Greater Essex County District School Board

Energy Conservation and Demand Management Plan

June 2014

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Greater Essex County District School Board

Energy Conservation and Demand Management Plan

1. Introduction

The Greater Essex County District School Board (GECDSB) demonstrates its continued commitment to energy conservation with the creation and adoption of a 5-Year Energy Conservation Demand Management Plan (ECDMP), covering the 2014 to 2018 fiscal years. This ECDMP also fulfills the reporting requirements of the Green Energy Act O. Reg. 397/11. The Board has aggressively pursued energy conservation opportunities since the early 1990's.

The GECDSB is committed to this plan, and will take the necessary steps to ensure success through annual reviews and regular updates as required.

2. The Green Energy Act

The Province of Ontario adopted the Green Energy Act (GEA) as "a mechanism to expand renewable energy generation, encourage energy conservation and promote the creation of clean energy jobs" (Ministry of Energy, 2012). A new regulation under the GEA will require public agencies, including school boards, to:

a. Report annually on energy use and GHG emissions beginning July 1, 2013 and ensure this information is available to the public; and,
b. Develop a five-year energy conservation and demand management plan (ECDMP) starting July 1, 2014, and ensure the plan is available to the public. The five-year plan is required to be reviewed and updated every five years.

As this plan is released, the GECDSB has completed its 2013 baseline energy consumption reporting and associated greenhouse gas (GHG) emissions, as well as the 2014 annual reporting requirements. This plan complies with the requirements of the Ministry of Energy's mandate for an ECDMP.

3. Education Sector Background

a. Funding and Energy Management Planning

All school boards receive 100% of their funding from the Ministry of Education. The Ministry announces each Board's funding allocation in March for the next Fiscal Year which runs from September 1st to August 31st. The Ministry does not provide School Boards with multi-year funding allocations.

As a result, while a Board may have a five-year energy management strategy, the Board's ability to implement their strategy is dependent on the funding that they receive in each of the five years covered by their energy management plan.

b. Asset Portfolios and Energy Management Planning

Energy consumption at a site can be impacted by a number of variables. The following list provides education sector examples of variables that may impact consumption at a site from one year to the next. These examples will play a significant role in the Board's assessment of energy management priorities.

i. Facility Variables

- Year of Construction
- Building Area
    a. Major additions
    b. Sites sold
- Portables
    a. installed
    b. removed
- Shared Use Sites (e.g. one building, two boards share common areas and/or partnered with a municipality)
- Swimming pools
- Libraries
- Lighted sports fields
- Equipment/Systems
    a. Type of technology
    b. Lifecycle
    c. % air conditioned building area

ii. Other Variables

- Programs
    a. Day care
    b. Before/After School Programs
    c. Summer School
    d. Community Use
- Occupancy
    a. Significant Increase or decrease in number of students
    b. New programs being added to or removed from a site

4. Greater Essex County District School Board Background

The Greater Essex County District School Board was formed on September of 1998 with the amalgamation of the Windsor and the Essex County Boards of Education. The board spans nine municipalities: Windsor, LaSalle, Amherstburg, Tecumseh, Lakeshore, Essex, Kingsville, Leamington and Pelee Island. In the 2013-14 Fiscal Year, the Board was comprised of 89 sites, with 505,000 m^2 of infrastructure supporting 35,222 students.

The Board's infrastructure construction dates from the early 1900's to present day, with wide variety of architectural designs and construction techniques. The geographical size of the Board, varying ages of buildings, and the multi-use of some facilities present a challenge to the Board in managing its energy use.

The Board has participated in four (4) energy conservation initiatives since the early 1990's which have generated significant energy savings through the implementation of the following types of measures:

- the conversion of lighting to energy efficient T8 lighting with some T5 lighting replacement in gyms
- implementation of building automation controls for all major pieces of HVAC equipment
- Energy efficient HVAC installation and retrofits such as boilers and air handling units.
- New windows and window covering replacements

The Board was fortunate to have constructed Canada's first LEED Platinum certified school, Dr. David Suzuki Public School. This school continues to aggressively surpass all energy performance criteria of other schools in the GECDSB and also in the province. The school contains 36kW solar system, two wind turbines, displacement ventilation, daylight and storm water harvesting systems and geothermal heating and cooling. This school was constructed as a demonstration site to encourage other public and private sector bodies to adopt some or all of the energy conservation measures installed at Dr. David Suzuki Public School. Construction and energy performance data is published on the www.suzukipublicschool.ca website.

The Board continues to adopt construction standards which ensure energy efficiency in new schools, additions and renovations. New changes in the Ontario Building Code now support the implementation of energy efficiency measures in all new construction, including energy monitoring, low flow plumbing fixtures, high efficiency lighting and energy efficient mechanical and electrical systems and electrical metering of all main systems in the building.

The Board also supports a system-wide environmental stewardship program through the implementation and continued support of the "Ontario EcoSchools" program which is aligned with the Board's Environmental Education and Stewardship Administrative Procedure. All schools participate in the program with a significant number of schools reaching certification annually. The Board supports this program through one day of training for all "EcoTeams" and incentive programs for energy savings.

