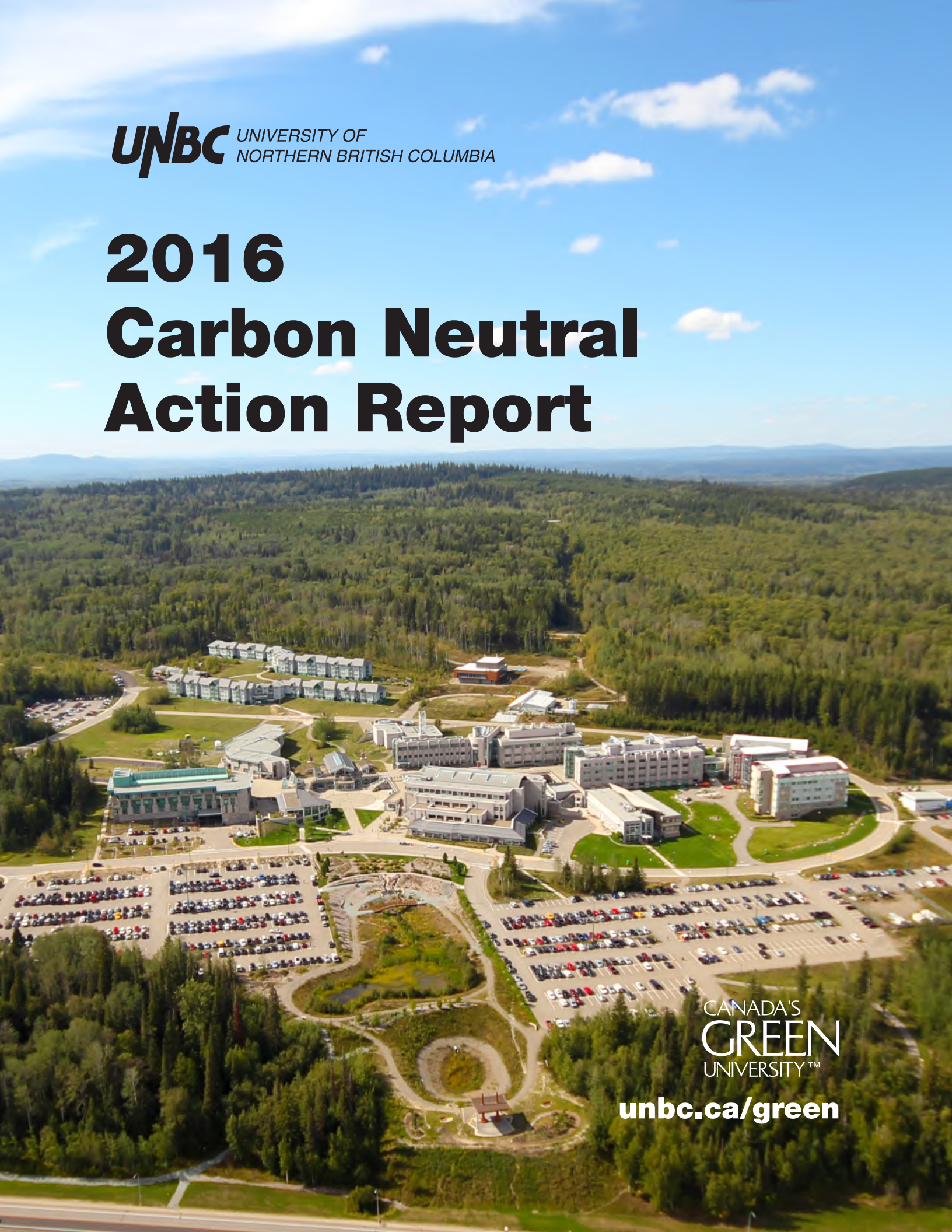
UNBC UNIVERSITY OF NORTHERN BRITISH COLUMBIA

