

While realities of budget restrictions are an important consideration in any planning activity, it is possible to achieve energy savings while adhering to the financial constraints of a publicly-funded the College system. It is clear that new technology and ideology changes have produced continued operational cost reductions while improving indoor comfort and environmental sustainability. These cost saving projects can often fund themselves by avoiding the use of previously allocated funds. As long as the savings are reinvested, these improvements can continue for the foreseeable future, ensuring a sustainable process. Many industries have had environmental programs running for over a decade and continue to hit their 3%-5% intensity reduction goals without sacrificing product quality.

3 HISTORICAL ENERGY MANAGEMENT

Historically, The College has addressed Energy Conservation and Demand Management on a project-by-project basis through the activities of the Facilities Management Group. Capital projects were implemented based on equipment’s expected useful life or in response to equipment emergency breakdowns. Utility savings, realized as a result of the implementation of these individual projects, have not historically been uniquely reported formally, but have been considered as a component of general operations. Thus, they have been reported through utility expenses in the Accounting System. Sustainability and long-term energy reduction goals, through this CDM Plan, will become integral components of the business reporting system.

Utility costs were viewed as a fixed overhead cost. The management of these costs relied on an exception-based investigation approach. In other words, utility costs were only reviewed if a utility bill was much higher, or lower, than typical.

In 2014, The College will embarked upon a strategic energy auditing project. The purpose of these audits will be to identify and analyze potential energy conservation and demand management opportunities. These efforts will be instrumental in assisting The College in aligning the CDM Plan with the the College’s **Business Plan 2014-2015**.

Historical Energy Reduction Projects Summary	
Year	Action Taken
2010	New exhaust fans in chemistry labs VAV inspections Auto Faucets and Flushers Replaced Cafeteria lighting to T5 & T8 Replaced a number of water fountains New heater installed in the ECE gym area/garage
2011	VAV Repairs Auto Faucets and Flushers Installed a new 560 ton chiller replacing an old chiller Fan units repaired
2012	Fan Unit upgrades <ul style="list-style-type: none"> • Vibration Analysis • Replaced aged 40HP motor(chilled water pump) • Replaced aged compressors feeding building pneumatic and labs Thin Clients utilized Virtualization strategy for server architecture Automatic shut off for lab and multimedia computers at 11:00 PM each night

2013	Replaced some aged skylights (South Building) Replaced aged hot water tank (Lambton INN, Academic side) Replaced aged motor in main sanitary lift station Replaced old cooling pump in the South building boiler room Replaced power unit in one of the South Building elevators
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4 CURRENT STATE OF CORPORATE ENERGY

Energy Data Management

While The College has an admirable history of managing its energy consumption, the Ontario government has required an increase in the College energy management practices. This has resulted in the need to enhance current practices and develop new approaches. To meet this need, The College will continue to enhance its comprehensive program for collecting and analyzing monthly energy billing information, and ensuring Staff is informed about energy consumption. This effort will produce an energy costs and consumption database that will be used for monitoring excessive variations, targeting facility follow-up evaluations, and highlighting areas that could be candidates for improved conservation. These monitoring enhancements will improve The College's understanding of the bottom line impact of energy management.

Energy Supply Management

Bluewater Power Distribution Corporation and Hydro One Networks Incorporated currently serve the College facilities for electricity and Union Gas Limited provides natural gas services. A comprehensive risk management and purchasing program for energy commodities is also employed utilizing independent energy suppliers. This strategy is reviewed annually during the budgeting process.

Energy Use in Facilities

College Staff Members have retained a great deal of knowledge with regard to their facility's energy use. This knowledge base will soon be enhanced by a series of comprehensive audits to be completed at The College's facilities. Through the deployment of energy management software, The College Staff will be equipped with the information necessary to make effective energy management decisions. This will make it possible to implement an effective energy procurement process, pursue appropriate capital projects, and implement successful conservation and demand management programs.

Equipment Efficiency

The College has pursued many measures to improve the energy efficiency of the College equipment. Some of these measures include:

- Heating and cooling equipment retrofits,
- Building envelope improvements,
- Electrical systems upgrade, and
- The pursuit of the feasibility of solar thermal and solar photovoltaic applications.

As the understanding of corporate energy consumption improves, The College Staff will be equipped with the knowledge necessary to make informed decisions. This improved understanding will also reveal how simple actions like commissioning and maintenance procedures can improve existing equipment efficiencies.

Organizational Integration

Day to day management of energy has been primarily the responsibility of The College Director, Facilities Management. Current practices will be enhanced with future plans including:

- The creation of an interdepartmental energy management team,
- Improved energy monitoring and feedback, and
- Interactive energy training and awareness.

Staff across all departments will be given the necessary tools to address corporate energy concerns such as budgeting, procurement, conservation, and generation.

Prior to the development of the CDM Plan, VIP assessed The College's energy management practices. This assessment was completed by speaking to The College Staff and reviewing relevant material. Upon completion of this review, VIP determined that The College had provided Staff Members with a mandate to pursue proper energy management, and through The College Staff ingenuity, The College was able to direct resources to energy management. However, VIP also noted that if The College is to achieve the Ministry's mandate, it will require the development of this CDM Plan that will address The College's energy management needs.

5 CURRENT ENERGY CONCERNS

Environmental, societal, and fiscal pressures accentuate the need for an energy Conservation and Demand Management Plan (CDM Plan).

Environmental

Concerns surrounding energy consumption with regard to climate change and air pollution have been well documented. Since 1990, Ontario's greenhouse gas emissions have increased 14%. The Government of Ontario estimates that 75% of Ontario's greenhouse gas emissions are associated with the consumption of fossil fuels for energy purposes. Increased smog and air pollution are also connected to the consumption of energy. Ontario's electricity generation is the Province's second largest source of sulfur dioxide and the third largest source of nitrogen oxides. These pollutants can cause irreparable harm to human health.

Societal

The 2003 Blackout heightened societal concerns surrounding the stability and security of our energy supply. Energy has been imbedded into most societal practices. If energy consumption is not managed appropriately, the frequency of energy interruption and the subsequent societal disruption will increase.

