ENERGY CONSERVATION AND DEMAND MANAGEMENT PLAN //2014

mohawk


QUALITY

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COLLEGE

To: Barry Beale
Director, Energy Efficiency and Innovative Technology Branch
Ministry of Energy

Date: June 26th, 2014

From: Ron Baskin
Chief Building & Facilities Officer
Mohawk College

Subject: Mohawk College Energy Conservation and Demand Management Plan

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Please find attached a copy of Mohawk College's Energy Conservation and Demand Management Plan. This Plan is in accordance with the Ministry of Energy's **O.Reg. 397/11**, under the Green Energy Act, 2009.

This Plan outlines:

- Information on the College's energy consumption and its demand for energy
- The College's goals and objectives for conserving and otherwise reducing energy consumption
- The College's proposed measures to reduce its energy consumption
- Sources of renewable energy operated at the College
- Cost and savings estimates for the proposed measures

This plan will be used along with other College guiding documents to achieve a reduction in the College's energy consumption and demand.

Sincerely,

Ron Baskin
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Mohawk College
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1.0 Executive Summary

This Energy Conservation and Demand Management (CDM) Plan is in accordance with the Ministry of Energy's, O.Reg. 397/11, under the Green Energy Act, 2009. This plan was created in an effort to help reduce the College's demand for energy, and is aligned with the recently approved Mohawk College Environmental Management Plan 2.0 (EMP 2.0).

Mohawk College is an industry leader in sustainability, and continues to be with the goals set out in this plan. A target has been set to reduce both natural gas and electricity consumption by 6% per m^2 of building space, from a 2012 baseline, by the year 2020. This target is in line with EMP 2.0's target to reduce the College's Greenhouse Gas (GHG) emissions by a further 6% in the same eight year span.

This goal will be accomplished through a number of strategies including:

- stakeholder engagement, awareness, and participation
- alternative energy sources
- facility and operational improvements
- efficiencies through future development and renovations
- effective space planning

A set of actions for these strategies will help make the new energy consumption goal a reality.

In particular a focus must be set on fostering a culture of sustainability among the College stakeholders. With the longstanding and continued commitment of the facility services team, Mohawk is already equipped as a state of the art, efficient facility. It is now time that all individuals at the College operate it in a state of the art, efficient manner.

2.0 Introduction and Reporting Requirements

With Mohawk College's Strategic Priority Actions of Quality, Innovation, and Sustainability, the College has dedicated itself to becoming a financial, social, and environmentally resilient institution. Since 2008 Mohawk has undergone a number of initiatives in order to reduce its impact on the environment and in turn, its energy consumption. In order to quantify the environmental impact that the College has, Mohawk has been measuring its Greenhouse Gas (GHG) emissions since 2007. The reported GHG emissions act as a consistent, measurable indicator of the College's environmental impact.

In order to reduce its GHG emissions, Mohawk has set reduction targets that require effort and cooperation from all areas of the College. This document will focus on Mohawk's energy reduction targets, under O. Reg. 397/11, which are necessary to achieve operational efficiencies and comply with provincial legislation.

Under the Green Energy Act, 2009, O. Reg. 397/11 requires public agencies; municipalities, municipal service boards, school boards, universities, colleges and hospitals; to report their energy consumption and (GHG) emissions annually beginning in 2013 and to develop and implement an energy Conservation and Demand Management (CDM) plan starting in 2014.

This CDM Plan outlines the following:

- Information on the College's energy consumption and its demand for energy
- The College's goals and objectives for conserving and otherwise reducing energy consumption
- Cost and amount of energy produced on an annual basis by the facility.

In order to reduce the College's demand for energy as well as reduce its environmental impact, this CDM plan has been aligned with the recently updated and approved Environmental Management Plan 2.0. EMP 2.0 focuses on social sustainability, supporting education, participation, and the demonstration of innovation at all Mohawk College campuses. The goal of EMP 2.0 is to continue to reduce the College's environmental impact by 30% by 2020, while developing the sustainability leaders for tomorrow's workplaces and communities.

