



**UNBC** UNIVERSITY OF  
NORTHERN BRITISH COLUMBIA

# 2014 Carbon Neutral Action Report



CANADA'S  
**GREEN**  
UNIVERSITY™

[unbc.ca/green](http://unbc.ca/green)

# Introduction

At the University of Northern British Columbia, sustainability is in our nature, for a wide variety of reasons. Geographically, we are located in one of the world's most magnificent natural settings: Northern British Columbia. We are, however, living in the North during a time of great change, including the lingering impacts of the pine beetle, increased interest in mineral and energy resource development, and our changing climate.

There are important questions to address regarding what sustainability means in the North, and as a university for the North, UNBC is uniquely positioned to address these considerations. This is evidenced by our four foci of scholarship, notably: Environment and natural resources; First Nations and Indigenous issues; Northern community sustainability and development; and Health and quality of life. In many regards we are living out the dreams of our founders, who imagined a university that would "improve the world through its research, service, and the graduates it produced."

One important component of UNBC's sustainability mandate relates to carbon neutrality. Over the past 4 years we have taken significant steps to reduce our carbon emissions and demonstrate sustainable practices in the north. Most notably, UNBC commissioned the Bioenergy Plant in 2011 – the first university owned and operated facility in Canada to use waste wood to heat campus buildings. The Bioenergy Plant delivers roughly 70% of UNBC's heat, and has helped UNBC reduce non-biogenic greenhouse gas emissions by 62%. Building on the successes of the Bioenergy Plant, UNBC commenced work in the fall of 2014 on a new low temperature district heating system which connects the student residences, greenhouse, and daycare to a small wood pellet boiler. This low temperature district heating loop is estimated to reduce UNBC's greenhouse gas emissions a further 7% , and will allow for experimentation with alternative heating sources such as heat recovery, solar thermal and geothermal.

Sustainability and carbon neutrality align with our core mission of serving society through our teaching, research, service and the actions of our graduates. The benefit of our sustainability initiatives are far reaching, and relate to our institutional impact on the environment, the expertise we develop and share, and the influence we have on the personal and professional lives of our faculty, staff and students. As we celebrate our past accomplishments during our 25th Anniversary in 2015, we will continue to look forward and work towards our mission for sustainability in the North and beyond as Canada's Green University™.



# Declaration statement

This Carbon Neutral Action Report for the period January 1st to December 31st, 2014 summarizes our emissions profile, the amount of offsets purchased to reach net zero emissions, the actions we have taken in 2014 to reduce our greenhouse gas emissions and our plans to continue reducing emissions in 2015 and beyond.

By June 30 the University of Northern British Columbia's final Carbon Neutral Action Report will be posted to our website at [www.unbc.ca](http://www.unbc.ca).

## Emissions and Offsets Summary Table:

University of Northern British Columbia GHG Emissions and Offsets for 2014 (TCO <sub>2</sub> E)	
<b>GHG Emissions created in Calendar Year 2014:</b>	
Total Emissions (TCO <sub>2</sub> E)	9,595
Total Offsets (TCO <sub>2</sub> E)	2,163
<b>Adjustments to GHG Emissions Reported in Prior Years:</b>	
Total Emissions (TCO <sub>2</sub> E)	6,597
Total Offsets (TCO <sub>2</sub> E)	115
<b>Total Emissions for Offset for the 2014 Reporting Year:</b>	
Total Offsets (TCO <sub>2</sub> E)	2,278

## Executive sign-off:

Colleen Smith  
Signature

May 26/15  
Date

Colleen Smith  
Name (please print)

Office of the VP Admin  
& Finance  
Title

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# Adjustments to Carbon Emissions Reported in Previous Years

Adjustments were made to previous years to correct for the wood fuel moisture content reported for the Bioenergy Plant, and to add the wood pellets used in the Pellet Plant. The adjustments resulted in an additional 115 tonnes of CO<sub>2</sub>e for offset.



