Peterborough Victoria Northumberland and Clarington Catholic District School Board

5-Year Energy Conservation and Demand Management Plan

July 2019

Prepared in co-operation with:

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Our Commitment to Energy Conservation

Peterborough Victoria Northumberland and Clarington Catholic District School Board

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June 27, 2019

To Whom It May Concern:

In the spirit of reducing the impact of rising energy costs, and in response to current regulatory requirements, Peterborough Victoria Northumberland and Clarington Catholic District School Board have developed a new 5-Year Energy Conservation and Demand Management (ECDM) Plan. This Plan outlines our progress against our original 2014 Plan as well as our planned conservation actions forward to 2024. This new plan and its related strategies and initiatives are supported by Board senior management.

This new Energy Conservation and Demand Energy Management Plan (ECDM Plan) has been updated in response to Ontario Regulation 507/18 made under the Conservation and Energy Efficiency section of the Electricity Act, 1998, requiring all public agencies to prepare, publish and implement an ECDM Plan. Our ECDM Plan fulfills the reporting requirements of the above regulations and provides the Board with a framework to support continued energy and sustainability initiatives within the built environment, operations, and programs. The Plan further identifies opportunities for continued energy conservation measures and sustainability initiatives to build on our existing plans and conservation efforts. Implementation of all initiatives is subject to future funding availability and budget approvals.

Our ECDM Management Plan has also been developed to address the fiscal, societal, and environmental costs and risks associated with energy consumption. Appropriate energy management will permit the Board to display leadership, improve the delivery of services, and enhance the overall quality of life within our Board.

Warmest Regards,

Isabel Grace

Isabel Grace CPA CA
Superintendent of Business and Finance
Peterborough Victoria Northumberland and Clarington Catholic District School Board

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Introduction – Executive Summary

Background

The Peterborough Victoria Northumberland and Clarington Catholic District School Board's (PVNCCDSB) Energy Conservation and Demand Management (ECDM) Plan was developed to meet the requirements of Ontario Regulation 507/18 requiring all public sector organizations to complete an update to their original 2014 ECDM Plan by July 1, 2019. In response to this regulatory requirement, as well as rising energy costs, The Board has developed this Energy Conservation and Demand Management (ECDM) Plan. This comprehensive Plan is an effective method of identifying energy conservation opportunities, selectively implementing the best projects and then measuring their effectiveness. The Plan has been developed to protect the interests of our school community and ensure that PVNCCDSB obtains the best possible value from our operating budgets. In addition to meeting our regulatory obligations, the Board believes that a strong commitment to energy conservation and a reduction of energy use is demonstrated evidence of our belief in becoming a more sustainable community while operating in a cost-effective manner that respects the value of taxpayer dollars.

Previous Results and Purpose of the Plan

The 5-Year Energy Conservation and Demand Management Plan is designed to guide PVNCCDSB towards a more energy-efficient future. The policies, practices and energy conservation measures identified illustrate the importance the Board places on acting responsibly towards energy consumption through the wise use of resources in Board operations.

To enhance our understanding of energy use and return on investment through conservation, this document contains a thorough review of the measures implemented since the creation of the original Plan, issued on July 1, 2014. Since then, the Board has initiated several substantial energy projects, yielding significant savings results, including:

- LED lighting and controls retrofits
- Boiler upgrades and replacements
- HVAC and controls retrofits and upgrades
- Building envelope and roofing improvements

The wise and efficient use of energy are two low cost options for meeting energy demands. They also provide many other environmental, economic and social benefits, including reducing greenhouse gas (GHG) emissions, cost avoidance and savings. Along with the primary benefits, the responsible use of energy also promotes local economic development opportunities, energy system reliability, improved energy supply security and reduced-price volatility.

Following the path of our previous ECDM Plan, this document is a continuation of a process involving the:

- Integration of establishing and evaluating a baseline for performance to be measured against;
- Reviewing the effectiveness of previous conservation efforts while setting future performance goals and objectives;
- Continuous improvement through identification of energy conservation potential;
- Strategic alignment of improvement measure implementation and fiscal constraints; and,
- Evaluation, measurement and communication of results achieved.

The following report summarizes the significant efforts applied by the PVNCCDSB Energy Conservation Team to create a Plan that can be implemented responsibly, over time, to create lasting results. The Plan takes advantage of internal expertise as well as all available external financial incentives and rebates currently being offered to support the implementation of energy savings ideas. The current energy picture for PVNCCDSB and our future Vision, Goals and Objectives as shown in the Board's Energy Conservation and Management Policy, are outlined. Our strategic focus areas are discussed in detail and our 5-year Action Plan is also laid out.

1.0 Historic Energy Performance

Historical Energy Usage

Effectively managing energy requires the creation of a robust energy monitoring strategy and establishing an accurate energy baseline is an essential first step in this process. This baseline assists with energy conservation and greenhouse gas reduction target setting, energy procurement and budgeting, bill verification, energy awareness, and the selection and assessment of potential energy projects. PVNCCDSB, similar to many other boards, relies on utility bills to establish this energy baseline.

To evaluate the effectiveness of the Board's previous energy conservation measures, the year 2013 was chosen as the base year for measurement; this aligns with the Ministry of Energy's Regulation 507/18 requirements for reporting. Overall, the Board's consumption in 2013 was 14.8 million kWh of electricity and 2.7 million m^3 of natural gas. This usage equates to spending $2.0 million for electricity and $863,000 for natural gas for the year (2013).

For comparative purposes, the raw energy consumption breakdowns by month since the original baseline for the Board are as follows:

Figure 1-1 – Electricity Use (2013 – 2018)

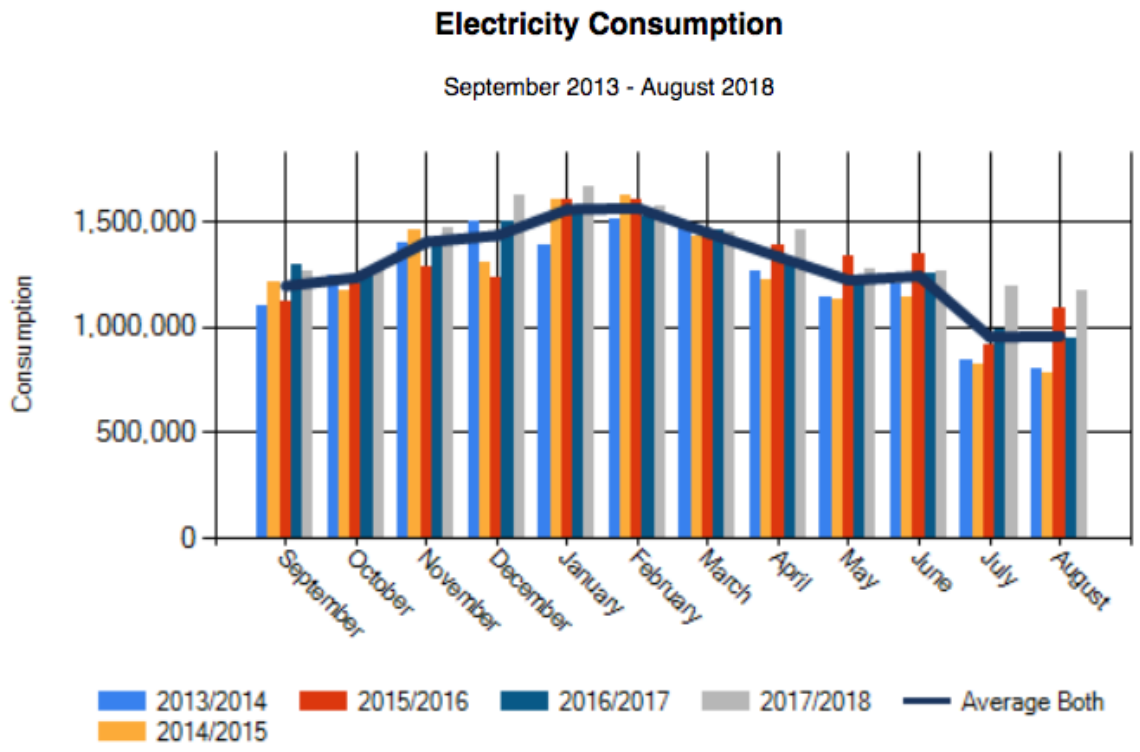


Figure 1-2 – Natural Gas Use (2013 – 2018)