3.0 Measured Success 2007 – 2012

3.1 HOW HAVE SUCCESSES BEEN MEASURED?

Mohawk measures the success of its sustainability initiatives through reductions in GHG emissions and annual monitoring of energy consumption across all campuses. By setting a baseline for the College's GHG emissions, setting a reductions target, and tracking progress, the effectiveness of Mohawk's sustainability efforts and facility performance can be measured.

Mohawk College Greenhouse Gas Emissions Tracking

- In 2010 the College created a baseline for its GHG emissions based on the 2007 calendar year.
- From this baseline the College created the Environmental Management Plan (EMP) which set a target for the College to reduce its GHG emissions by 20% (from 2007 baseline) by the year 2020.
- In 2013 Mohawk completed another GHG inventory for the 2012 calendar year, in line with the College's 5-year GHG reporting schedule. The report indicated that the college had reduced its GHG emissions by 24%, accomplishing, and surpassing its goal eight years ahead of schedule.
- In January 2014, the Sustainability Office held a series of stakeholder consultations to celebrate the success of the original Environmental Management Plan and to begin the process of updating it, introducing an updated target of a 30% reduction in 2007 baseline emissions by 2020.

In accordance with the Greenhouse Gas Protocol, emissions are grouped into three categories, also known as scopes. The scopes are arranged based on the activities which cause emissions. Arranging the activities into specific scopes allows for better tracking and management of emissions, and helps identify whether operational controls or change management techniques are best applied to yield reductions.

A comparison of the GHG emissions for 2007 and 2012 is shown below. Table 1 shows the GHG emissions for 2007 and 2012 aligned by Scope 1, 2 and 3 respectively.

Table 1: 2007 – 2012 GHG Emissions by Scope

Scope	2007 tCO_2e	2012 tCO_2e	% Reduction
Scope 1: Direct	3,647	2,811	23%
Scope 2: Indirect	4,876	2,108	53%
Scope 3: Optional Indirect	5,201	5,535	- 6%
Total	**13,724**	**10,454**	**24%**

Table 2: 2007 – 2012 Energy Consumption Reductions

	2007	2012	% Reduction
Natural Gas Consumption (m^3)	1,863,904	1,426,656	**23.46**
Natural Gas Consumption per m^2 of Building Area (m^3/m^2)	14.64	11.16	**23.82**
Electricity Consumption (kWh)	20,318,484	19,160,096	**5.70**
Electricity Consumption per m^2 of Building Area (kWh/m^2)	159.64	149.82	**6.15**

3.2 HOW WERE THESE REDUCTIONS ACHIEVED?

The success of these carbon and energy reductions is due in large part to the commitment of the facility services team as well as increasing the culture of sustainability among Mohawk College students and staff. Some examples of the previously undergone initiatives are given below.

SPACE PLANNING

Future Ready Facilities Planning creates a more efficient use of the College's campus space. By using a more effective space planning tool, as well as the adaptive reuse of older campus space, the College was able to reduce its carbon footprint, along with its demand for energy. These reductions were accomplished while growing the student population, and providing state of the art learning facilities.

LEED® DEVELOPMENT

Through the Fennell Renewal Project with Sustainability as one of its guiding principles, all new development at the Fennell Campus has achieved LEED® Gold certification. With this, Mohawk was able to provide state of the art facilities, while reducing its carbon footprint and energy demand through increased efficiency.

- 2 new additions to the College have achieved LEED® Gold
- These buildings operate at up to 40% more efficiently than a conventional building of the same size

FACILITY AND INFRASTRUCTURE UPGRADES

A long standing commitment from the facility services team, has already allowed Mohawk to implement many infrastructure upgrades aimed at reducing the College's demand for energy. By replacing/upgrading older, inefficient equipment, the college was able to increase its energy efficiency and reduce its environmental impact. Some of the major facility upgrades are listed below.

