

ENERGY AND WATER
CONSERVATION AND DEMAND
MANAGEMENT PLAN

2014 – 2019

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EXECUTIVE SUMMARY

This report presents the Conservation and Demand Management plan (CDM Plan) for Centennial College for the five year period beginning July 1, 2014 through 2019.

The World Commission on Environment and Development defines sustainability as, "A process of change in which the exploitation of resources, the direction of investments, the orientation of technological development and institutional change are all in harmony and enhance both current and future potential to meet human needs and aspirations". Centennial bases its work on this comprehensive approach, challenging the College and our community to ensure that the College survives, thrives, adapts and delivers, well into the future. The CDM Plan is a strategic plan for the College to make appropriate changes to its facilities and operations that will reduce energy consumption, water usage, and their associated costs.

Under the *Green Energy Act 2009, Ontario Regulation 397/11*, all public agencies are required to better understand and manage their energy consumption. As a part of this commitment, public agencies are required to annually report on their energy consumption and greenhouse gas (GHG) emissions starting July 1, 2013 and to develop a five-year energy CDM plan on or before July 1, 2014.

It is the College's goal, as documented in the College's Book of Commitments, 2nd edition, to foster "Smart Stewardship and the Truly Sustainable College".¹ As part of this goal, we have committed to adopting and implementing the Association for Canadian Community Colleges (ACCC) Sustainability Protocol which includes establishing a sustainability policy, incorporating sustainability principles and best practices in procedures and operations, and developing an institutional sustainability plan that includes mechanisms for tracking progress. These plans will include establishing a 'green team' to oversee and direct activities relating to conservation and sustainability as well as establishing minimum standards for construction and procurement activities in order to reach these goals.

Also, as outlined in this CDM Plan, over the next five year period, we commit to reduce our consumption of electricity by 7%, reduce our natural gas consumption by 12%, reduce our greenhouse gas (GHG) emissions by 501 Tonnes and achieve a 4% reduction in water usage by the end of 2019 as compared to the baseline year measurements taken in 2012. We have identified several key technical initiatives that will be implemented between 2014 and 2019 to achieve these goals.

¹ Centennial College Book of Commitments, 2nd Edition: <http://www.centennialcollege.ca/about-centennial/corporate-information/publications>

1. CENTENNIAL COLLEGE - DISTRIBUTION OF ENERGY CONSUMPTION IN 2012

Centennial College commissioned DIALOG, a third party consulting company, to undertake a study of our eight buildings located across four campuses and comprising over 1 million square feet of gross floor area (GFA). The aim of the study was to assess the College's facilities and building services, establish energy benchmarks for the College, and complete an analysis of the College's utilities and consumption rates in 2012.

1.1. OVERVIEW OF CENTENNIAL COLLEGE FACILITIES IN 2012

Centennial College facilities consist of four major campuses built over a 46 year span, with multiple buildings at two of the four major campus sites. There is approximately 1,500,000 sq. ft. (135,000 sqm) in built facility space across all sites.

In the years leading up to the baseline year of 2012, the College constructed a new campus at Morningside Avenue and Ellesmere Road (2004), and constructed several buildings at the Progress Campus in the Progress Avenue and Markham Road area of Toronto as follows:

- Student Centre (2000)
- Library and Academic Facility (2011)
- Athletic & Wellness Center (AWC) (2011)

In addition, the College also acquired a building from the Toronto District School Board in 2010 which is now referred to as the College's 'A' Block at Progress Campus.

The College will focus its initial efforts on its facilities that will provide the most long term benefits in terms of energy conservation and demand management. Buildings that have been recently constructed in accordance with LEED Gold standards (Progress Library Building), and buildings that are scheduled for decommissioning in the next 5 years (Residence building) or those that are operated by the Centennial College Student Association Inc. (CCSAI) (such as the Student Centre and the AWC building) will not be specifically targeted for improvements within this five year energy CDM Plan.

All College buildings have been regularly maintained with varying amounts of renovations and maintenance completed over the years. Each of the College's buildings is served with various types of mechanical and electrical systems, and utilizes a variety of building automation controls and lighting controls. The table below indicates the baseline inventory as of 2012 for all buildings at each campus location.

