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BUILDING OPERATIONS CARBON REDUCTION PLAN

- CONFIDENTIAL -

Prepared for:

Niagara College Rankin Technology Centre
300 Woodlawn Road
Welland, Ontario
L3C 7L3

Audit Team Leader
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Walker Environmental Group Inc.
P.O. Box 100
Thorold, Ontario
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Niagara College Canada
300 Woodlawn Rd.
Welland, ON
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Dear Ms. Wilkinson,

RE: Building Operations Carbon Reduction Plan

Please find attached a copy of the *Building Operations Reduction Plan* prepared by Walker Environmental Group Inc. for the Niagara College Rankin Technology Centre. This report is not a binding document and has been developed to assist Niagara College in reducing their operational carbon footprint. Walker Environmental Group would like to thank you for your continued support, participation and cooperation throughout the Carbon Neutral Building Project process.

Sincerely,

Carbon Neutral Building Service Team

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Executive Summary

Walker Environmental Group Inc. (WEG) was retained by Niagara College to create a Building Operations Carbon Reduction Plan on the Rankin Technology Centre (RTC). A Building Operations Greenhouse Gas Audit was completed in May 2013 to establish the building's operational carbon footprint; this Carbon Reduction Plan is based on the results of the GHG Audit.

The aggregated total of greenhouse gas emissions for the RTC for Niagara College's fiscal year was equal to 268.06 tonnes of carbon dioxide equivalents (CO_2e). Three contributing sources of operational greenhouse gas emissions were identified in the carbon audit:

1. Natural Gas—Used for the buildings heating and cooling needs – source of 142.39 tonnes (53.12% of total) CO2e emissions.
2. Electricity—Main source is the buildings lighting systems – source of 125.53 tonnes (46.83% of total) of CO2e emissions.
3. Water—Used throughout the facility in washrooms and labs – source of 0.13 tonnes (0.05% of total) of CO_2e emissions.

Walker Environmental Group has completed this Carbon Reduction Plan to include several initiatives that Niagara College may choose to implement to reduce the RTC carbon footprint. The initiatives included in this reduction plan include both building retrofit projects and behavioural changes. These proposed initiatives could assist Niagara College in reaching two of their sustainability targets:

- Reduce electricity consumption by 10 percent
- Reduce greenhouse gas emissions by 10 percent

This Carbon Reduction Plan was created to assist Niagara College in reducing its operational carbon footprint at the Rankin Technology Centre. WEG has provided a summary of reduction opportunities for Niagara College to consider.

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1. Introduction

Walker Environmental Group (WEG) was retained by Niagara College to conduct a Building Operations Greenhouse Gas Audit and accompanying Carbon Reduction Plan for the Rankin Technology Centre (RTC). The GHG Audit site visit occurred on February 22, 2013 and assessment of the audit continued through May 27, 2013. From the information and data collected and analyzed to determine the RTC carbon footprint, WEG has developed a Building Operations Carbon Reduction Plan.

1.1 Purpose of the Carbon Reduction Plan

This carbon reduction plan was created to provide Niagara College with opportunities to reduce the energy consumption, water consumption and overall carbon footprint experienced at the RTC. WEG has included several recommendations for Niagara College to reduce carbon emissions; these recommendations have been designed specifically for the RTC. This report will be the first in a series of carbon reduction initiatives undertaken by RTC which will be prepared for the RTC annually by WEG.

2. Project Background

Sustainability is an integral part of the Niagara College culture. The College has made a commitment to become a leader in sustainable development not only as an educational institution but also as a leader in the Niagara Region.[1] Niagara College has made several five-year sustainability targets to be achieved campus wide.

The Carbonzero Certification of the RTC is just one way that Niagara College is working towards achieving their targets; the Carbon Neutral Building Project has also been implemented at the Wine Visitor and Education Centre at the NOTL campus.[2] This carbon reduction report will address the following two college wide targets within the RTC:

- Reduce electricity consumption by 10 percent
- Reduce greenhouse gas emissions by 10 percent

Although Niagara College does have a goal to reduce water consumption by 5 percent, WEG will not be making recommendations to reduce their water consumption; water consumption at the WVEC accounted for only 0.04 percent of the operational carbon footprint and is therefore not considered significant.

WEG has worked with Niagara College to determine the RTC operational carbon footprint through an energy and carbon audit. Based on the audit results and carbon report produced, WEG was able to make several recommendations to assist the Niagara College RTC to decrease their energy

[1] Niagara College. 2013. Sustainability Home. Retrieved from http://www.niagaracollege.ca/content/Sustainability/SustainabilityHome.aspx

[2] Niagara College. 2013. Carbon Neutral Building Project. Retrieved from http://www.niagaracollege.ca/content/Sustainability/CarbonNeutralBuildingProject.aspx

consumption and carbon footprint. These recommendations are both a mixture of behavioural and retrofit projects. This carbon reduction plan outlines the steps that the RTC could take to achieve energy and carbon reductions based on the recommendations made by WEG.