- Efficient lighting upgrades across all campuses
- Chiller replacements
- Replacing boilers and generators with more efficient and cleaner natural gas burning equipment
- Updated HVAC handling equipment

3.3 ENHANCED CULTURE OF SUSTAINABILITY

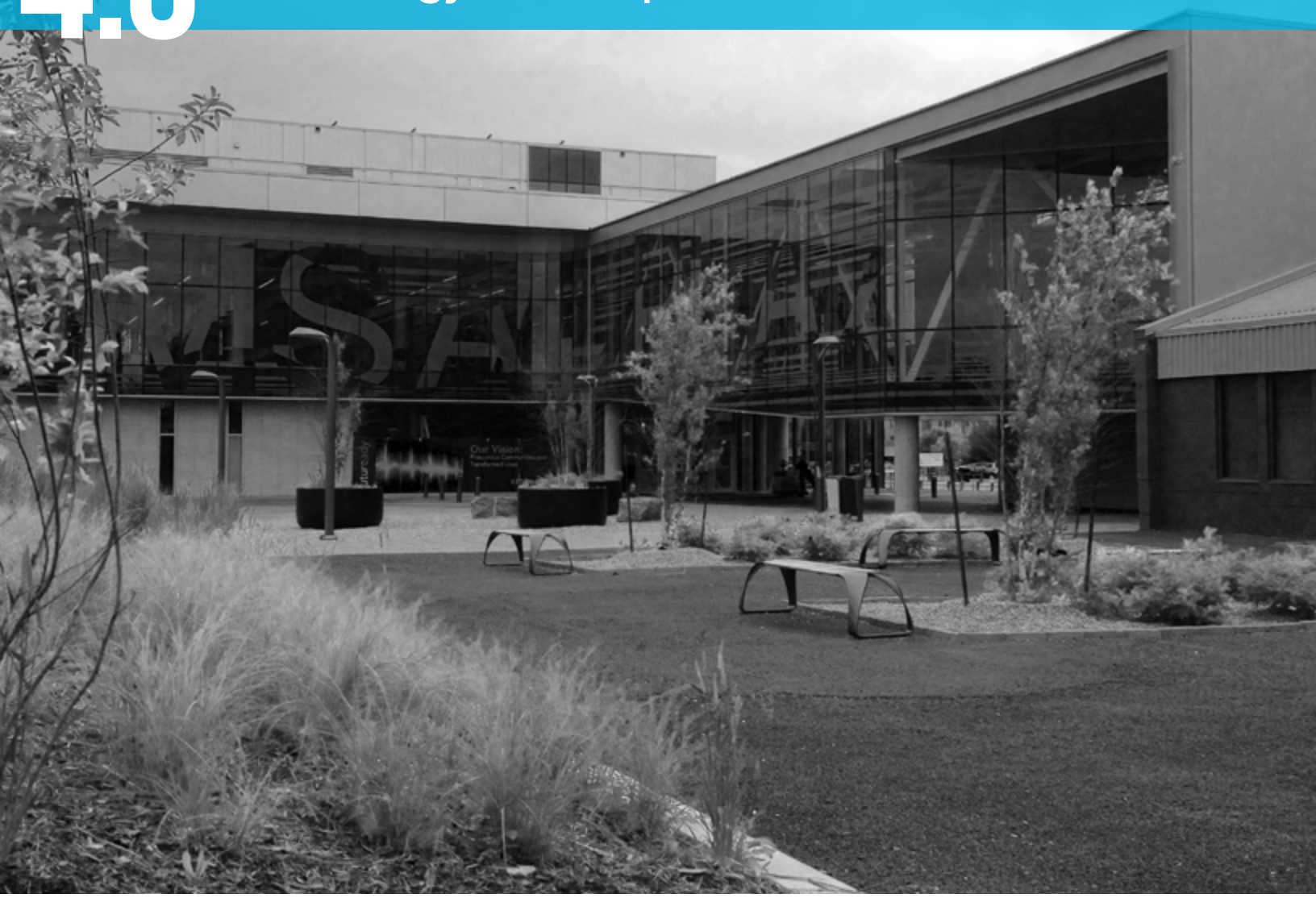
With the support of leaders from all levels within the College including the Board of Governors, Mohawk Students Association and the Mohawk Executive Group, a strong culture of sustainability has been established. This culture of sustainability has been accomplished through the following:

- Educating individuals on their environmental impact
- Events and incentives that encourage sustainable habits and decision making in everyday life
- Creating a social shift towards sustainability both at the College and in the surrounding community
- Enhanced programs and services

With the success of the Environmental Management Plan, Mohawk created EMP 2.0 which updated its goal to a 30% reduction of GHG emissions (from 2007 baseline) by the year 2020. EMP 2.0 re-affirms Mohawk's commitment to reducing its impact on the environment, and ensures social and financial resiliency while providing opportunities to engage staff, students and the community in an ever-growing culture of sustainability.