2016 Carbon Neutral Action Report



CANADA'S GREEN UNIVERSITY™

unbc.ca/green

Overview

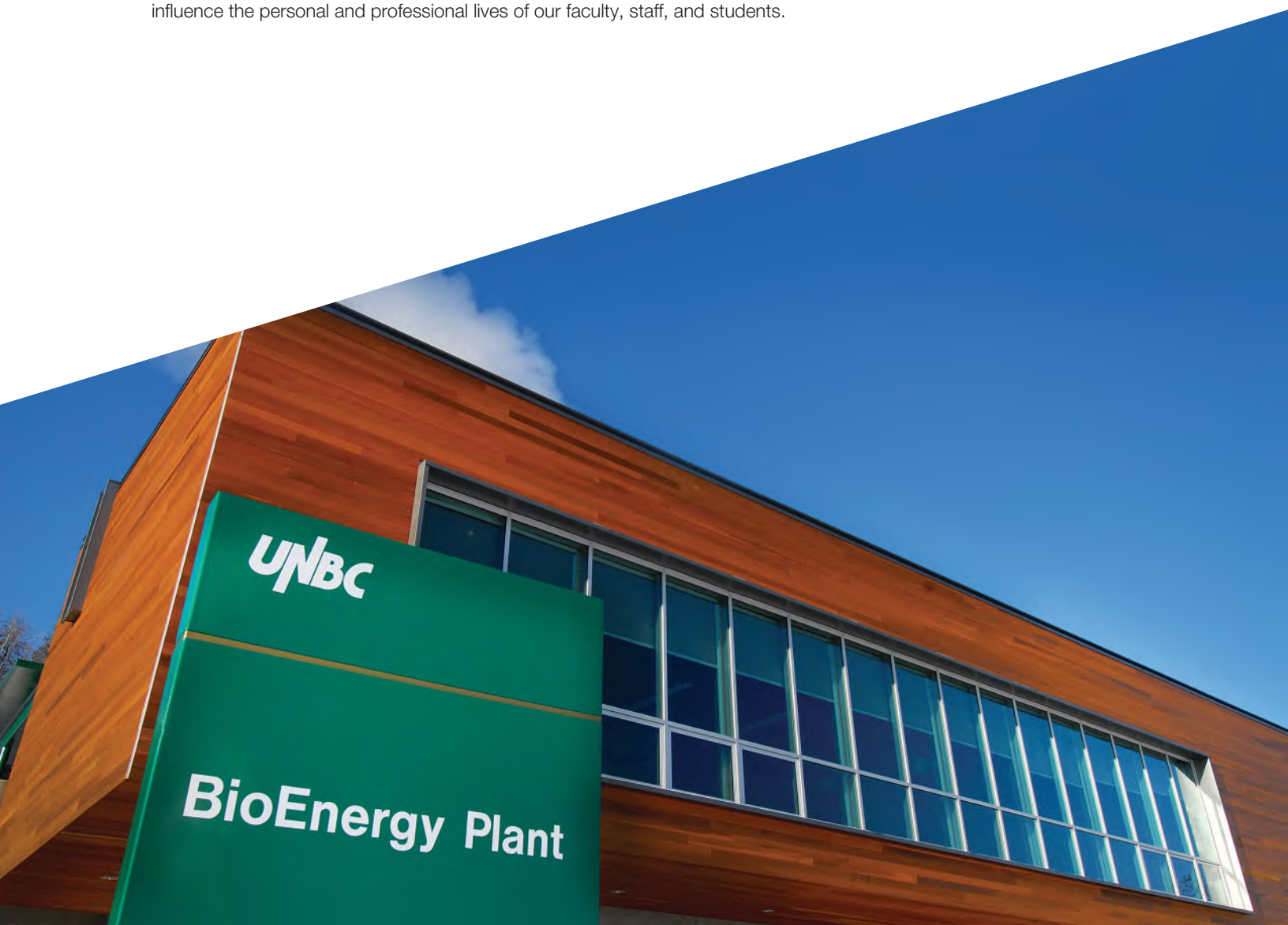
At the University of Northern British Columbia, we pride ourselves on being Canada's Green University. We integrate green into our teaching, research, and our day-to-day operations in order to live up to our name, and to demonstrate our leadership in sustainability and greenhouse gas emission reductions.

Since the Carbon Neutral Government was enacted in 2010, we have decreased our non-biogenic greenhouse gas emissions at UNBC by 71%. This decrease in emissions is in large part thanks to the commissioning of our Bioenergy Plant in 2011. The Bioenergy Plant uses sawmill waste wood to produce roughly 85% of the heat required by our Prince George Campus, and has displaced a large portion of our natural gas used for heating.

In 2014, our Sustainable Communities Demonstration Project was initiated to expand our successful renewable heating system to our two Residence buildings, Enhanced Forestry Laboratory (EFL) greenhouse, and Childcare Centre. In August 2016, the new low-temperature district heating loop was commissioned to deliver hot water heat to the first Residence and the EFL from our Wood Pellet Plant, with backup and peak heat provided by our Bioenergy Plant. When completed in 2017, we expect a further 9% reduction in greenhouse gases compared to 2010, bringing our total reduction to 80%.

