



**Energy Conservation &
Demand Management**

VERSION 2.0

2016

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EXECUTIVE SUMMARY

Brock University's Energy Conservation & Demand Management (ECDM) Plan forms the foundation for the next eight years for Brock's efforts to conserve energy, reduce GHG emissions and reduce operating costs. This plan, which serves as an update to the previous ECDM published on July 1, 2014 and includes utility information up to the end of 2015, along with all future versions will be posted on the Brock University's Facility Management website under the heading "Energy Conservation and Demand Management.

Brock University's ECDM Plan is built on the following five (5) objectives:

- 1. Improving the Efficiency and Diversity of On-Site Energy Generation**
- 2. Smart and Efficient Building Operations and Renewal**
- 3. Leveraging Strategic and Collaborative Procurement of Energy and Carbon Offsets**
- 4. Energy Awareness & Communication**
- 5. Energy Efficient Design, Construction and Renovation of Buildings**

Since the preparation of the original ECDM plan Brock has undergone additional expansion as well as implemented operational changes within a number of facilities, which as a result has increased our total energy consumption from our 2013 baseline. When we utilize carbon intensity as our benchmark, our performance since 2013 shows a modest improvement (0.1087 t CO₂e/sq.m. to 0.1066 tCO₂e/sq.m.). As we forecast continued expansion on campus and evolving op-

erational needs of our buildings, we have elected to utilize the 2013 benchmark for carbon intensity, which represents the total CO₂ emissions per square metre for the Brock portfolio.

Based on the proposed energy and GHG reduction initiatives, Brock University plans to pursue a GHG carbon intensity reduction target of 20% below 2013 baseline levels by the year 2023.

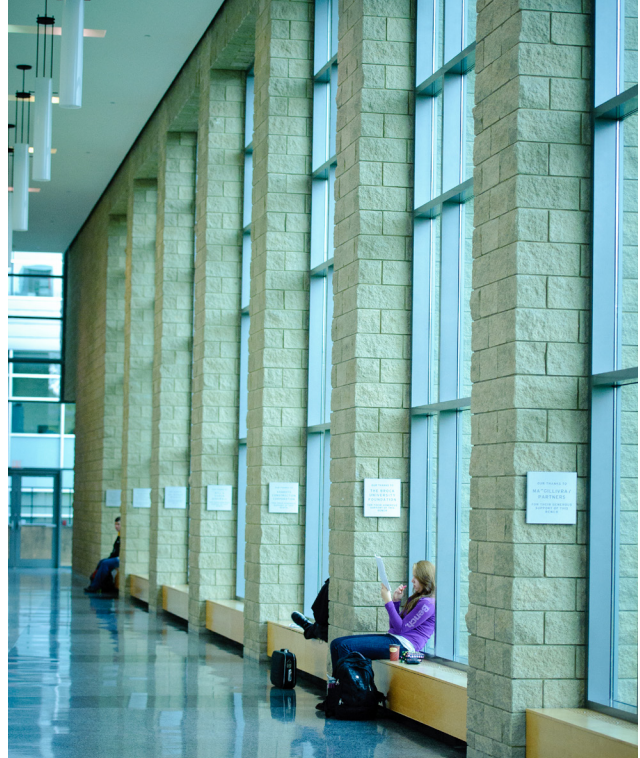
Annually, a review of ECDM plan implementation will take place and the Energy Performance Scorecard will be updated. A comprehensive review of the plan will be completed in 2019 in anticipation of the scheduled 2020 ECDM plan re-issue and re-approval. Furthermore, annual updating, changing and adding energy and GHG reduction initiatives will occur to meet the priorities of Brock. If/as additional funding sources become available, and as technologies and best practices change, Brock will evaluate and prioritize new energy and GHG reduction opportunities in support of our Strategic Priorities.

The majority of proposed measures that will have the largest impact on our overall carbon intensity (e.g. District Energy Efficiency Project (DEEP), Installation of Solar and Wind Power, etc.), as outlined in this plan are in the feasibility and planning stages. We expect that 2016 and 2017 will focus on determining the viability of the proposed measures and allow for initial planning and implementation of the practical measures. As such, our expectation is that our carbon intensity will not see significant reduction until 2018 when the proposed measures are implemented.

INTRODUCTION

Brock University's Energy Conservation & Demand Management (ECDM) Plan forms the foundation for the next eight years for Brock's efforts to conserve energy, reduce GHG emissions and reduce operating costs. This plan, which serves as an update to the previous ECDM published on July 1, 2014 and includes utility information up to the end of 2015, along with all future versions will be posted on the Brock University's Facility Management website under the heading "Energy Conservation and Demand Management." It will also be available in print form upon request. The approval of the updated ECDM Plan was recorded in the meeting Minutes of the University's Senior Administrative Council and a copy of the approval maintained as Annex B of this report.