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Table: 2012 Inventory of Centennial College Buildings

Campus	Address	Building ID (year built)	Building Area (SF)	Population (Staff and Students)
Progress Campus (Total: 645,655 SF)	939 Progress Ave.	A Block (1993 – acquired by College 2010)	102,000	15,923
	941 Progress Ave. “Main Building”	– Block B,C,D,E and G (1977/1989)	351,749	
	941 Progress Ave. “CCSAI”	Student Centre (2000) AWC (2011)	86,906	
	941 Progress Ave. “Library”	‘L’ block (2011)	105,000 <i>LEED Gold</i>	
Morningside Campus (Total: 245,142 SF)	755 Morningside Ave	(2004)	TOTAL: 245,142	5,946
Ashtonbee Campus (Total: 326,067 SF)	75 Ashtonbee Rd.	Blocks A,B,C,D,E and F (1971/ Annex 1980 / Hangar 2001)	269,163	5,373
	930 Warden Ave.	(1953)	56,904	
Story Arts Centre (Total: 106,652 SF)	951 Carlaw Ave.	(1956/re-opened 1994)	106,652	1,810
	550 Mortimer Ave.	(daycare 1995)	NA	

1.2. ENERGY BREAKDOWN BY UTILITY

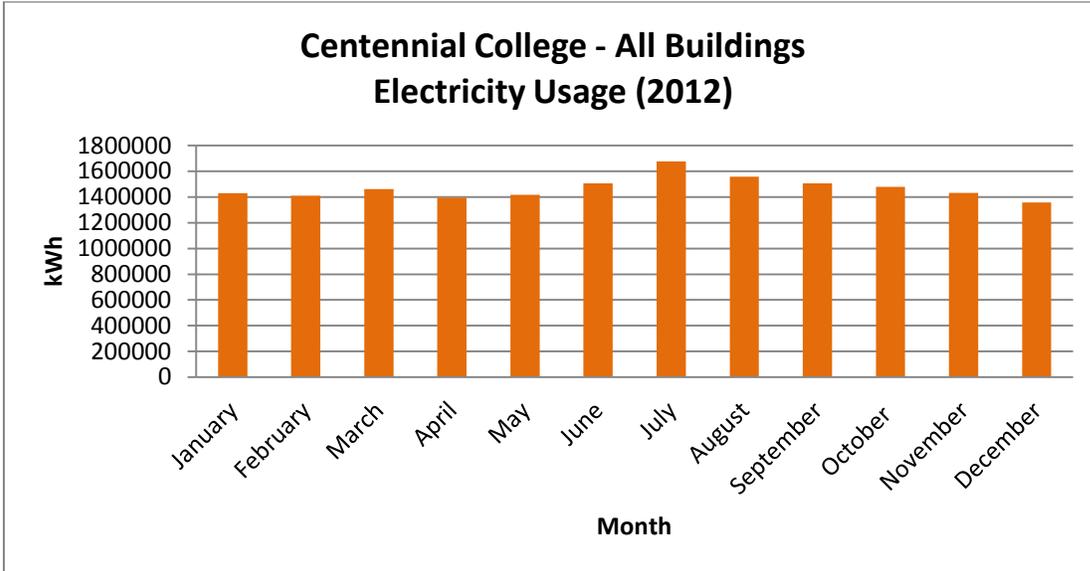
As per the requirements of *Ontario Regulation 397/11*, the energy consumption for the last full calendar year available, established as 2012, will be used as a benchmark for all future energy savings. It is important to note that late winter 2012 was a mild winter in Toronto and this is reflected in the energy usage of the buildings. The results of this study are presented below. The chart (below) summarizes Centennial College’s electricity, natural gas and water usage and energy cost consumptions for 2012.

	Usage	Energy Cost
Electricity (kWh)	17,631,020	\$2,505,516
Natural Gas (m ³)	1,404,870	\$347,005
Water (m ³)	82,464	\$223,790

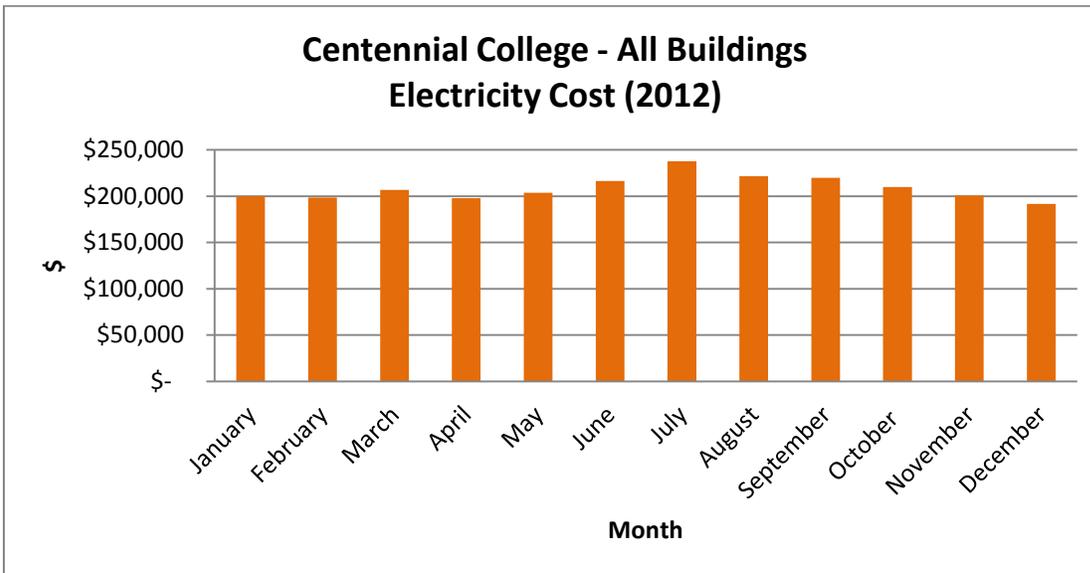
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1.2.1. ELECTRICITY CONSUMPTION