Fiscal

The fossil fuels traditionally used for the generation of energy are no longer financially accessible or environmentally acceptable. This has resulted in the promotion of renewable energy generation which comes with an additional expense. Energy costs are also anticipated to increase as Ontario's existing energy infrastructure is taken off-line or refurbished. Coming off of the lows of the 2009 recession, national electricity and natural gas prices are 27% and 21% greater than they were at the start of the decade. It is not anticipated that this upward trend will be altered in the short to medium future. The Province of Ontario has recently projected an annual 3.5% to 7.9% increase in electricity costs over the next 20 years. Natural gas is also projected to trend upward.

In recent years, The College has experienced flat student enrollment growth and is projected to grow into the future. As The College evolves, so will the College's environmental, societal, and fiscal energy concerns. The College recognizes that proper energy management must be pursued if these concerns are to be addressed.

6 SCOPE OF THE CDM PLAN

Lambton College is Ontario’s second oldest community college, in operation since 1966. Located in Sarnia-Lambton, close to the highway 402 & highway 40 interchange, Lambton College has an important role in the community as the only post-secondary institution.

The college campus is characterized by numerous buildings, dating from the 1960’s and 1970’s. No new facility construction has occurred on the main campus since 1972. Currently the college conducts its operations in the following facilities:

Lambton College Facilities – Modeland Road, Sarnia	
Facility	Description
Main Building “South Building”	353,524 SF main institutional building characterized by classrooms, laboratories, two-storey cafeteria, library, bookstore, offices and services.
North Building	61,432 SF two-storey brick building that currently houses a Daycare Centre, Early Childhood Education Faculty Offices and Lab classes, and community drop-in services. A significant portion of this building is a former college residence that has been moth-balled and has been difficult to retrofit or improve accessibility.
Skilled Trades and Training Centre (STTC)	23,564 SF facility that accommodates the skilled-trades apprenticeship programs. Teaching labs include carpentry, welding, electrical and pipefitting are located in this building that was previously a privately-owned squash and fitness centre.
Residence and Event Centre	114,602 SF facility that was formerly a hotel and restaurant complex. Today the building provides three predominant zones – a secure residence for college students, a conference and event centre as well as specialized teaching labs for culinary, esthetician and digital photography students.
Sustainable Smart Home	3,421 SF real-life laboratory provides hands-on training to students in the technology and trades programs. It provides researchers the ability to collaborate on renewable energy applied research projects on- or off-the-grid.
Suncor Sustainability Centre	13,570 SF building had several previous uses before being purchased by Lambton College. An extensive retrofit project resulted in 3,672 SF to house the College Research Office, meeting rooms, a resource library and amenities; an additional 9,898 SF is leased by a community partner and serves to provide safety training to tradespeople and industry employees from across the region.

Lambton College Facilities – Off Campus Facilities

Facility	Description
Fire and Emergency Response Training Centre	25,949 SF building is located off the main campus on the south perimeter of Sarnia. This new building was constructed in 2011/2012 through investment from the federal development infrastructure fund. This state-of-the-art training facility enables cross-disciplinary training for Lambton's Fire Science, Public Safety, Paramedic and Law & Justice students. Specialized burn towers and equipment bunkers establish this as a leading fire training facility for the province.
Employment and Learning Centre	4,533 SF is leased in Petrolia, Ontario to provide employment services and training to rural Lambton residents. Funded through Employment Ontario.

Lambton College Facilities - General Information

Building Name	Operation Type	Address	City	Postal Code	Total Floor Area (m ²)
Employment Learning Centre	Administrative offices	4248 Oil Heritage Road	Petrolia	N0N 1R0	340
Fire & Public Safety Centre of Excellence	Administrative offices	459 La Salle Line	Corunna	N0N 1G0	651
Lambton INN	Administrative offices	1485 London Road	Sarnia	N7S 1P6	1,877
North Building	Administrative offices	1431 London Road	Sarnia	N7S 1P6	4,086
Skilled Trades Training Centre	Administrative offices	1485 London Road Unit A	Sarnia	N7S 1P6	351
South Building	Administrative offices	1457 London Road	Sarnia	N7S 6K4	11,146
Suncor Sustainability Centre	Administrative offices	1489 London Road	Sarnia	N7S 1P6	82
Sustainable Smart Home	Administrative offices	1431 London Road Unit A	Sarnia	N7S 1P6	187
Fire & Public Safety Centre of Excellence	Classrooms and related facilities	459 La Salle Line	Corunna	N0N 1G0	1,752
Lambton INN	Classrooms and related facilities	1485 London Road	Sarnia	N7S 1P6	1,860
North Building	Classrooms and related facilities	1431 London Road	Sarnia	N7S 1P6	1,477
Skilled Trades Training Centre	Classrooms and related facilities	1485 London Road Unit A	Sarnia	N7S 1P6	557
South Building	Classrooms and related facilities	1457 London Road	Sarnia	N7S 6K4	12,575
Sustainable Smart Home	Classrooms and related facilities	1431 London Road Unit A	Sarnia	N7S 1P6	46
Greenhouse	Laboratories	1457 London Road	Sarnia	N7S 6K4	322
Hoophouse	Laboratories	1457 London Road	Sarnia	N7S 6K4	240
Lambton INN	Laboratories	1485 London Road	Sarnia	N7S 1P6	838
Skilled Trades Training Centre	Laboratories	1485 London Road Unit A	Sarnia	N7S 1P6	1,356
South Building	Laboratories	1457 London Road	Sarnia	N7S 6K4	5,694
Suncor Sustainability Centre	Laboratories	1489 London Road	Sarnia	N7S 1P6	110
Sustainable Smart Home	Laboratories	1431 London Road Unit A	Sarnia	N7S 1P6	85
Lambton INN	Library	1485 London Road	Sarnia	N7S 1P6	43
North Building	Library	1431 London Road	Sarnia	N7S 1P6	124
South Building	Library	1457 London Road	Sarnia	N7S 6K4	1,424
Suncor Sustainability Centre	Library	1489 London Road	Sarnia	N7S 1P6	176
South Building	Student recreational and athletic	1457 London Road	Sarnia	N7S 6K4	1,127
Lambton INN	Student residences	1485 London Road	Sarnia	N7S 1P6	63,296
					111,820

7 ENERGY BASELINE AND CURRENT ENERGY PERFORMANCE

Effectively managing energy requires implementing appropriate energy monitoring procedures. The establishment of an accurate energy baseline is essential in this process. It will assist with energy conservation and greenhouse gas reduction target setting, energy procurement and budgeting, bill verification, energy awareness, and the selection and assessment of potential energy projects. The College relies on its utility bills to establish its energy baseline.

