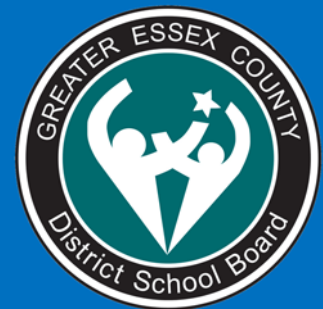
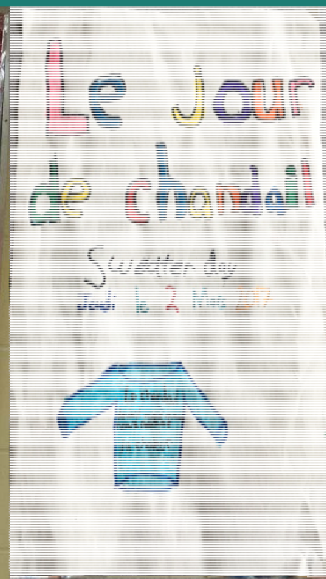




Energy Conservation & Demand Management Plan 2019 - 2023



July 1, 2019

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Executive Summary

In the Energy Conservation and Demand Management Plan 2019 - 2023, performance of energy conservation strategies implemented in the fiscal years of 2014 to 2018 is reported. Energy consumption and associated greenhouse gas (GHG) emissions are discussed with results measured against goals.


There has been a demonstrated positive impact in some areas, however, there is a recognition that more work is needed on a range of fronts.

New energy reduction targets are set for the next five years and strategies are identified to achieve these goals.

With Senior Management approval of the Energy Conservation and Demand Management Plan 2019-2023, the Board supports the energy reduction targets and renews its commitment to energy conservation through the continued implementation of conservation strategies to achieve energy reduction goals over the next five years.

Senior Management Approval

Greater Essex County District School Board approves the Energy Conservation and Demand Management Plan 2019 - 2023.

Signature: 
Full Name: Erin Kelly
Job Title: Director of Education
Date: June 24/19

INTRODUCTION

The Greater Essex County District School Board (GECDSB) considers energy conservation and associated greenhouse gas emission reductions a necessity to demonstrating responsible leadership and being a good local and global citizen. Compelling evidence strongly indicates that human activity is changing the environment and the Board must demonstrate its leadership by aiming higher and aggressively targeting to reduce its impact on the Earth. As an educational institution, there is a responsibility to deliver a clear message to students of the importance of conserving energy and reducing their footprint on the planet.

Since the early 1990's, the GECDSB has strongly pursued energy conservation opportunities. In 2014, the Board solidified its commitment to energy conservation with its first formal 5-Year Energy Conservation Demand Management Plan (ECDMP).

The ECDMP 2019 – 2023 reviews progress made toward goals in the previous five years and sets the Board's goals for the next five years.

The ECDMP 2019 – 2023 demonstrates the Board's commitment to ensuring the success of this plan through resource allocation, annual reporting and regular updates as required.

EDUCATION SECTOR BACKGROUND

Legislated Requirement for Energy Reporting

The Province of Ontario adopted the Green Energy Act as “a mechanism to expand renewable energy generation, encourage energy conservation and promote the creation of clean energy jobs” (Ministry of Energy, 2012).

The Green Energy Act was repealed in 2018 and various provisions of this Act placed under The Electricity Act, O.Reg.507/18, Broader Public Sector: Energy Reporting and Conservation and Demand Management Plan and O.Reg.506/18, Reporting of Energy Consumption and Water Use. These provisions require public agencies, including school boards, to:

- a. Report annually to the Ministry of Energy on energy use and GHG emissions 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 plan is required to be reviewed and updated every five years.

The ECDMP 2019 - 2023 is the first update of the original ECDMP, issued in 2014, and complies with the requirements of the Ministry of Energy's mandate.

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 annually for the next fiscal year which runs from September 1st to August 31st. The Ministry only allocates funding to School Boards on a year-by-year basis.

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 they receive in each of the five years covered by their energy management plan.

Asset Portfolios and Energy Management Planning

The education sector is unique in that a board's asset portfolio can experience important changes that impact a board's energy consumption over a five-year period. The following is a list of some of the more common variables that may impact consumption at a site. These variables are considered in the Board's assessment of energy usage and priorities for energy management initiatives.

Facility Variables:

- Changes to Building Area
 - a. Major additions
 - b. Sites sold/closed/demolished/leased
 - c. Portables – installed or removed

- Equipment/Systems
 - a. Replacements and Upgrades with newer technology
 - b. Increased use of air conditioning due to program and scheduling changes.
- Shared Use Sites (e.g. common areas shared with a partner, libraries, lighted sports fields etc.)

Other Variables:

- Programs
 - Day Care including Before/After School Programs
 - Summer School and Summer Programs
 - Community Use
- Occupancy
 - Significant Increase or decrease in number of students
 - New programs being added to or removed from a site

Typical School Energy Use

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 school. This has assisted the Board in prioritizing energy conservation strategies.