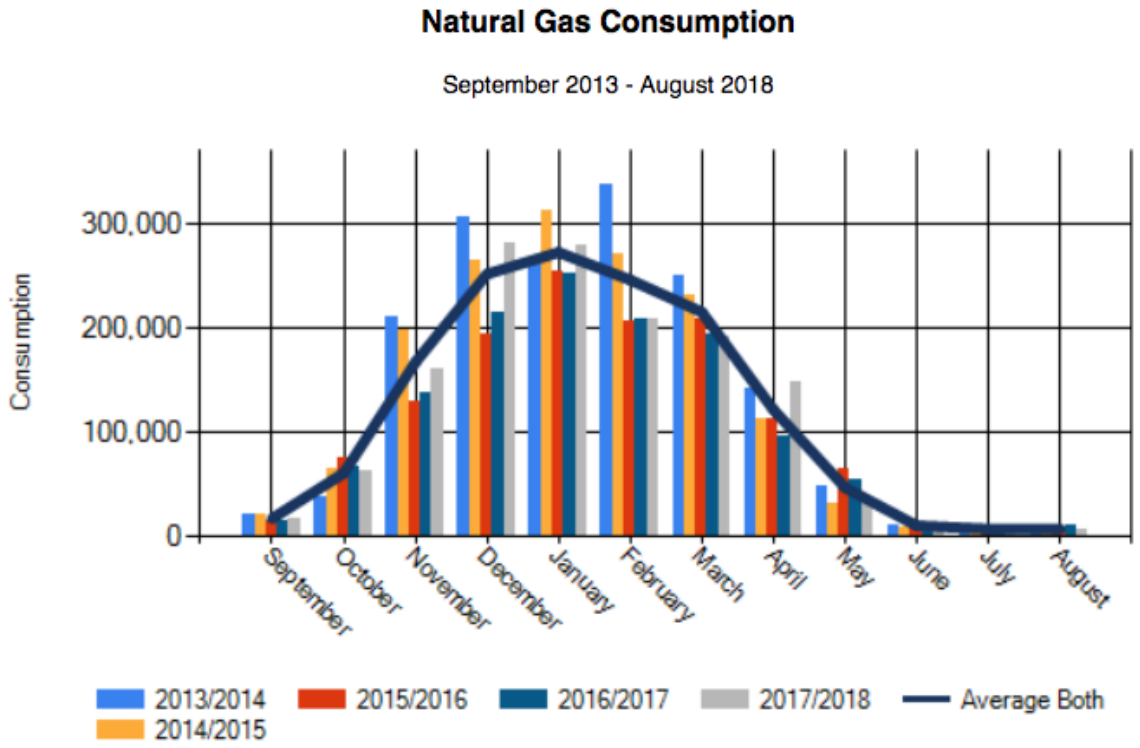
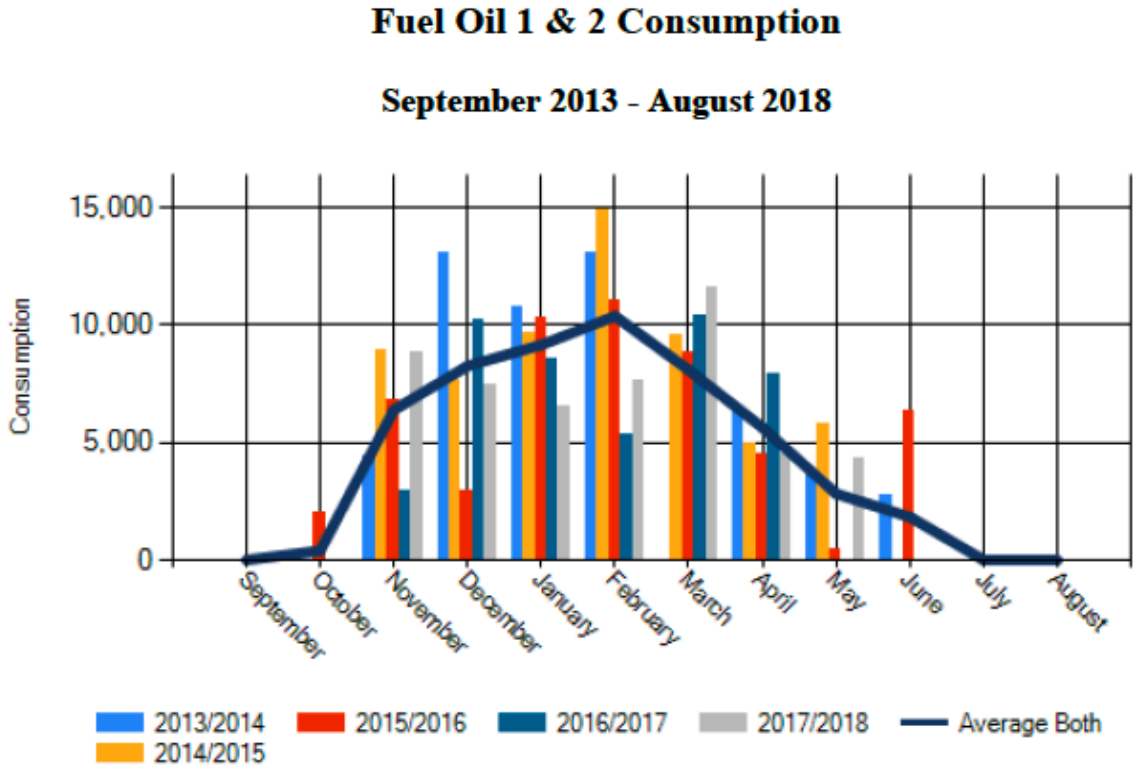


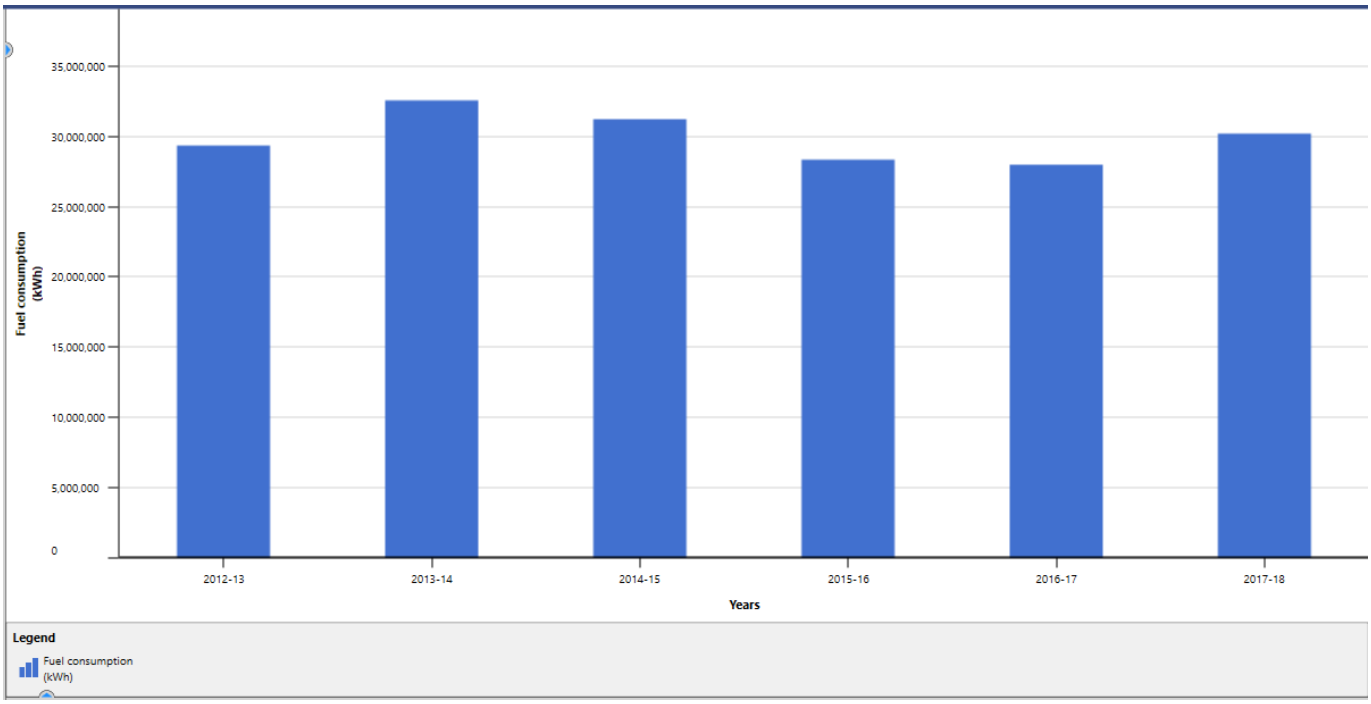
Figure 1-3 – Fuel Oil Use (2013 – 2018)



Peterborough Victoria Northumberland and Clarington Catholic District School Board Energy Baseline Analysis

For comparative purposes, the following equivalent kilowatt hours (ekWh) report was created using RETScreen's Portfolio Manager reporting system. Using ekWh's allows for a comparison of total energy used (electricity and natural gas) giving an analysis of total energy usage for the Board:

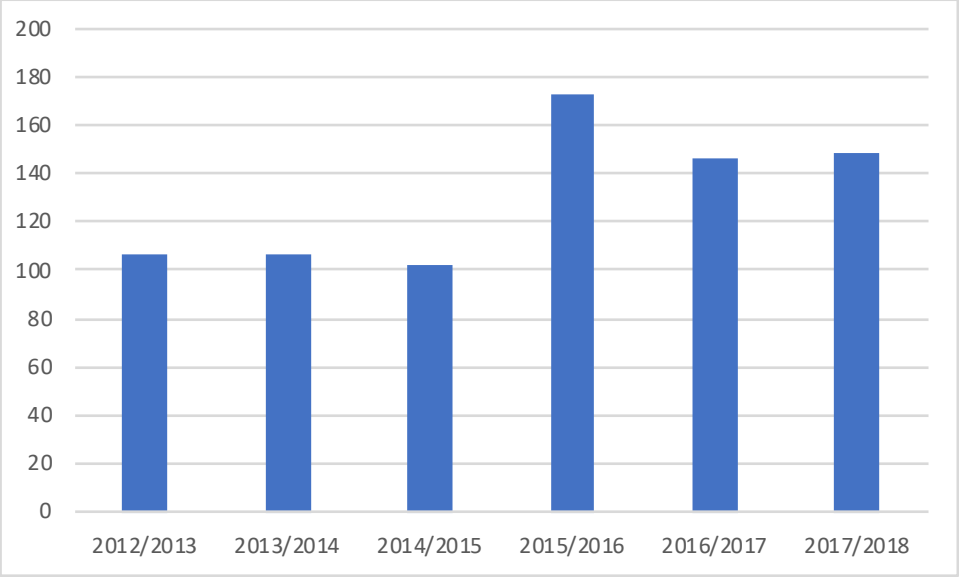
Figure 1-4 – ekWh Comparison (Fiscal 2013/2014 – 2017/2018)



This chart reveals that the Board increased their ekWh consumption by 2.9% between the base year of 2013/2014 (793,558 ekWh) and 2017/2018 (816,639 ekWh).

Changes in total m2 of facility floor area can influence overall energy usage for the Board. For example, building a new school or removing an old one from the building fleet can have a significant effect on Board-wide energy consumption. Similarly, weather and temperature are major variables affecting energy consumption.

Figure 1-4 Weather-Normalized Energy Intensity (ekWh/m^2)



Over the past 5 years, the Board's Weather-Normalized Energy Intensity (ekWh/m2) has gone through both an increasing and decreasing pattern, peaking during the 2015/2016 year. Since that time, the Board has managed to reduce its overall energy intensity by 14%. This means that the Board's conservation efforts have had a strong effect on energy consumption, as the previous rising trend in this measurement has been halted. This analysis reveals a slightly different pattern than with the raw data analysis indicating the influence of weather and temperature on the Board's energy consumption.

Energy Conservation Project Successes

Since the creation of the last 5-Year ECDM Plan, the Board has initiated significant investments in energy efficiency and energy-cost reduction. These projects include:

- LED lighting retrofits
- Audits and retro-commissioning assessments
- HVAC and controls upgrades
- Boiler retrofits and replacements

Details of our previous conservation investments can be found in Appendix B.

2.0 Energy Conservation and Management Policy

Our Commitment

PVNCCDSB is committed to allocating the necessary resources to develop and implement a strategic Energy Conservation and Demand Management (ECDM) Plan that will reduce energy consumption and its related environmental impact. As an organization, we value the notion of efficient operations and creating a more sustainable community.

We are committed to managing energy responsibly and will use energy efficiency practices throughout our facilities, operations and equipment wherever it is cost effective and we are able to secure funding to do so.

Our Vision

PVNCCDSB endeavours to minimize energy consumption, related costs, and carbon emissions by continuously improving its energy management practices without compromising the level of service delivery to the school community.

Our Goals and Objectives

As part of our 2019 ECDM Plan, the Board created several strategic avenues to achieve specific goals and targets with regards to energy management. We have re-examined our past objectives and are re-committing to this updated version.

1. Reduce energy intensity in Board facilities by 5% by 2024.

2. Enhance our culture of conservation through training and outreach to staff, students and facility users. Through this training staff will have the appropriate knowledge and training to be empowered to reduce energy consumption.

3. Expand upon our comprehensive energy management policy and practices by enhancing key existing business practices to include energy efficiency standards and energy management best practices.

4. Expand our monitoring and tracking program for energy use by providing access to our energy management system to make energy consumption visible to everyone in the corporation and support facility/management decision-making.

5. Deliver energy cost savings through the identification and implementation of processes, programs and projects that will reduce energy consumption.
   - Re-assess and benchmark the top energy consuming facilities in the Board. (2019)
   - Review previously identified energy savings opportunities through review of past energy audits and plan to renew energy audits and analysis of the capital asset renewal program. (Ongoing)

- Review and/or enhance standard operating and maintenance procedures to include energy conservation best practices. (Ongoing)
- Seek funding for energy-related projects from various sources to enhance the payback and reduce implementation costs. (Ongoing)

Strategic Action Plan

To achieve our new ECDM Plan, the Board will employ three strategic actions designed to ensure a positive outcome over the next 5 years. These key strategies support the delivery of our Goals and Objectives.

Strategy 1. Policies and Practices

Develop policies and practices that support the energy conservation effort and show leadership and commitment within the Board and community.

- Energy Management Team: Roles, Responsibilities and Accountability

Strategy 2. Education, Awareness & Outreach

Provide the guidance, leadership and framework necessary to empower staff and develop a culture of conservation.

- Energy Skills Training Program
- Energy Awareness Training
- Outreach, Engagement and Recognition Programs
- Feedback System for Staff Suggestions
- Brainstorming Sessions

Strategy 3. Energy Conservation Action Plan and Energy Information Management

Continually identify and deliver energy conservation processes, programs and projects in all areas of the Board (facilities, equipment, etc.). Demonstrate sound operating and maintenance practices to complement the energy efficiencies implemented through the capital asset renewal program. Employ a robust Energy Information Management System to ensure that all conservation activities are measured and verified to ensure the Board receives and maintains specified energy reductions and savings.

Energy Conservation Action Plan

- Key facility energy audits and re/retro-commissioning studies
- Asset renewal plan and energy conservation project delivery
- Standard facility operations procedure review

Energy Information Management

- Maintenance of the online energy monitoring and reporting system (electricity, natural gas and fuels)
- Regular Energy Use Review presentations for the community, council, accountable staff and energy users
- Energy bill verification and rate optimization
- Reporting requirements for Regulation 507/18 (formerly 397/11)

- Consistent updates and review of key performance indicators (KPIs)/benchmarking
- Standardize and implement project measurement and verification

3.0 STRATEGY 1: Energy Management Practices

PVNCCDSB has implemented essential practices, including key personnel deployment, to ensure a strong focus on energy management and savings. These efforts remain a key component of our renewed ECDM Plan.

The Energy Management Team: Roles and Responsibilities

Energy Sponsor: Superintendent of Business and Finance

The Energy Sponsor is ultimately responsible for creating budgets, securing spending authority and resources for the program. This role is responsible for setting and/or legitimizing the program's high-level goals and objectives, keeping track of major project activities and approving resources and funding for the team and its approved projects.

Energy Champion: Manager of Facility Services

The Energy Champion has direct knowledge of the Board's major energy-using systems and is responsible for developing and maintaining the focus for the Energy Management Team. The PVNCCDSB Energy Champion coordinates meetings, sets agendas, and delegates and manages tasks related to the Energy Management Team. This role helps create the vision for the program and will help the program maintain momentum, particularly when barriers arise. The Energy Champion is also responsible for ensuring that the monitoring and tracking systems for energy are accurate, up-to-date and available for use by Board staff.

The Energy Champion should have a technical background and is responsible for supporting and reporting on the technical aspects of the energy projects at all facilities. This role may also lead energy conservation projects as the project manager.

Board Energy Management Team

The Energy Management Team functions on a strategic level to set expectations for each of the Board facilities, develops metrics for tracking overall energy improvement, and builds accountability for energy management activities. In addition, this cross-functional team has direct responsibility for the consumption of energy within their respective departments. As a group, the team supports and monitors the energy management initiatives (processes, programs, and projects) at the various facilities and across the Board.

Actions: Continue to seek cross-departmental membership and support for the Energy Management Team. Continue to discuss the Energy Management Program to ensure implementation of new savings ideas as well as maintain the positive momentum built over the past 5 years.