In addition to our fuel switching from natural gas to bioenergy, our strong energy management practices have resulted in impressive emissions reductions. Since 2010, our heating demand has decreased by 9% and our electricity demand has decreased by 21%. With our focus on continually improving our operational efficiencies, our resource consumption and their associated emissions will continue to decrease.

Finally, sustainability and carbon neutrality aligns with our core mission of serving society through our teaching, research, service, and the actions of our graduates. Our leadership in green research, teaching, and operations has continued to influence the personal and professional lives of our faculty, staff, and students.



Declaration statement

This Carbon Neutral Action Report for the period January 1st, 2016 to December 31st, 2065 summarizes our emissions profile, the total offsets to reach net-zero emissions, the actions we have taken in 2016 to reduce our greenhouse gas emissions and our plans to continue reducing emissions in 2017 and beyond.

By June 30, 2017, the University of Northern British Columbia's final Carbon Neutral Action Report will be posted to our website at www.unbc.ca.

Emissions and Offsets Summary Table:

University of Northern British Columbia GHG Emissions and Offsets for 2016 (TCO2E)	
GHG Emissions created in Calendar Year 2016:	
Total Emissions (TCO_2E)	8,117
Total Offsets (TCO_2E)	1,660
Adjustments to GHG Emissions Reported in Prior Years:	
Total Emissions (TCO_2E)	7
Total Offsets (TCO_2E)	7
Total Emissions for Offset for the 2016 Reporting Year:	
Total Offsets (TCO_2E)	1,667

In accordance with the requirements of the Greenhouse Gas Reduction Targets Act and Carbon Neutral Government Regulation, the University of Northern British Columbia (the Organization) is responsible for arranging for the retirement of the offsets obligation reported above for the 2016 calendar year, together with any adjustments reported for past calendar years. The Organization hereby agrees that, in exchange for the Ministry of Environment 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.

Executive sign-off:

Signature

June 8, 2017
Date

Robert Knight
Name (please print)

Vice-President, Finance & Business Operations
Title

Adjustments to Carbon Emissions Reported in Previous Years

Our emissions from 2015 were underreported by 7 tCO2e and have been adjusted accordingly.

Actions Taken to Reduce Carbon Emissions in 2016

During 2016, a number of projects and initiatives were undertaken at UNBC to reduce the carbon emissions associated with fuel combustion, purchased electricity, the mobile fleet, and purchasing.

Commissioning of our Low-Temperature District Heating Loop

In summer 2016, we integrated and commissioned the low-temperature district heating loop into the main campus district heating loop to deliver heat in the form of hot water to the Residences, Enhanced Forestry Lab, and Childcare Centre. The low-temperature loop is anchored by our recently recommissioned 400 kW Wood Pellet Plant, with backup and peaking support from the Bioenergy Plant. The Wood Pellet Plant uses wood pellets donated by Pacific Bioenergy to produce hot water.

Neyoh Residence Renovation

In Summer 2016, we renovated our Neyoh Residence buildings. In doing so, we replaced natural gas air handlers and domestic hot water boiler with hot water units; converted electric baseboard heaters to hydronic hot water radiators; installed a hot water distribution system within building to deliver hot water to air handlers, and radiators; and ultimately connected the building to the low-temperature district heating loop;

Continuous Optimization of our Building Stock

In 2016, we completed the Implementation Phase of Continuous Optimization in three buildings. In our Northern Sports Centre, we optimized our air handler to better track usage and CO2 levels, installed occupancy sensors in key sections of the building, improved our scheduling procedures, and upgraded our control systems.

In our Administration Building we improved scheduling, upgraded control sequences on air handlers, reduced the cooling load in the Server room, and added differential pressure control to the hot water distribution pump.

Finally, in our Medical Building, we installed occupancy sensors in lecture theatres, revised our hot water pumping control, and optimized our air handler and exhaust fan control sequences.

