2016
CARBON NEUTRAL ACTION REPORT

BCIT™

BRITISH COLUMBIA
INSTITUTE OF TECHNOLOGY

BCIT AFRESH House showcases innovative yet practical ideas in sustainable housing

The BCIT Spartan Controls Centre for Energy Education and Research is home to the cleanest operating boiler in Western Canada.

DECLARATION STATEMENT

This Carbon Neutral Action Report for the period January 1, 2016, to December 31, 2016, 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, BCIT's final Carbon Neutral Action Report will be posted to our website at bcit.ca/facilities/sustainability/energy.

EMISSIONS AND OFFSETS SUMMARY TABLE

BCIT GHG EMISSIONS AND OFFSETS FOR 2016 (TCO2E)	
GHG emissions created in calendar year 2016	
Total emissions (tCO2e)	8,422
Total emissions for offsets (tCO2e)	8,418
Adjustments to GHG emissions reported in previous years	
Total emissions (tCO2e)	84
Total emissions for offsets (tCO2e)	80
Grand Total Offsets for the 2016 Reporting Year	
Grand Total Offsets (tCO2e)	8,498

RETIREMENT OF OFFSETS

In accordance with the requirements of the Greenhouse Gas Reduction Targets Act and Carbon Neutral Government Regulation, BCIT (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 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 SUMMARY

The British Columbia Institute of Technology® (BCIT) supports a population of nearly 20,000 full-time employees and students. Here, we face the same environmental challenges as a small city, and as our population grows, so do the demands on power and waste management systems. We recognize that there are limits on the amount of resources that can be used without exceeding ecological capacity and are making strides in reducing our environmental impact. This Carbon Neutral Action Report (CNAR) details some of the many activities that we have undertaken to reduce our carbon footprint in 2016.

BCIT is well known for transforming innovative ideas into real results. As a strong supporter of the BC government's mission to reduce energy use and greenhouse gas (GHG) emissions, we have applied a results-driven approach to our sustainability practices. Putting our mission into action, BCIT campuses serve as living laboratories, where examples of environmental stewardship are always evolving. Our main Burnaby Campus is home to a green roof, a solar panel electric car charging station, a greenhouse, and a wind turbine.

In 2016 we continued our mission to increase sustainability through innovations that support the social and economic prosperity of our campuses and the province—without harming the natural environment. For example, we completed the construction of the Factor Four 300 kW biomass boiler system (wood-waste-to-energy). This system comprises a wood fuel preparation and storage system, a biomass boiler, a state-of-the-art air emissions filtering system, and an advanced combustion and emissions monitoring system. To facilitate student learning, an educational boiler house is equipped with large windows, covered outdoor lecture areas, and displays. In 2016 we also increased our energy efficiency and completed the design for a new compost facility that produces both energy and a soil amendment.

In this report, we have tracked our reductions in land, energy, and materials use and have outlined our approach to assimilating the waste generated on campus. This report also outlines our sustainability advancements through engaged education and research, improved efficiencies of campus operations, and support for diverse green initiatives. Finally, we provide a snapshot of our plans to reduce our GHG emissions and improve sustainability in 2017, through work ranging from the optimization of heating controls to increased efforts to expand on-campus bee colonies. Moving forward, we are committed to continuing to find new ways to improve sustainability practices at each of the five BCIT campuses.

Lorcan O'Melinn
Vice President, Administration and CFO
May 3, 2017

2016 GREENHOUSE GAS EMISSIONS

In 2016, the total GHG emissions for BCIT was 8,422 tCO2e.

OFFSETS APPLIED TO BECOME CARBON NEUTRAL IN 2016

BCIT purchased 8,418 tCO2e of offsets to become carbon neutral.

The variance of four tCO2e were from biomass emissions and do not require offsets.

CHANGES TO GREENHOUSE GAS EMISSIONS AND OFFSETS REPORTING FROM PREVIOUS YEARS

80 tCO2e were purchased as an adjustment to offsets from 2015. These offsets were for emergency generator fuel purchases made on invoices that were unavailable prior to the 2015 reporting.