5. Energy Consumption Data for the Board

Presently, four Local Distribution Companies (LDCs) provide electricity to the board's sites. They are Enwin Utilities, Essex Energy, ELK and Hydro One. The Board relies mainly on natural gas, provided by Union Gas, for heating and domestic hot water heating, with the exception of one school located on Pelee Island. As natural gas services are not available on the island, the school must use oil for heating.

In order to assist school boards with the daunting task of measuring and tracking board-wide energy consumption and impact of energy efficiency initiatives, the Ontario Ministry of Education has contracted the services of a third party provider to compile utility data and provide the information in a Utility Consumption Database (UCD). The UCD also provides the ability for a sector wide peer comparison and facilitates the Energy Act reporting requirements.

As obtained from the UCD, the values below are "metered" energy data for the Board for the last two fiscal years. The Ministries of Education and Energy have determined that the 2011-12 Fiscal Year will the first reporting year for compliance with Phase 1 of the Green Energy Act.

Utility	Fiscal Year 2011 – 12 (1st Reporting Year)	Fiscal Year 2012 – 13 (Current)
Total Electricity (kWh)	29,362,531	27,003,629
Total Natural Gas (m3)	5,838,721	6,883,729
Total Heating Fuel (L)	3,012	4,372

The following chart illustrates the Board's electricity and natural gas consumption over the last three fiscal years.

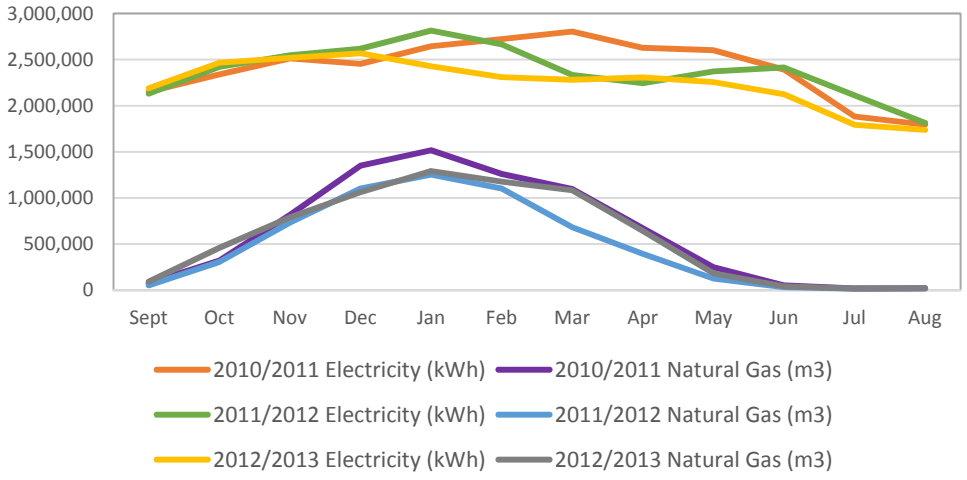

Figure 1. 3 Year Energy Consumption Trends for GECDSB

**Note: The above charts are actual consumption with no normalization of gas usage for variations in weather.

The energy intensity of a building is a measure of its energy efficiency and it is determined by calculating the building's energy use per unit area. Before determining the intensity, units of natural gas in cubic meters and heating oil in litres, must be converted to the equivalent amount of kWh consumed, also known as ekWh. The table below lists the combined electricity, natural gas and fuel oil consumption and average energy intensity of all of the Board's facilities for the last two reporting periods.

	Fiscal Year 2011 – 12 (1st Reporting Year)	Fiscal Year 2012 – 13 (Current)
Total Energy Consumed (ekWh)	90,992,038	99,713,189
Energy Intensity (ekWh/m2)	174	191

Although there has been a trend of an overall reduction in electricity consumption in the past three years, this reduction is not reflected in the overall energy intensity year to year comparison.

The reasons for the increase in energy intensity from FY2012 to FY2013 is due to the increase in consumption of natural gas for heating. The amount of energy needed to heat a building in any period of time is directly proportional to the number of heating degree days (HDD) during that period. In 2011/2012 there were 2747.4 HDD, while in 2012/2013 there were 3323.5 HDD, which translates to a 21% increase in HDD. The actual increase in gas consumption was only 18%.

Any increase in natural gas consumption will have a significant impact on the overall energy intensity, since one cubic meter of gas is equal to 10.6 ekWh.

In order to better manage energy consumption, it is also critical to gain an understanding of how the energy is being used in a facility. The following chart outlines a typical breakdown of energy consumption at a GECDSB school. This has assisted the Board in prioritizing energy conservation strategies.