3. Rankin Technology Centre Operational Footprint

3.1 Scope and Operational Boundary of the Carbon Reduction Plan

The operational boundaries that relate to the fiscal 2012 carbon audit are separated into direct greenhouse gas emissions (Scope 1), energy indirect greenhouse gas emissions (Scope 2) and other greenhouse gas emissions (Scope 3).

For the purpose of this carbon reduction plans, all recommendations and initiatives will target Scope 1 and 2 of the facilities operational footprint. Scope 1 direct emission reductions will pertain to natural gas combustion that takes place on site. Scope 2 indirect emissions reductions will focus on the electricity purchased by the RTC from Welland Hydro. At the RTC, there are several daily activities performed by the students and faculty that contribute to its greenhouse gas emissions.

3.2 Confirmation

Carbonzero conducted a review of the Building Operations Greenhouse Gas Report and provided external confirmation that the carbon audit was accurate. The results of their audit have been provided to Niagara College.

3.3 Offsets

The offsets purchased by Niagara College are from the Landfill Gas to Energy Project. Landfill gas is collected, captured and recovered from the East Quarry Landfill and is processed into a useable fuel source. The fuel is transferred to the nearby paper mill where it is combusted along with natural gas in the paper mill's steam plant. This carbon offset program is listed on the CSA CleanProjects Registry and has been 3rd party verified by ICF International under ISO-14064-2[3].

4. Carbon Reduction Projects

Niagara College has implemented several initiatives across both of its campuses to reduce their carbon footprint; the Carbon Neutral Building Project is the latest project at the Welland campus and is specifically aimed at the RTC. The RTC is Niagara College's second facility to offset its operational footprint. Their first participating facility, the WVEC, is the first post-secondary education facility in Canada to be Carbonzero Certified[4].

[3] Carbonzero. 2013. Niagara, ON – Landfill Gas to Energy Project Retrieved from http://www.carbonzero.ca/projects/niagara-landfill-gas-energy-project

[4] Niagara College. 2013. Wine Visitor + Education Centre's Carbonzero Certified status a first for colleges in Canada. Retrieved from http://niagaracollegenews.niagaracollege.ca/2013/01/07/wine-visitor-education-centres-carbonzero-certified-status-a-first-for-colleges-in-canada/

4.1 Targets and Objectives

Niagara College is committed to achieving their sustainability goals. At the RTC the following targets and objectives have been recommended to help achieve these goals:

- Reduce overall electricity consumption
- Reduce overall natural gas consumption

4.2 Recommendations

WEG has developed a series of initiatives to assist the RTC to reduce their carbon footprint. A breakdown of each of these initiatives is summarized below.

4.2.1 Welding Shop Lighting Retrofit Project

On the day of the site visit, it was observed that most lights in the welding shops were sodium bulbs. If these bulbs are retrofitted from sodium bulbs to T8 fluorescent lights as an example, a conservative estimate of energy savings from lighting will be approximately 20 percent[5] of the welding shops' operational costs for lighting. There is a retrofit program available that will pay a minimum of $12 per fixture[6] that Niagara College could participate in to help reduce the cost. Additionally, each individual welding booth has its own incandescent light bulb, during the site inspection the lights had been left on even though the booth was not in use. WEG would recommend that as the bulbs expire, have them upgraded to compact fluorescent lamp (CFL) models and switch them off when not in use.

4.2.2 Welding Shop Smart Power Strip/Switch Installation

During the tour, the welding shops were unoccupied, however, the lights at individual booths were on and the wlding units were plugged in. The constant "plug-in" and connection to the outlets may be drawing phantom power while the devices are not in use. The phantom load on that type of equipment could be drawing a large amount of power on an annual basis. The college could investigate the installation of smart strips or switches, which would help to reduce the electricity consumption in these welding shops when they're unused.

4.2.3 Welding Shop Engagement and Education

As mentioned previously, during the tour there were several lights left on in the welding shops while they were unoccupied. WEG would recommend that both instructors and students are educated on the importance of energy conservation and how to reduce their consumption through behavioural changes. This information can be made a part of the curriculum when students are trained on how to properly use equipment. Reminder posters or signs can also be placed around the shop to ensure that students and staff are aware they need to properly shut off all equipment.

4.2.4 Hallway Lighting

[5] JAFtech Mfg. (2012). Quick Comparison Chart. Retrieved from http://www.jaftech.com/comparison_roi

[6] Ontario Power Authority (2013). SaveONenergy: *RETROFIT_Eligible_Measures_Worksheet_Lighting_V.3.1._Mar2013*. Retrieved from https://www.saveonenergy.ca/Business/Program-Overviews/Retrofit-for-Commercial/Relevant-Documents.aspx?scNodeID=206

There were many opportunities for more efficient use of the lighting system that were observed while on the site visit of the RTC. In The building has several large and long halls with large windows that allow the natural sunlight to provide sufficient lighting during the daylight hours. Even during cloudier days there is sufficient sunlight available to light these hallways safely. The college could either have staff members turn off the hall lights when they are not needed or have them programmed so that they utilize the RTC's building automation system. Hallways are also equipped with daylight sensors which should detect when the daylight is sufficient to light the halls. Unfortunately some of the sensor seem to be out of syn with the building automation system or they are placed in poor locations. For example, one of the sensors was mounted behind a pillar in the hallway where it is unable to detect the direct natural sunlight; therefore it is communicating the wrong conditions to the building automation system. In order to increase the efficiency of the system, these sensors should be reinstalled in areas where they will detect sunlight and help to reduce costs and energy use associated with lighting.