## Actions Taken to Reduce Carbon Emissions in 2014

During 2014, a number of projects and initiatives were undertaken at UNBC to reduce the carbon emissions associated with fuel combustion, purchased electricity, and the mobile fleet.

- Retrofitted recessed lighting in the Bentley Centre, and Teaching Lab to LEDs.
- Installed LED motion-sensing bollards at the exterior of the cafeteria.
- Replaced metal-halide exterior wall-pack lighting around the Agora, Teaching Lab, and Medical Building with LED bulbs.
- Replaced CFL lighting with LEDs in the cafeteria dining hall.

- Replaced high-bay metal halide lighting in the Administration Building atrium with LED fixtures.
- De-commissioned the electric humidifier serving the Medical building as part of a retrofit project, reducing electricity consumption by 79,000 kWh over 3 months. A new humidifier was installed in early 2015.
- Removed the redundant heat recovery system in the Medical building, reducing pumping and fan energy. Heat is now recovered by the Teaching Lab heat recovery system.
- Enforced operation schedules for the Prince George campus chillers and cooling tower, reducing chiller run-time and electricity consumption, and saving roughly 7,200 kWh of electricity over 3 months.
- Shut-down the Prince George campus chillers in early September, saving approximately 58,000 kWh of electricity and a total of \$13,000 including demand charges.
- Implemented Prince George Campus-wide building schedules to shut down unessential HVAC and lighting on statutory holidays and for the winter holiday campus closure (between December 24th and Jan 2nd). A total of 22 reduced occupancy days were added to the schedule for 2014.
- Adjusted HVAC and lighting schedules to align closer with building occupancy, reducing operating hours by 5 hours per day in the Teaching Lab, and Administration Building.
- Implemented an HVAC and lighting schedule for the south wing of the Research Lab to shut down HVAC and unessential lighting overnight and on weekends, reducing operating hours by 13 hours per day during the week, and 24 hours per day on the weekend.
- Modified controls to mixed air dampers on air handling units in the Agora, Research Lab and Teaching Lab to optimize return and outside air use.
- Programmed static pressure resets in the Agora, Research Lab, and Teaching Lab to adjust air handling unit set-points to ensure that at least one Variable Air Volume (VAV) damper downstream of the air handler is completely open. This reduces the fan speed (and electricity consumption) for the air handler while delivering the same amount of air.
- Added warm-up mode to air handling units in the Agora, Research Lab, and Teaching Lab to use either 100% recirculated air (winter) or 100% outside air (summer) during start-up.
- Revised shut-down sequence for Agora and Teaching Lab air handling units to shut off heat supply during shutdown.
- Installed a Variable Speed Drive (VSD) on Agora HEX-2 glycol pumps to reduce glycol pumping based on heating demand.
- Commenced construction of the Sustainable Communities Demonstration Project (SCDP) Phase 1 where hot water piping was installed to connect the Enhanced Forestry Lab (EFL), two Residence buildings and Daycare to the existing 400 kW wood pellet boiler. Over the next year, natural gas equipment will be replaced with hot water equipment in the Residences and Daycare to allow for heating using hot water. The new hot water system will also be connected to the Bioenergy Plant to provide back-up heat.
- Continued the partnership with the City of Prince George, Northern Health, and Fraser-Fort George Regional District where UNBC Distribution Services, Residence Assistants, and UNBC employees had shared access to a fully electric Nissan Leaf from September to December 2014. The Nissan Leaf was used daily by Distribution Services instead of their gas-fueled van.
- Replaced the Facilities gas-fueled truck with a new, more efficient model.
- Competed in Campus Conservation Nationals (CCN), where a 3.4% reduction was seen in electricity consumption on the Prince George Campus over 2 weeks.
  - The Residence Energy Challenge (as part of the CCN) saw the two residence buildings, Neyoh and Keyoh, reducing their electricity consumption by 15.4% and 11.0%, respectively.
  - Staff and faculty were asked to commit to small energy habit changes during the CCN including turning off lights and shutting off computers when not in use, and adjusting thermostats according to the season.
- Held Sweater Day to encourage the UNBC community to turn down their thermostats.