The table (below) shows Centennial College’s electricity usage (in kWh) for all buildings in each month for 2012.



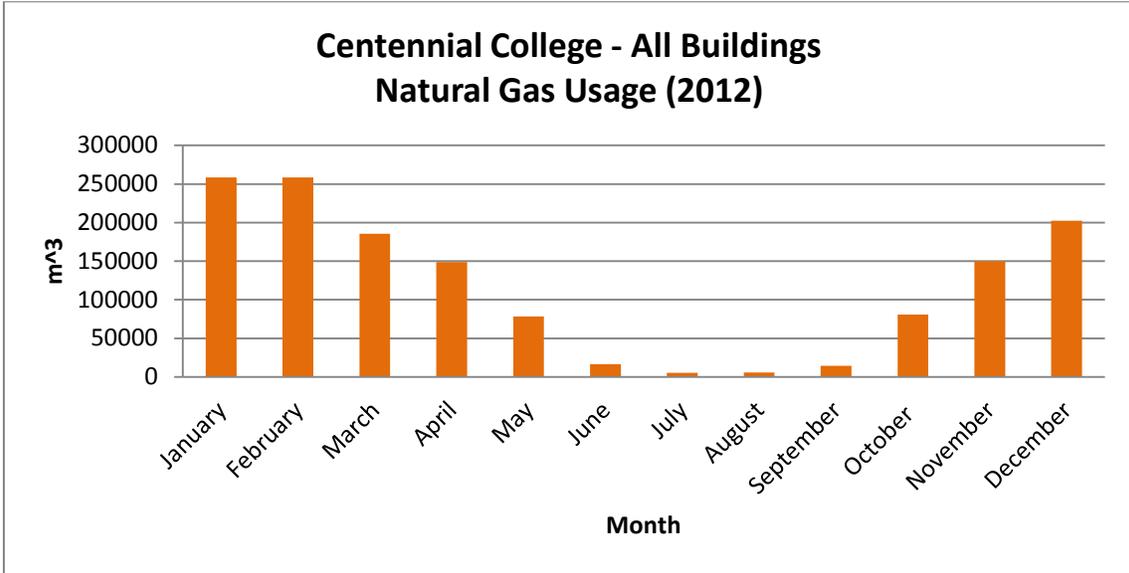
The following chart illustrates the monthly electricity cost (in dollars) for all buildings.



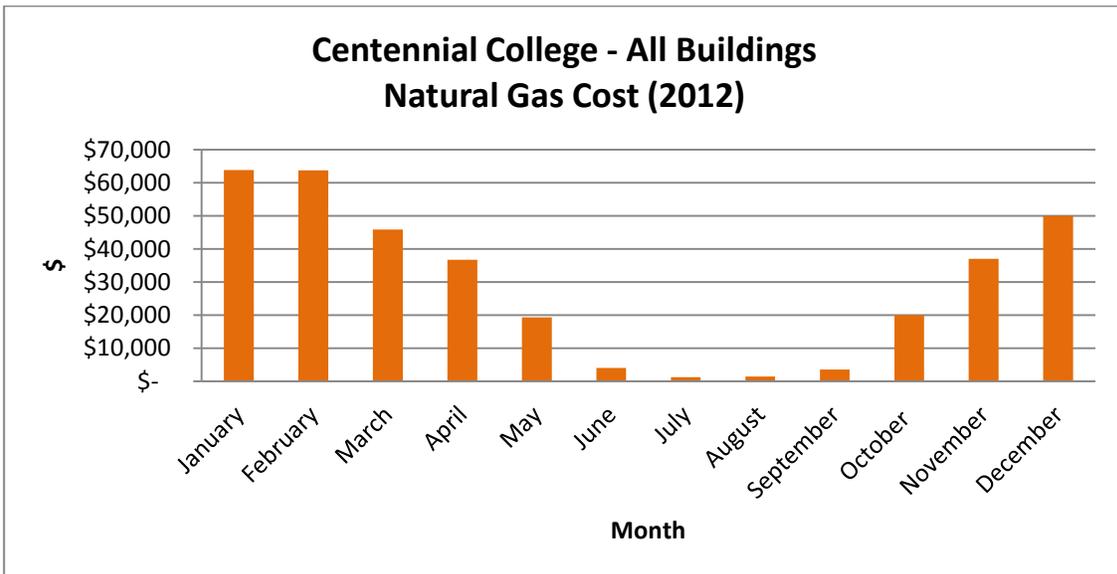
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1.2.2. NATURAL GAS CONSUMPTION

The table (below) shows Centennial College’s natural gas usage (in meters cubed) for all buildings in each month of 2012.