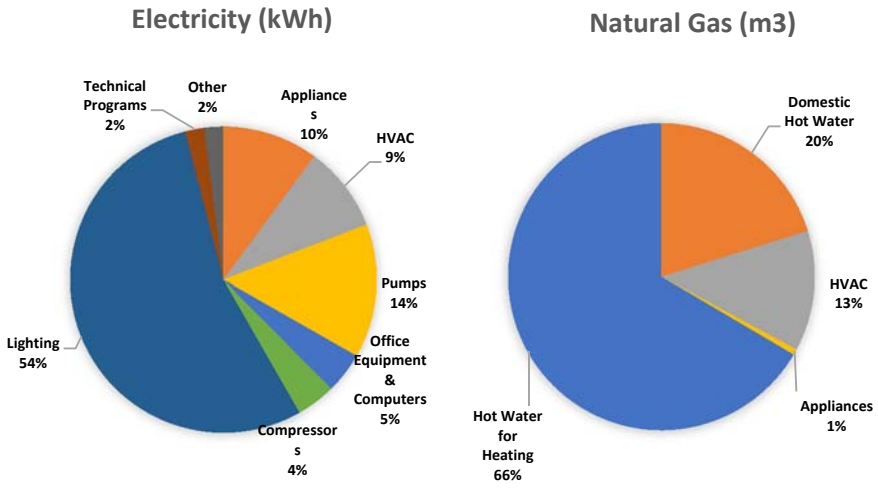

Figure 2. Typical School Energy Consumption Breakdown

6. Energy Procurement

As utility costs will continue to rise in the coming years, the Board, in an effort to optimize its energy expenditures, continues to participate in consortia arrangements for the purchase of both electricity and natural gas. The Board measures performance against budget and defines savings achieved through this process.

The challenges facing all school boards in Ontario is the continued unpredictability of electricity prices and the impact of weather on natural gas prices. The 2013/2014 school year saw Ontario School Boards dealing with major changes in the Global Adjustment Factor (GAF) which doubled, if not tripled, the cost of electricity. As the GAF is adjusted based on electricity prices, the Board would experience higher overall electricity pricing should an attempt be made to mitigate the pricing fluctuations by entering into fixed pricing contracts. This would exacerbate the impact of the GAF. Also, during this same period, Ontario experienced the coldest winter in several decades, as a result of the "Polar Vortex" phenomenon, and all Boards were exposed to the subsequent escalation of natural gas prices from previous record lows.

7. Renewable Energy

The GECDSB takes great pride in its renewable energy systems which consists of both solar photovoltaic (PV) systems and wind turbines. Presently, the Board maintains three rooftop or building mounted solar PV systems, located at Tecumseh Vista Academy (100 kW), Dr. David Suzuki Public School (38 kW) and Sandwich Secondary School (10 kW). Power generation for all three solar PV systems are under contract through the Ontario Power Authority's Feed-In-Tariff (FIT) and MicroFit programs, for which the Board receives compensation.

The Board's two wind turbines are located at Dr. David Suzuki Public School. They consist of one 5kW vertical axis and one 2.4 kW horizontal axis turbines. Both wind turbines offset the schools' electricity consumption.

The Board continues to pursue renewable energy opportunities through the FIT program with a 3rd party partner who, if successful, will install and maintain solar panel systems on a number of schools for which the Board will receive a licensing fee. This is currently at the application and approval stage. Implementation of this strategy is expected to occur in the 2014/2015 school year.

For a listing of the electricity produced by the Board's current renewable energy sites, please see Appendix A.

8. The Board's Energy Management Strategy

The Board's energy management goal is to reduce energy consumption and, in turn, mitigate greenhouse gas emissions, through the implementation of various energy management strategies.

The Board implements energy saving strategies by allocating a portion of the annual capital renewal grant to energy saving opportunities including:

- Lighting retrofits including conversion of exterior lights to LED
- Expansion of building automation systems BAS in existing schools
- HVAC replacement with high efficiency equipment
- Boiler upgrades with condensing or near-condensing boilers
- Heating conversions from steam to more efficient hot water systems
- Installation of occupancy sensors in under-utilized areas
- Building Envelope upgrades (roofing etc)

Other energy savings activities which the Board continues to use and support:

- Operational efficiencies through the monitoring of utilities and feedback from building automation systems
- Energy efficient designs for all new schools, additions and renovations
- 3rd party energy audits of all schools
- Staff energy conservation training
- Participation in the Ontario EcoSchools program

The Board also supports a full-time Energy & Environmental Officer responsible for the development and maintenance of the Board's Energy Management Plan. This includes the measurement and analysis of utility consumption, the management of all utility budgets, identification of energy saving opportunities, development of business cases for the implementation of these opportunities, application for energy grants/rebates, development of energy conservation training programs for various staff groups, and participation as an integral part of the Board's EcoSchools program.

Energy initiatives are managed through the Board's Facility Services Department. One of the focuses of the Facility Services Department, is to ensure energy efficiency is considered in all its departments including Operations, Maintenance and Renewal. Energy savings opportunities are discussed during departmental energy meetings held quarterly.

Energy management strategies, as outlined in this five year plan, fall into four key categories:

- Design/construction/retrofit
- Operations and maintenance
- Occupant Behaviour
- Policy and Planning

These strategies are explained in more detail below.

a. Design/Construction/Retrofit

Design/construction/retrofit encompasses the original and ongoing intent of how a building and its systems are to perform as a whole through the integration of disciplines such as architecture and engineering. This category highlights infrastructure standards and changes that can result in higher energy efficiencies. The various strategies used by GECDSB are as follows.

i. Energy Audits

During the first year of the Ministry's Energy Efficiency Funding (2009), the Board conducted independent 3rd party energy audits of all its facilities. These audits not only provided an inventory of equipment but also identified energy opportunities in each building. The 3rd party consultant was also able to consolidate like projects for implementation.

Facility Services has relied on these reports and the energy savings opportunities identified to prioritize energy efficiency work that was funded by the Ministry of Education Energy Efficiency Funding received in 2010, 2011 and 2012. Projects completed included boiler upgrades, steam trap retrofits, lighting retrofits, building envelope and controls upgrades and water conservation measures.