By striving to set carbon reduction goals at the College, Mohawk continues to take a leadership role in achieving sustainability.

4.0 2012 Energy Consumption Data (Baseline)



In 2013 Mohawk College collected all of its natural gas and electricity consumption data in order to complete a second GHG emissions inventory. Following is a summary of energy consumption, in both natural gas and electricity, for the 2012 calendar year.

The data below is reported on a total consumption basis by campus, as we are limited by metered locations, as well as consumption per m^2 of building space. Showing the consumption data on a per m^2 basis helps the College to better understand operational efficiencies of each campus and helps to better target areas of concern and focus.

With the previous success of reducing the College's energy consumption, Mohawk facilities are already operating at a highly efficient rate per m^2 of campus space. However, there is always room for improvement. Efforts should be concentrated at both the Fennel and Stoney Creek campuses where consumption rates are at their highest, and efforts will have the greatest positive impact on the operational efficiency of the college.

Table 3: 2012 Natural Gas Consumption by Campus			
Campus	**Total Consumption (m^3)**	**Building Area (m^2)**	**Consumption (m^3 per m^2)**
Fennell	936,810	84,033	11.15
Brantford	224,534	13,266	16.93
Stoney Creek	265,312	30,586	8.67
Total	**1,426,656**	**127,885**	**11.16**

Table 4: 2012 Electricity Consumption by Campus			
Campus	**Total Consumption (kWh)**	**Building Area (m^2)**	**Consumption (kWh per m^2)**
Fennell	14,287,469	84,033	170.02
Brantford	1,825,166	13,266	137.58
Stoney Creek	3,047,462	30,586	99.64
Total	**19,160,096**	**127,885**	**149.82**