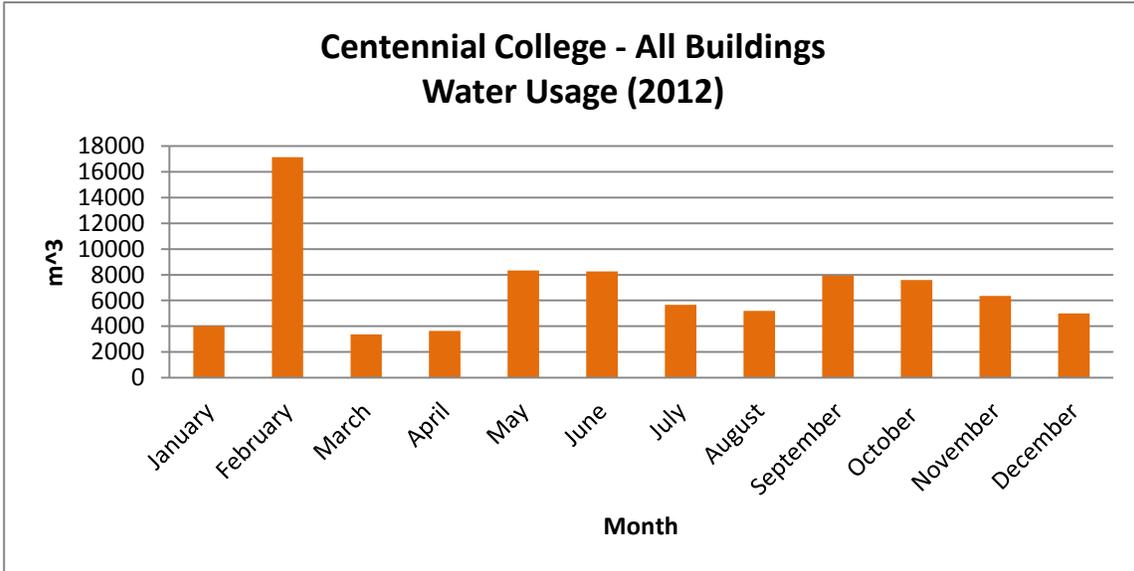


The following chart illustrates the monthly natural gas cost (in dollars) for all buildings.

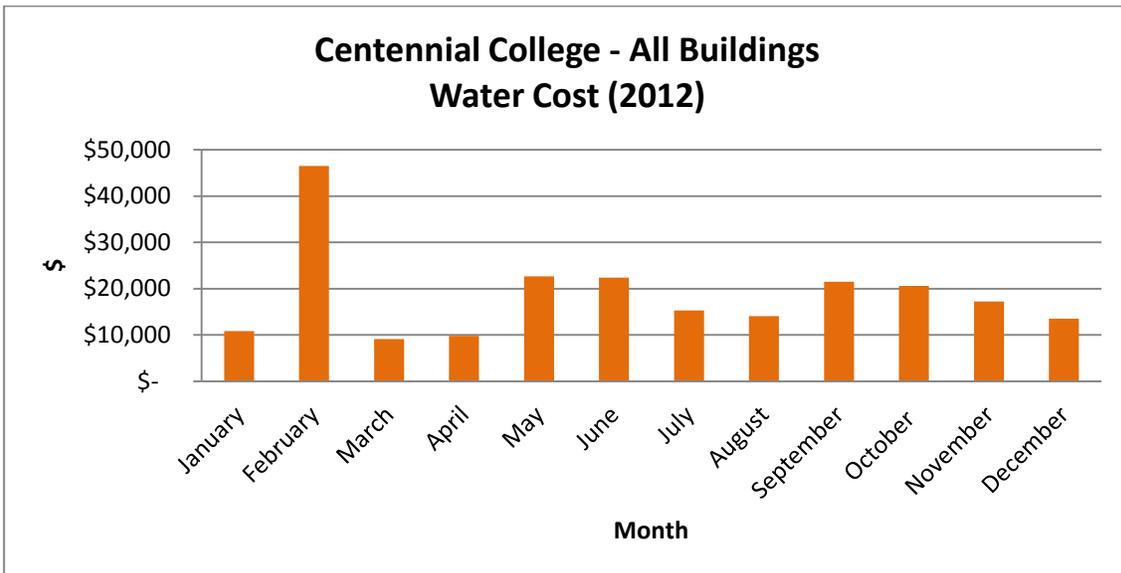


1.2.3. WATER CONSUMPTION

The table (below) shows Centennial College’s water usage (in meters cubed) for all buildings in each month of 2012.