Sustainability is one of the seven core values of Brock University's Integrated Strategic Plan that informs and strengthens the institution's actions. The University's Board of Trustees approved a Sustainability Policy in June 2013. This guiding policy ensures sustainability will be considered through an appropriate balance of resources and activities, evaluating impacts on the University's human, financial and environmental resources to ensure that the outcomes will not only be sustainable, but will also form a solid academic foundation for future scholarly endeavours. Brock University is committed to sustainability in human, financial, as well as environmental contexts.



In August 2013, Brock University became the first organization in the Regional Municipality of Niagara to achieve 'Leader' status within the Region's Sustainable Niagara plan, a 50-year community plan that emphasizes sustainability in Niagara Regional government decision-making. The Leader level is the plan's highest level of commitment to sustainability that can be achieved. The University received this status for incorporating Sustainable Niagara goals within its own sustainability policy. Brock's policy draws from not only the Region's sustainability strategy, but also from the Council of Ontario Universities pledge to foster sustainable environments at the province's universities, and the main characteristics of UNESCO biosphere reserves.

“Brock will strive to promote sustainable practices and act as a good steward of its unique natural environment. The focus includes sustainable building design, sound environmental planning practices for new buildings, and appropriate everyday Operations at the campus level.”

STRATEGIC PRIORITIES

Brock University's Integrated Strategic Plan, which has been endorsed by both the Board and the Senate, sets out the University's Integrated Strategic Priorities (ISPs), representing the principles of allocation of the University, as follows:

ISP1

- Ensure Brock is a preferred place to work and study.

ISP2

- Support Brock's undergraduate student-centred focus while maintaining excellence in graduate education.

ISP3

- Foster excellence in research, scholarship and creativity.

ISP4

- Serve the social, cultural and economic well-being of the University, as well as the local, national and global communities.

ISP5

- Encourage transdisciplinary initiatives.

ISP6

- Promote internationalization.

ISP7

- Practise accountability, fiscal responsibility and stewardship.

The full Integrated Strategic Plan can be viewed at brocku.ca/webfm_send/18651.

In developing this ECDM, wherever possible, these strategic priorities were used as a lens through which decisions were made and priorities were set.



2013 BASELINE ENERGY CONSUMPTION DATA

Brock University is comprised of the Main Campus (1812 Sir Isaac Brock Way), East Campus, Hamilton Campus, and several satellite buildings, which include Rodman Hall, Brock Research and Innovation Centre (BRIC) and Marilyn I. Walker School for Fine and Performing Arts (MIWSFPA). The main campus is primarily supplied by a district energy plant located on-site. The East and Hamilton Campuses, along with the satellite buildings use a combination of purchased electricity and natural gas for their respective operations. The total footprint in 2013 for all of Brock’s portfolio was 241,356 sq.m. which has grown to our current size (2015) of 256,565 sq.m.

Brock University’s cogeneration plant produces electricity, heat and cooling for majority of the main campus acting as an efficient “District Energy Plant”. The design of this central district energy plant is to use natural gas fired internal combustion engines to convert natural gas fuel into electricity and useful heat which in turn is used for powering, heating and cooling the campus. Both heat and electricity are captured and used efficiently to make the system economically viable. Brock’s 6.4 MW natural gas-fired generating plant produces power for over 85% of the University’s Campus and most of the Universities heating & cooling needs. Each of these eight internal combustion engines produces 820 kilowatts of electricity at 4,160 volts. As the generators produce power, for every kilowatt of electricity produced approximately 1.3 kilowatts of heat is also generated by the engines for a total of up to 8.3 MW of heat. In the summer time, a lithium bromide absorption chiller converts the recovered heat to

produce chilled water that is used for campus air conditioning systems (cooling). The District Energy Plant generates over 80% of Brock’s total annual greenhouse gas (GHG) emissions.

This ECDM Plan details the University’s proposed strategies to reduce energy and GHG emissions across all campuses based on the overall Carbon Intensity (t CO₂e/sq.m.), which accounts for growth of the overall building portfolio. A number of energy conservation initiatives have already been implemented over recent years, and a number of new initiatives are identified in this plan. Over the next eight years, these measures are expected to decrease our carbon intensity by 20% from 0.1087 t CO₂e/sq.m. to 0.0870 t CO₂e/sq.m.

Table 1 and Figure 1 below presents the 2013 Energy Consumption data that forms the baseline for this plan.