5.0 Goals for Energy Consumption & Demand Management

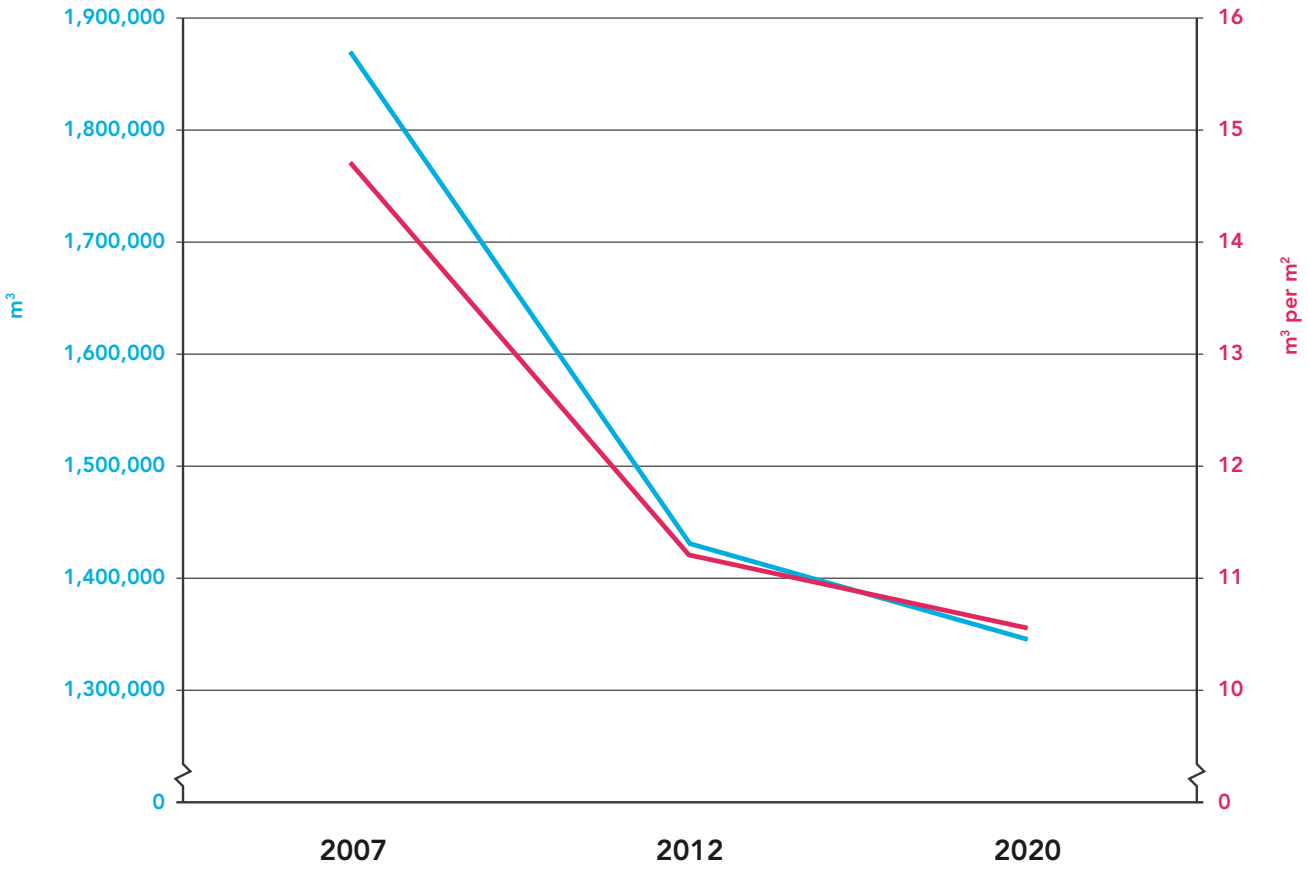
The overall goal for Mohawks Energy Consumption and Demand Management Plan is to reduce natural gas and electricity consumption (from 2012 baseline) by 6% per m^2 of campus space by the year 2020. This goal aligns with the goal set out in EMP 2.0 to reduce carbon emissions by an additional 6% (from 2007 baseline) in the same eight year span.

A 6% REDUCTION/m^2 IN 2012 BASELINE ELECTRICITY AND NATURAL GAS CONSUMPTION BY 2020

Following is a snapshot of the achieved energy consumption reductions to date, as well as the target energy consumption reductions for the year 2020.

*Total consumption target is based on 2012 building area.

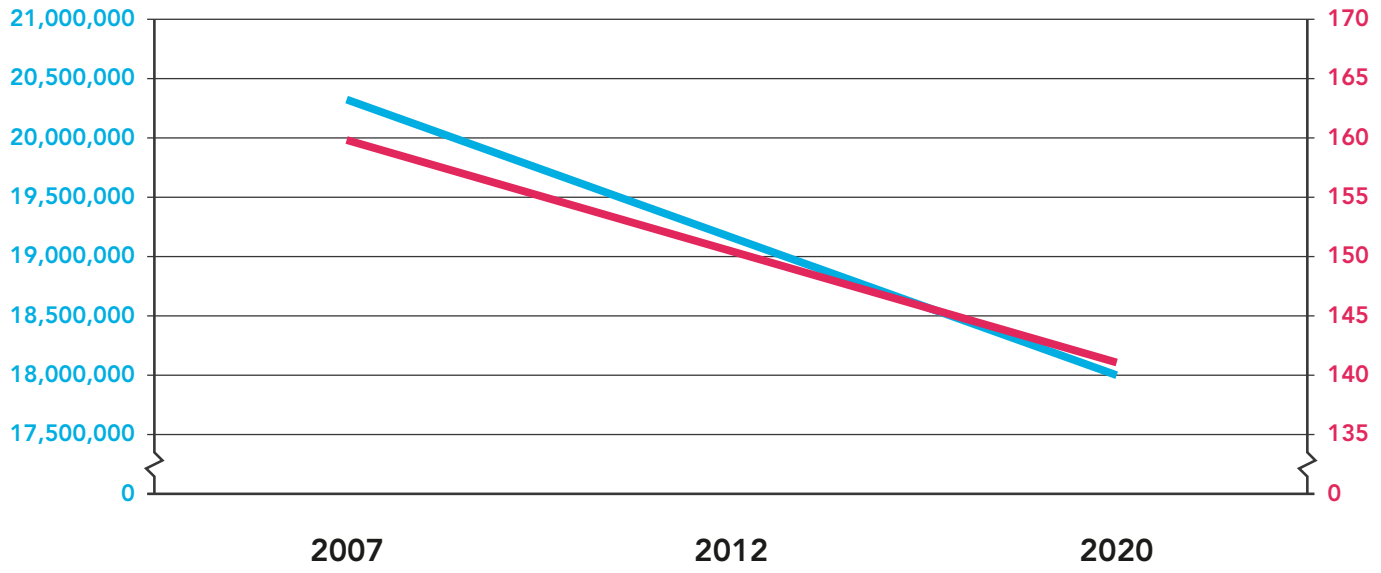
Graph 1: Previous and Target Natural Gas Consumption