The following chart illustrates the monthly water costs (in dollars) for all buildings.



1.2.4. END USE BREAKDOWN

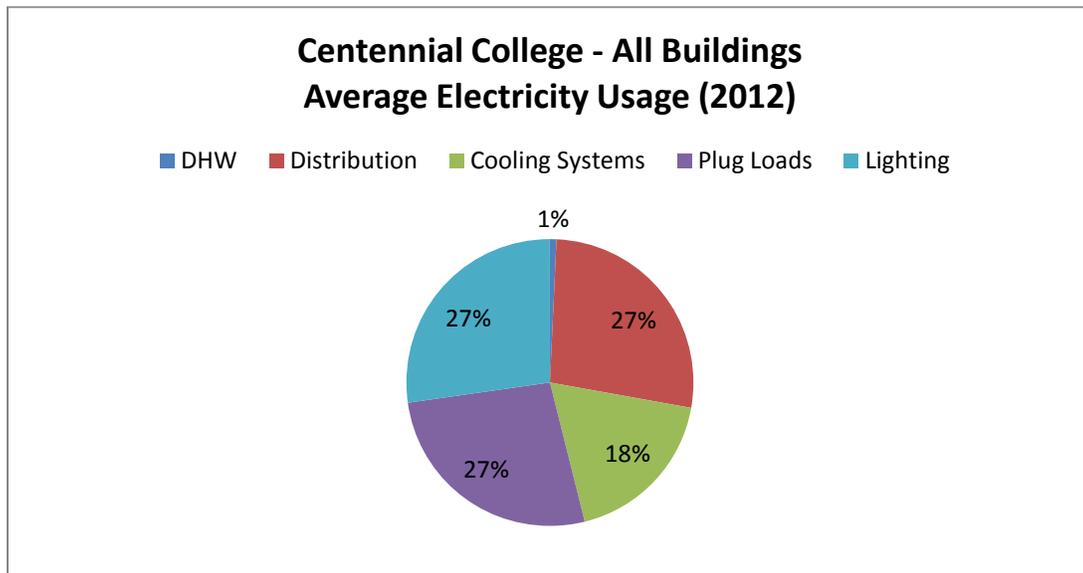
An estimated end use breakdown for all electrical equipment was prepared based on observed operations and scheduling, identified trends in utility data, and engineering principles. This breakdown can be used to assess which systems can be focused on to provide the greatest impact towards the college’s targeted energy savings.

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Electricity usage is composed of five main categories:

1. Domestic hot water (DHW);
2. Distribution systems - air handling units, rooftop units and exhaust fans and pumps;
3. Cooling systems - chillers, cooling towers, and heat pumps;
4. Plug loads – receptacles and their usage - computers, task lights, etc.; and
5. Lighting – interior and exterior building and property lighting.

The following chart shows Centennial College’s average electricity usage for all buildings in 2012.