TABLE 1 - 2013 BASELINE DATA

Energy Type	2013 Total Consumption
Natural Gas (m ³)	13,285,651
Purchased Power (KWh)	13,962,339
Fuel (L)	64,812
Water (m ³)	357,074
Carbon Emissions (t CO ₂ e)	26,236
Total Portfolio Foot Print (sq.m.)	241,356
Carbon Intensity (t CO ₂ e/sq.m.)	0.1087



FIGURE 1 - 2013 BASELINE DATA

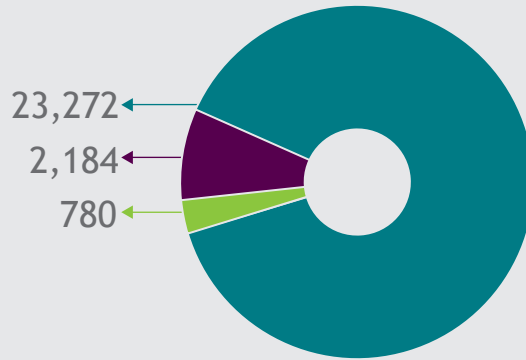
Main Campus

CFHBRC

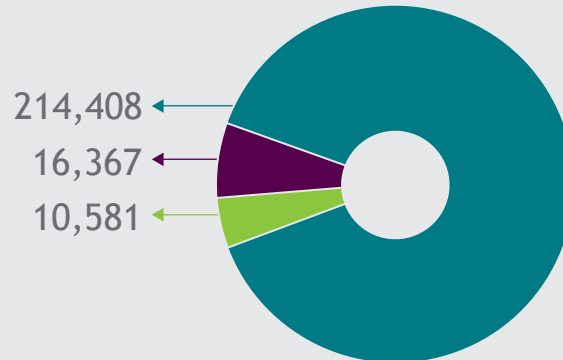
Satellite Sites

2013

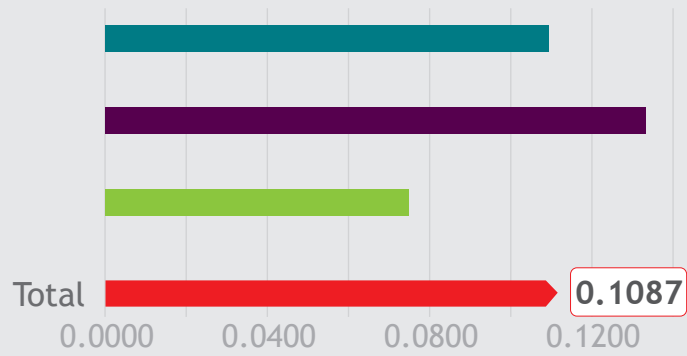
GHG EMISSIONS
(t CO₂ e)



FLOOR AREA
(m²)



INTENSITY
(t CO₂ e/m²)





GOALS AND OBJECTIVES

Based on the proposed energy and GHG reduction initiatives, Brock University plans to pursue a GHG emissions density reduction target of 20% below 2013 baseline levels by the year 2023.

Since the preparation of the original ECDM plan Brock has undergone additional expansion as well as implemented operational changes within a number of facilities, which as a result has increased our total energy consumption from our 2013 baseline. When we utilize carbon intensity as our benchmark, our performance since 2013 shows a modest improvement (0.1087 t CO₂e/sq.m. to 0.1066 tCO₂e/sq.m.). As we forecast continued expansion on campus and evolving operational needs of our buildings, we have elected to utilize the 2013 benchmark for carbon intensity, which represents the total CO₂ emissions per square metre for the Brock portfolio.

Our 20% reduction target from the 2013 baseline carbon intensity translates into a decrease of 0.0217 t CO₂e below the 2013 GHG emissions intensity. This intensity-based target would see Brock University achieve a Bronze pledging status with Niagara Sustainability Initiative (NSI). See the Brock University Carbon Project Annual Report, 2013 at: https://www.brocku.ca/web_fm_send/33026 for more information.

This plan is an evolving document that takes into consideration a number of factors: current consumption, available funding for improvements, incentives from local utilities companies, areas of greatest need, measures with best payback, environmental factors, new buildings, system renewals, new technologies and reinvestment of savings towards further projects. Brock University will consider implementation of opportunities in future operating and capital budgets and forecasts.

Brock University's ECDM Plan is built on the following five (5) objectives:

- 1 Generation**
Improving the Efficiency and Diversity of On-Site Energy Generation
- 2 Operations**
Smart and Efficient Building Operations and Renewal
- 3 Procurement**
Leveraging Strategic and Collaborative Procurement of Energy and Carbon Offsets
- 4 Communication**
Energy Awareness & Communication
- 5 Buildings**
Energy Efficient Design, Construction and Renovation of Buildings

PROGRESS AGAINST PLAN

Changes in Energy Profile On-Campus

Since the completion of the 2014 ECDM plan, there have been several operational changes across Campus that have resulted in an overall increase in energy consumption.

The Animal Care Facility and the Containment Level 3 (CL3) Laboratory facilities were brought on-line in late 2013, as such 2014 would be the first full year of operations for these facilities. Although these spaces do not represent a majority of the footprint of the Cairns Family Health and Biosciences Research Centre (CFHBRC), the operations consume a significant amount of energy and water, thereby increasing the energy consumption within CFHBRC.

On Campus District Energy production was increased as part of Brock's operating budget reduction program to take advantage of lower natural gas costs. By producing more of our own electricity we reduced our demand on the utility grid and altered our GHG profile.

Brock took possession of the Marilyn I. Walker School of Fine and Performing Arts (MIWSFPA) in May of 2015. The additional building, located on a satellite campus will increase the overall energy consumption for Brock. Additionally as 2016 will represent the first full year of operations for the building we expect a year-over-year increase in energy and water consumption in 2016 for MIWSFPA as well.