Total Natural Gas Consumption		
2007	Actual	1,863,904 m^3
2012	Actual	1,426,656 m^3
2020	Target	1,341,057 m^3

Total Natural Gas Consumption/m^2		
2007	Actual	14.64 m^3
2012	Actual	11.16 m^3
2020	Target	10.49 m^3

Graph 2: Previous and Target Electricity Consumption



Total Electricity Consumption		
2007	Actual	20,318,484 kWh
2012	Actual	19,160,096 kWh
2020	Target	18,010,491 kWh

Total Electricity Consumption/m^2		
2007	Actual	159.64 kWh
2012	Actual	149.82 kWh
2020	Target	140.83 kWh

The 6% reduction goal calls for a further reduction of 0.67 m^3 natural gas consumption per m^2 of building area and a reduction of 8.9 kWh per m^2 of building area. Assuming that the building area remains the same this is a proposed total reduction of 85,599 m^3 of natural gas and 1,149,606 kWh of electricity.

These reductions will not only lower the operational costs of the College but will also reduce the College's environmental impact, creating a more sustainable institution.

6.0 Proposed Measures

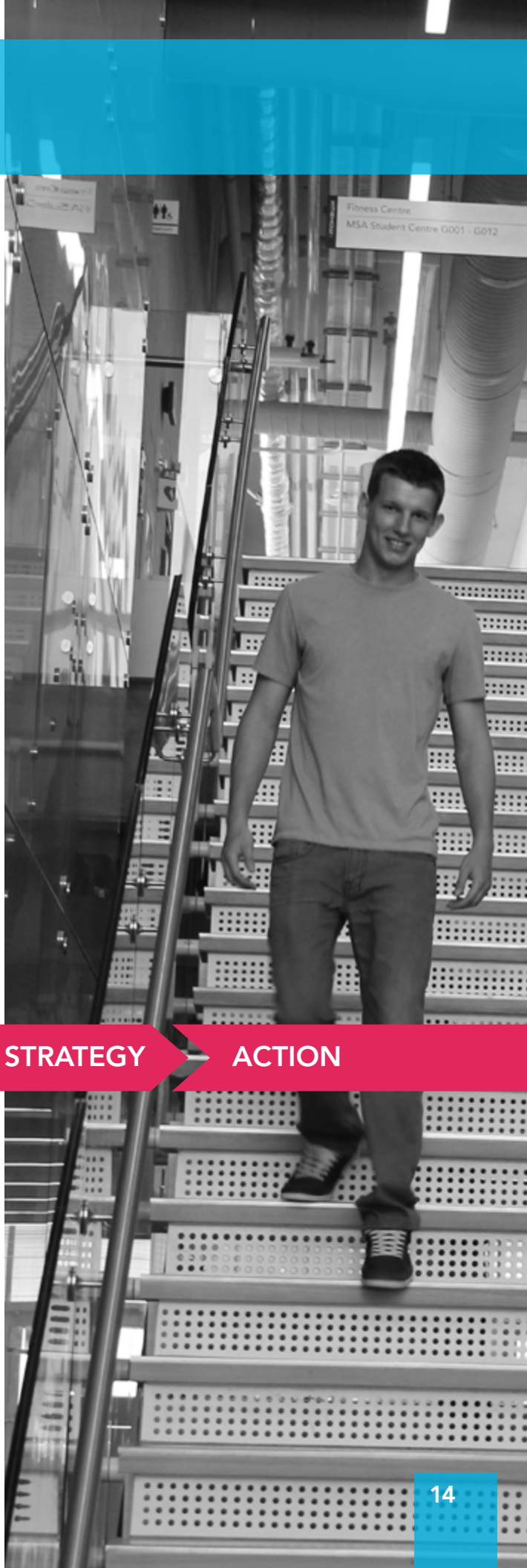
In order to further reduce the College's energy consumption, Mohawk will base its energy conservation strategies on future development, facility operations, and campus intensification. In this, the College must consider campus locations, existing buildings, future development, alternative energy and further integration with the broader community. Mohawk must respond to rising energy and operational costs to ensure long-term environmental, social and fiscal resiliency.