4.0 STRATEGY 2: Education, Awareness and Outreach

The Board's Education, Awareness and Outreach program will be utilized to assist with the Board's culture of conservation. This will be achieved by raising the level of awareness, understanding and general knowledge amongst staff regarding energy spending, usage and conservation. The Board will utilize a successful combination of program engagement, direct awareness marketing and hands-on training to enhance our energy reduction efforts to support the achievement of our energy conservation goals and objectives. As well, energy will be a regular agenda item at staff meetings to solicit new ideas for reduction of energy use, promote continued awareness of the cost of energy and ensure that energy conservation remains a key consideration for all Board staff.

The Education, Awareness and Outreach program provides guidance, leadership and the framework to empower staff and foster our culture of conservation. The program informs the organization of current energy use, operational practices as well as improvement opportunities, while ensuring that all staff have an opportunity to remain informed of the Board's energy reduction efforts. This continued practice will foster the greatest possible impact of education and awareness.

The program is comprised of the following focus areas:

Energy Skills Training Program

The Energy Skills Training Program is a vehicle for staff to continue to develop a general awareness and understanding of current energy use within the Board as well as skills to identify opportunities for improvement. The Training Program combines both general knowledge training and hands-on experience to gain maximum benefit.

Staff Brainstorming Sessions are an important part of the Energy Skills Training Program and are encouraged during the Energy Team meetings as a way of generating new ideas for energy conservation. As regular users and managers of Board facilities, our staff are one of our most valuable resources to both generate and implement our energy conservation strategies.

Outreach, Engagement, Recognition and Energy Awareness Training Program

PVNCCDSB will be used to engage all users of Board facilities (staff, students and the general public); recognizing that this is essential to the continued success of the energy management program. Our energy program will employ a comprehensive approach to both engaging staff and recognizing the efforts of staff who provide important support and ideas.

The Energy Awareness Training Program will provide consistent energy conservation messaging throughout all departments using Community-Based Social Marketing (CBSM) techniques to engage all users of Board facilities. Specific methods include conservation tips, eye-catching posters and other relevant marketing tools.

Feedback System for Staff and Student Suggestions

PVNCCDSB will create a feedback system to encourage staff to provide input and ideas. The suggestions submitted will be forwarded to the Energy Management Team to ensure a prompt response. The Energy Management Team can engage relevant staff to ensure that all ideas are captured and explored.

Actions: Review available energy training opportunities both generally (i.e. all staff) and for specific departments. Establish and maintain at least annual Outreach and Engagement efforts to keep energy conservation 'top-of-mind' for staff, students and stakeholders.

5.0 STRATEGY 3: Energy Conservation Activities and Information Management

Energy Conservation Action Plan

The Ministry of Energy 2019 Energy Conservation and Demand Management Plan Template (Appendix A) forms the blueprint for implementing energy conservation and cost saving measures. The Board has created a list of potential projects based on previous facility energy audits. The attached action plans have been created to guide this process based on a prioritized implementation schedule. All available incentives and funding sources will be explored to minimize the implementation cost of each measure. In addition to the measures shown, the Board anticipates that further energy audits, completed over the next 5 years, will augment the list of available energy conservation measures.

Appendix B contains a year-by-year implementation strategy and includes a by-facility breakdown. The strategy also highlights the measures that will be completed as part of our on-going maintenance program along with measures that were disqualified and those requiring further investigation to determine feasibility.

In all, the measures will include:

- Roofing and building envelope improvements
- Boiler replacements
- HVAC and controls upgrades

Additional measures will be added as funding becomes available on an annual basis. In general terms, our actions are expected to yield the following results:

- Education, Awareness and Outreach: 1-2% annual energy savings
- On-going regular reviews of consumption and baselines: 0.5 to 1% annual energy savings
- Re/retro Commissioning: 2-7% annual energy savings within the facilities where it is implemented (estimated to be 1% overall potential total annual savings)

Actions: Maintain a schedule of energy audit and re/retrocommissioning study renewals to ensure that our list of measures is up-to-date and that previous measures are still functional and providing savings. Perform periodic reviews of available incentives and stay up-to-date on potential sources of funding to offset the implementation costs of the proposed future measures. Review the list of measures at least annually and update as funding becomes available.

Energy Information Management

Online Energy Monitoring and Reporting System

The PVNCCDSB utilizes the Ministry of Education's Utility Consumption Database (UCD) portal and has implemented a system for managing and reporting on its energy consumption (electricity, natural gas, fuels) and water. The motivation for this effort is the notion that "you can't manage what you are not aware of". By

making our energy usage visual, and keeping the information up-to-date, all personnel can benefit from understanding the nature of energy use in their facilities, as well as the impact their actions or inactions have on the Board's overall energy cost and budgeting. This information is also key in evaluating the potential of new conservation projects as well as measuring the effectiveness of initiatives already taken.

Actions: Continue to gather and upload energy data into the Energy Information Management System regularly and analyze the data for patterns and savings opportunities.

Energy Management Presentations for Staff, Students and Energy Users

To gain traction for the initiatives within this Plan and ensure that the Board reaches its stated reduction targets, it is imperative that information regarding energy usage and cost, as well as the Board's energy conservation plans and projects, are well understood and top of mind of everyone from front-line staff to senior management. This broad awareness will lead to additional buy-in and support for the Board's continued efforts to reduce its energy usage and spending.

Actions: Make energy a key topic at staff and senior management meetings as well as provide an update on energy use and conservation to senior management, at least annually.

Key Performance Indicators (KPI's) and Monitoring and Verification

To ensure momentum continues, and the Board receives value-for-money with regards to its energy conservation efforts, a rigorous program of establishing KPI's and then monitoring and verifying ongoing savings is an essential element of this Plan. By establishing agreed upon KPI's and then performing regular and frequent monitoring, not only will Board personnel be able to verify that savings expected from various projects is achieved, but that the savings continue for the duration of the project or retrofit's useful life. This practice will protect the Board's investments as well as provide transparency and support for successful savings initiatives.

Actions: Review all conservation initiatives to understand the most appropriate monitoring and verification process. Review the project savings at pre-defined regular intervals and report outcomes to senior management.

Bill Verification and Rate Optimization

A consistent, periodic review of the Board's energy invoices is important to ensure that rates and recorded consumption values on energy bills is accurate. This ensures that the invoices presented by utilities are correct and are providing appropriate and relevant data to the Board's Energy Management Platforms.

Actions: Perform a rationalization check on monthly invoices and conduct at least annual detailed billing reviews to ensure accuracy.

Ongoing Ontario Regulation 507/18 Reporting

In addition to completing this Plan, PVNCCDSB is required to submit annual energy consumption and greenhouse gas emissions templates to the appropriate Ministry of Energy portal. Gathering and recording monthly energy invoices are necessary to complete these reports.

Actions: Complete all required regulatory reporting by July 1 of each year.

APPENDIX A: Ministry of Energy 2019 Energy Conservation and Demand Management Plan Template

Peterborough Victoria
Northumberland and Clarington
Catholic District School Board

Energy Conservation and Demand

Management Plan

The plan is due by July 1, 2019.

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Education Sector Background

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 assignment in March for the next school board Fiscal Year (September 1st to August 31st). The Ministry gives funding only on a year-by-year basis.

While a board may have a five-year energy management strategy, the ability to implement their strategy depends on the funding that's received for each of the five years covered by their plan.

Asset Portfolios and Energy Management Planning

The education sector is unique in that a board's asset portfolio can experience important changes that crucially impact a board's energy consumption over a five-year period.

The following is a list of some of the most common variables and metrics that change in the education sector.

Facility Variables:

- Construction
    - Year built
    - Number of floors
    - Orientation of the building
- Building Area
    - Major additions
    - Sites sold/closed/demolished/leased
    - Portables
        - Installed
        - Removed
    - Areas under construction
- Equipment/Systems
    - Age
    - Type of technology
    - Lifecycle
    - Percentage of air-conditioned space

- Site Use
    - Elementary school
    - Secondary school
    - Administrative building
    - Maintenance/warehouse facility
    - Community Hubs
- Shared Site Use (For example: two or more boards share common areas and/or partnered with a municipality)
    - Swimming pools
    - Libraries
    - Lighted sports fields
    - Sports domes

Other Variables:

- Programs
    - Child care
    - Before/After School Programs
    - Summer School
    - Community Use
        - Outdoor ice rinks
- Occupancy
    - Significant increase or decrease in number of students
    - Significant increase in the hours of operation
    - New programs being added to a site
- Air Conditioning
    - Significant increase in air-conditioned space
    - Portables
- Other
    - _____
    - _____

PART I: A REVIEW OF PROGRESS & ACHIEVEMENTS in the PAST FIVE YEARS

A. The Board's Asset Portfolio

The following table outlines the energy-related variables and metrics 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 1: Board's Asset Portfolio

Key Metrics	(Baseline Year) Fiscal Year 2012 to 2013	Fiscal Year 2017 to 2018	Variance
Total Number of Buildings	**40.00**	**38.00**	**0.00**
Total Number of Portables/Portapaks	**133.00**	**119.00**	**-9.00**
Total Floor Area (ft^2)	**2,015,634.88**	**2,000,525.49**	**-6,932.00**
Average Operating Hours	**49.00**	**49.00**	**0.00**
Average Daily Enrolment	**13,283.60**	**14,952.00**	**1,668.40**
Other Relevant Changes in the Operation of Assets:			

B. Energy Usage Data for the Board

The following table lists the "metered"[1] consumption values in the common unit of Equivalent Kilowatt Hours (ekWh) and Kilowatt Hours (kWh).