As Brock continues to utilize its space and assets outside of traditional "work hours", the operating hours of many of our buildings are increased, requiring additional energy to provide light, heating and cooling.



Updated Energy Consumption Data

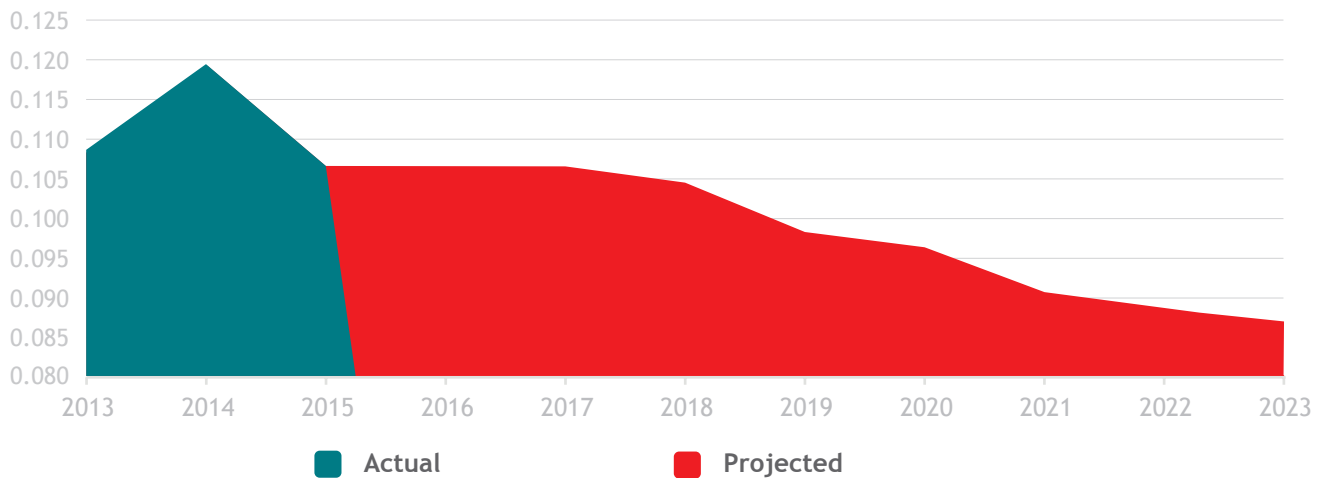
Table 2 and Figure 2 below provide the 2013 to 2015 energy consumption data along with the 2023 Forecast Baseline information for comparison purposes.

TABLE 2 - ANNUAL ENERGY CONSUMPTION AND 2023 FORECAST

Energy Type	2013 Total Consumption	2014 Total Consumption	2015 Total Consumption	2023 Goal for Total Consumption
Natural Gas (m ³)	13,285,651	14,820,881	14,503,364	12,273,424
Purchased Power (KWh)	13,962,339	10,455,400	9,623,226	12,898,555
Fuel (L)	64,812	69,554	69,315	59,874
Water (m ³)	357,074	359,767	399,710	329,869
Carbon Emissions (t CO ₂ e)	26,236	28,857	27,362	24,237
Total Portfolio Foot Print (sq.m.)	241,356	241,356	256,565	278,709*
Carbon Intensity (t CO ₂ e/sq.m.)	0.1087	0.1196	0.1066	0.0870

Notes: 2023 Total Footprint estimated based on current Campus Master Plan

FIGURE 2 - BROCK UNIVERSITY CARBON INTENSITY PROGRESS AGAINST GOAL



Completed Measures

Table 3 below provides a listing of measures completed since publishing the previous ECDM plan. Where available we have also provided preliminary results of the measures.