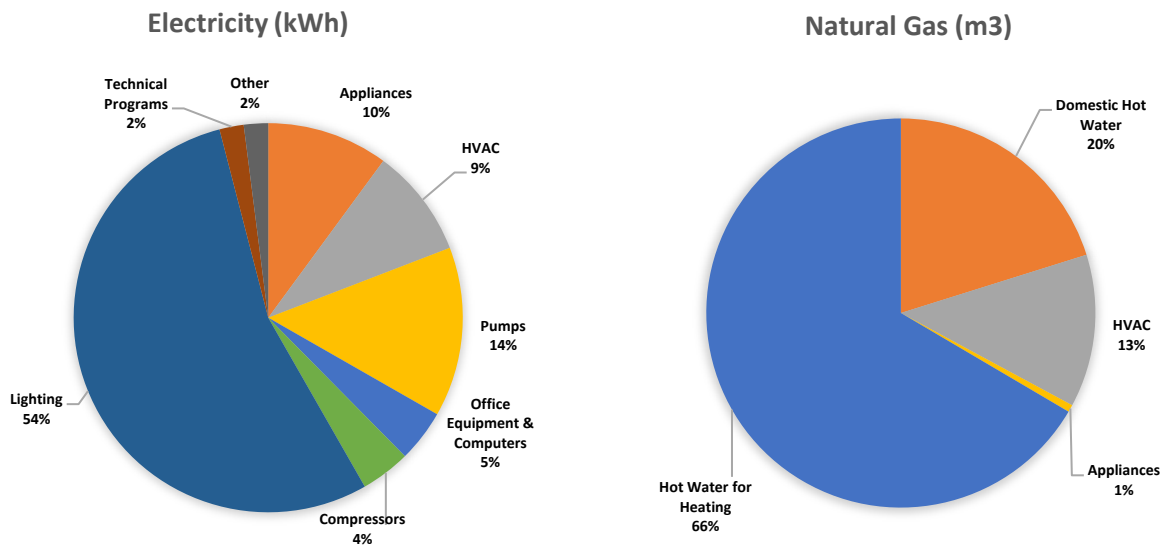


Figure 1 – Typical breakdown of school energy consumption

ENERGY CONSERVATION at GECDSB

Overview

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

Prior to implementing its first 5-year plan in 2014, the Board had participated in energy conservation initiatives since the early 1990's, resulting in significant reductions in energy use. Prior to the implementation of the first ECDMP, the initiatives included the conversion of lighting to energy efficient T8 lighting, the implementation of building automation controls for all major pieces of Heating, Ventilation and Air-Conditioning (HVAC) equipment and HVAC retrofits.

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

Since 2011, the Board has employed a full-time Energy & Environmental Officer, who is responsible for the development and maintenance of the Board's ECDMP. 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, the application for energy grants/rebates, the development of energy conservation training programs for Board employees and students, and participation on the Board EcoSchools Steering Committee.

To further enhance its energy management program, the Board has recently added an HVAC/Controls specialist (contract position) to its Facility Services staff. This key role focuses on the optimization of existing equipment and controls to improve efficiency. This position also establishes and implements mechanical, electrical and controls standards on all new construction and renovations, resulting in significant construction and energy savings for the Board.

The Board also supports a system-wide Environmental Stewardship Program, modelled on the "Ontario EcoSchools" program, which aligns with the Board's Policy, Regulation A/R-PR-09 and Administrative Procedure AP-PR-13 "Environmental Education and Stewardship". All schools participate in the program with a significant number of schools reaching EcoSchools certification annually. The Board supports this program with training opportunities for school staff and "EcoTeams" and incentive programs based on energy savings.

The Board also supported community energy conservation efforts and participated in Community Task Force Meetings where area stakeholders helped shape and develop the City of Windsor's Community Energy Plan. This plan aims to improve the City's energy efficiency,

reduce its energy consumption and associated greenhouse gas emissions, as well as support local economic development and ultimately, improving the quality of life for its residents.

The Board was fortunate to open Canada's first LEED Platinum certified school, Dr. David Suzuki Public School in 2011, as a demonstration site to showcase energy conservation measures for other public and private sector entities. The school contains a 36kW solar system, two wind turbines, displacement ventilation, daylight and storm water harvesting systems and geothermal heating and cooling and continues to aggressively surpass all energy performance criteria of other schools in the province. Construction, curriculum connections and energy performance data is published on the www.suzukipublicschool.ca website.

Presently, four Local Distribution Companies (LDCs) provide electricity to the board's sites, Enwin Utilities, Essex Energy, ELK and Hydro One. The Board relies mainly on natural gas, provided by Enbridge, formerly Union Gas, for its 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.

Energy Conservation Measures

Energy initiatives are managed through the Board's Facility Services Department. A focus for Facility Services is to ensure energy efficiency is considered in all departments including Operations, Maintenance and Engineering. Key members of the Facility Services team meet on a quarterly basis to discuss energy saving opportunities.

The Board's energy management goal is to reduce energy consumption and, in turn, mitigate greenhouse gas emissions. This is accomplished through the implementation of various energy management strategies that are funded through a portion of the annual capital renewal and operating grants or specific Ministry funding (Energy Efficiency, Green House Gas Reduction). These funding streams support energy saving strategies in four key categories:

1. Design/Construction/Retrofit
2. Operations and Maintenance
3. Occupant Behaviour
4. Policy and Planning

NOTE: It takes a minimum of one full year after an energy management strategy has been implemented before an evaluation can determine if project related energy savings were achieved.

1. Design/Construction/Retrofit

Design/construction/retrofit encompasses how a building and its systems perform 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 in design/construction/retrofit include the following:

A. Lighting

In recent years, significant improvements in LED lighting technology has made these fixtures more affordable and these technologies continue to evolve rapidly. Energy savings can be achieved by replacing older incandescent, metal halide, high pressure sodium lamps and fluorescent lighting with LED (light-emitting diode) lamps. Savings, which are dependent 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%.

**By the end of the 2018-2019 school year, 75% of
our schools will be fully LED as well as the
Administration Building.**

B. Heating, Ventilation and Air Conditioning (HVAC) Systems

HVAC systems modulate 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/working environment. They also account for a large portion of a building's energy use.

Due to the varying age of school buildings, various types of HVAC systems can be found across the GECDSD. Cooling is typically provided by chillers, window air conditioning units, single room internal air conditioning systems and internal/external HVAC units. The Board's heating systems include steam or hot water provided by natural gas fired boilers, rooftop or internal HVAC units with ducted distribution and electrical heating.

HVAC system improvements may include:

- Replacement of old Boilers, HVAC units and Chillers with more efficient models, with consideration to right sizing existing systems heating and/or cooling requirements.
- Include energy recovery, when feasible, for all new HVAC units.
- Replace or install constant volume systems with variable air volume systems (VAV) that produce fan energy consumption savings.
- Install Variable Frequency Drives (VFDs) for motors on pumps and 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, VFDs can be installed to promote higher efficiencies on motors. Energy savings vary depending on the specific system characteristics but, in certain cases, can be 50% or higher.

