

2011 Carbon Neutral Action Report

ROYAL ROADS UNIVERSITY – 2011 CARBON NEUTRAL ACTION REPORT

OVERVIEW

EXECUTIVE SUMMARY

The year 2011 was a significant one for Royal Roads University, with the opening of its first purpose-built LEED Gold academic building on campus – the Learning and Innovation Centre. The other major highlight for the year was the on-campus students voting in favour of the BC Transit U-Pass program. The year also marked an investment of over \$1 million dollars of Public Sector Energy Conservation Agreement dollars into energy retrofits in 92% of the existing buildings on campus, including a new energy efficient boiler for Hatley Castle, and a solar hot water system for the student residence building. The following is a summary of these and additional carbon neutral activities for the year 2011.

CLIMATE AND ENERGY ACTION AWARD

The Royal Roads Office of Sustainability, School of Environment and Sustainability and the City of Colwood won the 2011 Climate and Energy Action Award, presented at the Union of BC Municipalities meeting in September, 2011. This award, sponsored by the Community Energy Association was “In recognition of research and monitoring support provided to the development and operation of the Solar Colwood program through the *Green Learning in Action* Partnership.” This was a great accomplishment for the university and its partner the City of Colwood and marked a major recognition by the Union of BC Municipalities for collaboration on climate change initiatives.

RENEWAL OF ROYAL ROAD’S STRATEGIC DIRECTION

The year 2011 also marked a major renewal for the strategic direction of the university, with the following vision, mission and goals:

VISION: “We connect people, ideas and experiences to change lives and the world.”

MISSION: “We are leaders and partners creating an enduring prosperity. Transformation in career and life results from our teaching and research applied to solve problems and create opportunities in the world.”

GOALS:

- Demand-driven growth in high-quality, effective education and research that contribute to economic prosperity, social advancement, and environmental sustainability.
- The university of choice for relevant applied and professional education providing continuous opportunities to learn and transform lives and careers.
- A financially sustainable, high-performance organization.
- A workplace of choice supporting professional and personal success.
- A university with strong partnerships, responsive to our alumni and the communities we serve.
- A leader for sustainable stewardship of our historic lands.

As well, the previous commitments to reduce our greenhouse gas emissions by 50% by 2020, be carbon neutral by 2010 (accomplished), endeavour to be self-sufficient in energy, waste and water, and be a leader in sustainability are embedded in our 5-year Strategic Plan.

THE LEARNING AND INNOVATION CENTRE

Royal Roads University is also embarking on an aggressive growth strategy, with forecasts of 12% growth annually in student FTEs, with a growing percentage of international students, many of whom will be on campus. To accommodate this growth, the new Learning and Innovation Centre was opened in 2011, providing an additional 5,781 square meters of learning space for students. The LIC was built to Gold LEED standards and includes state-of-the-art technology to support RRU's innovative learning model. A "Centre for Dialogue" was created on the fourth floor of the LIC which incorporates specialized technology and furnishings to support RRU's outreach and participation in globally significant dialogue and learning opportunities through webcasts, live streaming, video conferencing and multimedia presentations.

The LIC includes a solar hot water system, which is very beneficial because the student/staff and faculty showers are located in the LIC, for cyclists and others. There are innovative water technologies, such as the collection of non-potable water to be reused for toilets and irrigation, which result in a water savings estimated at 1.7 million litres of water each year, and the system has the potential for treating wastewater on site. Seventy-five percent of the roof is highly reflective, thereby reducing heat absorption and addressing the potential heat island effect. During construction, 95% of the construction waste was diverted from the landfill. Following the construction, and the review from the consultants, the building was deemed to have created zero environmental impacts, particularly important because of the proximity to the fish bearing Colwood Creek.

The University also won an Excellence Award for the LIC, in the Institutional Category of the Commercial Building Awards, sponsored by the Commercial Division of the Victoria Real Estate Board.

RRU STUDENTS ADOPT THE BC TRANSIT UPASS

Another significant change at RRU in 2011 was the adoption of the U-Pass system by the on-campus student body – marking the first time the students have passed the required bylaw and referendum to increase their student fee, to enable the U-Pass (77% of on campus undergraduate students voted and of those, 83% voted in favour of the U-Pass program). A Transportation Demand Study was completed in 2007 which revealed that 90% of the students, staff and faculty were arriving at RRU in single-occupant vehicles. Since that time the university has started a number of initiatives to encourage carpooling, cycling and transit, however, the passing of the U-Pass has been the single most significant change. Ridership has increased on transit which should lead to increased service by BC Transit. In addition, to further improve access to transit, a bus turnaround station has been added to plans for developing the north end of campus which will accommodate more buses coming into campus and concentrate the transportation nodes for campus at the north end. Future residences are also being planned for this area, all part of the creation of the Upland Village.