TABLE 3 - COMPLETED MEASURES, ENERGY CONSERVATION

Objective	Measure
Improving the Efficiency and Diversity of On-Site Energy Generation	<p>Solar Array Feasibility - West Campus Buildings Brock conducted a feasibility study to consider the installation of a solar array on select West Campus Buildings under FIT 4. However, the primary metering (13,800 volts) requirements made the project financials impractical.</p> <p>Ontario's Demand Response Program Brock completed an investigation to leverage Ontario's Demand Response Program in which using existing CFHBRC emergency generators under IESO's DR3 program (now called Capacity-Based Demand Response) was considered. As the program would have increased our overall GHG emissions for Brock, and would not have resulted in measurable financial savings, the program was not implemented.</p>
Smart and Efficient Building Operations and Renewal	<p>Addressing Deferred Maintenance Brock has significantly increased its focus on addressing the campuses deferred maintenance, including an increase of nearly 1,000% in annual capital renewal funding over historical levels, with plans to increase funding further into the future. Wherever possible, Brock has invested available capital dollars into retrofits that would have an overall reduction in its energy and water consumption to further our progress towards the 2023 goal.</p> <p>Energy Conservation - District Winter Chilling During the winter season the need for chilled water from the campus loop is reduced significantly. By allowing CFHBRC #1 Chiller to be the primary winter chiller for the entire Main Campus it has increased its load from less than 10% to approximately 25%. This results in the chiller operating at higher efficiency. This approach has allowed the H-Block 150 Tonne Chiller to be placed on standby, to be used only as emergency back-up. The project delivered a cost savings of approximately \$277/day or \$52,350/year and an annual savings of approximately 392 metric tonnes of GHG.</p> <p>Energy Conservation - IT Server Upgrade In April 2015, Brock deployed a new energy efficient Cisco UCS within its on-site data centre. The project delivered a reduction in annual energy consumption of approximately 42,640 kWh/year resulting in an annual cost savings of \$4,392/year. Additionally, as the new server has a lower heat load than the old server, a reduction in the cooling load for the data centre is expected as well.</p> <p>Energy Conservation - Lighting Retrofit As part of Brock's on-going lighting modernization older fixtures were upgraded with the most practical technology available including T5s and LEDs. As an example a recent lighting retrofit resulting in annual savings of approximately 113,000 kWh of electricity and \$17,000 in reduced utility costs.</p> <p>Energy Conservation - CFHBRC District Heating Brock tested and implemented a new strategy to heat the CFHBRC with excess plant district energy during the summer months. This approach has allowed the standalone boilers in CFHBRC to be shut down. The savings associated with this initiative will be optimized and measured over the next few years.</p> <p>Water Conservation - Low Flow Toilets & Urinals Brock achieved annual savings of approximately 601,000 L of water by replacing existing toilets with new low flow technology in the Welch Hall (24 dual flush toilets, 3 low flush toilets, and 8 urinals).</p> <p>Water Conservation - GE Water Savings By increasing the Cooling Tower number of cycles from an average of 3.5 to 5.0, Brock has reduced the amount of cooling water blow down by over 40%, resulting on an annual water savings of 10,505m³ or over \$32,000 in reduced utility costs.</p> <p>Water Conservation - Irrigation Management Rain water harvesting is being completed from CFHBRC, which is used for irrigation or neighbouring landscaped areas. Additionally, significant reduction in sports field irrigation has occurred due to the installation of an artificial turf field on campus.</p>
Energy Awareness & Communication	<p>Productivity & Innovation Software Using Productivity & Innovation Funding (PIF) Brock, in conjunction with 10 other universities, piloted a software system for energy monitoring and dash boards. As a result of the pilot a campus-wide program of submeter installation is currently underway, also known as "The Year of the Meter".</p> <p>Student and Faculty Engagement A contest was held with occupants of the various laboratories within CFHBRC. Numerous fume hoods were consistently being left open unnecessarily by students and faculty. The contest resulted in behaviour change increasing compliance with fume hood closure requirements, significantly reducing the hours of operation for the ventilation systems and reducing the overall energy usage.</p>

ON-GOING AND PROPOSED COMPLETED MEASURES

Table 4 provides a list of initiatives that are currently underway and that are planned for the near future to support our ECDM Plan.

TABLE 4 - ON-GOING AND PROPOSED MEASURES

Objective	Measure
<p>Improving the Efficiency and Diversity of On-Site Energy Generation</p>	<p>District Energy Loop Study Brock recently undertook a study of its District Energy Loop. This study identified buildings connected to the district energy loop that are not using the campus energy in the most efficient manner. The study provided recommendations to optimize the operation and control of these buildings to ensure the district energy loop is the primary source of energy before supplementary sources are required. As Brock implements the recommendations a reduction of waste energy produced by the cogeneration plant, and a corresponding reduction in the need for supplementary energy production is expected.</p> <p>Alternative Energy Initiatives Currently there are several feasibility studies underway exploring the implementation of Embedded micro-solar and wind power generation on campus. Further details on alternative energy initiatives can be found on Page 15.</p>
<p>Smart and Efficient Building Operations and Renewal</p>	<p>Energy Conservation Measures Brock is planning to undertake the following measures to reduce the overall energy consumption on-campus including:</p> <ul style="list-style-type: none"> • Since opening the energy performance of CFHBRC has underperformed against expectations. As a result, Brock is the options of entering into an Energy Performance Contract to optimize the energy use of the CFHBRC. In the process we will recommission the facility allowing us to develop KPIs against which the building on-going operations are measured • Replace two existing 100 HP (considered to be over-sized) air compressors with two new correctly-sized compressors to supply system air to the Main Campus • Provide occupancy sensors/lighting controls in older buildings as part of DM retrofits • Continue with replacement of incandescent lighting. Install LED for roadways and parking lot lighting upgrades • Planned installation of 20 new smart energy meters across the Campus • Implement Energy Star compliant appliances wherever possible • Provide energy metering for new and existing buildings. Connect energy meters to tracking software to develop building and campus energy profiles for KPIs • Develop vehicle replacement and maintenance programs to optimize vehicle life, reduce emissions and lower operating costs <p>Water Conservation Measures Brock is planning to undertake the following measures to reduce the overall water consumption on-campus including:</p> <ul style="list-style-type: none"> • Continuing to retrofit existing buildings with low flow appliances and fixtures (toilets, showers, etc.) to increase water conservation • Monitoring other process water usage (e.g. RO, CBF, cooling towers, boilers, etc.) to identify further water conservation opportunities • Continuing to provide additional bottle fillers campus-wide • Overhauling four existing district energy plant cooling towers, which will result in a reduction in process water usage
<p>Leveraging Strategic and Collaborative Procurement of Energy</p>	<p>Strategic Initiatives Brock is reviewing various opportunities and the risks associated with making long-term energy commitments, which include the following:</p> <ul style="list-style-type: none"> • Developing strategic policies and energy procurement practices through OEMC and Energy Advisors (e.g. Blackstone, E2 Energy) • Leveraging participation in the Niagara Sustainability Initiative and the OAPPA Energy Committee • Reviewing opportunities for demand management in larger buildings and areas of the campus