EMISSIONS REDUCTION ACTIVITIES IN 2016

Key actions taken between January 1, 2016, and December 31, 2016, to reduce greenhouse gas emissions include:

- Construction of the Factor Four 300 kW biomass boiler system (wood-waste-to-energy) was completed. The system comprises a wood fuel preparation and storage system, a biomass boiler, a state-of-the-art air emissions filtering system, an advanced combustion and emissions monitoring system, and the educational boiler house, which is equipped with large windows, covered outdoor lecture areas, and various displays, all designed to enhance student learning.
- BC Hydro's Continuous Optimization program was implemented at the Aerospace Technology Campus. Actions taken to reduce energy consumption included the optimization of the HVAC controls systems scheduling and the addition of occupancy sensors.
- To conserve energy, windows with a higher R-value were installed in the BCIT Centre for Architectural Ecology at the Burnaby Campus. The project was completed with the 'campus as living lab' concept in mind and included an on-site study on the acoustic versus energetic value of the windows.

BCIT grad and Mechanical Designer Emi works in the BCIT Biomass Education Facility.

Part of the wood fuel preparation and storage system that feeds into the 300 kW biomass boiler.

- A multi-building energy study on 12 buildings at the Burnaby Campus was conducted. The results of the study included measures that can reduce GHG emissions by more than 800 tonnes of CO2.
- The final phase of DDC hardware upgrades at the Burnaby Campus to current technology was completed. The system is now fully web hosted, and plans for optimization of monitoring and alarm dashboards are underway. Kaizen analytics and fault detection diagnostic software features have recently been activated to help identify inefficient and wasteful equipment operation.
- BCIT contracted a DDC Maintenance Service Program to perform preventative maintenance on the Building Automation System. By doing scheduled checks of primary equipment, control panels, system settings, and parameters, the reliability and operational energy efficiency of the Burnaby Campus buildings' HVAC systems will be significantly improved.
- Two older air compressors in NE1 and SE1 were replaced with new more efficient units.
- Renovations in SW1-1100 included an HVAC retrofit utilizing air source heat pumps, which improve energy efficiency.
- Two new high horsepower motors were installed on the DTC cooling tower.
- Two high-efficiency condensing boilers and one high-efficiency condensing water heater were installed at the Aerospace Technology Campus in Richmond.
- Five rooftop units on SW9 and three units on NE1 were replaced with high-efficiency air source heat pumps.
- A new high-efficiency backup heating boiler was installed in SE16.
- Approximately 50% of the T-12 lighting was replaced with LED lighting in the Centre for Applied Research Initiatives. The remaining T-12 lights will be replaced in 2017.
- Daylight sensors were installed in the atrium of SE1 to ensure that lights turn off when there is sufficient daylight.
- Full HID to LED light conversion was completed in the airplane hangar at the BCIT Aerospace Technology Campus. The retrofit included an advance control strategy using wireless controllers to maximize daylight.

- Facilities and Campus Development staff frequently use of golf carts in lieu of other vehicles to reduce GHG emissions. Two electric golf carts were replaced and one new cart was added to the fleet.
- A new rollup door was installed for the electrical shop in the NE7 building. The new door is glazed to increase day exposure and reduce reliance on interior lighting.
- The design was completed for a new landscaping compound with the goal of improving composting and enhancing our green waste diversion program. The new compost facility will include leaf litter (green waste) and an anaerobic digestion system for solid organic waste conversion. Anaerobic digestion is the only technology that can produce both energy and a soil amendment to be used on campus. This project is tied to an audit of the green waste diversion program and will reduce or eliminate our reliance on offsite composting and soil material. Once implemented, the project will utilize state-of-the-art green technologies in construction, and there are plans to pursue a new sustainability rating system, Envision, which is the LEED certification equivalent for infrastructure projects.
- Facilities Services implemented an electrical meter dashboard, which is a new tool for assessing the energy performance of any building on the Burnaby Campus. More meters will be added in 2017 to further refine the information provided to Facilities and Campus Development. The tool is tied in to the DDC system and shows real-time energy data from electrical sub meters installed at strategic points in the electrical system.
- An educational lunch hour series taught Facilities staff about existing energy-efficient building technologies.
- Facilities Services staff are using bicycles to make service calls to avoid using fleet vehicles.
- Facilities Services is saving paper by distributing the majority of on-demand work requests through their online work request system. The mobile framework for the request system has been purchased and will be implemented in 2017. If on-demand service requests made via the mobile app are successful, plans will be developed to move the preventive maintenance requests from paper to mobile.