These Energy Audit Reports continue to provide prioritized energy efficiency initiatives that can be implemented as additional funding becomes available.

The Ministry of Education is currently entering its final year of its Condition Assessment Initiative which will provide detailed infrastructure assessments of all schools in the Province of Ontario. These assessments identify renewal needs in each school with an assigned priority. These renewal needs are captured in the Total Capital Planning Solution (TCPS) software system which has the ability to extract identified energy saving renewal opportunities in a report format. This will be another valuable tool available to the Board to identify renewal needs which will also impact energy consumption.

ii. Lighting

Significant improvements have been made in the area of lighting technology in recent years, and the technologies are rapidly evolving. Energy savings can be achieved by replacing older incandescent, metal halide and high pressure sodium lamps with T5 fluorescent, compact fluorescent (CFL), and LED (light-emitting diode) lamps. Savings, which are dependant on the lamp type, wattage and ballast used, can range from 30-70%.

Lighting occupancy and daylight harvesting sensors can be used to turn lights off during periods of inactivity or when there is enough sunlight to light the space. Typical energy savings from installing these systems are approximately 40%.

iii. Heating, Cooling and Ventilation Systems (HVAC)

HVAC systems control the indoor air temperature, humidity and air quality for people and equipment in our facilities. Their primary function is to provide a comfortable and safe learning and working environment. They also account for a large portion of a building's energy use.

Due to varying age of school buildings, various types of HVAC systems can be found across the GECDSB. Window air conditioning units, split systems and rooftop units are used for cooling. The Board's heating systems include steam or hot water radiation provided by natural gas fired boilers, rooftop or internal HVAC units with ducted distribution and electrical heating. Air handling units provide air circulation throughout the building.

HVAC system improvement may include:

- Replacement of old HVAC units and chillers with more efficient models, with consideration to right sizing existing systems heating and/or cooling requirements
- Replace or install constant volume systems with variable air volume systems (VAV) that produce fan energy consumption savings
- Heat recovery considerations for all new HVAC units
- Whole school air balancing of existing and new systems

Standard boilers operate at an efficiency of approximately 80%. Newer condensing boilers can operate at efficiencies of up to 95%, and typical energy savings when upgrading to a condensing boiler are approximately 10%.

In HVAC and boiler systems, variable frequency drives (VFDs) can be installed on the motors to match the fan output to the required airflow. Energy savings vary depending on the specific system characteristics, but in certain cases can be 50% or higher.

Testing, Adjusting, and Balancing (TAB), also known as air balancing, reviews the current operation of dampers and valves, and adjusts their operation in order to reduce system pressure. This method restores confidence and performance to the current system, and, by reducing the system pressure, achieves energy savings through a corresponding reduction in fan power. Another added benefit is the reduction of air leakage into a building which reduces the heating or cooling load for the system.

iv. Building Automation System (BAS) Implementation

A BAS system offers one of the best returns on investment. Energy savings are achieved by the greater level of control available through the BAS, allowing building managers to optimize the operation of the various building systems. Additional benefits include improved indoor comfort and reduced response time for service calls. Typical energy savings achieved through the implementation of a BAS are 5-15%.

Opportunities for BAS improvements, include efficient equipment scheduling to reflect building occupancy, setpoint standardization and re-commissioning of existing systems to ensure operational efficiencies.

v. Building Envelope Upgrades

The addition of new insulation to the roof increases the "R-Value" associated with the building envelope, thereby reducing the amount of energy lost to the environment. By implementing this measure, studies have shown that heating loads may be reduced by 37% and cooling loads by 10%. For existing buildings, this is generally a high cost measure since the walls and roof essentially need to be rebuilt. The most effective strategy is to coordinate an increase in insulation with a roof or wall replacement.

Other building envelope opportunities include caulking of windows and doors to prevent infiltration and the upgrade of external doors to ensure appropriate weather seals. Another higher cost initiative is the replacement of original single sash windows with more energy efficient units.

vi. Energy Efficient Incentives

The Board applies to various incentive programs to support the implementation of energy efficient projects on a regular basis.

Between Fiscal Year 2009-10 and 2012-13, the Board has received approximately $203,000 in incentive funding from various agencies to support the implementation of energy efficient projects.

The Board also consults with the sector's Incentive Program Advisor.

vii. Energy Services Contracting (ESCO)

The Board is developing an RFP for a firm who will provide energy services for a fifth energy retrofit program. The decreasing cost and increased efficiency of LED lighting provides for further energy efficiencies in all board buildings. The ESCO will provide for an energy

assessment of each building which will identify energy opportunities. This initiative will be funded through proven energy savings.