In 2014, the College will embark upon a strategic detailed energy audit project. The audits will consist of a detailed analysis of historical consumption and demand information as well as a walkthrough of the facility by a qualified energy auditor. Based on the auditor's survey, a detailed equipment list and an energy consumption breakdown have been created, as well as a comprehensive list of potential energy conservation measures for each facility. Once a list of feasible energy conservation measures is developed, this Plan will be updated to reflect both the scope of each measure as well as its impact on The College's energy consumption.

BASELINE PERFORMANCE (2011)

The College has elected to utilize the consumption data from 2011 to represent its baseline energy consumption performance. Based on this information, and normalizing for weather conditions, the baseline energy performance may be represented by a normalization analysis.

Lambton College Facilities - 2011 Energy

Building Name	Total Electricity Consumption (kWh)	Total Natural Gas Consumption (m ³)	GHG Emissions (kg)	Energy Intensity (ekWh/ft ²)	Energy Intensity (GJ/m ²)
Employment Learning Centre	22,915	5,070	11,419	21	0.81
Fire & Public Safety Centre of Excellence	89,025	16,163	37,679	37	1.44
Lambton INN	303,136	23,229	68,167	27	1.06
North Building	402,428	97,461	216,457	33	1.27
Skilled Trades Training Centre	26,108	3,987	9,627	18	0.70
South Building	2,276,596	217,119	592,619	38	1.48
Suncor Sustainability Centre	1,571	1,358	2,693	18	0.70
Sustainable Smart Home	18,947		1,516	9	0.37
Fire & Public Safety Centre of Excellence	239,726	43,522	101,463	37	1.44
Lambton INN	300,449	23,023	67,563	27	1.06
North Building	145,516	35,242	78,270	33	1.27
Skilled Trades Training Centre	41,391	6,321	15,262	18	0.70
South Building	2,568,595	244,967	668,629	38	1.48
Sustainable Smart Home	4,701		376	9	0.37
Greenhouse	65,751	23,992	50,620	93	3.59
Hoophouse	48,995		3,920	19	0.74
Lambton INN	135,382	10,374	30,444	27	1.06
Skilled Trades Training Centre	100,821	15,397	37,176	18	0.70
South Building	1,163,118	110,927	302,770	38	1.48
Suncor Sustainability Centre	2,112	1,826	3,621	18	0.70
Sustainable Smart Home	8,583		687	9	0.37
Lambton INN	6,918	530	1,556	27	1.06
North Building	12,216	2,958	6,570	33	1.27
South Building	290,898	27,743	75,723	38	1.48
Suncor Sustainability Centre	3,366	2,909	5,770	18	0.70
South Building	230,119	21,946	59,902	38	1.48
Lambton INN	949,912	72,789	213,611	3	0.10
	9,459,296	1,008,853	2,664,108	17	0.65

CURRENT PERFORMANCE (2012)

It is imperative to understand the energy characteristics of each facility. By understanding these values, baselines can be established and future retrofits and improvements to the buildings can be monitored and tracked to ensure that the intended benefits are fully realized. The College's most recent energy consumption inventory was completed in 2012. This inventory took into account the electricity and natural gas consumption of The College facilities. In 2012, The College's total energy use, including electricity and natural gas, was 19,845,145 equivalent kilowatt hours (ekWh). This total consisted of 9,033,072 kWh of electricity and 1,017,341 m³ of natural gas, which is equivalent to 10,812,073 ekWh. The 2012 combined total cost of electricity and natural gas was \$1,164,417.

Lambton College Facilities - 2012 Energy					
Building Name	Total Electricity Consumption (kWh)	Total Natural Gas Consumption (m ³)	GHG Emissions (kg)	Energy Intensity (ekWh/ft ²)	Energy Intensity (GJ/m ²)
Employment Learning Centre	11,085	4,426	9,255	16	0.62
Fire & Public Safety Centre of Excellence	111,875	17,423	41,890	42	1.64
Lambton INN	288,209	21,918	64,495	26	1.00
North Building	393,540	80,121	182,961	28	1.10
Skilled Trades Training Centre	27,520	3,114	8,089	16	0.62
South Building	2,122,137	228,234	601,277	38	1.47
Suncor Sustainability Centre	8,839	3,389	7,114	51	1.97
Sustainable Smart Home	17,995	-	1,440	9	0.35
Fire & Public Safety Centre of Excellence	302,478	47,105	113,257	43	1.65
Lambton INN	285,655	21,724	63,924	26	1.00
North Building	142,303	28,971	66,158	28	1.10
Skilled Trades Training Centre	45,866	5,190	13,482	17	0.65
South Building	2,394,325	257,508	678,397	38	1.47
Sustainable Smart Home	4,465	-	357	9	0.35
Greenhouse	61,290	23,506	49,344	90	3.48
Hoophouse	45,671	-	3,654	18	0.69
Lambton INN	128,716	9,789	28,804	26	1.00
Skilled Trades Training Centre	110,079	12,456	32,356	17	0.64
South Building	1,084,205	116,605	307,194	38	1.47
Suncor Sustainability Centre	12,053	4,621	9,701	52	2.00
Sustainable Smart Home	8,152	-	652	9	0.35
Lambton INN	6,578	500	1,472	26	1.00
North Building	11,946	2,432	5,554	28	1.10
South Building	271,162	29,163	76,830	38	1.47
Suncor Sustainability Centre	19,285	7,393	15,521	52	2.01
South Building	214,506	23,070	60,777	38	1.47
Lambton INN	903,137	68,682	202,104	26	1.00
	9,033,072	1,017,341	2,646,058	34	1.31

In all, The College has increased its energy intensity from 2011 to 2012 indicating a slight shift in energy utilization from 0.65 GJ/m² to 1.31 GJ/m².