TABLE 4 - ON-GOING AND PROPOSED MEASURES (CONTINUED)

Objective	Measure
Energy Awareness & Communication	<p>Facilities Management recognizes the importance of engaging the Brock Community in maximizing the impact and the benefits of the ECDM. As a result, the following initiatives are underway to provide on-going communication and seek input from all members of the Brock Community:</p> <ul style="list-style-type: none"> • Collaborating with Brock’s Sustainability Committee, develop a communication plan and engagement strategy to be rolled out to entire Brock community • Annual updates of the Energy Performance Scorecard will be generated and distributed to the Brock Community • Completing annual waste audits and communicating the results and successes • Creating and implementing Solid Waste Reduction Action Plans and a Solid Waste Management Policy • Providing strategically located dashboards on-campus that provide information on baseline building energy consumption data and encourage the engagement of stakeholders • Providing energy awareness and management training opportunities for Facility Management staff across all disciplines • Providing forums for engaging the Brock Community to share energy and water conservation ideas • Engaging Horizon Utilities to explore the opportunity for an Embedded Energy Manager (EEM) • Conducting energy audits for Brock buildings and integrating the results into the annual Capital Planning process
Energy Efficient Design, Construction and Renovation of Buildings	<p>Design Standards for New Construction and Major Retrofit Projects</p> <p>Wherever possible, Brock will endeavour to implement the latest technology and building systems available to maximize the energy efficiency gains when completing major retrofits as well as building new facilities including:</p> <ul style="list-style-type: none"> • Developing a retrofit strategy for the Schmon Tower with the goal of addressing major deferred maintenance requirements as well as significantly increasing energy efficiency • Designing all new buildings to Leadership in Energy Efficiency and Environmental Design (LEED) standards • Conducting a review of future major deferred maintenance projects to highlight energy-related building components and determine if an Energy Service Contract is a viable option to accelerate Brock’s ability to implement energy efficient measures
District Energy Efficiency Project (DEEP)	<p>The Central Utility Plant generates between 80 and 85% of Brock’s total carbon emissions. As such, improving the efficiency of the plant represents the largest opportunity to reach our emissions reduction goals.</p> <p>Brock has commenced the District Energy Efficiency Project (DEEP), which consists of three sub-projects, including:</p> <ul style="list-style-type: none"> • Replacement of the domestic waterline to all main campus buildings • Replacement of four existing generators with two high efficiency generators • Adding a high efficiency winter-load absorption chiller and retrofitting the existing absorption chiller <p>Once completed, DEEP will provide an overall efficiency gain of approximately 15% in the cogeneration operation (Eff/kWh).</p>



ADDRESSING ONTARIO'S CAP & TRADE SYSTEM

Ontario's new Cap & Trade System came into effect on July 1, 2016. Brock's Main Campus is considered a *Mandatory Participant* under the new legislation since it generates over 25,000 tonnes of GHG's per year (27,362 tonnes in 2015).

Under the current legislation, as a Mandatory Participant, Brock would be required to purchase carbon offset credits on the open market. For 2017-2020 Brock will receive 100% free emission allowances (credits) in the program until December 31, 2020. At today's carbon price and current emissions, Brock would pay approximately \$500,000/year for offset credits.

On October 3rd, 2016 Prime Minister Trudeau addressed carbon pricing for the country and used a figure of \$50 for a carbon credit by 2022 for those Provinces that do not have a carbon program in place such as Ontario's Cap & Trade Program. Were that to be the market price for carbon in Ontario, this could potentially increase carbon pricing for the University from \$500,000 per year at today's prices to potentially \$1,400,000 per year by 2022 (assuming 28,000 tonnes of annual emissions).

Brock's satellite sites (Including MIWSFPA, Hamilton Campus, Rodman Hall and BRIC) fall under the *Non-Participant* category as they produce less than 10,000 tonnes/year of GHG's. Satellite sites are anticipated to cost an additional \$14,000/year (based on \$0.04 m3) for the Cap & Trade embedded fee that will be billed directly through the appropriate natural gas utility provider.