In addition to upgrading the facilities and infrastructure at the College, efforts must also be concentrated on change management and educating individuals on their environmental impact. With the population of the College rising, it is of great importance that energy consumption of the individual is addressed. By increasing the "Sustainability IQ" of the students and staff at the college, energy consumption at the personal level can be reduced. When dealing with large populations, like at the College, even small changes at the personal level can compound to large impacts at the institutional level.

HOW WILL WE DO IT?

In order to achieve these goals the College will use a set of supporting strategies. These strategies will be implemented through a set of actions that will help to reduce the College's demand for energy.

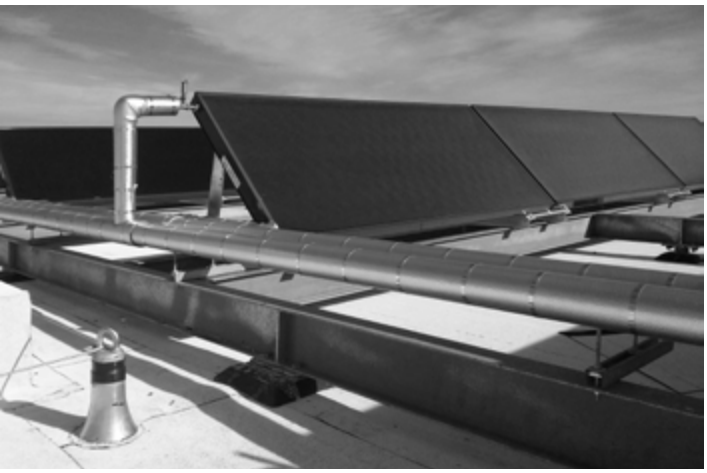
GOAL > STRATEGY > ACTION



6.1 ENERGY CONSERVATION AND DEMAND MANAGEMENT WORKPLAN

Strategy	Actions
Space Planning	• Increase the number of faculty, staff and students that can be served by existing areas through adaptive reuse of space • Effective and efficient space planning
Future Development and Renovations	• Maintain LEED® Building and Renovation Standards • Build sustainable demonstration facilities • Gain efficiencies through renovations
Facility Operations	• Develop energy and water conservation targets • Establish Sustainability and Efficiency Metrics into the capital planning process • Manage energy through monitoring, tracking, trending and reporting • Make change from analogue to digital controllers
Alternative Energy	• Explore energy independence and resiliency • Develop academic partnerships • Establish a Campus Clean Energy Framework
Stakeholder Engagement and Awareness	• Support campus, local and national campaigns • Hold workshops, outreach events and information kiosks • Give classroom presentations • Develop digital, print and social media communication strategies • Collaborate with Aboriginal Education and Student Services and Social Inc. • Hold on-campus events with local sustainability leaders, organizations and businesses • Develop participation incentive and monitoring tool • Continue commitment to the Environmental Management Plan Steering Committee • Support the Environmentally Committed Organization of Students (ECOS) committee • Develop staff leadership opportunities, committees or networks • Enhance programs and services • Develop co-curricular credits that encourage sustainable living

7.0 Sources of Alternative Energy



SOLAR ENERGY

The David Braley Athletic and Recreation Centre (DBARC) rooftop houses 14 flat-plate solar collectors that use collected energy to preheat domestic hot water for showers and sinks throughout the building, reducing the amount of non-renewable energy required.