Table 2: Metered Usage Values

Utility	Fiscal Year 2012 to 2013 (Baseline year)	Fiscal Year 2017 to 2018
Total Electricity (kWh)	**14,024,390.00**	**14,338,320.00**
Total Natural Gas (ekWh)	**14,666,560.00**	**14,438,430.00**
Total Heating Fuel (Type 1 and 2) (ekWh)	**0.00**	**0.00**
Total Heating Fuel (Type 4 and 6) (ekWh)	**528,700.80**	**0.00**
Total Propane (ekWh)	**0.00**	**0.00**
Total Wood (ekWh)	**0.00**	**0.00**
Total District Heat (ekWh)	**0.00**	**0.00**
Total District Cool (ekWh)	**0.00**	**0.00**

C. Weather Normalized Energy Consumption Values

In Ontario, 25% to 35% of energy consumption for a facility is affected by weather.

To demonstrate the effect of weather, the following table shows the Weighted Average Heating Degree Days (HDD)[2] and Cooling Degree Days (CDD)[3] for the six most common Environment Canada weather stations in the Ontario education sector.

1 Metered consumption is the quantity of energy used and does not include a loss adjustment value (the quantity of energy lost in transmission).

[2] 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.

[3] 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.

Table 3: 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

The best way to compare energy usage values from one year to another is to use weather normalized values as they take into consideration the impact of weather on energy performance and allows an "apple-to-apple" comparison of consumption across multiple years.

However, a straight comparison of Total Energy Consumed between one or more years does not take into consideration changes in a board's asset portfolio, such as changes in buildings' features (refer to the Facility Variables listed on pages 5 and 6), and newly implemented programs (refer to the Note to Readers on pages 10-12) which will greatly impact energy consumption.

As a result, weather normalized Energy Intensity[4] is the most accurate measurement that allows the evaluation of a board's energy use from one year to another as it cancels out any change in floor area. The unit of measurement used is either equivalent kilowatt hours per square foot (ekWh/ft2) or equivalent kilowatt hours per square metre (ekWh/ft2).

Table 4: Weather Normalized Values

Weather Normalized Values	Fiscal Year 2012 to 2013 (Baseline Year)	Fiscal Year 2017 to 2018 (Most Recent Data Available)
Total Energy Consumed (ekWh)	**19,865,530.00**	**27,665,340.00**
Energy Intensity (eKWh/ft2)	**9.86**	**13.77**
Energy Intensity (eKWh/m2)	**106.09**	**148.25**

4 Energy Intensity (known as EI) is the quantity of total energy consumed divided by the total floor area. EI is typically expressed as equivalent kilowatt hours per square foot (ekWh/ft2), gigajoule per square metre (GJ /m2), etc., depending on the user's preference.

D. Review of Previous Energy Conservation Goals and Achievements

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

Table 5: Comparison of Energy Intensity Conservation Goal and Actual Energy Intensity Reduced

Fiscal Year	Conservation Goal ekWh/ft2	Conservation Goal ekWh/m2	Conservation Goal Percentage	Actual Energy Savings ekWh/ft2	Actual Energy Savings ekWh/m2	Actual Energy Percentage
2013 to 2014		**0.64**	**0.60**	**-0.04**	**-0.38**	**-0.36**
2014 to 2015	**6.89**	**0.64**	**0.60**	**0.45**	**4.85**	**4.56**
2015 to 2016	**6.57**	**0.61**	**0.60**	**-6.55**	**-70.51**	**-69.40**
2016 to 2017	**11.09**	**1.03**	**0.60**	**2.45**	**26.39**	**15.33**
2017 to 2018	**9.36**	**0.87**	**0.60**	**-0.23**	**-2.51**	**-1.72**

NOTE TO READERS:

The Conservation Goals were forecasted in Spring 2014. Since then several factors, which impact energy use, have been introduced to the education sector that may either raise or limit a board's ability to make the forecasted Conservation Goals.

Some of these factors include:

Full Day Kindergarten (also known as FDK)

The introduction of FDK created many new spaces through new additions or major renovations of existing facilities. The result was more floor area and sometimes more energy-intensive designs due to factors such as:

- Higher ventilation requirements,
- Use of air conditioning, etc.

These factors increase the energy intensity of a building. Under FDK, spaces for more than 470,000 new students were added to the education sector.

Before and After School Programs

These programs were implemented to help the introduction of FDK spaces. However, Before-School and After-School Programs need a facility's Heating, Conditioning, and Air Conditioning (also known as HVAC) system to operate for an extended period of time on a daily basis, which will increase the overall energy intensity.

Community Use of Schools

The Ministry of Education introduced funding to all school boards, so they can make school space more affordable for use after hours. Both indoor and outdoor school space is available to not-for-profit community groups at reduced rates, outside of regular school hours. The use of spaces in schools, typically gymnasiums and libraries, increased to maximum usage. The use of these spaces during non-school hours requires a facility's HVAC system to operate for an extended period of time on a daily basis, which will increase the overall energy intensity.

Community Hubs

In 2016, the Ministry of Education introduced funding for boards to carry out Community Hubs within their asset portfolios. As a result, many schools now offer a greater range of:

- events (cultural),
- programs (arts, recreation, childcare), and
- services (health, family resource centres).

The dramatic increase in community use means that many schools now run from 6:00 a.m. until 11:00 p.m. during weekdays and are open many times on weekends. The use of these spaces during non-school hours requires a facility's HVAC system to operate for an extended period of time on a daily basis, which will increase the overall energy intensity.

Air Conditioning

Historically, schools have not had air conditioning, or it has been a minimal space in the facility. However, with changing weather patterns, "shoulder seasons" such as May, June and September are experiencing higher than normal temperatures. Parents are demanding that schools have air conditioning. Air conditioning significantly increases a facility's energy use.

Compliance with current Ontario Building Code (also known as OBC)

When renovations or an addition is built onto an existing school, in-place equipment such as HVAC systems, lighting etc., may be required to meet up-to-date OBC standards which may result in increased energy use.

For example under the OBC, buildings built today have increased ventilation requirements, meaning more outside air is brought into a facility. As a result, HVAC systems need to work longer to heat or cool the outdoor air to bring it to the same temperature as the standard indoor temperature for the building.

E. Cumulative Energy Conservation Goal

The following table compares the 2014 Forecasted Cumulative Energy Intensity Conservation Goal with the Actual Cumulative Energy Intensity Reduced Savings.

Table 6: Cumulative Energy Intensity Goal from Fiscal Year 2013 to 2014 through Fiscal Year 2017 to 2018

Cumulative Energy Intensity	(ekWh/ft2)	(ekWh/m2)	Variance
Forecasted. Cumulative Energy Intensity Conservation Goal of Fiscal Year 2013 to 2014 through Fiscal Year 2017 to 2018	**-34.23**	**-3.18**	Do not write in this cell
Forecasted Cumulative Energy Intensity Conservation Goal as a Percentage	Do not write in this cell	Do not write in this cell	**3%**
Actual Cumulative Energy Intensity Reduced or Increased from Fiscal Year 2013 to 2014 through Fiscal Year 2017 to 2018 – Weather Normalized	**453.81**	**42.16**	Do not write in this cell
Variance between 2014 Forecast Cumulative Conservation Goal and Actual Cumulative Energy Intensity– Weather Normalized	**419.58**	**38.98**	Do not write in this cell
% of Cumulative Energy Intensity Conservation Goal Achieved - Weather Normalized	Do not write in this cell	Do not write in this cell	

F. Measures Implemented from Fiscal Year 2012 to 2013 to Fiscal Year 2017 to 2018

A list of the measures implemented, the related costs, and the fiscal year that the measure was implemented within the Board are outlined in **Appendix: Investments in Energy Efficiency between Fiscal Year 2013 and Fiscal Year 2018.** Here is the list of sheets:

1. Design, Construction and Retrofit Investments
2. Operations and Maintenance Investments
3. Occupant Behaviour Investments
4. Renewable Energy Investments
5. Summary of All Investment Types

NOTE TO READERS:

Important Consideration - It takes a minimum of one full year after an energy management strategy has been implemented before an evaluation can figure out the related actual energy savings achieved.