Landscaping introduced more plants to the north side of the Burnaby Campus.

An instructor explains green building techniques in the High Performance Building Lab.

ACTIONS TO REDUCE PROVINCIAL EMISSIONS AND IMPROVE SUSTAINABILITY

- This year, the BCIT School of Construction and the Environment launched the High Performance Building Lab (HPBL), positioning the School as an educational leader in the construction of zero-emissions buildings. The HPBL provides a hands-on learning space for trades and technology students and was created to enable training in the high-efficiency envelope building techniques needed to meet new requirements for energy-efficient housing. The HPBL teaches students how to look at buildings as a system, including methods pertaining to building envelope assembly, air-tightness testing, and HRV (Heat Recovery Ventilation systems).
- Approximately 15 older water fountains were replaced with new fountains with bottle filling features in an effort to reduce waste from disposable bottles.
- Approximately 15 old constant flush urinal tanks were replaced with new automatic flush valve technology that reduces water use.
- The BCIT Green Team promoted National Earth Hour, National Sweater Day, and our own "Christmas Power Down" campaign.
- The BCIT Green Team organized the Celebration of Guichon Creek Tour. Staff and faculty learned about the importance of salmon cycles and the creek that runs through the BCIT Burnaby Campus.
- A new drought-tolerant 'pattern bed' with succulent plants and low-growing ground covers was installed at the SW01 South entrance. This area receives a lot of sunlight and heat during the summer months due to its southern exposure. The drought-tolerant plants help mitigate the heat island effect from the surrounding buildings while creating an attractive entrance with fragrant perennials.
- A new outdoor space was created between SW01 and SW03 with seating, self-watering planters, a new grassed area, and an ornamental grass planting bed.

- To minimize water use, 19 new self-watering planters were added at the Burnaby Campus. The planters are produced from recycled plastic and their design includes a water-containment system.
- Vermi-compost was produced through the vermi-bins maintained by the Recycling Department of Facilities Services. Vermi-soil is the richest soil in organic content, and nutrients in this soil are readily taken up through plants' roots. Vermi-compost eliminates the use of synthetic fertilizers, which can produce negative environmental effects.
- An edible ornamental garden that includes 75 blueberry shrubs was created at the Rix café patio. In addition to the fruit-bearing blueberry plants, five apple trees will be planted and grown espalier-style on the walls behind the blueberry plants.
- The pond at the Rix patio was overhauled and new water plants were introduced, including hardy water lilies, marginal plants that provide water filtration, and floating aquatic plants, which help eliminate warm temperature algae growth.
- The Biotech Department at BCIT has been working on the tissue culturing of flowering cherry trees that were originally donated to Vancouver by Japan after WWI. In 2016 we planted seven cherry trees that were cultivated from this tissue.
- Himalayan blackberry plants were removed from Guichon Creek and replaced with plants native to the Pacific Northwest. The native plants will produce flowers from spring through late summer. The staggered bloom times will provide pollen for bees, a species at risk due to urbanization.
- Two new lawn areas were installed at Maquinna Residence and between SW01 and SW03.
- Facilities and Campus Development worked with Interior Design students and the School of Construction and the Environment on a design project aimed at raising awareness about BCIT's Factor Four area (a part of campus where we aim to reduce energy and materials use by 75%) and Guichon Creek. The design includes moss graffiti artwork that represents the fluid movement of water. BCIT is committed to daylighting the Guichon Creek, which runs beneath the project on Smith Street by NE06.
- Central Receiving began a pilot project to use re-usable fabric to wrap skids before deliveries to the bookstore. They used to use plastic wrap which was a one-time use. The pilot was successful and approximately 80% of plastic waste was eliminated.

New plants are introduced to a pond outside the Rix café that provide water filtration.