# 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 associated emissions. In addition, as the University expands offerings, such as the new food service plan, operating hours will be increased leading to increased emissions.

- 2014 had 7% more heating degree days than 2013, indicating a colder year.
- Bioenergy Plant emergency shutdown for metering bin repair.
- Bioenergy Plant emergency shutdown for ash conveying system repair.
- As part of the SCDP project, the 400 kW wood pellet boiler that was heating the greenhouse was temporarily decommissioned and relocated beside the Bioenergy Plant in November 2014. The greenhouse is using natural gas for heating until the pellet boiler is reconnected in 2015.
- In September 2014 a small residential building was added to the UNBC portfolio resulting in a minimal increase of electricity, and natural gas.
- The cafeteria and kitchen were renovated during the summer of 2014, to accommodate changes to the meal plan at UNBC. Changes that increased energy consumption are:
  - o Extended hours of operation including early mornings, late nights, and weekends
  - o Gas-fired pizza oven that runs 24-7
  - o Installation of two larger coolers and two larger freezers



# 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.

- As part of the 5th year Environmental Engineering Design Course, students studied and designed environmental solutions to a range of problems including:
  - Rainwater harvesting feasibility for UNBC
  - Cooling Tower upgrade for UNBC
  - Bioenergy system design for Twin Sister's Native Plants Nursery Ltd. (a joint venture between Saulteau First Nations and West Moberly First Nations).
  - Brown white water recovery design for Canfor Pulp
  - CO2 capture for the Prince George Husky Refinery
  - Sediment management solutions for the City of Prince George
  - Stream crossing design for Onsite Engineering Ltd.
- Partnered with local businesses, government, and the Canada Winter Games to fund a Sustainability Manager for the 2015 Canada Winter Games. The Sustainability Manager worked primarily out of the UNBC Green University Centre.
- Hosted a University's Farmers Market every Tuesday featuring local food, produce and products to promote local living.
- Hosted 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 a food strategy consultation.
- Participated in Bike to Work Week 2014 from May 26th to June 1st. Over the week UNBC cyclists logged a total of 266 trips and 1,952 kilometers.
- Held our second annual Bike to School Week (in addition to Bike to Work Week) from September 23rd to 27th to promote active modes of transportation. Over the 5 days, 44 cyclists logged 1,700 kilometers.
- Sent a team of students to the 3rd Annual CNC Sustainability Showcase, to provide information on green initiatives such as the Bioenergy Plant and gardening on campus.
- Recruited Green Reporters in 2014 to look for green stories on and off campus. The 3 Green Reporters published stories on topics such as transportation, food, and Green UNBC Alumni.
- UNBC students gave presentations on climate change to local Grade 10 students as part of our Green Outreach Program, and to younger kids as part of UNBC's Active Minds summer camp.
- Hosted the opening reception for the 2014 International Bioenergy Conference & Exhibition, and toured 60 attendees through our award winning Bioenergy Plant.
- Hosted David Suzuki in November 2014 as part of the nationwide Blue Dot Tour. The campus event brought together community members and students to brainstorm ways of improving sustainability in the North.
- Highlighted the Bioenergy Plant during the 2014 International Congress of Arctic Social Sciences, with roughly 70 people attending the Bioenergy Plant tours.
- Each year, up to \$45,000 is available to fund sustainable projects on campus. The Green Fund was created in 2009 from parking revenues to fund the Sustainability Manager position as well as sustainability initiatives on campus. Any member of the UNBC community (students, faculty, and staff) can submit a project to the Green Fund. Successful projects receiving funding in 2014 were:
  - The Cafeteria Organic Waste Audit was funded to determine the amount and characteristics of food waste on campus, with the end goal being to size an institutional composter.
  - Campus Food Strategy Coordinators were funded to support local, sustainable, healthy, and accessible food options at UNBC.
  - Food waste minimization and redistribution to keep food waste from the cafeteria minimal, and to donate left-over food to the St. Vincent de Paul Society.
  - University Farmer's Market Advertising to develop new signs and fund a kick-off event for the on-campus Farmer's Market.
  - PG PIRG Rooftop Garden was funded to hire students to maintain the two gardens and compost program, and to provide educational workshops on gardening.
  - Solar PV outreach to support educational activities around solar energy at UNBC and in Northern BC.
  - UNBeeC received funding to expand the beekeeping program at UNBC, including outreach related to bees and food production.
  - The Land Stewardship project was funded to produce hardcopy and digital maps of the UNBC forest lands, and to restore some of the forested land adjacent to the Prince George Campus.
  - Enhancing the Ancient Forest Trail is a project that aims to raise the awareness of students and faculty about the Ancient Forest through displays and photo contests.
  - The Smart Irrigation project will see weather stations and controllers added to the current Prince George campus irrigation system to optimize irrigation based on actual weather.