Energy Recovery Ventilation (ERV) can be added to new ventilation systems, where the energy in building exhaust air is used to pre-condition the incoming outdoor ventilation air. During the warmer seasons, an ERV will pre-cool and dehumidify incoming air while, in cooler seasons, it will humidify and pre-heat. The benefit of using energy recovery is the ability to meet ventilation & energy standards, while improving indoor air quality and reducing total HVAC equipment capacity and energy use.

Testing, Adjusting, and Balancing (TAB), also known as air balancing, reviews air and water flows through HVAC and Boiler systems to ensure optimum flow to meet proper spatial requirements for ventilation, cooling and heating. Air balancing optimizes performance of the system thus achieving energy savings. Another added benefit is mitigation of over or under pressurizing a building which reduces the heating or cooling requirements for the building.

Through the SCIA funding the past 3 years, the Board was able to renew over \$11,000,000 in HVAC infrastructure while implementing greater energy efficiencies.

C. Building Automation System (BAS)

A BAS system offers one of the best returns on investment. Energy savings are achieved by the greater control of various HVAC and Lighting systems, allowing the Board to optimize their operation. Additional benefits include improved indoor comfort and greater visibility into building systems reducing 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, set-point standardization and equipment programming to ensure operational efficiencies.

With expenditures of \$1,750,000 over the past 5 years, the Board was able to implement/upgrade controls systems to mitigate un-necessary usage.

D. Building Envelope Upgrades

Building Envelope upgrades include roofing, windows, exterior cladding, caulking and exterior door 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%.

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

In the past two years, Board spent \$20,000,000 to replace glazing and roofing making the classroom more comfortable while saving energy.

E. Energy Efficient Incentives

The Board regularly applies for various incentive programs offered by utility companies to support the implementation of projects which produce energy savings.

Since 2014, the Board has received over \$920,000 in incentive payments to offset operating costs.

The Board also consults with the education sector’s Incentive Program Advisor and has used his services to apply for incentives on behalf of the board.

2. 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:

A. 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 supporting its Condition Assessment Initiative which continue to 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 Ministry supported VFA software system which can 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.

The HVAC/Controls Project Administrator portfolio includes building audits to identify energy waste and opportunities for improvements in areas of maintenance, operations and renewal. Opportunities that have been identified during audits this school year include installing VFD's on heating pumps and fan motors, improving existing or adding new controls to increase efficiencies while improving occupant comfort, capital needs such as HVAC replacements and highlighting maintenance and operational practices that waste energy.

**The HVAC/Controls Administrator has completed
18 audits this school year identifying many
opportunities to save energy.**

B. Temperature Set Points and Equipment Scheduling

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 establish temperature set points along with schedules for occupancy. The schedule and temperatures for both heating and cooling seasons are 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.

For several years, all outside lighting that is controlled by the BAS has been scheduled to turn off from 2 a.m. to 5 a.m. at its City of Windsor sites and from 12 a.m. to 6 a.m. at all other schools. This practice has proven very successful in reducing nighttime electricity demand for the Board.

C. 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 the timely measurement of the

performance of energy efficiency projects implemented and initiatives taken by schools or Facility Services Department. Newer meters (available in a small portion of the Board's portfolio) allow for electronic access to daily and monthly data either through static data on a website or a dynamic dashboard provided by the LDC. This data is usually aged 24 hours.

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

The lack of real time energy data can also make it difficult to quantify energy savings realized directly through operational changes, especially when there has been a concurrent building system improvement.

In order to facilitate the completion of legislated reporting requirements, The Ministry of Education has contracted the services of a third-party provider to compile utility data the all LDC's and populate the information in the Utility Consumption Database (UCD) for all Ontario school boards. The UCD also provides the ability for a sector wide peer comparison.

By reviewing both utility and UCD data, anomalies in consumption and demand can be detected and corrected, through repairs or equipment scheduling, which typically results in a decrease in electricity or water usage.

3. Occupant Behaviour

A. EcoSchools and Energy Challenge



The Board recognizes 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 environmental stewardship program which contains a component focused on energy conservation.

Facility Services developed and continues to support an “Energy Conservation Challenge” within the Board’s EcoSchools program. The basis of the challenge is to increase energy and water conservation awareness by encouraging school occupants to change their behaviour and reduce energy and water usage through conservation strategies. As a reward for their efforts, participating schools receive a portion of the savings realized within the six-month challenge period.

Strategies adopted by schools have included the formation of a dedicated energy “watchdog” team, performing energy audits, participating in sweater days, 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 with the entire school community.

The table below highlights the energy and water savings through the Energy Challenge.

Table 1 - Energy Challenge Results 2012 to 2018

Year	# of sites participating	Electricity (kWh)	Water (L)
2012	7	258,551	1,744,000
2013	8	150,478	2,359,000
2014	35	477,504	15,733,000
2015	50	844,310	20,130,000
2016	42	430,473	15,049,000
2017	50	698,816	13,120,000
2018	38	285,523	6,599,000
Total		1,730,843	39,966,000

In addition to utility savings, the current year’s Energy Challenge also aims to reward participating schools for each implemented conservation initiative.

Since its inception 8 years ago, schools have saved enough electricity to charge 153,289,000 smart phones and enough water to fill 530 average pools through the Energy Conservation Challenge

A. Training and Education

Successful energy management programs depend on staff and student support. Increasing knowledge about energy use motivates the school community to integrate effective actions to reduce energy waste in their day-to-day activities. As a result, staff and students play an important and ongoing role in ensuring that the Board meets its energy reduction goals and promoting the growth of an energy conscious culture.

The Board has created a training video “[Reduce Your Use](#)” to provide awareness training to school staff and newly hired custodians, and there are plans to further expand the scope of training to other staff.



Reduce Your Use Video

The Board has provided for EcoSchools Training in various formats for all school EcoTeams, including administrators, teachers, students and custodians.

Though very successful and well-received, off site training events have had limited attendance due to venue size. Plans are currently underway to develop training presentations to be brought to schools and delivered to the entire student body, thus gaining a larger audience to spread energy conservation awareness.