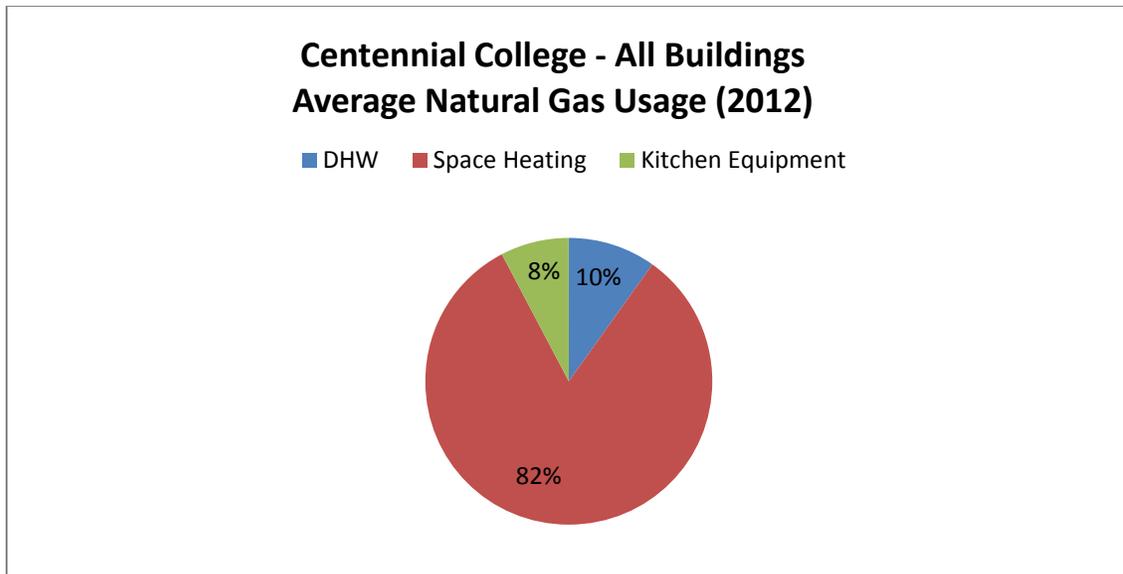


Electricity usage data was analyzed to determine the energy usage under each of the categories defined above. The results in the chart above show an equal distribution of 27% of overall electricity usage in each of three categories: distribution systems; lighting; and plug loads. Cooling systems such as chillers used during the summer months and year round cooling of the IT servers account for 18% of overall electricity usage and the remaining 1% represents usage of domestic hot water.

Natural gas usage can be organized into three main categories:

1. Space heating;
2. Kitchen equipment; and
3. Domestic hot water (DHW).

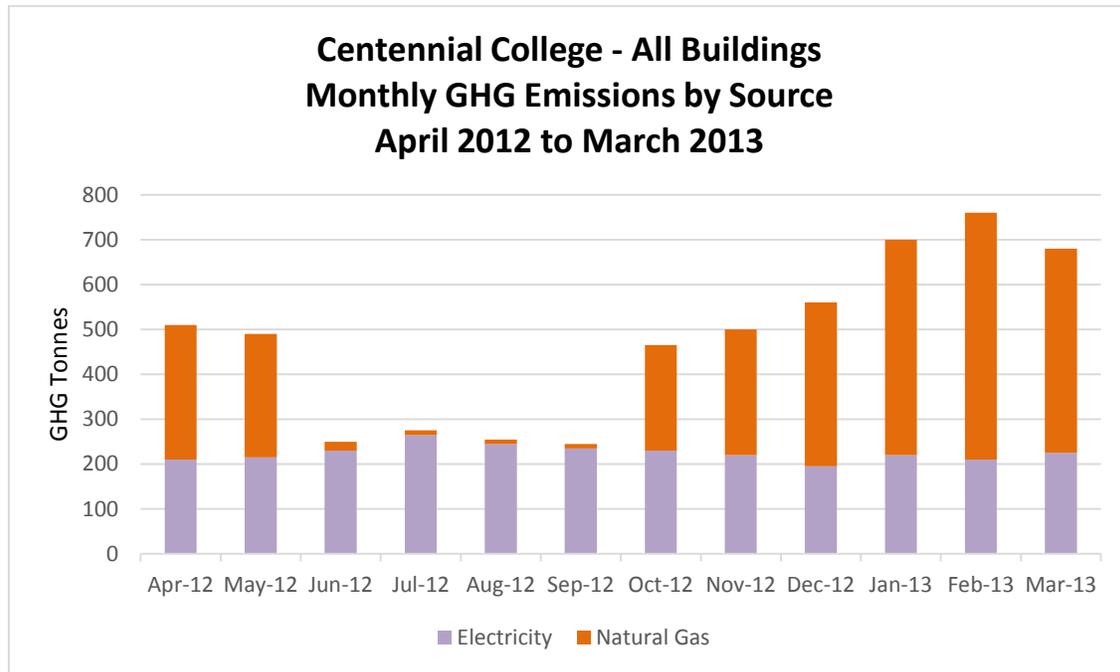
The following chart illustrates Centennial College's average natural gas usage for all buildings in 2012.



Natural gas is used by the College primarily for two applications: space heating and domestic hot water. Space heating uses the majority of the College's total natural gas consumption, at 82%. This large space heating load is typical in climates such as Toronto's.

2.2.5 Energy Consumption and Greenhouse Gas (GHG) Emissions Reporting

The GHG produced by each energy source is essentially equal during the course of the year; however, the major impact on GHG emissions results from natural gas used for space heating during cold and inclement weather which is more likely to occur during the fall and winter months. The table (below) details the monthly GHG breakout by source, showing which months GHG emissions are generated by electricity and natural gas emitters individually and combined.



2. GOALS AND OBJECTIVES

The College has committed to “Smart Stewardship and the Truly Sustainable College” as part of its strategic plan, The ‘Book of Commitments, 2nd edition’². As part of this commitment, the College plans to adopt the Association for Canadian Community Colleges (ACCC) Sustainability Protocol. This protocol requires the incorporation of sustainability practices for energy and water conservation and demand management within the College’s procedures and operations.