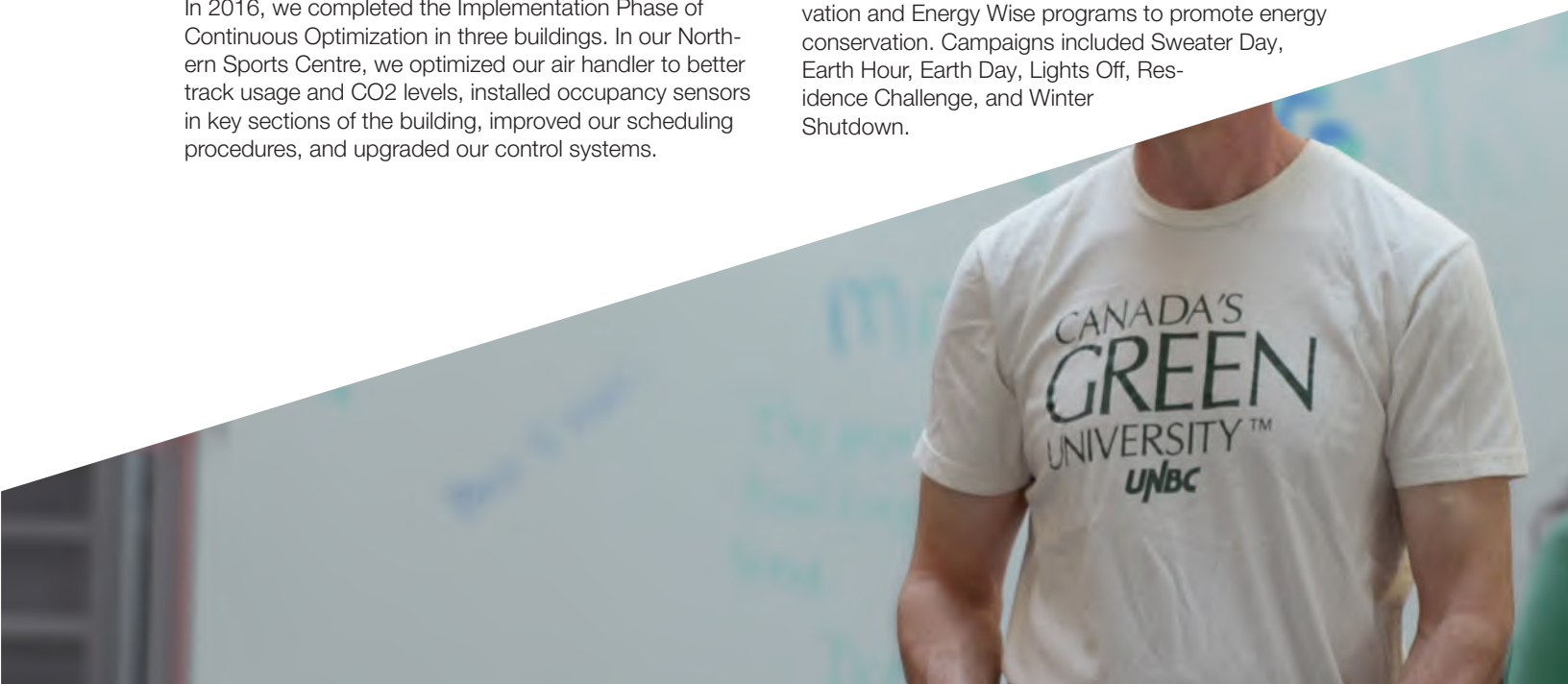
In total, this phase of the Continuous Optimization program will save UNBC an estimated 3,600 GJ of heat and 690,000 kWh of electricity, and will reduce fossil emissions by 120 tCO2e. Utility cost savings are expected to be $81,000 per year.

Lighting Retrofits

In 2016, UNBC completed lighting improvements at the Prince George and Terrace campuses. At the both campuses, exterior lighting was replaced with LEDs. At the Prince George campus, LEDs were tested for replacing T8 office lighting as part of a large retrofit project taking place in 2017.

Workplace Conservation

UNBC participated in the BC Hydro Workplace Conservation and Energy Wise programs to promote energy conservation. Campaigns included Sweater Day, Earth Hour, Earth Day, Lights Off, Residence Challenge, and Winter Shutdown.



Operating Changes that Increased Carbon Emissions

UNBC strives to reduce carbon emissions; however, with our carbon emissions heavily reliant on the operation of our Bioenergy Plant and Pellet Plant, emergency and system shutdowns can lead to increased natural gas consumption and emissions. Similarly, our emissions depend strongly on our heating demand which is correlated to the outside air temperature. Our Bioenergy Plant is capable of providing the campus heat when temperatures are above -5°C, however, when temperatures drop below -5°C, extra heat must be supplied by our natural gas boilers. Compared to 2015 we used 300% more natural gas in our power plant boilers for the following reasons:

- 2016 was only 2% colder than 2015 in terms of total heating required, however in 2016 we experienced 17 days of intense cold (below -15°C), whereas in 2015 we experienced only 3 days The intense cold meant that more natural gas was used to supplement the Bioenergy Plant.
- The Bioenergy Plant was shut down a total of 26 days in 2016, compared to 10 days in 2015. In October, the scheduled maintenance shutdown was extended by 6 days in order to replace critical components. In addition, an unscheduled shutdown occurred in December for 4 days when the average temperature was -17°C. During the shutdowns, the campus heat was provided by the natural gas boilers.