PART II – ENERGY CONSERVATION and DEMAND MANAGEMENT PLAN for FISCAL YEAR 2018 to 2019 to FISCAL YEAR 2023 to 2024

Part II outlines the board's plan to reduce energy consumption through renewable energy and energy management strategies including:

1. Design, Construction and Retrofit;
2. Operations and Maintenance; and lastly
3. Occupant Behavior.

Background

1. To date the Board's energy management strategy has included the following:

PVNCCDSB endeavours to minimize energy consumption, related costs, and carbon emissions by continuously improving its energy management practices without compromising the level of service delivery to the school community.

2. The Board has an energy management position which includes the following options.
   - ☒ In-house including:
     a. Shared job function
   - ☒ Contracted third party, or
   - ☐ None

3. Energy Management Strategies

Energy management strategies fall into four key categories:

1. Renewable Energy
2. Design/Construction/Retrofit
3. Operations and Maintenance
4. Occupant Behaviour

Renewal Energy

Definition

Renewal energy is a strategy to cut down a board's energy use from the province's electricity grid and includes:

- solar panels
- wind turbines, etc.

For a list of the Board's renewable energy projects, please refer to the **Calculating Energy Conservation Goals Fiscal Year 2019 to Fiscal Year 2023** explained in **Appendix A: Renewable Energy**.

Design/Construction/Retrofit

Definition

Design, construction, and retrofit includes the original and ongoing intent of how a building and its systems are to work through the combination of disciplines such as architecture and engineering.

For the Board's relevant projects over the next five years, please refer to **Calculating Energy Conservation Goals Fiscal Year 2019 to Fiscal Year 2023, Appendix B: Design, Construction, and Retrofit.**

Operations and Maintenance

Definition

Operations and maintenance include the strategies the Board uses to make sure that the existing buildings and equipment performs at maximum efficiency. For the Board's relevant projects over the next five years, please refer to **Calculating Energy Conservation Goals Fiscal Year 2019 to Fiscal Year 2023, Appendix C: Operations and Maintenance.**

Occupant Behaviour

Definition

Strategies that the Board uses to teach occupants, including staff, students and community users, with an emphasis on changing specific actions to reduce energy consumption. For the Board's relevant projects over the next five years, please refer to **Calculating Energy Conservation Goals Fiscal Year 2019 to Fiscal Year 2023, Appendix D: Occupant Behaviour.**

A. Future Energy Conservation Goals

The Board has set out the following energy intensity reduction conservation goals for the next five fiscal years.

Table 7: 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
ekW/ft2	**0.27**	**0.27**	**0.27**	**0.27**	**0.27**
ekW/m2	**2.93**	**2.93**	**2.93**	**2.93**	**2.93**
Percentage Decrease	**1.97**	**1.97**	**1.97**	**1.97**	**1.97**

The following table shows the Board's Cumulative Energy Intensity Conservation Goal for the next five fiscal years.

Table 8: Cumulative Conservation Goal

Cumulative Conservation Goal	Fiscal Year 2018 to 2019 through Fiscal Year 2022 to 2023
ekWh/ft2	**1.35**
ekWh/m2	**14.52**
Percentage Decrease	**9.79**

NOTE TO READERS:
There are many factors that influence a board's ability to meet energy conservation goals. A list of some of these factors include, but are not limited to, in the following changes:

1. Changes in Programming

   For example:
   - Introduction of Before and After School Programs to schools meant that the number of hours that a facility's HVAC system operates daily was expanded by four or more hours per weekday to reflect the longer occupancy hours.

2. Changes to the Ontario Building Code

   For example:
   - Regular changes/updates to the Ontario Building Code can impact energy use. For example, an increase in levels of ventilation in newly constructed buildings or other requirements. As a result, more fresh air is brought into a school to meet the ventilation requirements throughout the day requires heating and cooling of the air (dependent on the season) to meet standard classroom temperatures.

3. Changes to School Board Funding Models

   - Forecasted Conservation Goals are based on current funding models being in place throughout the next five years.
   - All boards' funding is determined on an annual basis. Any changes to the funding model will impact forecasted values.

4. Changes in Technology

   - Forecasted Conservation Goals are based on current technologies and related energy savings. If new technologies become available, anticipated energy savings may increase.

B. Environmental Programs

In Fiscal Year 2018 to 2019, schools within the Board participated in environmental programs.

1. Eco Schools:
   12 schools participate
2. Earth Care Schools:
   0 schools participate
3. Enbridge: The School Energy Challenge
   0 schools participate
4. Other: The School Energy Challenge
   The name of the program is National Sweater Day
   16 schools participate

C. Energy Efficiency Incentives

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

   X Yes ☐ No

   If yes, between Fiscal Year 2013 to 2014 and Fiscal Year 2017 to 2018, the Board has applied for incentive funding from different agencies to support the implementation of energy efficient projects.

2. The Board uses the services of the sector's Incentive Programs Advisor (IPA).

   X Yes ☐ No

D. Energy Procurement

1. The Board participates in a consortia arrangement to purchase electricity.

   ☐ Yes X No

   If yes,

   ☐ OECM's Strategic Electricity Management and Advisory Services
   ☐ Other:
   Provide Name of Consortia: _____

2. The Board participates in a consortia arrangement to purchase natural gas.

   ☐ Yes X No

   If yes,

   ☐ Ontario Education Collaborative Marketplace's (also known as OECM) Natural Gas Management and Advisory Services
   ☐ Catholic School Board Services Association' (also known as CSBSA) Natural Gas Management and Advisory Services
   ☐ Other:
   Provide Name of Consortia: _____

E. Demand Management

1. The Board uses the following method(s) to monitor electrical Demand:
   - [X] Invoices
   - [X] Real-time data
   - [ ] Online data from the Local Distribution Company (LDC)
   - [ ] Other:

     _____

2. The Board uses the following methodologies to cut down electrical Demand:
   - [X] Equipment scheduling
   - [X] Phased/staged use of equipment
   - [ ] Demand-limit equipment
   - [ ] Deferred start-up of large equipment (e.g. chiller start-up in spring)
   - [ ] Other:

     _____

F. Senior Management Approval of this Energy Conservation and Demand Management Plan

I confirm that Peterborough Victoria Northumberland and Clarington Catholic District School Board senior management has reviewed and approved this Energy Conservation and Demand Management Plan.

Full Name: **Isabel Grace CPA, CA**

Job Title: **Superintendent of Business & Finance**

Date: **June 21, 2019**

APPENDIX B: Historic and Planned Energy Conservation Measures and Calculations

Investments in Energy Management Strategies

Press TAB to moveto input area. Press UP or DOWN ARROW in column A to read through the document.

Design, Construction and Retrofit Strategies

	2013-2014	2014-2015	2015-2016	2016-2017	2017-2018
Lighting	**Investments in Energy Management Strategies**	**Investment in Energy Management Strategies**	**Investment in Energy Management Strategies**	**Investment in Energy Management Strategies**	**Investment in Energy Management Strategies**
High-efficiency Lighting Systems (T-8, T-5, CFL, LED ...)	$ -	$ 25,000	$ -	$ 35,000	$ -
Daylight Sensors	$ -	$ -	$ -	$ -	$ -
Outdoor Lighting	$ -	$ -	$ -	$ -	$ -
Occupancy Sensors	$ -	$ -	$ -	$ -	$ -
Daylight Harvesting	$ -	$ -	$ -	$ -	$ -
Other (Describe)	$ -	$ -	$ -	$ -	$ -

	2013-2014	2014-2015	2015-2016	2016-2017	2017-2018
HVAC	**Investment in Energy Management Strategies**	**Investment in Energy Management Strategies**	**Investment in Energy Management Strategies**	**Investment in Energy Management Strategies**	**Investment in Energy Management Strategies**
Efficient Boilers (near condensing)	$ -	$ -	$ -	$ 10,000	$ -
High-efficiency Boilers (condensing)	$ -	$ 548,000	$ 54,000	$ 54,000	$ 760,600
High-efficiency Boiler Burners	$ -	$ -	$ -	$ -	$ -
Geothermal	$ -	$ -	$ -	$ -	$ -
Heat Recovery/Enthalpy Wheels	$ -	$ -	$ -	$ -	$ -
Economizers	$ -	$ -	$ -	$ -	$ -
Energy Efficient HVAC Systems	$ -	$ -	$ 50,000	$ -	$ -
Energy Efficient Rooftop Units	$ -	$ -	$ -	$ -	$ -
High-efficiency Domestic Hot Water	$ -	$ -	$ -	$ -	$ -
Efficient Chillers and Controls	$ -	$ -	$ -	$ -	$ -
High-efficiency Motors	$ -	$ -	$ -	$ -	$ -
VFD	$ -	$ -	$ -	$ -	$ -
Demand Ventilation	$ -	$ -	$ -	$ -	$ -
Entrance Heater Controls	$ -	$ -	$ -	$ -	$ -
Other (Describe)	$ -	$ -	$ -	$ -	$ -