Ontario will deliver its cap-and-trade program through infrastructure established by Western Climate Initiative, Inc. and use a compliance instrument tracking system service (CITSS).

Brock will procure a long term "Cap & Trade Advisory Service" through the Broader Public Sector group procurement entity e.g. the Ontario Education Collaborative Marketplace (OECM) or a group of Ontario universities e.g. the Ontario Association of Physical Plant Administrators (OAPPA).

ALTERNATIVE ENERGY INITIATIVES

Brock is currently undertaking planning and feasibility studies to integrate renewable energy options at its main campus on Sir Isaac Brock Way.

200 KW Solar Power Array on South Campus

Brock is investigating the construction of a 200 KW Solar installation which would be mounted atop the Facilities Management Works Building, planned to be built on the South Campus. The array would be connected directly to the Hydro One network.

100 KW Solar Power Array Installation on East Academic Buildings

Brock is also considering taking advantage of the Micro FIT Program with the installation of a 100 KW Solar Power Array that would be installed on East Academic buildings located on the East Campus, across Glenridge Avenue.

1 to 2 MW Wind Turbine Installation on South Campus

In addition to the potential solar installations, Brock is planning to undertake a study to determine if the installation of a 1 to 2 MW (+/-) Wind Turbine would be possible on the South Campus. The purpose of the Wind Turbine would be to offset 100% of the CFHBRC energy.

Brock will continue to study new renewable and alternative energy technologies that make practical and financial sense. Within the Niagara Region there are many challenges associated with connecting to the power grid (location and capacity) and metering limitations related with high voltage connections (13,800 Volts, Main Campus). With the increasing cost of purchased electricity and the evolving cost of carbon, the life cycle cost for alternative energy sources are likely to become more favourable, making potential implementation at Brock more feasible, and further our pursuit of GHG reductions.





ON-GOING IMPLEMENTATION AND MONITORING

Facilities Management, Maintenance & Utilities are managing the implementation, ongoing monitoring, verification and reporting of this ECDM Plan. On an annual basis, in consultation with key departments, personnel responsible for the initiatives outlined in this Plan will submit data to FM regarding the status of the energy and GHG reduction initiatives and their contribution to achieving the University's targets.

This data will continually be presented to Brock's Sustainability Co-ordinating Committee – with membership drawn from across the university from administrative departments, faculties and students on the development and progress of energy conservation efforts and the ECDM plan. Brock's senior management has also been updated annually since 2010 on energy conservation efforts through the Capital Infrastructure Committee, which reports to the Board of Trustees.



Annually, a review of ECDM plan implementation will take place and the Energy Performance Scorecard will be updated. A comprehensive review of the plan will be completed in 2019 in anticipation of the scheduled 2020 ECDM plan re-issue and re-approval. Furthermore, annual updating, changing and adding energy and GHG reduction initiatives will occur to meet the priorities of Brock. If/as additional funding sources become available, and as technologies and best practices change, Brock will evaluate and prioritize new energy and GHG reduction opportunities in support of our Strategic Priorities.



The majority of proposed measures that will have the largest impact on our overall carbon intensity (e.g. Central Utility Plant Upgrade, Installation of Solar and Wind Power, etc.), as outlined in this plan are in the feasibility and planning stages. We expect that 2016 and 2017 will focus on determining the viability of the proposed measures and allow for initial planning and implementation of the practical measures. As such, our expectation is that our carbon intensity will not see significant reduction until 2018 when the proposed measures are implemented.

APPENDIX A - ACRONYMS

Annex A - List of Acronyms

AHU	Air Handling Unit	kWh	Kilowatt Hour
BAS	Building Automation System	LDC	Local Distribution Company
BRIC	Brock Research and Innovation Centre	LED	Light Emitting Diode
BUSU	Brock University Student Union	LEED	Leadership in Energy and Environmental Design
CFHBRC	Cairns Family Health and Bioscience Research Complex	LTCP	Long Term Capital Plan (Brock)
CPDC	Campus Planning Design and Construction, part of Facilities Management	MC	Mackenzie Chown
CUB	Central Utilities Building	M+O	Maintenance & Operations, part of Facilities Management
CAC's	Criteria Air Contaminants	MOE	Ministry of Environment
ECDM	Energy Conservation and Demand Management Plan	MTCU	Ministry of Training, Colleges and Universities
ekWh	Equivalent Kilowatt Hours	MUSH	Market sector covering Municipalities, Universities and Colleges, Schools and Hospitals
EEM	Energy Embedded Manager	MW	Megawatt
ERII	Energy Retrofit Initiative Incentive, program from Horizon Utilities	N/A	Not Applicable
EPA	Environmental Protection Authority, US Federal government entity responsible for environmental regulations	NERC	Northeast Recycling Council
ESRC	Environmental Sustainability Research Centre	NSI	Niagara Sustainability Initiative
EV	Electric Vehicles	OAPPA	Ontario Association of Physical Plant Administrators
FCI	Facility Condition Index	OECM	Ontario Educational Collaborative Marketplace
FM	Facilities Management	PIF	Productivity and Innovation Fund
GHG	Greenhouse Gas	PCB	Polychlorinated Biphenyl
GJ	Giga Joule	RO-water	Reverse Osmosis Water, purified water generally used for laboratories and research applications
GWP	Global Warming Potential	SAC	Senior Administration Council
HP	Horsepower	SCC	Sustainability Coordinating Committee
HID	High Intensity Discharge Lamp	SUA	Satellite Utilities Area
HX	Heat Exchanger	SWIM	Single Window Information Management
HVAC	Heating, Ventilation and Air Conditioning system	TBD	To Be Determined
IEAP	Illinois Environmental Authority Protocol (for reporting Air emissions to SWIM & Environmental Protection Authority (EPA))	UNESCO	United Nations Educational, Scientific, and Cultural Organization
ITS	Information Technology Services	VFD	Variable Frequency Drive
kW	Kilowatt	WARM	Waste Reduction Model