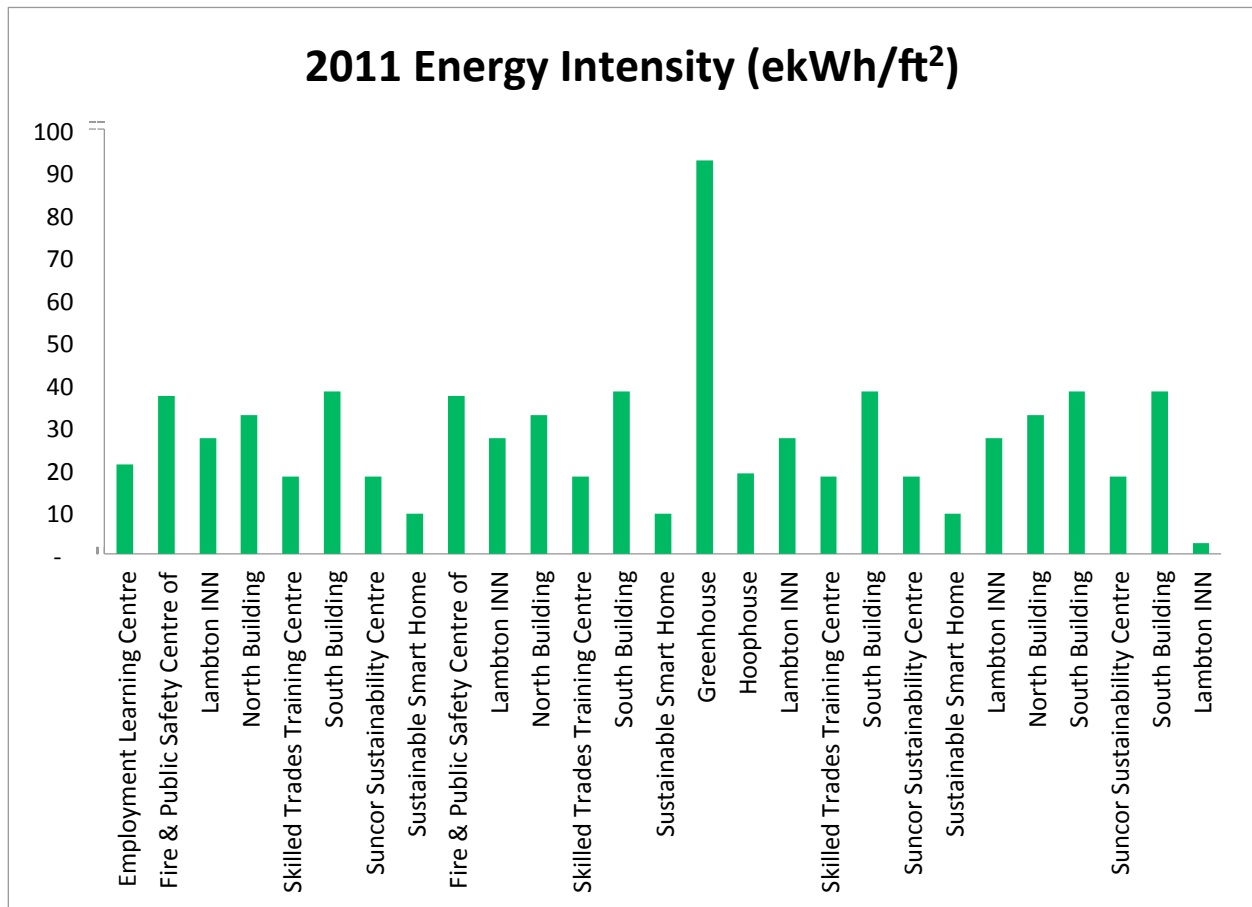
BENCHMARKING

Market Sector

Energy Intensity (ekWh/ft ²)				
Sector	Minimum	Average	Maximum	No. of Organizations
Universities	0.0	34	196	46

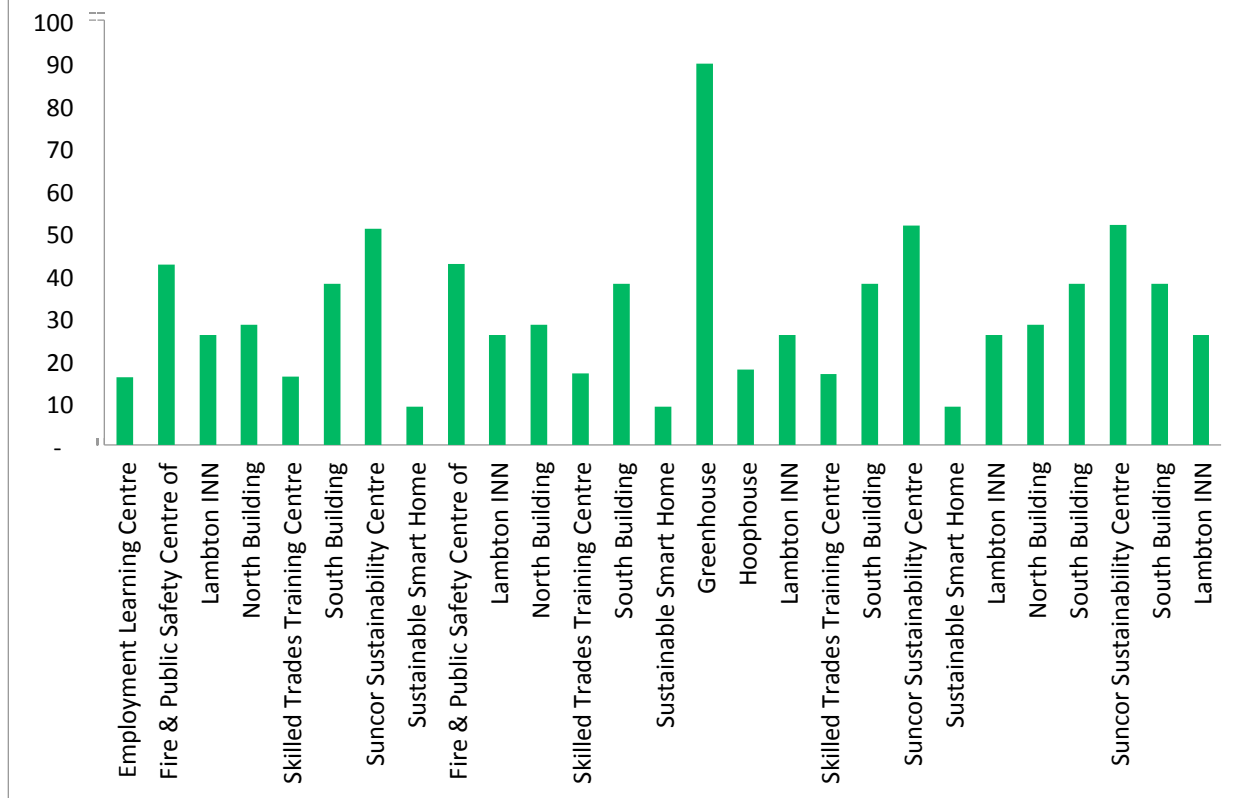
The College's facilities have an average 34 ekWh/ft² energy intensity, on par with the industry average based on the Ministry of Energy's 2011 Public Sector Energy Consumption Data.