For a list of the Board's relevant new construction and retrofit projects over the next five years, please refer to Appendix B.

b. Operations and Maintenance

Various operations and maintenance strategies are used by the Board to ensure that the existing buildings and equipment perform at peak efficiency. These include:

i. Day and Night Temperature and Equipment Scheduling

Typically, building temperature settings and equipment schedules revolve around comfort and building occupancy. In the early 1990's, during the Board's first energy retrofit program, the Board standardized and upgraded each school's building automation system (BAS) which controlled key pieces of equipment including HVAC and boilers. These controls allowed the Board to set temperature set points along with schedules for occupancy. The schedule and temperatures for both heating and cooling seasons was standardized and implemented across the Board's infrastructure. This has produced significant energy savings by shutting down equipment and lowering temperatures when buildings are un-occupied.

ii. Night-time Site Blackout

Previously, outside lighting at Board facilities in the City of Windsor that are controlled by the BAS, followed a sunrise/sunset array. Operation was based on the calculated sunrise and sunset times, depending on the day of the year. However, recent scheduling changes ensures that these outside lights are now turned off from 2 a.m. – 5 a.m., in an effort to save electricity. This practice has proven very successful in reducing nighttime electricity demand for several school boards across the province.

Rural schools continue the established practice of scheduling outside lights off at midnight until 6 am in the morning.

iii. Monitoring of Utility Consumption and Demand

Presently, the Board does not have access to current, real-time energy consumption data in most of its school buildings. This poses a challenge in measuring the performance of energy efficiency projects implemented and initiatives taken by schools or Facility Services Department to reduce energy use. However, a handful of schools presently have interval meters and local LDCs have provided dashboard access to the "Near Real-Time" electricity data, i.e. provided 24hrs after collection.

The Board anticipates access to daily electricity consumption data through the LDC websites with the implementation of Time of Use metering at the remainder of the schools.

Presently, only monthly consumption of natural gas is available through Union Gas.

The Board monitors electrical demand on a quarterly basis, by reviewing the following:

- Invoices
- Real-time data
- Online data from the Local Distribution Company (LDC)

By reviewing this information, anomalies in consumption and demand can be detected and corrected, sometimes through changes in equipment scheduling, which typically results in a decrease in electricity demand.

Some of the LDCs provide the power factor on each bill. Where available, the Board monitors the Power Factor on a quarterly basis.

Refer to Appendix C for a summary list the Board's relevant operations and maintenance projects for the next five years.

c. Occupant Behaviour

i. Ontario EcoSchools

The Board has recognized that 1/3 of all energy savings realized in a building can be achieved by modifying specific occupant behaviours to reduce energy consumption. With this in mind, the Board adopted the Ontario EcoSchools program and provides energy related training for its school staff, students and other Board employees.

Ontario EcoSchools is an environmental education and certification program for grades K-12 that helps school communities develop both ecological literacy and environmental practices to become environmentally responsible citizens and reduce the environmental footprint of schools. Energy Conservation is one of the key areas of focus for the program.

The Ontario EcoSchools "5 Step Process" guides school communities towards the successful implementation of the program. The steps include the establishment of an "EcoTeam" comprised of teachers, students, administrators and custodians. The EcoTeam completes energy audits, develops and implements action plans based on those audits and then measures their successes. The program also provides for curriculum to support the environmental stewardship initiative in the classroom. Schools may use the program free of charge and are encouraged to implement the program at their own pace.

In 2013-14, all 75 schools operating within the Board participated in the Ontario EcoSchools program.

Schools may also voluntarily chose to apply for annual EcoSchools certification which assesses their program and recognizes accomplishments by awarding points in six key areas. More information about the Ontario EcoSchools Program can be found at **ontarioecoschools.org**

The Board developed and continues to support an "Energy Conservation Challenge" within the Board's EcoSchools program. The basis of the challenge is to encourage school occupants to change their behaviour and implement energy conservation strategies to reduce as much of their school's utility consumption as possible. As a reward for their efforts, each school will receive 25% of the utility savings realized within the six month challenge period. Strategies adopted have included shutting lights and equipment off when not in use, taking advantage of natural light in classrooms, removing old and unused small appliances, using window treatments to optimize indoor building temperature and most importantly, having a good communication strategy. The program has been quite successful, resulting in savings of 409,000 kWh of electricity and 34,158 m^3 natural gas since its inception.

ii. Training and Education

Successful energy management programs depend on employee and student support. Energy conservation awareness training increases the occupants' knowledge about energy use motivating them to integrate effective actions and measures to reduce energy waste in their day-to-day activities. As a result, school staff will play an important and ongoing role in ensuring that the Board's facilities are energy efficient and to sustain the growth of an energy conscious culture. In recognition of this "knowledge is power" effect, the Board has provided awareness training to its custodians and plans to further expand the scope of training to other staff.

The Board provides for annual EcoSchools Training for all school EcoTeams, which is a full day conference that brings together principals, teachers, students and custodians from across the School Board, as well as community partners. The conference includes interesting guest speakers and workshops that enrich the Ontario EcoSchools program experience.

For a listing of costs and energy savings associated with participation in the EcoSchools programs and staff training, please refer to Appendix D.

d. Policy and Planning

i. Energy Management Policy

The GECDSB strives to set Policies and Administrative Procedures which guides the activities of the Board. It is the Board's intention to support this plan with a policy which demonstrates the Board's commitment to energy conservation and management.

ii. Energy Savings through School Closures

The GECDSB faces the same challenges as other Board in the Province in terms of declining enrolment. The Board's Superintendent of Accommodations assists in developing the Board's strategies to "right-size" our facilities. The process for school closures follows the Board's Program Accommodation Review Process (PARC) and involves members of each school involved along with community members. The PARC reviews and assesses the current school community in terms of age of infrastructure, current utilization, programs offered, future enrolment and value to the community. Based on these factors, the Board of Trustees decide on recommendations provided by both the PARC and the Director.