4. Policy and Planning

A. Energy Management Policy & Procedure

The Board approves and supports the ECDMP 2019 – 2023 which acts as a framework for our energy conservation programs.

The Board should consider adopting a policy which demonstrates the Board's commitment to energy conservation and management and supports this plan.

B. Energy Savings through School Closures

The GECDSB faces the same challenges as other Board in the Province in terms of under-utilized facilities. 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).

The Board has closed several 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.

School consolidations that result in new buildings allows for the closure of older, inefficient buildings and supports the construction of buildings that meet a higher standard of energy efficiency. In most cases, a new school will be more energy efficient even with the introduction of air conditioning.

For detailed information on the Board's future goals in terms of accommodations, refer to the [Annual Board's Accommodation Report](#) found on the Board's website.

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

C. 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 uses the services of the Education Sector's OECM

Strategic Electricity Management and Advisory Services for the purchase of electricity and Shell Energy for the purchase of gas.

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 School Boards dealing with major changes with the introduction of the Global Adjustment Factor (GAF) cost which doubled, if not tripled, the cost of electricity. As the GAF reacts inversely to 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.

For the past 5 years, procurement of both electricity and natural gas has been through open market purchases due to low cost of natural gas and the introduction of the Global Adjustment Factor which performs inversely to electricity prices. The Board continues to procure transportation contracts for natural gas on a multi-year basis. Facility Services monitors energy costs against budgets.

D. Renewable Energy

Dr. David Suzuki Public School



The Board has supported renewable energy installations consisting of both solar photovoltaic (PV) systems and wind turbines. Presently, the Board owns three 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 is under contract with the Independent Electricity System Operator (IESO) through the Feed-In-Tariff (FIT) and MicroFit programs to supply electricity to the grid for compensation which offsets electricity costs for the building.

In 2016/2017, the Board leased school rooftops to a 3rd party partner for the installation of PV systems at 25 of its schools, for a 20 year FIT program term and supplying an estimated total 6,246,000 kWh of clean energy per year to the electricity grid. The Board receives approximately \$350,000 annually under this lease arrangement.

The Board has also recently completed upgrades to the rooftop PV systems located at Dr. David Suzuki Public School and Tecumseh Vista Academy to increase their efficiencies. It is estimated that they will now generate and supply an average of 30 to 40% more clean energy to the grid.

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.

Table 2 - GECSB's Current Renewable Energy Sites

Renewable Energy	Define	Number of systems in asset portfolio	Total size (kW)	Average Estimated Annual Generation (ekWh)
Solar photovoltaic	Board owned	3	148	171,015
	3rd party owned, rooftop leased	25	4,727	6,246,175
Wind Turbine	Dr.David Suzuki PS	2	7.4	unknown

PROGRESS AGAINST GOALS - A Review of the Past 5 Years

Changes to the Board's Asset Portfolio from the Baseline Year

The following table outlines changes in the Board's asset portfolio that changed from the baseline Fiscal Year 2012 to 2013 to the end of the five-year reporting period Fiscal Year 2017 to 2018.

Table 3 - Board's Asset Portfolio

Key Metrics	(Baseline Year) Fiscal Year 2012 to 2013	Fiscal Year 2017 to 2018	Variance
Total Number of Buildings	81	77	- 4
Total Number of Portables/Portapaks	58	70	+12
Total Floor Area (ft ²)	5,310,378	5,112,712	-197,666
Average Daily Enrolment	32,998	36,496	+ 3,498
Community Use of Schools:			
• Community Rental Hours	31,118	34,972	+ 3,854
• # of School Based Childcare Programs	39	48	+ 9

Although the number of the Board's buildings has decreased, all other metrics have increased and therefore creating an additional challenge for the board to achieve its energy saving goals.

Implementation of Projects

The following chart shows planned vs actual spending in the energy conservation strategy category of Design/Construction/Retrofits, which includes lighting, HVAC and controls retrofit projects, as well as building envelope improvements. A complete list of the Board's investment

in these strategies for the 2013 to 2018 fiscal year period can be found in [Appendix A - Design/Construction/Retrofit Strategy Investments from FY2014 to FY2018.](#)

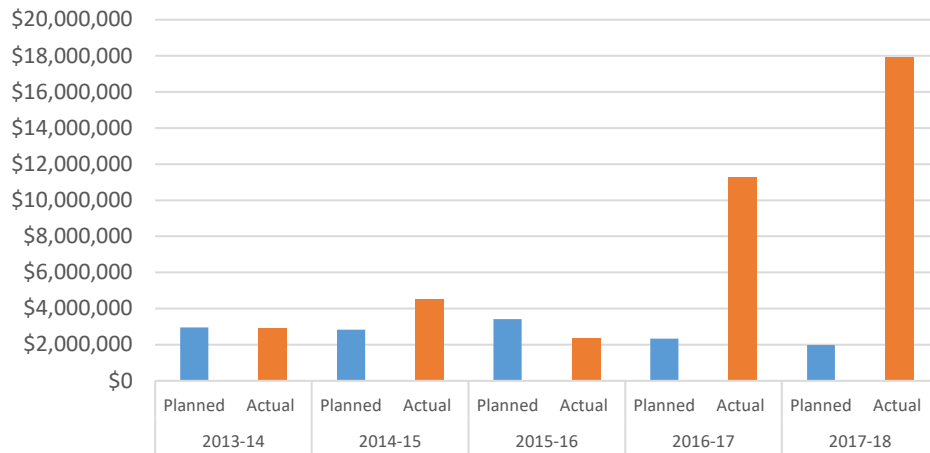


Figure 2 – Investments in Design/Construction/Retrofit Projects FY2014 to FY2018

The Board invested close to \$39,000,000 in renewal strategies that impacted energy savings over the past 5 years.

In addition to Ministry of Education Greenhouse Gas Reduction Funding initiative in 2017 & 2018, the Board was able to invest more monies through the School Condition Improvement Allocation (SCIA) funding to support the replacement, renewal and installation of energy efficient equipment and building infrastructure.