	2013-2014	2014-2015	2015-2016	2016-2017	2017-2018
Controls	**Investment in Energy Management Strategies**	**Investment in Energy Management Strategies**	**Investment in Energy Management Strategies**	**Investment in Energy Management Strategies**	**Investment in Energy Management Strategies**
Building Automation Systems - New	$ -	$ -	$ -	$ -	$ -
Building Automation Systems - Upgrade	$ -	$ -	$ 75,000	$ -	$ -
Other (Describe)	$ -	$ -	$ -	$ -	$ -

	2013-2014	2014-2015	2015-2016	2016-2017	2017-2018
Building Envelope	**Investment in Energy Management Strategies**	**Investment in Energy Management Strategies**	**Investment in Energy Management Strategies**	**Investment in Energy Management Strategies**	**Investment in Energy Management Strategies**
Glazing	$ -	$ -	$ -	$ -	$ -
Increased Wall Insulation	$ -	$ -	$ -	$ -	$ -
New Roof	$ -	$ -	$ -	$ 80,000	$ 1,800,000
New Windows	$ -	$ -	$ -	$ 240,000	$ 60,000
Treatments	$ -	$ -	$ -	$ -	$ -
Shading Devices	$ -	$ -	$ -	$ -	$ -
Other (Describe)	$ -	$ -	$ -	$ -	$ -
Total Investment in Design, Construction and Retrofit Strategies	**$ -**	**$ 573,000**	**$ 179,000**	**$ 419,000**	**$ 2,620,600**

Investments in Energy Management Strategies

Operations and Maintenance Strategies

	2013-2014	2014-2015	2015-2016	2016-2017	2017-2018
Policy and Planning	**Investment in Energy Management Strategies**	**Investment in Energy Management Strategies**	**Investment in Energy Management Strategies**	**Investment in Energy Management Strategies**	**Investment in Energy Management Strategies**
New School Design/Construction Guidelines and Specifications	$ -	$ -	$ -	$ -	$ -
Day and Night Temperature Guidelines for all Schools	$ -	$ -	$ -	$ -	$ -
Nighttime Blackout of Sites - Interior	$ -	$ -	$ -	$ -	$ -
Nighttime Blackout of Sites - Exterior	$ -	$ -	$ -	$ -	$ -
Procures Only Energy Star Certified Appliances	$ -	$ -	$ -	$ -	$ -
Daylight Harvesting (servicing)	$ -	$ -	$ -	$ -	$ -
Demand Ventilation (servicing)	$ -	$ -	$ -	$ -	$ -
Other (Describe)	$ -	$ -	$ -	$ -	$ -

	2013-2014	2014-2015	2015-2016	2016-2017	2017-2018
Energy Audits	**Investment in Energy Management Strategies**	**Investment in Energy Management Strategies**	**Investment in Energy Management Strategies**	**Investment in Energy Management Strategies**	**Investment in Energy Management Strategies**
Walk Through Audit	$ -	$ -	$ -	$ -	$ -
Engineering Audit	$ -	$ -	$ -	$ -	$ -
Other (Describe)					
Total Investment in Operations and Maintenance Strategies	$ -	$ -	$ -	$ -	$ -

Investments in Energy Management Strategies

Occupant Behaviour Strategies

	2013-2014	2014-2015	2015-2016	2016-2017	2017-2018
Training and Education	**Estimated Cost of Implementation**	**Estimated Cost of Implementation**	**Estimated Cost of Implementation**	**Estimated Cost of Implementation**	**Estimated Cost of Implementation**
Building Operator Training	$ -	$ -	$ -	$ -	$ -
NRCan Benchmarking Program	$ -	$ -	$ -	$ -	$ -
Building Automation Training (site specific)	$ -	$ -	$ -	$ -	$ -
Ongoing Training and Awareness Programs for Energy Conservation	$ -	$ -	$ -	$ -	$ -
Provide Detailed Information on Building Operational Costs	$ -	$ -	$ -	$ -	$ -
Provide Detailed Information on Energy Consumption (e.g. via the Utility Consumption Database or other database)	$ -	$ -	$ -	$ -	$ -
Participate in Environmental Programs, such as EcoSchools, Earthcare	$ -	$ -	$ -	$ -	$ -
Other tools (Define)	$ -	$ -	$ -	$ -	$ -
Total Investment in Occupant Behaviour Strategies	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**

Investments in Energy Management Strategies

	Investment in Renewable Energy Technology ($)						
Type of Renewable Energy	**Fiscal Year 2013-2014**	**Fiscal Year 2014-2015**	**Fiscal Year 2015-2016**	**Fiscal Year 2016-2017**	**Fiscal Year 2017-2018**	**Number of systems added**	**Capacity Added (kW)**
Solar Photovoltaic	$ -	$ -	$ -	$ -	$ -		
Solar Air	$ -	$ -	$ -	$ -	$ -		
Solar Water	$ -	$ -	$ -	$ -	$ -		
Wind Turbine	$ -	$ -	$ -	$ -	$ -		
Biomass	$ -	$ -	$ -	$ -	$ -		
Other	$ -	$ -	$ -	$ -	$ -		
Total	$ -	$ -	$ -	$ -	$ -		

Investments in Energy Management Strategies

Summary of Investment by Type

	2013-2014	2014-2015	2015-2016	2016-2017	2017-2018	2013/2014-2017/2018
Total Investments in Energy Management Strategies FY 2012-13 to FY 2017-18	**Investment in Energy Management Strategies**	**Investment in Energy Management Strategies**	**Investment in Energy Management Strategies**	**Investment in Energy Management Strategies**	**Investment in Energy Management Strategies**	**Total Investment in Energy Management Strategies**
Design, Construction and Retrofit Investments Total	$ -	$ 573,000	$ 179,000	$ 419,000	$ 2,620,600	3,791,600
Operations and Maintenance Investments Total	$ -	$ -	$ -	$ -	$ -	0
Occupant Behaviour Investments Total	$ -	$ -	$ -	$ -	$ -	0
Renewable Energy Investments Total	$ -	$ -	$ -	$ -	$ -	0
Total Investment Per Fiscal Year	$ -	$ 573,000	$ 179,000	$ 419,000	$ 2,620,600	3,791,600

Calculating Energy Conservation Goals for FY 2019 to FY 2023

Press TAB to move to input area. Press UP or DOWN ARROW in column A to read through the document.

Renewable Energy			Estimated number of systems installation					Estimated total number of ekWh generated annually						
Type of Renewable Energy	Define	Number of existing systems in asset portfolio (owned)	Fiscal Year 2018-2019	Fiscal Year 2019-2020	Fiscal Year 2020-2021	Fiscal Year 2021-2022	Fiscal Year 2022-2023	Fiscal Year 2018-2019	Fiscal Year 2019-2020	Fiscal Year 2020-2021	Fiscal Year 2021-2022	Fiscal Year 2022-2023	Total Size (kW)	Actual or Estimated Generation (ekWh)
Solar photovoltaic														0
Solar air														0
Solar water														0
Wind Turbine														0
Biomass														0
Other														0

End of worksheet.