The College Facilities



This illustration outlines the Energy Intensity (equivalent kilowatt hours per square foot) of each of the College's facilities for 2011.

2012 Energy Intensity (ekWh/ft²)



This illustration outlines the Energy Intensity (equivalent kilowatt hours per square foot) of each of the College's facilities for 2012.

8 MISSION AND VISION

Mission

Lambton College is committed to student and community success.

Vision

Lambton College fosters innovation and entrepreneurship among our faculty, staff, and students – and in the local and global communities we serve. As the sole provider of higher education in our region, we remain committed to providing teaching and learning excellence in a broad range of program offerings, and a full range of credentials. We will enhance the student experience and learning outcomes by becoming a mobile learning college. In particular, we will distinguish ourselves amongst all Canadian colleges by leveraging our unique strengths to become a global leader in education and applied research in the areas of Energy & Bio-Industrial Technology, and Fire & Public Safety.

The CDM Plan has been developed to address the fiscal, societal, and environmental costs and risks associated with energy consumption. Proper energy management will allow The College to display leadership, improve the delivery of services, and enhance the overall quality of life with respect to the campus.

This CDM Plan outlines key actions that must be pursued to make this vision a reality. The completion of these actions will assist The College in meeting its energy conservation targets and its greenhouse gas emission reduction commitment. Achieving these goals will assist The College in securing a strong energy management reputation and will allow for cost savings that can benefit The College, its employees, and its students.

It is acknowledged that, for this vision to come to fruition, energy management at The College must become an inclusive process. Recognizing that energy affects everyone differently, this Plan was created to address a variety of energy related concerns, while capturing innovative and relevant actions that will lead to meaningful change.

This CDM Plan will allow energy management to be incorporated into all The College activities, including organizational and human resource procedures, procurement practices, financial management and investment decisions, and facility capital, operations, and maintenance.

Overview

This CDM Plan is designed to meet the current energy needs and obligations of The College. The intent is to guide The College in the development of an energy management foundation. This will be a living Plan that will evolve as The College's energy needs are revealed and better understood.

The College's approach to energy management is three pronged. It begins with:

- Elimination of waste,
- Improving efficiencies, and
- Optimizing energy supply.

Prior to pursuing these actions, The College must be aware of the facility and Staff behaviours that influence energy consumption. Once encapsulated, this knowledge must be dispersed throughout the organization, allowing for the development of a culture of sustainability.

An improved understanding of corporate energy consumption will require improvements in energy management and awareness. Energy awareness campaigns will strive to make energy a tangible asset that Staff Members can appreciate when it is being consumed or wasted. In addition to increasing energy awareness, this energy Plan will integrate energy efficiency into the strategic, capital and operational decision making of the organization.

9 GOALS AND OBJECTIVES

It is of critical importance to improve energy efficiency and reduce operating costs. Equally important is displaying commitment to the environment through the reduction of greenhouse gases, while improving air quality. It is also important that these actions are carried out without adversely impacting The College's operations. All The College Staff will have an essential role in the success of this energy management Plan. It will be the responsibility of the Energy Management Team to ensure that energy management measures are properly communicated and effectively implemented. An Energy Mandate for The College has been developed and is an integral component of this CDM Plan.

The College's CDM Plan was completed to help support the following goals:

- Encourage reduced greenhouse gas emissions and energy consumption at the College by promoting built forms that create more sustainable, efficient, healthy, and livable school communities,
- Maximize the use of operational budgets by ensuring that College facilities are operating in as energy efficient manner as possible,
- Ensure that minimizing energy use is considered throughout the various aspects of Lambton's operations including purchasing where financially viable, and
- Recognize the importance of the input and participation of Lambton's employees and students in supporting energy conservation and sustainability initiatives through education, awareness and training

The primary objective of this Plan is to improve the management of The College's energy consumption. Part of this objective is setting a conservation target that will see The College reduce its 2011 energy consumption by 3% by the end of 2019. Recognizing that The College is targeting to maintain a growing campus and student base, The College's energy conservation target will be intensity based. It is also the objective of this Plan to improve The College's understanding of energy consumption which is essential for The College to meet its corporate energy management goals.

Measurements of Success

The measurements of success will be based on a variety of indicators:

- Reaching the CDM Plan's energy conservation target,
- Assisting with the corporate greenhouse gas reduction target,
- Achieving the savings outlined in the Plan's budget section, and
- Imbedding energy management in The College's strategic, capital and operations decision-making process.