The Board has closed a significant number of schools in the past five years and recognizes that there continues to be a need to ensure efficiencies on how space is utilized and programs delivered.

For detailed information on the Board's future goals in terms of accommodations, refer to the Annual Board's Accommodation Report found on the public website.

Facility Services also has developed a standard operating procedure which ensures closed buildings are operated in an energy efficient manner.

9. Energy Conservation Goal

The Board has set the following conservation goals for the next five fiscal years. These goals consider past energy consumption and the energy management strategies discussed in this plan.

	Annual Conservation Goal				
Fiscal Year	**2013-14**	**2014-15**	**2015-16**	**2016-17**	**2017-18**
% reduction in ekWh consumed	2	2	2	2	2
Or... equivalent reduction in ekWh	1,994,000	1,994,000	1,994,000	1,994,000	1,994,000
Or...equivalent reduction in ekWh/m2	3.87	3.87	3.87	3.87	3.87

10. Next Steps

This energy management plan provides a framework for energy management activities taking place at GECDSB. The plan will be reviewed and updated annually.

11. Senior Management Approval

I confirm that the Greater Essex County District School Board senior management has reviewed and approved this Energy Conservation and Demand Management Plan.

Erin Kelly
Director of Education

Date June 24/14

Appendix A - Renewable Energy Projects

Renewable Energy	Number of systems in asset portfolio	Total size (kW)	Expected total number of ekWh generated annually	Actual Generation (ekWh)
Solar photovoltaic*	3	148	171,015	183,084
Wind Turbine	2	7.4	14,400	Not known

* Information obtained from April 15, 2014 quarterly performance report, data collected between April 2013 & March 2014

Design, Construction and Retrofit Strategies

New School Design & Construction	Quantity of Time that Measure will be in place (years)	2013-14		2014-15		2015-16		2016-17		2017-18		2013/14-2017/18
		Estimated Cost of Implementation	Estimated Annual Energy Savings from all projects (ekWh)	Estimated Cost of Implementation	Estimated Annual Energy Savings from all projects (ekWh)	Estimated Cost of Implementation	Estimated Annual Energy Savings from all projects (ekWh)	Estimated Cost of Implementation	Estimated Annual Energy Savings from all projects (ekWh)	Estimated Cost of Implementation	Estimated Annual Energy Savings from all projects (ekWh)	Estimated Total Accumulated Energy Savings (ekWh)
Energy efficiency considerations in new school design, construction and equipment installation	30	$ -		$ 840,000	2,054,558	$ 1,471,310	3,678,472	$ 579,607	1,449,017	$ -		22,151,681

Lighting Retrofit	Quantity of Time that Measure will be in place (years)	2013-14		2014-15		2015-16		2016-17		2017-18		2013/14-2017/18
		Estimated Cost of Implementation	Estimated Annual Energy Savings from all projects (ekWh)	Estimated Cost of Implementation	Estimated Annual Energy Savings from all projects (ekWh)	Estimated Cost of Implementation	Estimated Annual Energy Savings from all projects (ekWh)	Estimated Cost of Implementation	Estimated Annual Energy Savings from all projects (ekWh)	Estimated Cost of Implementation	Estimated Annual Energy Savings from all projects (ekWh)	Estimated Total Accumulated Energy Savings (ekWh)
Lighting strategies to include but not limited to the installation of high efficiency lighting, occupancy sensors, outdoor lighting replacement with LED fixtures, daylight sensors, daylight harvesting	15	$ 250,000	246,914	$ 250,000	246,914	$ 250,000	246,914	$ 250,000	246,914	$ 250,000	246,914	3,703,704

HVAC Retrofit	Quantity of Time that Measure will be in place	2013-14		2014-15		2015-16		2016-17		2017-18		2013/14-2017/18
		Estimated Cost of Implementation	Estimated Annual Energy Savings from all projects (ekWh)	Estimated Cost of Implementation	Estimated Annual Energy Savings from all projects (ekWh)	Estimated Cost of Implementation	Estimated Annual Energy Savings from all projects (ekWh)	Estimated Cost of Implementation	Estimated Annual Energy Savings from all projects (ekWh)	Estimated Cost of Implementation	Estimated Annual Energy Savings from all projects (ekWh)	Estimated Total Accumulated Energy Savings (ekWh)
High Efficiency Boilers (condensing)	15	$ 250,000	649,287	$ -	-	$ 250,000	649,287	$ -	-	$ 250,000	649,287	5,843,587
Energy efficient HVAC systems	30	$ 250,000	39,582	$ 250,000	39,582	$ 250,000	39,582	$ 250,000	39,582	$ 250,000	39,582	593,736
High Efficiency Domestic Hot Water	15											