Aesthetic lighting was also observed in the hallways. These lights do not provide any substantial practical lighting benefits, especially during daylight hours. The college could limit the use of these lights and reduce the RTC operational footprint.

4.2.5 Utilize Building Automation System

A building automation system (BAS) has been installed at the RTC to control lighting, heating and cooling needs; however, to date, the system has yet to be fully utilized. With proper training and programming, the technology can be used to automate lighting and heating and cooling programs. If used properly these programs can minimize the use of unnecessary lighting as well as further maintain and control the heating and cooling system at the RTC.

The automated system at the RTC is from Lutron Inc. According to Lutron, lighting accounts for 39 percent of office electricity consumption[7]. At the RTC this average was lowered to an estimate of 25 percent; there are several pieces of intensive equipment used in the engineering technology programs that could impact Lutron's general estimate. . When the Lutron system is used, electricity consumption from lighting is reduced by 60 percent. The proper use of the automation system will help to reduce electricity demand by as much as 15 percent. This 15 percent decrease translates to a savings of 171,178.4 kWh and a reduction of 25.68 tonnes of CO_2e based on the 2012 GHG footprint data. The table below provides an explanation of how WEG arrived at this estimation.

[7] Lutron Electronics Co. (2013). Energy Savings. Retrieved from http://www.lutron.com/en-US/Residential-Commercial-Solutions/Pages/Commercial-Solutions/CommercialEnergySavings.aspx

Table 2: Estimated Electricity and Carbon Reduction from Lutron Programming

Estimated Savings from Lutron Programming	
RTC Annual Electricity Consumption (kWh)	1,141,189.33
Average Lighting Use	0.25
Estimated Electricity Use for Lighting	285,297.33
Energy savings using Lutron	0.60
Estimated Electricity Savings	**171,178.40**
Estimated Carbon Reduction	**25.68**

4.2.6 Realign and Replace Weather Stripping on Doors

The outer doors to the RTC do not properly align, so they do not close or seal properly, as a result there is a noticeable draft that comes through this gap. In addition to the improper alignment, the weather stripping is in very poor condition, which contributes to the draft. In order to minimize the heat and cooling loss from these entrances, WEG suggests that the doors be realigned and the weather stripping replaced. These changes could help to improve the building envelope; a sealed envelope ensures that heat is not lost in winter months and cool air is not lost in the summer.

Furthermore, a set of interior doors were being held open during the inspection which was letting cold air flow through the halls. These doors should remain closed at all times to reduce heat loss in the winter and cooling in the summer.

4.2.7 Installation of a Vestibule at Main Entrance

The main entrance to the RTC consists of a set of double doors surrounded by glass walls. During the site visit, it was noted that it is very cold due to the heat loss. The installation of a second set of doors to create a vestibule at this entrance is could be considered as it would help to decrease the heat loss experienced in this area of the building.

4.2.8 Classroom Lighting Engagement

It was observed during the site visit that lights and computers remained on in some of the unoccupied classrooms. Reminder signs could be placed at both the computer stations and doors to ensure that both students and professors are reminded to shut off the lights and shut down the computers when exiting the classroom. Alternatively the lights could be placed on sensors and programmed into the BAS so that they would automatically shut off after a specified time period.

4.2.9 Auto Shop Lighting

The lighting in the auto shop uses sodium bulbs similar to the welding shops. As stated in section 4.2.1, these sodium bulbs could be upgraded to T8 or T12 fluorescent lights. There could be a

potential annual energy savings of 20 percent[8] of the auto shops operations for lighting through retrofit projects.

4.2.10 Garage Door Heating Shutoff

Due to the nature of the activities within the auto shop, the bay/garage doors are frequently opened and closed to allow cars to enter and exit the facility. When these doors are open, they allow a significant amount of heating or cooling energy to escape the building. A sensor could be installed on the garage doors that will shut off the heating or cooling when the doors are open. This could help to reinforce that the doors should only be opened when absolutely necessaryReprogram Lighting Sensors in Washrooms

[8] Ontario Power Authority (2013). SaveONenergy: *RETROFIT_Eligible_Measures_Worksheet_Lighting_V.3.1._Mar2013*. Retrieved from https://www.saveonenergy.ca/Business/Program-Overviews/Retrofit-for-Commercial/Relevant-Documents.aspx?scNodeID=206