Energy Use

All energy consumption data used to monitor and measure performance against goals was obtained from the Ministry of Education UCD. A summary of source UCD data used for this report may be found in [Appendix B - UCD Report EOR02 5 Year Energy Consumption and Demand Management Plan Data.](#)

The following table compares the “metered” consumption data of the baseline year (2012-2013) and the most recently compiled data for fiscal year 2017-2018. Natural gas and heating oil are converted to a common unit of Equivalent Kilowatt Hours (ekWh) for comparison purposes.

Table 4 - Metered Energy Usage

Utility	Fiscal Year 2012 to 2013 (Baseline year)	Fiscal Year 2017 to 2018
Total Electricity (kWh)	27,447,270	25,159,790

Utility	Fiscal Year 2012 to 2013 (Baseline year)	Fiscal Year 2017 to 2018
Total Natural Gas (ekWh)	71,126,050	55,145,230
Total Heating Fuel (Type 1) for Pelee Island (ekWh)	56,707 (2013/2014)	55,039

Metered, also known as “raw” consumption data, does not take into consideration the impact of weather on energy usage and as a result it does not allow an accurate analysis of energy performance from one year to the next.

Impact of Weather

In Ontario, 25% to 35% of energy consumption for a facility is affected by variations in weather during heating and cooling seasons.

The following table shows the annual Heating Degree Days (HDD)¹ and Cooling Degree Days (CDD)² for the six most common Environment Canada weather stations in the Ontario education sector for the last six years.

Table 5 - Ontario Degree-days

Ontario Degree Days	Fiscal Year 2012 to 2013	Fiscal Year 2013 to 2014	Fiscal Year 2014 to 2015	Fiscal Year 2015 to 2016	Fiscal Year 2016 to 2017	Fiscal Year 2017 to 2018
HDD	3698	4285	4091	3355	3583	3989
CDD	289	217	271	462	303	432

From the data above, it is clear that weather is not consistent from year to year. Therefore, the best way to compare energy usage from one year to another is to factor in the impact of weather on energy performance which allows for an equitable comparison of consumption across multiple years. This is called “weather-normalized” data.

However, a straight comparison of Total Energy (weather-normalized or not) between one or more years does not take into consideration variations in a board’s asset portfolio, such as square footage, enrolment, programs and building features, which will also impact energy consumption.

¹ Heating Degree Day (HDD) is a measure used to quantify the impact of cold weather on energy use. In the data above, HDD are the number of degrees that a day’s average temperature is below 18C (the balance point), the temperature at which most buildings need to be heated.

² Cooling Degree Day (CDD) is a measure used to quantify the impact of hot weather on energy use. In the data above, CDD are the number of degrees that a day’s average temperature is above 18C, the temperature at which most buildings need to be cooled. It should be noted that not all buildings have air conditioning and some building have partial air conditioning. The UCD only applies CDD to meters that demonstrate an increase in consumption due to air conditioning.

A more accurate measure of performance is to compare Energy Intensity between various school years. Energy Intensity is value derived by calculating the building’s energy use per square foot, reported as *equivalent kilowatt hours per square foot* (ekWh/ft²). It allows for year over year comparisons of a building’s energy efficiency which takes into account changes in square footage, building upgrades, programs and enrolment. The table below shows the combined electricity, natural gas and fuel oil consumption in ekWh for the Board and the Board’s average energy intensity for the baseline year and the last reporting year.

Table 6 - Weather Normalized Energy Consumption

Weather Normalized Values	Fiscal Year 2012 to 2013 (Baseline Year)	Fiscal Year 2017 to 2018
Total Energy Consumed (ekWh)	95,550,770	74,999,880
Energy Intensity (ekWh/ft ²)	17.37	13.46

Despite the increases in school areas, number of portables and in school use, a trend of decreasing energy consumption for both electricity and gas has occurred over the last five years, with metered **electricity use reduced by over 4 million kWh** and **gas use reduced by 27 million m³**.

Energy reductions over the past 4 years equals the GHG emissions saved by taking 3,248 cars off the road for one year.

Energy Conservation Results Measured Against Goals

In 2014, the Board set annual energy conservation goals for five fiscal years, FY2013 to FY2018. The following table compares the Energy Intensity Conservation Target with the Actual Energy Intensity Reduced for each year.

Table 7 - Comparison of Weather Normalized Energy Intensity Conservation Goals and Actual Energy Intensity Achieved

Fiscal Year	Energy Intensity Goal ekWh/ft ²	Conservation Goal % Reduction	Actual Energy Intensity ekWh/ft ²	Actual % Difference
2012 to 2013	Baseline Year	-----	17.37	-----
2013 to 2014	17.02	- 2	17.29	+ 1.6

Fiscal Year	Energy Intensity Goal ekWh/ft2	Conservation Goal % Reduction	Actual Energy Intensity ekWh/ft2	Actual % Difference
2014 to 2015	16.94	- 2	15.74	- 7.1
2015 to 2016	15.43	- 2	16.12	+ 4.5
2016 to 2017	15.79	- 2	14.91	- 5.6
2017 to 2018	14.66	- 2	13.46	- 8.1
Cumulative Goal 2014 - 2018	-----	- 8 %	-----	- 14.7 %

Note: Weather normalized data used

The Board has significantly surpassed its energy conservation goals for 2014-2018

Individual school energy intensity can be found in *Appendix C – School Energy Intensity 2017-2018 (Weather Normalized)*.

Utility Costs for 2014-2018

The cost of utilities over time must also be considered when reviewing the Board’s energy performance over the last five years. The table below showing our energy expenditure compared to the total energy consumed highlights the fact that, even with the application of millions of dollars in energy conservation strategies, the Board has only been successful in minimally mitigating the impact of higher energy prices.

Table 8 – Utility Consumption vs. Cost

Weather Normalized Values	Fiscal Year 2012 to 2013 (Baseline Year)	Fiscal Year 2017 to 2018	Reduction
Total Energy Consumed (ekWh)	95,550,770	74,999,880	21.5%
Total Cost of Energy	\$5,839,282	\$5,506,788	5.7%

Consumption was reduced by 21.5% but costs were only reduced 5.7%.