In 2016, UNBC started leasing space in the Wood Innovation Design Centre (WIDC) in downtown Prince George. The WIDC is an efficient new building which uses low-carbon district heat from the City of Prince George, and therefore is only responsible for an increase of 9 tCO¬2e in 2016.

Actions to Reduce Provincial Emissions and Improve Sustainability

UNBC has been involved in a number of initiatives to promote sustainability and emissions reductions that fall outside the reporting scope defined by the Greenhouse Gas Reduction Targets Act, ranging from infrastructure improvements, to community and student engagement.

Sustainability Across the Curriculum

UNBC includes a strong sustainability component in its course offerings.

In the **Environmental Engineering Design Course**, UNBC students studied and designed environmental solutions to a range of local problems including:

- Optimization and design of a biomass heating system expansion for the Red Rock PRT seedling greenhouses.
- Recommendations for manure management and energy efficiency upgrades for the Prince George Horse Society.
- Assessment and design of run-of-river hydro for Valemount Glacier Destination.
- Design and proposal of an eco-hotel in Valemount.

In **Carbon Management**, UNBC students calculated the carbon footprint of local businesses, and recommended ways to reduce emissions and ultimately become carbon neutral.

In **Local Food in Vanderhoof**, UNBC students undertook a feasibility study of a community greenhouse for the Region of Vanderhoof and Nechako Valley Secondary School.

The UNBC **Forestry Club** developed a Christmas Tree Farm, which will demonstrate sustainable forestry techniques. This farm helps build on our expertise in experiential learning.

Community Engagement

Throughout the year, UNBC offers several opportunities for promoting sustainability through engagement. Some notable examples include:

- Hosted a University's Farmers Market every Tuesday featuring local food, produce and products to promote local living.
- Hosted the 9th annual Green Day, a day to celebrate all of the green initiatives on campus. Interactive activities included mug painting for the Borrow-A-Mug program (BAM), a vermicomposting workshop, and edible insects.
- Hosted Bike To Work Week (May) and Bike To School Week (September) to promote low-carbon transportation.
- In collaboration with PICS and the Two Rivers Art Gallery, developed and curated an art exhibit focused on climate change.
- Hosted UNBC's second annual Bioenergy Day, to promote sustainable heating in the North.
- Hosted the Senate Committee on Energy, the Environment, and Natural Resources, to promote UNBC and the North as leaders in a low-carbon energy transition.

Research and Consulting

Building off its research excellence in the environment and sustainability, several UNBC professors were highlighted for their work. Notably:

- Environmental Studies Professor Dr. Annie Booth earned third place in the best paper category at the World Symposium on Sustainable Development at Universities for her paper about on-campus food security.
- Forestry Professor Dr. Oscar Venter's research into humanity's global ecological footprint was published in the journal Nature Communications.

Plans to Continue Reducing Emissions in 2017 and Beyond

UNBC has a number of projects and initiatives planned for 2017 and beyond to reduce emissions. Some of the projects are highlighted below:

- In summer 2017, we will complete the Sustainable Communities Demonstration Project (SCDP) when the second Residence and Daycare will be connected to the low-temperature district heating loop supplied by the 400kW Wood Pellet Plant.
- The final phase of buildings in the BC Hydro Continuous Optimization program will be completed in summer 2017. Included in the final phase are the Library, Conference Centre/ Northern Undergraduate Student Centre, and the Teaching and Learning building.
- A bypass pipe will be installed in the Power Plant to allow hot water produced by the Bioenergy Plant to bypass the natural gas boilers. This will reduce heat losses in the system by as much as 600 kW.
- The controls interfacing the Bioenergy Plant and the natural gas boilers will be modified to improve operation of the Bioenergy Plant, and to minimize operation of the gas boilers.
- Magnetic-ballasted linear fluorescent fixtures in our Administration building, Library building, Conference Centre, Daycare, and Power Plant will be replaced with LED fixtures. Dimming control and occupancy sensors will be installed in many locations.
- LED lighting in the soccer fields will be replaced with more efficient LED lighting including a wireless control system to allow for dimming and occupancy control.

Contact

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