Reporting Standards

The CDM Plan will allow for the monitoring and reporting that is necessary for The College to meet the regulatory requirements of the **Green Energy Act** and The College's greenhouse gas reduction targets. Regular energy monitoring and feedback to the Ministry and The College Management and Staff will improve knowledge and help make energy consumption a tangible asset, making possible appropriate behavioural changes. The intent of monitoring and reporting on energy consumption is to make energy management transparent and the consumer accountable. The Ministry will be provided with annual updates on the state of energy management at The College. Energy consumption feedback provided to Staff will be imbedded into The College's regular business.

10 ENERGY MANAGEMENT TEAM

Historically, The College addressed Energy Conservation and Demand Management on a project-by-project basis through the activities of the Facilities Management Group. Strategic directives have been provided by the the College Board of Governors and the Senior Executive Team.

This CDM Plan outlines a commitment to integrate Energy Conservation and Demand Management into the operations of the College. Within the duration of the CDM Plan, planned activities will become an integral component of the annual budgeting process. A collaborative effort will be undertaken to achieve this integration, involving:

- Internal Staff (which may include but will not be limited to Facilities Management, Finance, and Procurement),
- Advisement from the Ministry of Energy and the Ministry of Education, and
- Consultations with Energy Management experts.

Currently, energy management is being driven by the Director, Facilities Management and the Facilities Management Group.

11 FINANCIAL ASSESSMENT

The energy Conservation and Demand Management Plan's financial assessment philosophy is to treat fiscal resources as if they were energy assets. Therefore, financial investments follow the same three pronged approach used for the management of energy:

- Elimination of waste,
- Improving efficiencies, and
- Optimizing energy supply.

The future plans for proposed process improvements, program implementation, and projects are:

Lambton College
Opportunity
Android app for green-energy technology
Detailed energy audit and building condition assessment program

If initiated and monitored effectively, it can be anticipated that savings can be sustained. It should also be noted that the price of energy is anticipated to increase, whereas the costs of capital projects will likely decrease with advancements in technology. This could potentially lead to increased savings and decreased costs in the later years of the plan. The potential for avoided costs adds to the relevance of a plan of this nature.

12 ENERGY MANAGEMENT ACTIONS

The economic feasibility of proposed actions played a large role in the prioritization of the processes, programs, and projects. Equally important in this prioritization exercise was the evaluation of The College's internal capacity to complete the proposed initiatives. Recognizing the need to develop The College's internal capacity, the initial years of the Plan focus heavily on processes and programs. The implementation of the recommended processes and programs will result in an improved understanding and awareness of energy consumption. As these actions are completed, the Energy Management Team will meet to discuss monitoring results and how they can be used to enhance the Plan. The CDM Plan is intended to be a living document. Anticipated improvements in knowledge and capacity will result in enhancement of the proposed actions.

Annual Reporting

An Annual Conservation and Demand Management Plan Update Report will be provided that details Lambton's activities and results relating to this 2014-2018 Energy Conservation and Demand Management (CDM) Plan. The Report will describe the CDM Plan related activities that have happened in the previous year and will focus on linking actions to results. In addition, the Report will take a forward view of the upcoming year to lay out the roadmap and identify any changes or adjustments that should be considered based on what the current market conditions are. The overarching goal of the report is to make the 5-Year CDM Plan living document that is reviewed and updated on yearly basis.

Future Energy Projects

Energy projects at The College were evaluated prior to the development of the CDM Plan. The College Staff Members have advocated for some ambitious energy initiatives that were investigated and determined to be not feasible for a variety of reasons. It is anticipated that as The College grows and energy management practices evolve, these actions will be reassessed.

Future Energy Reduction Projects Summary	
Year	Actions Planned
2014	Android app for green-energy technology Detailed energy audit and building condition assessment program
2015	T.B.D. dependent upon the measures identified and selected as a result of the energy audit
2016	T.B.D. dependent upon the measures identified and selected as a result of the energy audit
2017	T.B.D. dependent upon the measures identified and selected as a result of the energy audit
2018	T.B.D. dependent upon the measures identified and selected as a result of the energy audit

Renewable Energy

Feasibility and promotion of renewable energy technologies were examined throughout the development of the CDM Plan. These technologies have been incorporated into the CDM Plan where it made sense to do so, strategically or fiscally.

In Progress 2009 – 2014, the Lambton College RECSR project is aimed at the development of an integrated modular hybrid Renewable Energy Source (RES) system with the capability of optimizing captured energy at varying production levels and operating conditions.

Lambton College's Alternative Energy Engineering Laboratory incorporates an array of renewable energy resource training modules and simulation equipment for educational use and in the testing of small prototype systems. The lab features various mobile solar photovoltaic and solar thermal energy training systems and a purpose-built wind tunnel facility designed to simulate up to 20 m/s wind speeds for characterizing wind turbine performance. Several industry-manufactured small wind energy systems have been donated toward the enhancement of student learning and are available for use in standalone or combined renewable energy resource simulation. The Alternative Energy Engineering Laboratory also houses Lambton College's biomass processing and biofuel generation equipment, including a raw ingredient pelletization mill, high efficiency wood gasification reactors, and biodiesel and ethanol burning engines designed for biofuel performance characterization.

Purchasing Practices

Traditionally, purchasing practices in the public sector were designed to favour equipment or physical retrofits at the lowest cost in order to ensure the highest possible financial responsibility. As energy conservation best practices emerged, it was revealed that there is a major issue in doing this. Almost all wasteful energy consuming equipment is less expensive than their energy conserving counterparts. The practice in itself does not encourage energy efficiency, as most energy intensive alternatives such as standard efficiency motors are less costly than their higher efficiency counterparts. When dealing with energy intensive hardware, the initial capital cost is only a fraction (5%-10%) of the total lifecycle cost.

The practice of 'low bidder wins' purchasing limits the Staff when trying to make the right environmental decision. Making a specific amount of money available to include the conservation upgrades allows the College to take advantage of necessary investments in order to reduce their impact on the bottom line after the cost of purchase. For example, when purchasing a motor, all suppliers will specify standard efficiency motors. An energy smart buyer will know that 90%+ of the motor's lifecycle cost is in its energy use. Therefore, buying a premium efficiency motor at a small incremental cost has a payback of less than three years. Missing this opportunity translates into a long-term financial increase. In fact, the incremental cost between a less efficient and a more efficient alternative is often less than 5% of the capital cost. That 5% capital cost difference is often recuperated in less than three years. This allows Staff to make the right environmental decision based on industry best financial practices.