Greenhouse Gas (GHG) Emissions

In conjunction with energy savings, the Board also reduced its impact on the environment. The chart below shows our carbon emissions from energy usage, as calculated by the UCD from our raw energy data, have steadily decreased since FY2014.

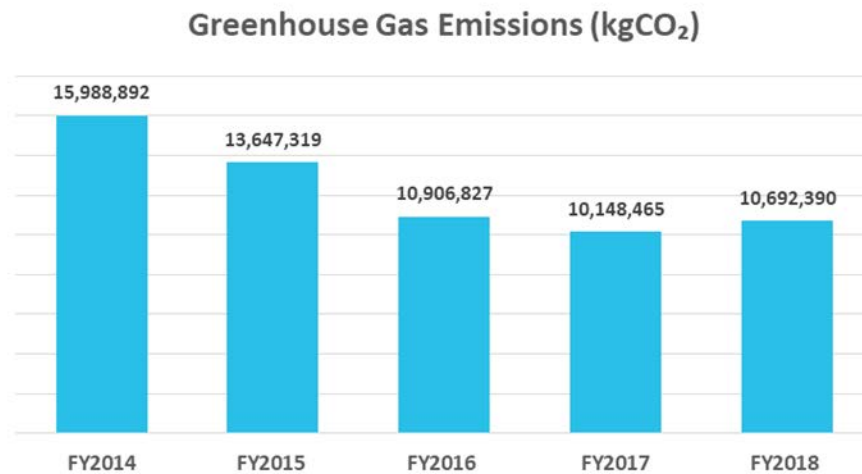


Figure 3 - Total GECDSD GHG emissions FY2014 to FY2018

The Board mitigated over 15 thousand tonnes of GHG emissions during 2014-2018

Equivalent to the GHG/CO₂ emissions from...



1,832

homes' energy use for one year

and carbon sequestered by...



252,977

tree seedlings grown for 10 years

Source: U.S. EPA Greenhouse Gas Equivalencies Calculator

LOOKING AHEAD – ENERGY PLANNING FOR THE NEXT 5 YEARS

The GECDSD will continue to implement energy management strategies, in key areas as described previously, for 2019 to 2023, to reduce energy consumption and associated GHGs emissions. For a comprehensive listing of the Board's planned investments in energy conservation over the next five years, please refer to *Appendix D – Energy Conservation Investment Goals for FY2019 to FY2023*.

Energy Conservation Goals FY2019 to FY2023

The Board commits to the following energy intensity reduction conservation goals for the next five fiscal years.

Table 9 – Annual Energy Intensity Conservation Goals

Annual Energy Intensity Conservation Goal	Fiscal Year 2018 to 2019	Fiscal Year 2019 to 2020	Fiscal Year 2020 to 2021	Fiscal Year 2021 to 2022	Fiscal Year 2022 to 2023	Cumulative Goal
ekW/ft ² *	13.19	12.93	12.68	12.43	12.19	63.42
Percentage decrease from previous year	2	2	2	2	2	10

* Based on achieving the annual percentage decrease target and using 2017/2018 actual weather normalized intensity as baseline

Other Energy Goals

The Board will explore the introduction of an Energy Conservation Policy to support the Energy Conservation and Demand Management Plan 2019-2023.

The Board will explore increasing the level of real-time metering in order to provide more immediate feedback on energy conservation measures.

Barriers to Achieving the 2019 – 2023 Energy Intensity Reduction Goals

Several factors may influence the Board's ability to meet its energy conservation goals. A few of these factors include, but are not limited to:

1. Enrolment Increases or Decreases
2. Changes to School Board Funding Models
3. Building Changes – additions, portables, renovations
4. Severe weather trends
5. Changes in Occupant Behaviour
6. Increasing use of buildings through changes in programs
7. Increasing use of buildings through community partners such as child care

CONCLUSION

Despite facing some future challenges to achieving its goals, the Board continues to invest in energy conservation because, as a responsible organization, it is a necessity. The Board recognizes that energy and resource conservation must be ingrained in students in order to have long-lasting impact on the environment.

The Greater Essex County District School Board also realizes that the strength and success of its energy conservation program is dependent on everyone working together towards its goals and plans, not only in investing in building changes over the next five years, but also in continuing to educate its employees, occupants and school communities about the importance and need to conserve in this world of limited resources.

APPENDIX A - Design/Construction/Retrofit Strategy Investments from FY2014 to FY2018

	2013-14		2014-15		2015-16		2016-17		2017-18	
	Planned	Actual	Planned	Actual	Planned	Actual	Planned	Actual	Planned	Actual
New School Design	\$0	\$35,000	\$840,000	\$550,000	\$1,471,310	\$250,000	\$579,607	\$550,000	\$0	\$0
Lighting Retrofits	\$250,000	\$200,000	\$250,000	\$50,000	\$250,000	\$92,801	\$250,000	\$2,092,353	\$250,000	\$6,298,907
HVAC - Boilers	\$250,000	\$200,000	\$0	\$0	\$250,000	\$444,023	\$0	\$210,550	\$250,000	\$0
HVAC Systems	\$200,000	\$300,000	\$200,000	\$0	\$200,000	\$372,862	\$200,000	\$3,667,680	\$200,000	\$6,226,739
Controls - New	\$200,000	\$250,000	\$200,000	\$200,000	\$200,000	\$400,000	\$200,000	\$500,000	\$200,000	\$400,000
Controls - Upgrades	\$50,000	\$100,000	\$50,000	\$50,000	\$50,000	\$70,276	\$50,000	\$39,281	\$50,000	\$63,181
Glazing	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$1,022,057	\$0	\$338,139
New Roof	\$2,000,000	\$1,800,000	\$1,295,000	\$3,645,641	\$995,000	\$715,891	\$1,060,000	\$3,162,974	\$1,040,000	\$4,581,695
TOTAL	\$2,950,000	\$2,885,000	\$2,835,000	\$4,495,641	\$3,416,310	\$2,345,853	\$2,339,607	\$11,244,895	\$1,990,000	\$17,908,661