ENERGY RETROFITS AT ROYAL ROADS

The majority of the buildings on the RRU campus were either part of the Dunsmuir Estate, for example Hatley Castle, or part of the military history of the site. RRU was fortunate to receive over \$1 million dollars in 2011 to undertake major retrofits of these buildings, as part of the plan to reduce greenhouse gas emissions by 50% by 2020. It is expected that these retrofits will reduce emissions by 20%. Retrofit actions included a new energy efficient boiler for Hatley Castle, air sealing and insulation for all of the buildings, significant upgrades to direct digital control systems, spark igniters for the gas stoves in the cafeteria, a new hot water boiler in the gymnasium, new LED and compact fluorescent units for all of the office desks and residences, as well as new shower heads throughout. Discussions are still underway on the feasibility of a district energy system for the university, and the potential of various alternative energy sources, such as wind, solar and geothermal.

ACADEMICS AND SUSTAINABILITY AT ROYAL ROADS

On the academic side, the university launched the first ever Carbon and Energy Leadership and Sustainable Community Development Certificates; completed two Bachelor of Science student projects, completed the first year of a Social Diffusion research project on the Solar Colwood project; and completed a transportation challenge project by the Bachelor of Commerce students.

RRU is a partner with the City of Colwood on the Solar Colwood project. This project is a \$3.9 million program, under Natural Resources Canada, which will result in 1,000 homes in Colwood undergoing energy assessments, and choosing either solar hot water systems or ductless split heat pumps, to decrease the greenhouse gas emissions in the City of Colwood.

The results of these two student projects are highlighted below:

1. **Monitoring Project:** This project represented leading-edge research into the energy use and GHG emissions at the household level. The main outcomes of the project were:
 - a. The identification of an information gap regarding energy use at the household and community level – which showed that only provincial level average information has been used in the past, which precludes the development of accurate energy use leading to accurate GHG emissions information, and
 - b. The development of a methodology for quantifying the energy use and GHG emissions reductions associated with retrofitting homes with solar hot water systems.
2. **Lifecycle Assessment of a Solar Thermal System:** The students conducted a lifecycle analysis (LCA) and a benefit-cost analysis (BCA) of a solar thermal hot water (SHW) system. The research project consisted of two objectives:
 - a. To calculate carbon dioxide (CO₂) emissions by using LCA applications, based on SHW system production and subsequent transportation to Vancouver Island; and,
 - b. To determine if Colwood homeowners should consider the Solar Colwood program by applying BCA methods based on financial savings, and social and environmental values.

Results for the first objective indicated that there was a net reduction in CO₂ emissions, especially for homeowners with hot water tanks originally heated by natural gas. Therefore, it was recommended that Colwood homeowners participate in the Solar Colwood program if they wish to apply SHW technology as a means to reducing their personal carbon footprint. Study findings for the second objective indicated that the homeowner financial benefits varied due to many influences, such as fuel inflation rates, current energy source used, and the various financial incentives in the Solar Colwood program. As a result, recommendations for Colwood homeowners were to evaluate their individual situation and determine their actual financial savings. The study also strongly recommended that homeowners consider the positive social and environmental benefits of participating in the SHW program.

In addition to these student projects, there is a two-year research study on the social diffusion aspects of Solar Colwood underway, funded by the Pacific Institute for Climate Solutions. A

number of barriers to the adoption of solar systems were identified, such as lack of awareness, installation concerns, lack of knowledge about energy efficiency options, the complexity of rebate programs, low energy prices, a mild climate and the perceived inability to capitalize energy efficiency improvements in home values. The benefits identified included taking action and demonstrating leadership, providing an example for a better future for young people and saving money through reduced energy costs. This study will continue through 2012, as well as three more Solar Colwood student projects in the Bachelor of Science program.

The learning model at Royal Roads University encourages and supports students working on real world challenges and opportunities. In this past year the focus has been on transportation in the Bachelor of Commerce program and on Solar Colwood in the Bachelor of Science program. 2012 will see a continuation of these programs, but also a new challenge area on food security and carbon in the Masters of Environmental Management program, and a Bachelor of Commerce Venture Challenge on the SAFE fund (Sustainability Actions for the Environment Fund).