2.1. SUSTAINABILITY POLICY AND PROCEDURE

The College will establish a policy that will reflect the commitment and direction of the College towards sustainability and related practices to ensure the College’s day to day activities are aligned with the goals of this CDM plan. This policy will also address the requirement for mechanisms/measures that facilitate tracking progress towards these goals over time.

2.2. ENERGY REDUCTION TARGETS

The College has established the following key objectives for the reduction of energy consumption over the duration of this 5 year CDM plan (2014 – 2019) as calculated against the 2012 baseline:

² Centennial College Book of Commitments, 2nd Edition: <http://www.centennialcollege.ca/about-centennial/corporate-information/publications>

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- A. 7% reduction in electrical energy consumption
- B. 12% reduction in natural gas energy consumption,
- C. 501 Tonnes reduction in Greenhouse Gas (GHG) emissions, and
- D. 4% reduction in water usage.

2.3. PROCUREMENT OBJECTIVES

Centennial College recognizes that green purchasing practices support its commitment to incorporate the principles and best practices of sustainability and energy conservation into corporate endeavors. Working collaboratively with internal and external stakeholders, the College will develop and implement a procurement plan that supports energy conservation and reduction.

3. MEASURES

To achieve these objectives, outlined in section 2.2 and 2.3, the College has established the following initiatives which will be implemented over the term of the 5 year period covered by this CDM Plan:

3.1. ORGANIZATIONAL MEASURES**3.1.1. SUSTAINABILITY POLICY**

Establish and implement a Sustainability Policy and procedures for the College in alignment with the College's strategic plan.

3.1.2. ESTABLISH A COLLEGE 'GREEN TEAM'

The Green Team will be tasked with establishing and promoting energy efficiency and conservation goals. They will promote awareness of the College's sustainability policy, and the goals and objectives established as part of this plan to inform and educate faculty, staff and students within the College community.

3.1.3. NEW CONSTRUCTION STANDARDS

Establish and implement new minimum standards for all new construction, all renovations and deferred maintenance activities on campus relating to Conservation and Demand Management.

3.1.4. MONITOR GOVERNMENT INCENTIVE PROGRAMS

Utilizing solar photovoltaic (PV) panels for renewable energy generation was identified as a site potential for some of the College's campus buildings; however, the estimated installation cost is currently too high to make this a feasible direction at this time. The College will closely monitor feed in tariff (FIT) contracts with the Ontario Provincial

Government to determine when and if the program were to become feasible. At that time, a more detailed study of rooftop PV will be undertaken which will include simulation analyses of net output for array as well as structural and condition assessment of the proposed roof location.

3.1.5. PROCUREMENT ACTIVITIES

The College will:

- Establish energy conscious, environmental friendly and social responsibility procurement policies
- Develop procedures for responsible acquisition and disposal of equipment, furniture and electronics including reducing wasteful buying;
- Review eco certifications and representations to ensure minimum requirements related to product are met by contractors/suppliers;
- Set minimum quality standards for products and services and new construction;
- Prepare in-house minimum criteria for procurement activities such as minimum recycled content, minimum standards for energy efficiency of acquired equipment, etc.

For each of the measures articulated above, achievement towards targeted goals will be measured and reported annually.

3.2. BEHAVIOURAL MEASURES

3.2.1. EDUCATIONAL PROGRAMMING

- Develop and implement educational programming and targeted messaging on conserving energy which will encourage staff and students to:
 - Turn off lights when leaving a room (especially where there are no occupancy sensors),
 - Use window coverings appropriately to minimize interior lighting and heating/cooling requirements,
 - Refrain from adjusting room specific thermostats for improved efficiency, and
 - Keep operable windows closed when the air conditioning or heat is running.

3.2.2. PROCUREMENT TRAINING

- Encourage green purchasing behaviors of staff and students by providing College-wide education and training programs, and
- Training of College managers in green procurement best practices

3.3. TECHNICAL MEASURES

3.3.1. COMPUTER LAB POWER SETTINGS

- Establish and implement new default power settings for computers (PC) in labs and classrooms in order to reduce the electricity used by idle machines.
- Expected Results: Unused PCs will remain active for a reduced number of hours per day resulting in reduced energy consumption and potentially an increased service life of IT equipment.
- Potential Savings: \$32,960.

3.3.2. LIGHTING SYSTEMS

- Install occupancy sensors in all new construction or renovated areas where possible and consider opportunities to harvest natural lighting in the design of new or renovated spaces.
- Expected Results: Light levels will adjust to match actual lighting requirement. As peak daylighting levels are likely to occur coincident to peak cooling demands, this measure should result in both energy and demand savings.
- Potential Savings: \$6,890.