Appendix B - UCD Report EOR02 5 Year Energy Consumption and Demand Mangement Plan Data

UCD Data Fields for Completing the 5-year Energy Conservation and Demand Management Plan	FY2013 / AF2013 (baseline fiscal year)	FY2014 / AF2014	FY2015 / AF2015	FY2016 / AF2016	FY2017 / AF2017	FY2018 / AF2018	Variance between FY2013 and FY2018
Average Daily Enrolment (ADE)	32,997.68	32,369.50	33,939.00	34,351.65	35,249.41	36,496.00	3,498.32
Total Electricity (kWh) - raw	27,447,270.00	28,430,670.00	26,080,920.00	26,407,420.00	24,978,360.00	25,159,790.00	
Total Natural Gas (ekWh) - raw	71,126,050.00	82,165,500.00	70,871,220.00	55,701,730.00	51,970,220.00	55,145,230.00	
Total Heating Fuel (Type 1) (ekWh) - raw	no data	56,706.61	58,577.25	46,730.95	52,290.61	55,039.12	
Total Energy Consumed (ekWh) - raw	98,573,320.00	110,652,900.00	97,010,710.00	82,155,870.00	76,743,550.00	80,305,020.00	
Energy Intensity (ekWh/ft2) - raw	17.92	20.20	17.71	15.10	13.90	14.43	
Total Electricity (kWh) - weather normalized	25,095,520.00	26,327,410.00	25,127,160.00	26,457,000.00	24,938,720.00	24,833,180.00	-262,340.00
Total Natural Gas (ekWh) - weather normalized	70,455,250.00	68,322,380.00	61,025,280.00	61,189,640.00	57,307,190.00	50,121,410.00	-20,333,840.00
Total Heating Fuel (Type 1) (ekWh) -weather normalized	no data	44,609.31	48,439.25	50,197.17	38,909.08	45,291.81	
Total Energy Consumed (ekWh) - weather normalized	95,550,770.00	94,694,400.00	86,200,880.00	87,696,840.00	82,284,820.00	74,999,880.00	-20,550,890.00
Energy Intensity (ekWh/ft2) - weather normalized	17.37	17.29	15.74	16.12	14.91	13.46	-3.91

APPENDIX C - School Energy Intensity 2017-2018 (weather normalized)

School Name	Energy Intensity (ekWh/ft ²)
A V Graham PS	16.37
Administration Building	15.34
Amherstburg Public School	17.65
Anderdon Central Public School	21.44
Belle River District High School	14.44
Belle River Public School	19.95
Bellewood Public School	10.82
Centennial Central Public School	18.32
Central Public School	12.59
Colchester North Public School	17.31
Coronation Public School	13.24
D M Eagle PS	14.71
David Maxwell Public School	24.50
Dougall Avenue Public School	13.96
Dr. David Suzuki Public School	7.67
East Mersea Public School	15.69
Eastwood Public School	11.78
Essex District High School	19.68
Essex Public School	10.35
Facility Services	9.54
Ford City Public School (formerly Percy P McCallum PS)	12.12
Forest Glade Public School	15.53
Forest Glade Public School Primary Learning Centre (Former H. B. McManus)	20.12
Frank W Begley Public School	8.83
General Amherst District High School	18.65
General Brock Public School	13.05
Giles Campus French Immersion (formerly W D Lowe Secondary School) *	16.79
Glenwood Public School	14.15
Gore Hill Public School	15.24
Gosfield North Central Public School	19.77
Harrow District High School - Closed	0.97
Harrow Public School	12.71
Hon W C Kennedy Secondary School	17.00
Hugh Beaton Public School	17.69
J A McWilliam Public School	15.36
Jack Miner Public School	13.55
John Campbell Public School	11.62
King Edward Public School	12.45
Kingsville District High School	23.73
Kingsville Public School	17.93
Lakeshore Discovery	11.53
LaSalle Public School	16.29

Leamington District Secondary School	22.44
Leamington District Secondary School - CLOSED	0.40
M S Hetherington Public School	14.63
Malden Central Public School	18.56
Margaret D Bennie Public School	10.73
Marlborough Public School	18.56
Mill Street Public School - CLOSED	0.42
Mount Carmel-Blytheswood Public School	17.73
Northwood Public School	14.38
Parkview Public School	11.04
PASS (formerly Alicia Mason)	18.62
Pelee Island Public School	12.26
Prince Andrew Public School	26.39
Prince Edward Public School	16.66
Princess Elizabeth Public School	11.20
Queen Elizabeth Public School	13.13
Queen Victoria Public School (Windsor)	14.20
Riverside Secondary School	14.92
Roseland Public School	10.71
Roseville Public School	14.01
Sandwich Secondary School	15.01
Sandwich West Public School	18.86
Southwood Public School	11.22
Sun Parlor Jr Public School	35.15
Talbot Trail	10.71
Tecumseh Vista Elementary & Secondary	13.16
Vincent Massey Secondary School	13.54
W F Herman Academy K-12 (formerly Secondary School)	13.29
Walkerville Collegiate Institute & Centre for the Creative Arts	13.87
West Gate Public School	9.52
Western Secondary School	22.80
Westview Freedom Academy (formerly Century Secondary School)	19.07
William G Davis Public School	13.40

* Estimated (2017-2018 data not available due to gas meter issues)