OTHER HIGHLIGHTS AND WINNING RRU STUDENTS IN “READY, SET, SOLVE”

Other highlights from 2011 include the completion of the Wetland Assessment Report, a cycling survey of staff and faculty to help drive a new cycling infrastructure plan at RRU, and the highly successful *Ready, Set, Solve* Project, coordinated by a RRU alumni working for the goBEYOND Campus Climate Network as part of the Office of Sustainability at RRU, and won by a team of RRU students. The winning project was a Greenhouse Gas Emissions calculator for the Town of Sidney – the students volunteered their time over a three-month period, in a competition with students from UVIC and Camosun College. This project was sponsored by the Capital Region District and BC Hydro. Another shining example of RRU students undertaking real world challenges for the benefit of sustainability in the larger community.



Dan Tulip,
Vice President and Chief Financial Officer
Royal Roads University

EMISSIONS REDUCTIONS ACTIVITIES

ACTIONS TAKEN TO REDUCE GREENHOUSE GAS EMISSIONS IN 2011

1. RRU completed a number of Energy Upgrades to its buildings in 2011, with the support of over \$1 million from the Public Sector Energy Conservation Agreement. Projects completed include:
 - A new energy efficient boiler for Hatley Castle
 - Air sealing and insulation in 16 buildings
 - Attic insulation in Hatley Castle
 - Digital control systems installed in nine buildings
 - Spark igniters installed in the gas stoves in the cafeteria
 - A new hot water boiler in the gymnasium
 - New LED and compact fluorescent units for office desks and residences – 68 desk lamps replaced, 63 special LED floodlights replaced for Media Services, 205 replacement lamps for staff
 - New water saving shower heads installed
 - Heat pumps for four houses on campus
 - Solar hot water system for the residences

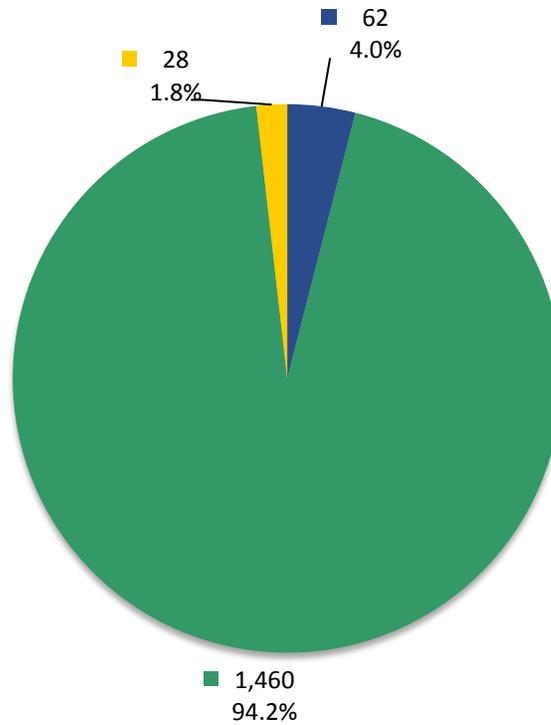
2. Opening of the new Learning and Innovation Centre, with the following Gold LEED features:
 - Energy performance optimized through an atrium, with “chimney effect” ventilation
 - High indoor air quality standards
 - Low emitting materials, and locally extracted/manufactured resources
 - 95% construction waste diverted from the landfill
 - High-efficiency lighting with auto sensors
 - 75% of the roof is highly reflective thereby reducing heat absorption, and addressing the potential heat island effect
 - Innovative water technologies – collection of non-potable water to be reused for toilets and irrigation, resulting in water savings estimated at 1.7 million litres per year, and potential for treating wastewater on site
 - Landscaping plan features native species and uses a water-efficient irrigation system
 - Alternative transportation options promoted by adjacency to public transportation and construction of bicycle parking and showers
 - Solar Hot Water system

- New recycling stations, with the sustainability brand, installed on every floor of the LIC, and outside the building
 - Three virtual education labs (sound production booths) contain interactive communications technologies and multimedia presentation capabilities to enable faculty to conduct teaching and research with students in a virtual environment
 - State-of-the-art large scale video conferencing, including two 60-inch LCD displays
 - “Centre for Dialogue” has a 30-foot wall screen and offers a wide range of podcasting tools, wikis, and wiki tutorials, as well as software for multimedia presentations and simultaneous language interpretation
 - Virtual meeting rooms linked to AV control centre
 - Wireless internet access throughout the building
3. Four full-size Energy Star refrigerators replaced older units, and one bar fridge.
 4. Two new Energy Star washers and dryers to replace older units.
 5. One new Energy Star dishwasher.
 6. Continued discussion on a District Energy System for campus with FortisBC, BC Hydro, League Assets, and Natural Resources Canada.
 7. The students passed a bylaw and a referendum leading to a successful vote to become part of the BC Transit U-Pass system. Bus ridership is up, and with the construction of a bus turnaround at the top of campus, bus service will be expanded. The university also accepted some recommendations from the student project on carpooling – having a week of free parking at the beginning of the academic term to enable students to sort out their travel arrangements and having multiple students on an annual parking pass, to support carpooling arrangements.
 8. The Solar Colwood Program was launched, with 80 installations of either solar hot water systems or ductless split heat pumps, or both. Two student reports were completed, as well as the first year of the Social Diffusion research project. The work being done by RRU on this program will represent the first ever documented energy savings from solar hot water systems – all other research in this area is based on surrogate data.
 9. Electric Vehicles are part of the Solar Colwood program, and there are plans for electric vehicle charging station infrastructure being built in Colwood. RRU is part of those plans.
 10. The baseline assessment for the Wetland Restoration Project was completed.
 11. Plans were completed for a new recycling station in the cafeteria, and funding was approved from the SAFE Fund (Sustainability Actions for the Environment) and the custodial staff’s Pop Bottle Fund for the construction of this new station, complete with the new sustainability branding.