3.3.3. THERMOSTAT CONTROLS

- Conduct a review of the pre-set chilled water control sequence of operations and fine-tune the parameters to achieve greater electrical energy efficiency and chilled water plant optimization. The review will include a detailed study of chiller performance at various load conditions during the summer months.
- Expected Results: Chillers should operate more frequently at their desired load point. As the chilled water plant is a significant source of peak load, this measure should generate both energy consumption and demand savings.
- Potential Savings: \$6,550.

3.3.4. VARIABLE FREQUENCY DRIVES

- Addition of variable frequency drives to chilled water, heating water and heating glycol water circulation pumps at all campuses. Reduction of fan energy consumption is proportional to the cube of flow reduction hence reducing the flow during the part load condition will result in electrical energy savings.

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- Expected Results: Pumps will operate at low speeds when there is minimal demand on their associated circulation loop. This is particularly significant during after hour operations when heating demand is set back.
- Potential Savings: \$48,270.

3.3.5. AIR AUDITS

- Establish improved operating parameters by conducting air audits at each campus and conducting regular reviews of existing operating parameters and the performance of air distribution systems. Make adjustments to the operating parameters as required.
- Expected Results: Air quality will be improved in indoor spaces which should improve the working and learning conditions for both employees and students, and provide opportunity for early fault detection for air-side components.
- Potential Savings: There are no explicit energy savings that can be predicted from this program, however it is anticipated that savings will result by identifying faulty parameters with sensors and improving indoor air quality.

3.3.6. MOTION SENSOR CONTROLS

- Retrofit existing urinal flush tanks at all campuses, where not already completed, to implement motion sensor control to reduce water usage.
- Expected Results: Original urinals with tank flush systems will only flush as necessary when used and/or to maintain washroom sanitary conditions. As tanks had previously been flushed on a timed basis, this will significantly reduce water consumption during unoccupied hours.
- Potential Savings: \$5,860.

3.3.7. REVIEW OF EXISTING BUILDING SYSTEMS

- Existing building systems will be put through a commissioning program for the purpose of ensuring the system is operating to specifications. Additionally, this process may identify opportunities for further improvement of system performance resulting in further energy savings.
- Expected Results: Electricity savings, natural gas savings and reduction in GHG emissions.
- Potential Savings: There are no explicit energy savings that can be predicted to result from this program, however it is anticipated that savings will result by identifying faults/malfunctions with equipment and improving documentation for enhanced operator understanding of systems.

3.3.8. EQUIPMENT REPLACEMENT/RENEWAL

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The College will plan for the replacement of existing equipment near end of life with models that meet a pre-defined minimum standard for energy efficiency. This standard will be established as part of our procurement initiatives.

Improved energy efficiency will be specifically achieved with the following future planned replacements over the next five year period:

Progress Campus

- Existing Boilers serving Progress Campus A Block to be replaced with a new high-efficiency condensing model.
- Replacement of original chiller and cooling tower serving Progress Campus A Block.
- Replacement of one through cooler serving elevator room at Progress Campus A Block to conserve water.

Morningside Campus

- Retrofit electrical circuit controls at Morningside Campus to allow 4th floor corridors and areas adjacent to front atrium glazing to have their non-emergency lights controlled "off" when adequate daylight is present.

Ashtonbee Campus

- Replacement of aged and inefficient hot water heating boilers and domestic hot water boilers with new boilers.

Story Arts Centre & 550 Mortimer Avenue

- Replacement of four existing original furnaces at 550 Mortimer Avenue with modern high performance units.
- Addition of corridor daylight and occupancy control in the Story Arts Centre corridor to reduce electrical consumption when adequate daylight is present. In all cases, where daylight controls are to be added, vacancy controls will also be added to control common area lights during after-hours periods.
- Replacement of lights serving Studio rooms at the Story Arts Centre with LED, high efficiency lighting.
- Retrofit existing urinal flush tanks at the Story Arts Centre to implement motion sensor control.
- Addition of occupancy sensors to control non-emergency circuit lights at the Story Arts Centre to ensure lights are turned off when no staff are present.
- Retrofit to LED Exit.

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- Overall Expected Results: Improved lighting and lighting controls, more efficient mechanical systems, greater control of mechanical system functioning, less water wastage, high efficiency operational measures and better utility monitoring of costs.
- Potential Savings: \$64,070.

4. RESPONSIBILITIES & APPROVAL

The Centennial College Facilities & Services division is responsible for carrying out the activities contained within this report and ensuring progress is made towards the stated goals.

Approved:

Shannon Brooks, CPA-CGA, MBA
Associate Vice-President, Corporate Services
Centennial College