Appendix D - GECCSB Energy Conservation Investment Goals for FY 2019 to FY 2023

	2018-2019		2019-2020		2020-2021		2021-2022		2022-2023		2018/2019-2022/2023 Estimated Total Accumulated Energy Savings (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) ²	Estimated Cost of Implementation	Estimated Annual Energy Savings from all projects (ekWh) ³	Estimated Cost of Implementation	Estimated Annual Energy Savings from all projects (ekWh) ⁴	Estimated Cost of Implementation	Estimated Annual Energy Savings from all projects (ekWh)	
Design, Construction and Retrofit Strategies	\$ 11,150,000	4,121,377	\$ 3,713,000	2,959,517	\$ 6,113,000	3,291,278	\$ 2,575,000	2,063,321	\$ 5,375,000	3,195,980	49,641,407
High Efficiency Lighting Systems, indoor and outdoor lighting	\$ 300,000		\$ 300,000	589,246.26	\$ 300,000	589,246.26	\$ 300,000	589,246.26	\$ 300,000	589,246.26	8,838,693.84
High-efficiency Boilers (condensing)	\$ 500,000	1,390,143.88	\$ 500,000	1,390,143.88	\$ 250,000	695,071.94	\$ 250,000	695,071.94	\$ 500,000	1,390,143.88	17,376,798.50
Energy Efficient HVAC systems	\$ 1,500,000	196,415.42	\$ 250,000	32,735.90	\$ 250,000	32,735.90	\$ 250,000	32,735.90	\$ 250,000	32,735.90	1,309,436.12
Energy Efficient Rooftop Units	\$ -	-	\$ 250,000	81,839.76	\$ 250,000	81,839.76	\$ 250,000	81,839.76	\$ 250,000	81,839.76	818,397.58
Efficient Chillers and Controls	\$ 675,000	38,571.43	\$ -	-	\$ 500,000	28,571.43	\$ -	-	\$ 500,000	28,571.43	307,142.86
High-efficiency Motors	\$ 100,000	57,142.86	\$ 100,000	57,142.86	\$ 100,000	57,142.86	\$ 100,000	57,142.86	\$ 100,000	57,142.86	857,142.86
VFD	\$ 100,000	144,495.62	\$ 100,000	144,495.62	\$ 100,000	144,495.62	\$ 100,000	144,495.62	\$ 100,000	144,495.62	2,167,434.30
Demand Ventilation	\$ 25,000	49,103.85	\$ 25,000	49,103.85	\$ 25,000	49,103.85	\$ 25,000	49,103.85	\$ 25,000	49,103.85	736,557.82
Building Automation Systems - New	\$ -	-	\$ 200,000	130,943.61	\$ -	-	\$ -	-	\$ -	-	523,774.45
Building Automation Systems - Upgrade	\$ -	-	\$ 400,000	261,887.22	\$ 400,000	261,887.22	\$ 400,000	261,887.22	\$ 300,000	196,415.42	2,553,400.44
Real-time energy data for operators to identify and diagnose building issues	\$ -	-	\$ -	-	\$ 200,000	654,718.06	\$ 200,000	654,718.06	\$ 200,000	654,718.06	3,928,308.37
New Roof	\$ 3,500,000	302,140.88	\$ 1,000,000	86,325.97	\$ 1,000,000	86,325.97	\$ 1,000,000	86,325.97	\$ 1,000,000	86,325.97	2,373,964.09
New Windows	\$ 3,000,000	647,444.75	\$ -	-	\$ 2,000,000	431,629.83	\$ -	-	\$ 2,000,000	431,629.83	4,963,743.09
Shading Devices	\$ 250,000	71,428.57	\$ -	-	\$ 150,000	42,857.14	\$ -	-	\$ 150,000	42,857.14	528,571.43
Operations and Maintenance Strategies	\$ 415,000	808,216	\$ 440,000	832,768	\$ 440,000	832,768	\$ 440,000	832,768	\$ 440,000	832,768	12,368,755
New School Design/Construction Guidelines and Specifications	\$ 300,000	589,246.26	\$ 300,000	589,246.26	\$ 300,000	589,246.26	\$ 300,000	589,246.26	\$ 300,000	589,246.26	8,838,693.84
Day and Night Temperature Guidelines for all Schools	\$ 10,000	34,530.39	\$ 10,000	34,530.39	\$ 10,000	34,530.39	\$ 10,000	34,530.39	\$ 10,000	34,530.39	517,955.80
Nighttime Blackout of Sites - Exterior	\$ 10,000	8,163.27	\$ 10,000	8,163.27	\$ 10,000	8,163.27	\$ 10,000	8,163.27	\$ 10,000	8,163.27	122,448.98
Procures Only Energy Star Certified Appliances	\$ 25,000	28,571.43	\$ 25,000	28,571.43	\$ 25,000	28,571.43	\$ 25,000	28,571.43	\$ 25,000	28,571.43	428,571.43
HVAC Optimization (coil cleaning, re-calibration of equipment)	\$ 30,000	147,311.56	\$ 30,000	147,311.56	\$ 30,000	147,311.56	\$ 30,000	147,311.56	\$ 30,000	147,311.56	2,209,673.46
Commissioning (retro and re)	\$ -	-	\$ 25,000	24,551.93	\$ 25,000	24,551.93	\$ 25,000	24,551.93	\$ 25,000	24,551.93	245,519.27
Walk Through Audit	\$ 40,000	392.83	\$ 40,000	392.83	\$ 40,000	392.83	\$ 40,000	392.83	\$ 40,000	392.83	5,892.46
Occupant Behaviour Strategies Total	\$ 100,000	93,537	\$ 115,000	222,336	\$ 115,000	222,336	\$ 100,000	93,537	\$ 100,000	93,537	2,304,646
Building Automation Training (site specific)	\$ -	-	\$ 15,000	128,799.59	\$ 15,000	128,799.59	\$ -	-	\$ -	-	901,597.11
Ongoing Training and Awareness Programs for Energy Conservation	\$ 50,000	31,178.87	\$ 50,000	31,178.87	\$ 50,000	31,178.87	\$ 50,000	31,178.87	\$ 50,000	31,178.87	467,683.10
Participation in EcoSchools	\$ 50,000	62,357.75	\$ 50,000	62,357.75	\$ 50,000	62,357.75	\$ 50,000	62,357.75	\$ 50,000	62,357.75	935,366.20
TOTAL	\$ 22,030,000	8,728,232	\$ 7,833,000	7,671,253	\$ 12,633,000	8,334,775	\$ 6,430,000	6,474,961	\$ 12,030,000	8,740,278	123,966,929