- As part of UNBC's 25th Anniversary, members of the UNBC community were asked to propose projects to be implemented over the year to celebrate the 25th Anniversary. A few of the successful projects strengthen UNBC's Green branding:

- o A Living Memorial and Future Legacy will plant 16,000 trees across a number of UNBC properties as a living memorial to the 16,000 petitioners who supported the idea of UNBC 25 years ago.
- o The Solar Electricity project will showcase solar panels in a northern climate with the installation of 25 solar panels on top of the Conference Centre roof, 16 panels of which were donated from School District No. 57.
- o A History of Weather and Climate Data Collection will create a one-stop source of information on climate related records and statistics.



# Plans to Continue Reducing Emissions in 2015 and Beyond

UNBC has a number of projects and initiatives planned for 2015 and beyond to reduce emissions. Some of the projects are highlighted below:

- Implementation of the Sustainable Communities Demonstration project to connect the Residences, Daycare and greenhouse to the 400kW Pellet Plant will continue. The next steps will be: connecting the pellet boiler to the Bioenergy Plant; installing energy transfer stations in the Residences and Daycare; removing the natural gas equipment from the Residences and Daycare; and commissioning the new low temperature heating loop. This is expected to reduce our off-settable emissions from 62% to 69% compared to 2010.
- UNBC is enrolled in the BC Hydro Continuous Optimization program to retrofit and optimize existing building operations. Three buildings have completed the implementation phase as of March 2015. The next three buildings will be completed by March 2016, with expected annual savings of 700,000 kWh of electricity, 1,800 GJ of district heating, and 2,000 GJ of natural gas. The final group of buildings will be investigated for opportunities in 2015.
- As part of the Carbon Neutral Capital Program (CNCP), UNBC received funding to upgrade the natural gas air handler in the Power Plant. The upgrade was completed in March 2015, and is expected to save 450 GJ of natural gas per year.
- UNBC is investigating the conversion of an air handler serving the NUSC building from natural gas to hot water served from the Bioenergy Plant. This project would save over 800 GJ per year of natural gas.
- The natural gas boilers at UNBC's Bank of Montreal Building will be replaced with higher efficiency models in 2015.
- A 5th year Environmental Engineering design group will be focusing on heat recovery options for the Bioenergy Plant. Increasing the efficiency of the Bioenergy Plant has the potential of significantly decreasing natural gas use for peak load heating.

## Contact

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# 2014 Carbon Neutral Action Report (CNAR) - Part 2 ACTIONS

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## Organization Name

University of Northern British Columbia

## Actions Taken to Reduce Emissions

### 1) Stationary Fuel Combustion, Electricity (Buildings): Indicate which actions were taken in 2014:

Performed energy retrofits on existing buildings

Yes

Built or are building new LEED Gold or other "Green" buildings.