The Campus Hydro Station, a 25 kV receiving and distribution centre that improves electrical distribution for the south end of Burnaby Campus, will soon serve the entire campus.

PLANS TO FURTHER REDUCE GREENHOUSE GAS EMISSIONS AND IMPROVE SUSTAINABILITY IN 2017 AND BEYOND

BCIT will be focusing on the following key areas to reduce greenhouse gas emissions and improve sustainability in the coming year:

- We are planning the construction of a smart thermal grid for educational purposes that will connect the biomass system to buildings in the Factor Four area.
- The BCIT Green Team will continue to celebrate Earth Hour and Sweater Day and will organize tours of sustainability initiatives on campus, such as the Smart Micro Grid, the Factor Four area, and Guichon creek.
- Fluorescent lighting will be replaced with LED lighting in NE4 and NW3. This project will set a new green standard for shop lighting.
- Facilities Services will systematically upgrade lighting controls to optimize lighting levels and improve energy efficiency in buildings across campus.
- A high-efficiency condensing boiler will be installed at the Marine Campus.
- Heating controls will be optimized in the majority of the buildings in the Factor Four area, which will reduce GHG emissions. The idea behind the project is to reduce energy waste to the lowest possible levels by only heating the buildings when they are occupied and by optimizing thermal comfort levels by taking into account the occupants' level of physical activity (classroom versus trades hands-on learning) and the type of heating system (forced-air system versus infrared).

Rain gardens along the Goard Way pedestrian mall provide bio-filtration of water run-off into local waterways, including Guichon Creek.

- BC Hydro's Continuous Optimization program will be implemented at the Downtown Campus. Changes that will improve energy efficiency will include optimizing the HVAC controls systems scheduling and resets and sequencing, upgrading some of the building's controls, and other low-cost measures.
- There is a program planned for 2017/2018 to continue replacing old unitary HVAC equipment with more energy-efficient equipment.
- New water conservation projects will be implemented and additional water bottle filling stations will be installed.
- Project design briefs are underway to replace the old cooling tower at the Downtown Campus and to complete a pneumatic to DDC controls conversion of SW3 at the Burnaby Campus.
- We will introduce additional mason bee shelters and mason bee cocoons. Mason bees are hearty pollinators, and they are considered the 'friendly bee,' as they do not have stingers.
- Green façades will be created at SE12. Green façades are similar to living wall systems; the primary difference is that façades are created with plants growing from the ground level that climb walls or trellis systems. Green facades provide considerable benefits to the environment as they help mitigate greenhouse gas effects, mitigate the heat island effect, and provide pollen and nectar for bees and butterflies.
- A new landscape area with outdoor seating will be developed at the SE10 north entrance.

- We will conduct a roof assessment for a proposed green roof above the chemical storage sheds at SW01 and alongside the newly landscaped raised patio bed between SW01 and SW03. This will be a 'tactile' green roof, which the BCIT community will be able to see and touch from the patio grounds. This project will also serve as an educational and awareness-raising tool for living roof systems and the work being done by the School of Architectural Ecology and the landscape department within Facilities Services.
- We will identify another space on campus where an edible organic garden will be designed and installed.
- We will implement a new waste station with a sink at the SE02 cafeteria that collects five waste streams (organics, refundables, recyclables, paper, and waste).
- We will engage with stakeholders to develop a materials recovery program for the six Schools at the Burnaby Camus and various BCIT departments. We will develop a common goal and program for a materials management system, working with the data collected from the waste audit conducted in 2016 by Facilities Services. As a result of these efforts, the Recycling Department and BCIT stakeholders will build capacity for future actions to mitigate waste and improve recycling processes.
- We will work with Metro Vancouver on a case study project to assess an anaerobic digestion unit that processes waste streams from the Burnaby Campus.
- We will add more recycling bins and organics waste containers to office lunch rooms. This is part of BCIT's drive to meet Metro Vancouver's Integrated Solid Waste and Resource Management Plan to compost and recycle 80% of the region's waste by 2020.

A new waste station in the SE2 cafeteria on the Burnaby Campus collects five waste streams.