APPENDIX B - APPROVAL

Annex B - Approval of Brock University's Senior Management



Office of the President

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**Minutes of Meeting
Senior Administrative Council (SAC)
Monday, June 16, 2014 2:00 - 4:00 pm | 13th Floor Board Room**

Present: J. Lightstone (Chair), T. Arkell, H. Ben-El-Mechaiekh (for E. Ahmed), F. Blaikie, C. Colebatch, D. Cyr, G. Finn, B. Hutchings, G. Libben, I. Makus, J. Mandigo, N. McCartney, K. Meade, T. Saint-Ivany, D. Cullum

Internal Guests: D. Balasiak, R. Cargnelli, D. Kasunic, M. Kerr, D. McArthur, S. Sekel

External Guests: B. Blaszyński, L. Michaels, B. Smith (all from Horizon Utilities)

1. Welcome

- J. Lightstone welcomed the Council and called the meeting to order at 2:00 p.m.
- J. Lightstone and the Council acknowledged and thanked I. Makus for her dedicated service during her one-year term as Interim Dean for the Faculty of Social Science.
- I. Makus thanked the Council for their guidance and support.

2. Approval of Agenda

- The Energy Conservation and Demand Management Plan (item #6) was changed from an information item to a decision item at the request of T. St. Ivany.
- A Registration Update was added under Other Business by K. Meade.
- The amended agenda was approved by the Council.

3. Approval of minutes - June 2, 2014

- The minutes of the previous meeting on June 2 were approved as circulated.

4. Horizon Utilities ERII Rebate

- B. Smith expressed Horizon Utilities' appreciation for their partnership with Brock University and for the University's commitment to energy efficiency.
- B. Smith and L. Michaels presented T. St. Ivany and D. Balasiak with a rebate cheque in the amount of \$138,662.30.
- J. Lightstone and the Council thanked Horizon Utilities for their partnership and attendance at the meeting.

5. NSI 2013 Most Impactful Initiative Award

- T. St. Ivany announced that the University was recognized with the Most Impactful Initiative Award by the Niagara Sustainability Initiative (NSI) as a result of its efforts and results in reducing electricity consumption on campus.
- J. Lightstone and the Council congratulated Facilities Management on this achievement and thanked them for their efforts.
- D. Kasunic responded to questions from the Council on future sustainability plans.

6. Energy Conservation and Demand Management Plan

- T. St. Ivany presented the proposed Energy Conservation and Demand Management Plan.
- The Plan was approved by the Council.

APPENDIX C - CHECKLIST

Annex G - ECDM Plan Checklist

This checklist will ensure that all of the required elements have been included in the ECDM plan before/on approval by senior management.

Item Completed	Description
✓	The public agency's goals and objectives for conserving and otherwise reducing energy consumption and managing its demand for energy
✓	The public agency's proposed measures under its energy conservation and demand management plan?
✓	Cost and saving estimates for its proposed measures?
✓	The estimated length of time the public agency's energy conservation and demand management measures will be in place?
✓	A description of any renewable energy generation facility operated by the public agency and the amount of energy produced on an annual basis by the facility?
N/A	<p>A description of:</p> <ul style="list-style-type: none"> • The ground source energy harnessed, if any, by ground source heat pump technology operated by the public agency • The solar energy harnessed, if any, by thermal air technology or thermal water technology operated by the public agency • The proposed plan, if any, to operate heat pump technology, thermal air technology or thermal water technology in the future
✓	Confirmation that the energy conservation and demand management plan has been approved by the public agency's senior management?
<p>✓</p> <p>N/A</p> <p>✓</p>	<p>The ECDM plan will be made publically available by:</p> <ul style="list-style-type: none"> • Publishing it on the public agency's website (if there is one)? • Publishing it on the public agency's intranet site (if there is one)? • Making it available to the public in printed form at the head office?



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