No

Undertook an evaluation of overall building energy use.

Yes

Please list any other actions taken to reduce emissions from Buildings:

- Retrofitted recessed lighting in the Bentley Centre, and Teaching Lab to LEDs.
- Replaced metal-halide exterior wall-pack lighting around the Agora, Teaching Lab, and Medical Building with LED bulbs.
- Installed LED motion-sensing bollards at the exterior of the cafeteria.
- Replaced CFL lighting with LEDs in the cafeteria dining hall.
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- De-commissioned electric humidifier serving the Medical building as part of a retrofit project, reducing electricity consumption by 79,000 kWh over 3 months. A new humidifier will be installed in early 2015.
- Removed redundant heat recovery system in the Medical building, reducing pumping and fan

energy. Heat is now recovered by the Teaching Lab heat recovery system.

- Enforced operation schedules for the Prince George campus chillers and cooling tower, reducing chiller run-time and electricity consumption, and saving roughly 7,200 kWh of electricity over 3 months.
- Shut-down the Prince George campus chillers in early September, saving approximately 58,000 kWh of electricity and a total of \$13,000 including demand charges.
- Implemented Prince George Campus-wide building schedules to shut down unessential HVAC and lighting on statutory holidays and for the winter holiday campus closure (between December 24th and Jan 2nd). A total of 22 days were added to the schedule for 2014.
- Adjusted HVAC and lighting schedules to align closer with building occupancy, reducing operating hours by 5 hours per day in the Teaching Lab, and Administration Building.
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- Staff and faculty were asked to commit to small energy habit changes during the CCN including turning off lights and shutting off computers when not in use, and adjusting thermostats according to the season.
- Sweater Day was held to encourage the UNBC community to turn down their thermostats.

## **2) Mobile Fleet Combustion (Fleet and other vehicles): Indicate which actions were taken in 2014:**

Do you have a fleet?

Yes

Replaced existing vehicles with more fuel efficient vehicles (gas/diesel)

Yes

Replaced existing vehicles with hybrid or electric vehicles

No

Reduced the overall number of fleet vehicles

No

Took steps to drive less than last year

Yes

Please list any other actions taken to reduce emission from fleet:

- Continued the partnership with the City of Prince George, Northern Health, and Fraser-Fort George Regional District where UNBC Distribution Services, Residence Assistants, and UNBC employees had shared access to a fully electric Nissan Leaf from September to December 2014. The Nissan Leaf was used daily by Distribution Services instead of their gas-fueled van.
- Replaced the Facilities gas-fueled truck with a new, more efficient model.
- UNBC participated in Bike to Work Week 2014 from May 26th to June 1st. Over the week UNBC cyclists logged a total of 266 trips and 1,952 kilometers.
- In addition to Bike to Work Week, UNBC held the second annual Bike to School Week from September 23rd to 27th to promote active modes of transportation. Over the 5 days, 44 cyclists logged 1,700 kilometers.

### **3) Supplies (Paper): Indicate which actions were taken in 2014:**

Used less paper than previous year

No

Used only 100% recycled paper

No

Used some recycled paper

Yes

Used alternate source paper (Bamboo, hemp, etc.)

No

Please list any other actions taken to reduce emissions from paper use:

- Installed 74 new multifunction devices with 2-sided printing default

**Page 3**

### **Actions Taken to Reduce Emissions - continued**

Explain how you plan to continue minimizing emissions in 2015 and future years:

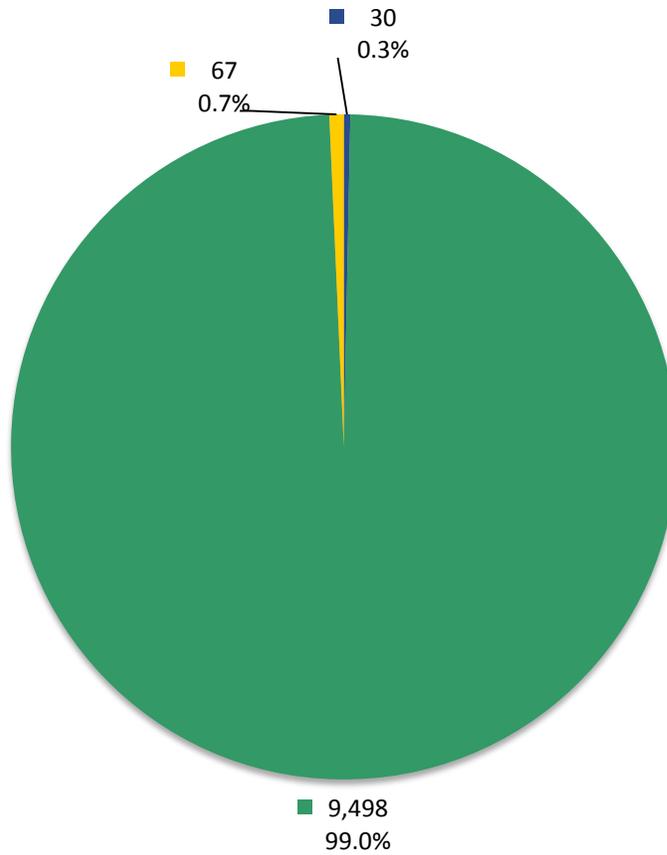
- Work commenced on the Sustainable Communities Demonstration Project (SCDP), Phase 1 where hot water piping was installed to connect the Enhanced Forestry Lab (EFL), 2 Residence buildings and Daycare to an existing 400 kW wood pellet boiler. Over the next year, natural gas equipment will be replaced with hot water equipment in the Residences and Daycare to allow for heating using hot water. The new hot water system will also be connected to the Bioenergy Plant to provide back-up heat. This project will reduce natural gas consumption by roughly 6,500 GJ per year.
- UNBC is enrolled in the BC Hydro Continuous Optimization program to retrofit and optimize existing building operations. Three buildings have completed the implementation phase as of March 2015. The next three buildings will be completed by March 2016, with expected annual savings of 700,000 kWh of electricity, 1,800 GJ of district heating, and 2,000 GJ of natural gas. The final group of buildings will be investigated for opportunities in 2015.
- As part of the Carbon Neutral Capital Program (CNCP), UNBC received funding to upgrade the natural gas air handler in the Power Plant. The upgrade was completed in March 2015, and is expected to save 450 GJ of natural gas per year.

- UNBC is investigating the conversion of an air handler serving the NUSC building from natural gas to hot water served from the Bioenergy Plant. This project would save over 800 GJ per year of natural gas.
- The natural gas boilers at UNBC's Bank of Montreal Building will be replaced with higher efficiency models in 2015.

If you wish to list any other "sustainability actions" outside of buildings, fleet, paper and travel check "yes". This reporting is optional.

No

**University of Northern British Columbia  
Greenhouse Gas Emissions by Source  
for the 2014 Calendar Year (tCO<sub>2</sub>e\*)**



**Total Emissions: 9,595**

- Mobile Fuel Combustion (Fleet and other mobile equipment)
- Stationary Fuel Combustion (Building Heating and Generators) and Electricity
- Supplies (Paper)

**Offsets Applied to Become Carbon Neutral in 2014 (Generated June 23, 2015 4:48 PM)**

Total offsets required: **2,163**. Total offset investment: **\$54,075**. Emissions which do not require offsets: **7,432** \*\*

\*Tonnes of carbon dioxide equivalent (tCO<sub>2</sub>e) is a standard unit of measure in which all types of greenhouse gases are expressed based on their global warming potential relative to carbon dioxide.

\*\* Under the *Carbon Neutral Government Regulation of the Greenhouse Gas Reduction Targets Act*, all emissions from the sources listed above must be reported. As outlined in the regulation, some emissions do not require offsets.