The rooftops of DBARC and the H-wing addition are Solar PV Ready facilities, allowing for the solar facility to be expanded to accommodate additional panels without additional infrastructure upgrades.

WINDMILLS

Mohawk has two windmills on its campus that together produce up to 6 kW of power.

The power from these is fed into the College. The use of these windmills reduces the College's energy demand from non-renewable sources, as well as generates revenue through cost reductions.

DEMONSTRATION FACILITIES

The College is equipped with a renewable energy lab as a part of the Electrical Engineering Technology Department. This lab consists of thin film laminate PV, Building Integrated PV, and standard solar PV panels with micro inverters. The lab also has the latest in off grid lighting technology featuring solar and wind powered LED street lighting.

FIT APPLICATIONS/FUTURE DEVELOPMENT

The College has been active in the past, applying for Feed-in Tariff Program (FIT) contracts under the Ontario Power Authority. Three unsuccessful applications have been submitted to date, however, the College remains committed to pursuing solar P.V. opportunities through the FIT program.

8.0 Costs & Savings Estimates

Strategy/Action	Estimated Cost Savings
The 6% reduction target	By achieving the 6% reduction target the College will save approximately $550,000, from its operational costs, between 2012 and 2020.
Continuing LEED® Development	By continuing LEED® development, all new additions to the school will operate approximately 30% more efficiently than a standard construction building of the same size. This results in a 30% savings in operational costs for new building space.
Space Planning	By creating a more efficient use of campus space the College can expand its services without incurring any additional operational costs. These costs avoidances can be reinvested elsewhere in the College.
HVAC Upgrades	Efficiencies will be realized through upgrading to devices that service each, individual room's requirement for conditioning, either heating or cooling, as opposed to conditioning larger building blocks. Fine tuning the system will result in less overall energy consumption to condition the same space. These upgrades should achieve an expected energy reduction of 5 to 10%.
Upgrade to Digital Controllers	Converting building controls from pneumatic to digital allows more precise adjustments, scheduling of on/off run times, and better local control; based on space use and occupancy. With digital controls; fan motors can be more easily scheduled, dampers can be more easily and precisely adjusted, and electric motors can be converted to variable speed drives. Each of these measures can save between 5 and 10% of energy costs.
Alternative Energy Sources	Investing today in the energy of tomorrow will guarantee Mohawk's ability to respond to the potential risks associated with dependence on non-renewable energy resources.
Stakeholder Engagement and Awareness	By increasing the "Sustainability IQ" of the College Stakeholders. It is estimated that operational costs can be reduced by up to 10%. This correlates to savings up to $900,000 between the years 2012 and 2020.

9.0 Implementation & Next Steps

Mohawk must continue its commitment to reduce its energy consumption and its impact on the environment. This CDM plan sets a target of reducing both natural gas and electricity consumption by 6% per m^2 of building area from 2012 baseline by the year 2020. This target is to be achieved through campus intensification, sustainability in future development and renovations, increasing efficiencies in facility operations, and increasing stakeholder engagement, education and participation.

In particular, the focus must be on change management, in order to foster a culture of sustainability, for all College stakeholders. This increased awareness and participation seeks to create opportunities for students and staff to make informed decisions with an environmentally conscious approach to daily life. Implementation of this plan along with EMP 2.0 will have a positive impact on the reduction of carbon emissions, operational costs and an improved quality of life for students, staff and the broader community.

Mohawk is already equipped with top notch sustainable facilities. It is now time for us all to operate them in a top notch manner.

10.0 Appendices

2007 GHG INVENTORY

http://www.mohawkcollege.ca/Assets/Environmental-Sustainability/2011-ghg-inventory-pdf.pdf

2012 GHG INVENTORY

http://www.mohawkcollege.ca/AssetFactory.aspx?vid=46545

EMP 2.0

http://www.mohawkcollege.ca/environmental-sustainability/environmental-management-plan.html#

ONTARIO REGULATION 397/11

http://www.e-laws.gov.on.ca/html/source/regs/english/2011/elaws_src_regs_r11397_e.htm