PLANS TO CONTINUE REDUCING GREENHOUSE GAS EMISSIONS 2012-2014

1. The monitoring of the Solar Colwood program will continue, with results coming in on the actual energy savings from solar hot water systems. This will represent the first time that household level data has been collected.
2. New student projects will be underway related to Climate Change, Renewable Energy and Food Security.
3. An electric vehicle charging station will be in place on campus.
4. The feasibility of replacing more of the aging fleet vehicles with electric vehicles will help inform fleet vehicle replacements.
5. New recycling stations will be placed in more campus buildings, through funding from the SAFE fund and student legacy projects.
6. A feasibility study will be underway on the potential for renewable energy sources on campus, to meet our Board of Governors target of reducing GHG emissions by 50%.
7. A waste audit will be underway, with a study on the feasibility of an on campus composting system. The diversion rate on RRU is currently estimated at 70% and actions are needed to push this closer to 100%.
8. Continue to replace appliances with Energy Star appliances.
9. The potential of carbon sequestration in the wetland restoration area will be researched.
10. Results of the social diffusion research project will be released.
11. New funding streams will help increase the funds in the SAFE fund to enable more sustainability projects on campus, and off campus. The SAFE funds are divided into projects on campus and projects from alumni to use as start-up funds in their communities.
12. The bus turnaround will be completed at the top of campus, enabling additional buses to serve the RRU campus, and continue to increase ridership by RRU staff, faculty and students.
13. RRU will be re-assessed by the STARS rating system in 2014, with the plan to go from Silver to Gold. ISO 14000 will be researched by MEM students.
14. The Carbon and Energy Leadership Certificate will go online, which will increase enrolment in the program. Additional certificates will be reviewed specifically in the area of District Energy and Renewable Energy.

**Royal Roads University
Greenhouse Gas Emissions by Source
for the 2011 Calendar Year (tCO₂e*)**



Total Emissions: 1,550

- 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 2011 (Generated March 15, 2012 2:46 PM)

Total offsets required: **1,547**. Total offset investment: **\$38,675**. Emissions which do not require offsets: **2**

*Tonnes of carbon dioxide equivalent (tCO₂e) 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

SMARTTool Greenhouse Gas Inventory Report

Reporting Entity: Royal Roads University

Reporting Year: Calendar Year 2011

Measure	Quantity	Greenhouse Gases in Tonnes				
		CO ₂	CH ₄	N ₂ O	tCO ₂ e ¹	
Scope 1 (Direct) Emissions						
Mobile Combustion (Fleet)	Litres	28,584.82	56.58	0.01	0.01	60.65
Stationary Combustion, Reported ³	GigaJoules	28,552.43	1,327.78	0.03	0.02	1,335.74
Total Scope 1 Emissions			1,384.37	0.03	0.04	1,396.39
Scope 2 (Indirect) Emissions						
Purchased Energy, Estimated ²	GigaJoules	146.40	31.04	0.00	0.00	31.04
Purchased Energy, Reported ³	GigaJoules	13,393.50	92.42	0.00	0.00	92.42
Total Scope 2 Emissions			123.45	0.00	0.00	123.45
Scope 3 Emissions						
Business Travel and Office Paper						
Office Paper	Packages	4,631.00	27.51	0.00	0.00	27.51
Total Scope 3 Emissions			27.51	0.00	0.00	27.51
Emissions from Biomass						
Total Biomass Emissions			2.42	0.00	0.00	2.42
Total Emissions, Calendar Year 2011			1,537.75	0.03	0.04	1,549.77

1. Global Warming Potential (GWP) has been applied only to the tCO₂e values.

2. Estimated data has been calculated based on the methods described in the Methodology Document.

3. Reported data refers to consumption which has been directly billed to the organization.

This information is provided by the Government of British Columbia, and is subject to verification.