Controls	Quantity of Time that Measure will be in place	2013-14		2014-15		2015-16		2016-17		2017-18		2013/14-2017/18
		Estimated Cost of Implementation	Estimated Annual Energy Savings from all projects (ekWh)	Estimated Cost of Implementation	Estimated Annual Energy Savings from all projects (ekWh)	Estimated Cost of Implementation	Estimated Annual Energy Savings from all projects (ekWh)	Estimated Cost of Implementation	Estimated Annual Energy Savings from all projects (ekWh)	Estimated Cost of Implementation	Estimated Annual Energy Savings from all projects (ekWh)	Estimated Total Accumulated Energy Savings (ekWh)
Building Automation Systems - New	10	$ 200,000	158,330	$ 200,000	158,330	$ 200,000	158,330	$ 200,000	158,330	$ 200,000	158,330	2,374,944
Building Automation Systems - Upgrade	10	$ 50,000	39,582	$ 50,000	39,582	$ 50,000	39,582	$ 50,000	39,582	$ 50,000	39,582	593,736

Building Envelope	Quantity of Time that Measure will be in place	2013-14		2014-15		2015-16		2016-17		2017-18		2013/14-2017/18
		Estimated Cost of Implementation	Estimated Annual Energy Savings from all projects (ekWh)	Estimated Cost of Implementation	Estimated Annual Energy Savings from all projects (ekWh)	Estimated Cost of Implementation	Estimated Annual Energy Savings from all projects (ekWh)	Estimated Cost of Implementation	Estimated Annual Energy Savings from all projects (ekWh)	Estimated Cost of Implementation	Estimated Annual Energy Savings from all projects (ekWh)	Estimated Total Accumulated Energy Savings (ekWh)
Glazing	30	$ -	-	$ -	-	$ -	-	$ -	-	$ -	-	-
Increased Wall Insulation	50	$ -	-	$ -	-	$ -	-	$ -	-	$ -	-	-
New Roof	25	$ 2,000,000	186,081	$ 1,295,000	120,488	$ 995,000	92,575	$ 1,060,000	98,623	$ 1,040,000	96,762	1,984,090
New Windows	30	$ -	-	$ -	-	$ -	-	$ -	-	$ -	-	-
Treatments	10	$ -	-	$ -	-	$ -	-	$ -	-	$ -	-	-
Other (Describe)		$ -	-	$ -	-	$ -	-	$ -	-	$ -	-	-

Design, Construction and Retrofit Strategies Total	$ 3,000,000	1,319,777	$ 2,885,000	2,659,453	$ 3,466,310	4,904,743	$ 2,389,607	2,032,048	$ 2,040,000	1,230,458	37,245,478

APPENDIX C - Operation and Maintenance Strategies

Operations and Maintenance Strategies																					
Policy and Planning	**Quantity of Time that Measure will be in place (years)**	**2013-14**		**2014-15**		**2015-16**		**2016-17**		**2017-18**		**2013/14-2017/18**		**Energy Payback Period**	**% related to Electricity**	**% related to Natural Gas**
		Estimated Cost of Implementation	**Estimated Annual Energy Savings from all projects (ekWh)**	**Estimated Cost of Implementation**	**Estimated Annual Energy Savings from all projects (ekWh)**	**Estimated Cost of Implementation**	**Estimated Annual Energy Savings from all projects (ekWh)**	**Estimated Cost of Implementation**	**Estimated Annual Energy Savings from all projects (ekWh)**	**Estimated Cost of Implementation**	**Estimated Annual Energy Savings from all projects (ekWh)**	**Estimated Total Accumulated Energy Savings (ekWh)**				
School closure strategies	Until Sold	$ 2,000	261,243	$ 2,000	1,901,564	$ 2,000	578,918	$ 2,000	1,590,442	$ 2,000	830,451	14,660,561				
Day and Night Temperature Guidelines for all Schools (In Place)	10		370,000		370,000		370,000		370,000		370,000	5,550,000		5	20	80
Nighttime exterior lighting blackout	10	$ 200	74,000		74,000		74,000	$ -	74,000		74,000	1,110,000		7	100	0
Energy Audits	**Quantity of Time that Measure will be in place**	**2013-14**		**2014-15**		**2015-16**		**2016-17**		**2017-18**		**2013/14-2017/18**		**Energy Payback Period**	**% related to Electricity**	**% related to Natural Gas**
		Estimated Cost of Implementation	**Estimated Annual Energy Savings from all projects (ekWh)**	**Estimated Cost of Implementation**	**Estimated Annual Energy Savings from all projects (ekWh)**	**Estimated Cost of Implementation**	**Estimated Annual Energy Savings from all projects (ekWh)**	**Estimated Cost of Implementation**	**Estimated Annual Energy Savings from all projects (ekWh)**	**Estimated Cost of Implementation**	**Estimated Annual Energy Savings from all projects (ekWh)**	**Estimated Total Accumulated Energy Savings (ekWh)**				
Walk Through Audit	**5**	$ 2,000	185,000	$ 2,000	185,000	$ 2,000	185,000	$ 2,000	185,000	$ 2,000	185,000	2,775,000		1000	50	50
Energy Monitoring	**Quantity of Time that Measure will be in place**	**2013-14**		**2014-15**		**2015-16**		**2016-17**		**2017-18**		**2013/14-2017/18**		**Energy Payback Period**	**% related to Electricity**	**% related to Natural Gas**
		Estimated Cost of Implementation	**Estimated Annual Energy Savings from all projects (ekWh)**	**Estimated Cost of Implementation**	**Estimated Annual Energy Savings from all projects (ekWh)**	**Estimated Cost of Implementation**	**Estimated Annual Energy Savings from all projects (ekWh)**	**Estimated Cost of Implementation**	**Estimated Annual Energy Savings from all projects (ekWh)**	**Estimated Cost of Implementation**	**Estimated Annual Energy Savings from all projects (ekWh)**	**Estimated Total Accumulated Energy Savings (ekWh)**				
Review near real-time energy data to identify and diagnose building issues	1	$ 1,500	10,000	$ 1,500	10,000	$ 1,500	10,000	$ 1,500	10,000	$ 1,500	10,000	150,000		3	80	20
Operations and Maintenance Strategies Total		**$ 5,700**	**900,243**	**$ 5,500**	**2,540,564**	**$ 5,500**	**1,217,918**	**$ 5,500**	**2,229,442**	**$ 5,500**	**1,469,451**	**24,245,561**				