Energy Management and Information Systems

An Energy Management and Information System (EMIS) is an important element of a comprehensive Energy Management Program (EMP), as it helps to ensure that the full benefits of other energy conservation efforts are achieved and sustained. In fact, a quality EMIS can reduce energy use and cost by at least 5%. (Ref: Office of Energy Efficiency, National Resources Canada). Current industry and international standards, such as the International Performance Measurement & Verification Protocol (IPMVP), use an average of an 8%-10% reduction in energy consumption and costs. VIP Energy Services has documented a conservation average of 17% over customers served to date. However, in order to be as conservative as possible in its financial calculations, VIP generally uses NRCAN's conservative numbers (5%) to ensure objectivity in the investment matter. The savings from an EMIS result from the following measured impacts:

- Early detection of poor performance,
- Support for optimal decision making,
- Effective performance reporting,
- Auditing of historical performance,
- Identification and justification of energy projects,

- Evidence of implementation success,
- Support for energy budgeting and accounting, and
- Provision of energy data to other systems (such as Building Automation Systems, BAS).

When looking at performance reports, an EMIS facilitates ensuring that upgrades or changes actually meet forecasted savings, as well as the quantification of losses or gains. However, it is important to note that placing meters to isolate individual retrofit projects determined by their scope is generally cost ineffective and typically does not allow incorporation of out-of-scope project factors that directly affect equipment performance.

A one-time, comprehensive metering solution allows for a much more cost effective view, while enabling accountability to 90% of the planned projects budgeted to date. Reporting can be the most essential part of this plan as multiple portions of the organization rely on this data to make periodic decisions. The Finance Team can use this information to verify billing accuracy and other potential costs, such as construction back-charges. Energy Conservation Managers generally look at this data for building performance, future opportunity and functional trending. Project Managers rely on this information to ensure that vendors are supplying and meeting contractual obligations. Collecting the information in any EMIS program is really only the first step, as the data must then be used to instigate change and push action. This can only be done through analysis and warning systems built on baseline information. In order for an EMIS system to function properly, communication loops must also be established between departments in order for the maximum benefit to be realized.

Building Re-Commissioning

Building re-commissioning, or retro-commissioning, refers to the optimization of the current automation, controls and energy consuming systems. As buildings age, both the functionality of the equipment and the functions that they serve can undergo significant changes. A re-commissioning program generally focuses on ensuring that the equipment operations are modified to include any new or deleted duties. The following is a list of common problems found in re-commissioning projects that result in increased energy costs:

- Inefficient scheduling of HVAC equipment,
- Simultaneous heating and cooling,
- Economizer sequences not optimized,
- Incorrect airflow and water balance,
- Malfunctioning sensors or incorrect calibration,
- Fan VFD control overridden,
- Supply air static pressure set-points not optimized,

- Boiler controls not operating efficiently,
- Balancing dampers and valves not installed or installed in poor or unusable locations,
- Incorrectly piped water coils,
- Process or space classification changes (lab space to office, etc.),
- Incomplete or incorrect control component installation,
- Control sequence incorrectly implemented,
- Substituted control components,
- Incomplete installations (missing control valve, actuators, etc.), and
- Testing, adjusting, and balancing (TAB) not completed or only partially completed.

National Resources Canada (NRCAN) has published several guidelines for costing and expected returns from re-commissioning projects. Building re-commissioning is an increasingly important practice, not only from an energy standpoint, but also from a comfort and safety perspective as well. The more complex building controls and ventilation become, the more risk there is that one or more components will fail or deliver incorrect measurements.

Current practices in re-commissioning indicate that the cost to complete these initiatives is between \$2.90 and \$4.50/m². Expected savings from the projects are typically between \$1.00 and \$4.00/m², depending upon the starting efficiency of the building, thus creating very attractive paybacks in this area.

Energy and Resource Awareness (ERA) Programs

Independent studies done by organizations such as Natural Resources Canada (NRCAN) show that initiatives directed at Staff and facility users, in particular ERA Programs, can lead to significant savings on their own. In fact, NRCAN reports indicate that dedicated, consistent Energy Awareness Programs are proven to be the most effective way to reduce energy usage with no capital costs and minor operational expenses. A conservative estimate of savings for an effective ERA Program can be as high as 5% -7% of annual utilities spending.

An effective ERA Program is designed to assist organizations to attain energy savings by promoting a fundamental shift in the personal philosophies of Staff and facility users towards reducing their energy use. The Program utilizes community-based social marketing to develop influential communication materials and in-house displays that are carefully designed to inform and motivate employees to effectively decrease energy consumption. In many cases, an ERA Program has proven to be the most effective way to lower energy usage without any capital costs and minimal operational expenses. A typical ERA Program would include features such as:

- A detailed ERA Program written plan including a GANTT chart,

- The creation of a program email address for suggestions and concerns and access to ERA experts to answer questions,
- A customized identity and marketing program ,
- Training and support for an Energy Steward Team,
- ERA displays with various relevant conservation themes, and
- Annual Marketing Effectiveness Reports and Feedback system.

A continuous and consistent ERA Program is not only an effective way to lower energy use within a facility, but can also serve to be an effective marketing tool to spread the word that the College is a community leader in energy conservation and environmental sustainability.