$0.135	**= cost of 1 ekWh electricity**
$ 0.0334	**= cost of 1 ekWh natural gas**
0.0955	**m^3 = 1 ekWh**
$0.35	**= cost of 1 m^3 of natural gas**

APPENDIX D - Occupant Behaviour Strategies

Occupant Behaviour Strategies

Training and Education	Quantity of Time that Measure will be in place (years)	2013-14		2014-15		2015-16		2016-17		2017-18		2013/14-2017/18	Energy Payback Period	% related to Electricity	% related to Natural Gas
		Estimated Cost of Implementation	Estimated Annual Energy Savings from all projects (ekWh)	Estimated Cost of Implementation	Estimated Annual Energy Savings from all projects (ekWh)	Estimated Cost of Implementation	Estimated Annual Energy Savings from all projects (ekWh)	Estimated Cost of Implementation	Estimated Annual Energy Savings from all projects (ekWh)	Estimated Cost of Implementation	Estimated Annual Energy Savings from all projects (ekWh)	Estimated Total Accumulated Energy Savings (ekWh)			
Ongoing training and awareness programs for energy conservation	5	$ 10,000	8,010	$ 10,000	8,010	$ 10,000	8,010	$ 10,000	8,010	$ 10,000	8,010	120,151	10	90	10
Participate in EcoSchools program/Energy Challenge	1	$ 100,000	160,202	$ 100,000	160,202	$ 100,000	160,202	$ 100,000	160,202	$ 100,000	160,202	2,403,028	5	90	10
Occupant Behaviour Strategies Total		**$ 110,000**	**168,212**	**$ 110,000**	**168,212**	**$ 110,000**	**168,212**	**$ 110,000**	**168,212**	**$ 110,000**	**168,212**	**2,523,179**			

$0.135	= cost of 1 ekWh electricity
$ 0.0334	= cost of 1 ekWh natural gas
0.0955	m^3 = 1 ekWh
$0.35	= cost of 1 m^3 of natural gas

APPENDIX E - Strategy Summary

	FY2013
Total Building Area (includes portables) (m²)	521,828
Total Building Area (includes portables) (ft²)	5,616,911
Energy Consumption for the board (ekWh)	99,713,189

1 ft² = 0.0929 m²

	2013-14		2014-15		2015-16		2016-17		2017-18		2013/14-2017/18
	Estimated Cost of Implementation	Estimated Annual Energy Savings from all projects (ekWh)	Estimated Cost of Implementation	Estimated Annual Energy Savings from all projects (ekWh)	Estimated Cost of Implementation	Estimated Annual Energy Savings from all projects (ekWh)	Estimated Cost of Implementation	Estimated Annual Energy Savings from all projects (ekWh)	Estimated Cost of Implementation	Estimated Annual Energy Savings from all projects (ekWh)	Estimated Total Accumulated Energy Savings (ekWh) °
Appendix B - Design, Construction and Retrofit Strategies Total	$ 3,000,000	1,319,777	$ 2,885,000	2,659,453	$ 3,466,310	4,904,743	$ 2,389,607	2,032,048	$ 2,040,000	1,230,458	37,245,478
Appendix C - Operations and Maintenance Strategies Total	$ 5,700	900,243	$ 5,500	2,540,564	$ 5,500	1,217,918	$ 5,500	2,229,442	$ 5,500	1,469,451	24,245,561
Appendix D - Occupant Behaviour Strategies Total	$ 110,000	168,212	$ 110,000	168,212	$ 110,000	168,212	$ 110,000	168,212	$ 110,000	168,212	2,523,179
TOTAL	**$ 3,115,700**	**2,388,231**	**$ 3,000,500**	**5,368,230**	**$ 3,581,810**	**6,290,873**	**$ 2,505,107**	**4,429,702**	**$ 2,155,500**	**2,868,120**	**64,014,218**

Estimated Conservation

										Accumulated Total °
Estimated Percentage Reduction *		**2.4**		**5**		**6**		**4**		**3**	**12.84**
Estimated Overall Decrease in Energy Intensity (ekWh/m²)		**4.58**		**10.29**		**12.06**		**8.49**		**5.50**	**122.67**
Conservation Goal (ekWh/ft²)		**0.43**		**0.96**		**1.12**		**0.79**		**0.51**	**11.40**

* Estimated Percent Reduction is based on all estimated annual energy savings from projects, as calculated from appendices B, C & D. The Board has chosen to adopt a more conservative 2% reduction per year.

° Accumulated totals assume that savings are carried over the entire five year ECDM plan period