APPENDIX A

Energy Data

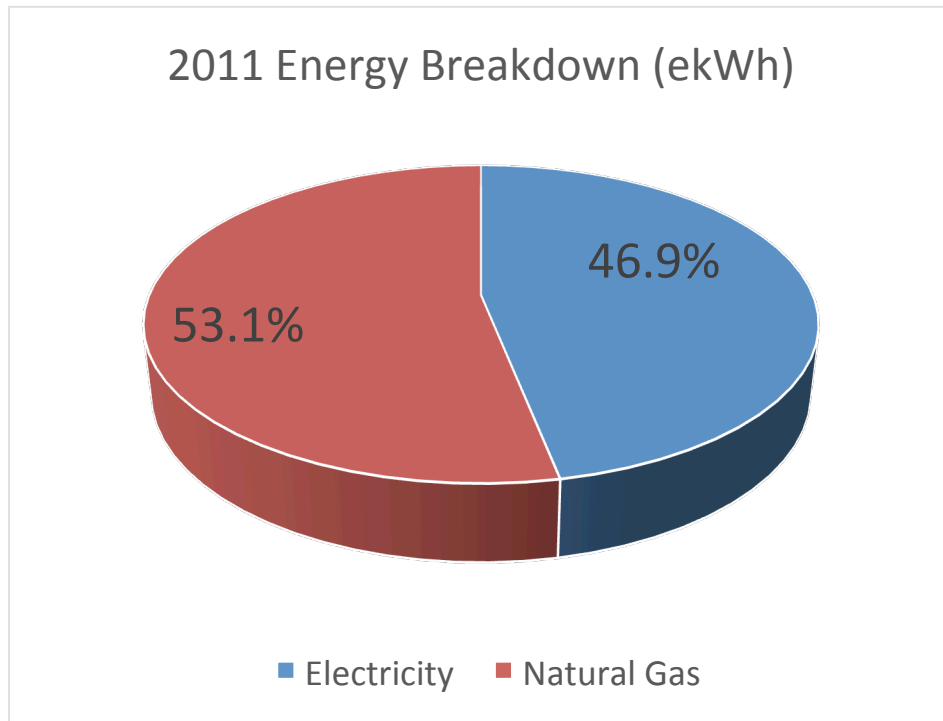
ENERGY CONSUMPTION

Lambton College – Energy Consumption				
Building Name	2011 Electricity (kWh)	201 Natural Gas (m³)	2012 Electricity (kWh)	201 Natural Gas (m³)
Employment Learning Centre	22,915	5,070	11,085	4,426
Fire & Public Safety Centre of Excellence	89,025	16,163	111,875	17,423
Lambton INN	303,136	23,229	288,209	21,918
North Building	402,428	97,461	393,540	80,121
Skilled Trades Training Centre	26,108	3,987	27,520	3,114
South Building	2,276,596	217,119	2,122,137	228,234
Suncor Sustainability Centre	1,571	1,358	8,839	3,389
Sustainable Smart Home	18,947		17,995	-
Fire & Public Safety Centre of Excellence	239,726	43,522	302,478	47,105
Lambton INN	300,449	23,023	285,655	21,724
North Building	145,516	35,242	142,303	28,971
Skilled Trades Training Centre	41,391	6,321	45,866	5,190
South Building	2,568,595	244,967	2,394,325	257,508
Sustainable Smart Home	4,701		4,465	-
Greenhouse	65,751	23,992	61,290	23,506
Hoophouse	48,995		45,671	-
Lambton INN	135,382	10,374	128,716	9,789
Skilled Trades Training Centre	100,821	15,397	110,079	12,456
South Building	1,163,118	110,927	1,084,205	116,605
Suncor Sustainability Centre	2,112	1,826	12,053	4,621
Sustainable Smart Home	8,583		8,152	-
Lambton INN	6,918	530	6,578	500
North Building	12,216	2,958	11,946	2,432
South Building	290,898	27,743	271,162	29,163
Suncor Sustainability Centre	3,366	2,909	19,285	7,393
South Building	230,119	21,946	214,506	23,070
Lambton INN	949,912	72,789	903,137	68,682
TOTAL	9,459,296	1,008,853	9,033,072	1,017,341

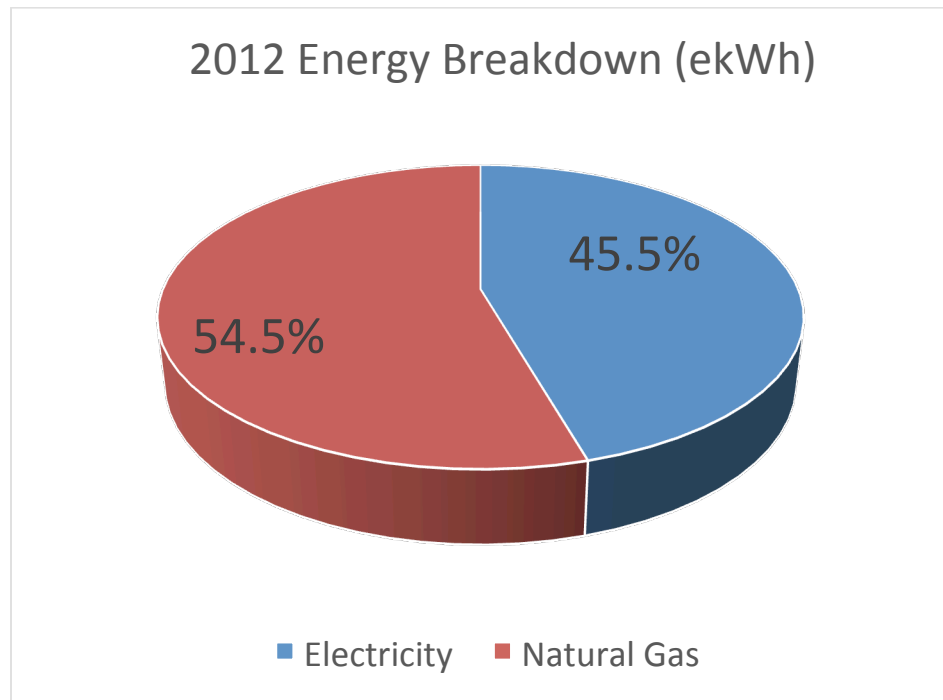
APPENDIX B

Energy Use Breakdown

ENERGY USE BREAKDOWN



This chart breaks down the energy use (53.1% electricity and 46.9% gas) for the College for 2011.



This chart breaks down the energy use (54.5% electricity and 45.5% gas) for the College for 2012.