Calculating Energy Conservation Goals for FY 2019 to FY 2023

Design, Construction and Retrofit Strategies

		2018-2019		2019-2020		2020-2021		2021-2022		2022-2023	2018/2019-2022/2023			
Lighting	**Quantity of Time that Measure will be in place (years)**	**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 Saving (ekWh)**	**Estimated Total Accumulated Energy Savings (ekWh)**	**Energy Payback Period**	**% related to Electricity**	**% related to Natural Gas**
High Efficiency Lighting Systems	15	$ 10,000	8,163	$ 10,000	8,163	$ 10,000	8,163	$ 10,000	8,163	$ 10,000	8,163	122,449	7	100	0
Outdoor Lighting	15	$ 10,000	8,163	$ 10,000	8,163	$ 10,000	8,163	$ 10,000	8,163	$ 10,000	8,163	122,449	7	100	0
Occupancy Sensors	10	$ -	-	$ -	-	$ -	-	$ -	-	$ -	-	-	5	100	0
Other (Describe)		$ -	-	$ -	-	$ -	-	$ -	-	$ -	-	-	0		100

		2018-2019		2019-2020		2020-2021		2021-2022		2022-2023	2018/2019-2022/2023			
H.V.A.C.	**Quantity of Time that Measure will be in place**	**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 Payback Period**	**% related to Electricity**	**% related to Natural Gas**
Efficient Boilers (near condensing)	30		-	$ -	-	$ -	-	$ -	-	$ -	-	-	15	5	95
High-efficiency Boilers (condensing)	15	$ 100,000	278,029	$ 100,000	278,029	$ 100,000	278,029	$ 100,000	278,029	$ 100,000	278,029	4,170,432	10	5	95
High-efficiency Boiler Burners	10	$ -	-	$ -	-	$ -	-	$ -	-	$ -	-	-	5	5	95
Geothermal	20	$ -	-	$ -	-	$ -	-	$ -	-	$ -	-	-	35	100	0
Heat Recovery/Enthalpy Wheels	30	$ -	-	$ -	-	$ -	-	$ -	-	$ -	-	-	8	20	80
Economizers	15	$ -	-	$ -	-	$ -	-	$ -	-	$ -	-	-	7.5	50	50
Energy Efficient HVAC systems	30	$ -	-	$ -	-	$ -	-	$ -	-	$ -	-	-	75	50	50
Energy Efficient Rooftop Units	15	$ -	-	$ -	-	$ -	-	$ -	-	$ -	-	-	30	50	50
High Efficiency Domestic Hot Water	15	$ -	-	$ -	-	$ -	-	$ -	-	$ -	-	-	10	15	85
Efficient Chillers and Controls	25	$ -	-	$ -	-	$ -	-	$ -	-	$ -	-	-	100	100	0
High-efficiency Motors	20	$ -	-	$ -	-	$ -	-	$ -	-	$ -	-	-	10	100	0
VFD	15	$ -	-	$ -	-	$ -	-	$ -	-	$ -	-	-	5	75	25
Demand Ventilation	10	$ -	-	$ -	-	$ -	-	$ -	-	$ -	-	-	5	50	50
Entrance Heater Controls	20	$ -	-	$ -	-	$ -	-	$ -	-	$ -	-	-	5	50	50
Destratification Fans	10	$ -	-	$ -	-	$ -	-	$ -	-	$ -	-	-	7	100	0
Other (Describe)		$ -	-	$ -	-	$ -	-	$ -	-	$ -	-	-	0		100

		2018-2019		2019-2020		2020-2021		2021-2022		2022-2023	2018/2019-2022/2023			
Controls	**Quantity of Time that Measure will be in place**	**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 Payback Period**	**% related to Electricity**	**% related to Natural Gas**
Building Automation Systems - New	10	$ -	-	$ -	-	$ -	-	$ -	-	$ -	-	-	15	50	50
Building Automation Systems - Upgrade	10	$ 50,000	32,736	$ 50,000	32,736	$ 50,000	32,736	$ 50,000	32,736	$ 50,000	32,736	491,039	15	50	50
Real-time energy data for operators to identify and diagnose building issues	10	$ -	-	$ -	-	$ -	-	$ -	-	$ -	-	-	3	50	50
Voltage Harmonizers	15	$ 30,000	24,490	$ 30,000	24,490	$ 30,000	24,490	$ 30,000	24,490	$ 30,000	24,490	367,347	7	100	0
Other (Describe)		$ -	-	$ -	-	$ -	-	$ -	-		-	-	0		100

		2018-2019		2019-2020		2020-2021		2021-2022		2022-2023	2018/2019-2022/2023			
Building Envelope	**Quantity of Time that Measure will be in place**	**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 Payback Period**	**% related to Electricity**	**% related to Natural Gas**
Glazing	30	$ -	-	$ -	-	$ -	-	$ -	-	$ -	-	-	80	20	80
Increased Wall Insulation	50	$ -	-	$ -	-	$ -	-	$ -	-	$ -	-	-	40	20	80
New Roof	25	$ 2,000,000	172,652	$ 2,000,000	172,652	$ 2,000,000	172,652	$ 2,000,000	172,652	$ 2,000,000	172,652	2,589,779	200	20	80
New Windows	30	$ 100,000	21,581	$ 100,000	21,581	$ 100,000	21,581	$ 100,000	21,581	$ -	-	302,141	80	20	80
Treatments	10	$ -	-	$ -	-	$ -	-	$ -	-	$ -	-	-	10	20	80
Shading Devices	30	$ -	-	$ -	-	$ -	-	$ -	-	$ -	-	-	20	100	0
Other (Describe)		$ -	-	$ -	-	$ -	-	$ -	-	$ -	-	-	0		100

		2018-2019		2019-2020		2020-2021		2021-2022		2022-2023	2018/2019-2022/2023
Design, Construction & Retrofit Strategies Total	**Quantity of Time that Measure will be in place**	**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)**
Total		**$ 2,300,000**	**545,814**	**$ 2,300,000**	**545,814**	**$ 2,300,000**	**545,814**	**$ 2,300,000**	**545,814**	**$ 2,200,000**	**524,233**	**8,165,635**

Keys	
colour: yellow	= Default value
colour: blue	= Calculated Value
$0.175	= cost of 1 ekWh electricity
$ 0.0287	= cost of 1 ekWh natural gas
0.0955	m³ = 1 ekWh (as per NRCan conversion table)
$0.30	= cost of 1 m³ of natural gas

Calculating Energy Conservation Goals for FY 2019 to FY 2023

Press TAB to move to input area. Press UP or DOWN ARROW in columns A to read through the document.

Operations and Maintenance Strategies

		2018-2019		2019-2020		2020-2021		2021-2022		2022-2023		2018/2019-2022/2023			
Policy and Planning	**Quantity of Time that Measure will be in place (years)**	**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 Payback Period**	**% related to Electricity**	**% related to Natural Gas**
New School Design/Construction Guidelines and Specifications	5	$ -	-	$ -	-	$ -	-	$ -	-	$ -	-	-	5	50	50
Day and Night Temperature Guidelines for all Schools	10	$ -	-	$ -	-	$ -	-	$ -	-	$ -	-	-	5	20	80
Nighttime Blackout of Sites - Interior	10	$ -	-	$ -	-	$ -	-	$ -	-	$ -	-	-	7	100	-
Nighttime Blackout of Sites - Exterior	10	$ -	-	$ -	-	$ -	-	$ -	-	$ -	-	-	7	100	-
Procures Only Energy Star Certified Appliances	5	$ -	-	$ -	-	$ -	-	$ -	-	$ -	-	-	5	100	-
Demand Ventilation (servicing)	3	$ -	-	$ -	-	$ -	-	$ -	-	$ -	-	-	5	50	50
HVAC Optimization (coil cleaning, re-calibration of equipment)	3	$ -	-	$ -	-	$ -	-	$ -	-	$ -	-	-	2	50	50
Commissioning (retro and re)	10	$ -	-	$ -	-	$ -	-	$ -	-	$ -	-	-	10	50	50
Other (Describe)		$ -	-	$ -	-	$ -	-	$ -	-	$ -	-	-	0		100

		2018-2019		2019-2020		2020-2021		2021-2022		2022-2023		2018/2019-2022/2023			
Energy Audits	**Quantity of Time that Measure will be in place**	**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 Payback Period**	**% related to Electricity**	**% related to Natural Gas**
Walk Through Audit	5	$ -	-	$ -	-	$ -	-	$ -	-	$ -	-	-	1000	50	50
Engineering Audit	5	$ -	-	$ -	-	$ -	-	$ -	-	$ -	-	-	1000	50	50
Other (Describe)		$ -	-	$ -	-	$ -	-	$ -	-	$ -	-	-	0		100

		2018-2019		2019-2020		2020-2021		2021-2022		2022-2023		2018/2019-2022/2023			
Operations and Maintenance Strategies Total	**Quantity of Time that Measure will be in place**	**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)**			
Total		$ -	-	$ -	-	$ -	-	$ -	-	$ -	-	-			

Keys	
$0.125	= cost of 1 ekWh electricity
$0.0287	= cost of 1 ekWh natural gas
0.0938	m³ = 1 ekWh
$0.30	= cost of 1 m³ of natural gas

End of worksheet.

Press TAB to move to input area. Press UP or DOWN ARROW in column A to read through the document.

Occupant Behaviour Strategies

		2018-2019		2019-2020		2020-2021		2021-2022		2022-2023		2018/2019-2022/2023			
Training and Education	**Quantity of Time that Measure will be in place (years)**	**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 Payback Period**	**% related to Electricity**	**% related to Natural Gas**
Building Operator Training	3	$ -	-	$ -	-	$ -	-	$ -	-	$ -	-	-	3	60	40
Energy Benchmarking Program	5	$ -	-	$ -	-	$ -	-	$ -	-	$ -	-	-	1000	50	50
Building Automation Training (site specific)	3	$ -	-	$ -	-	$ -	-	$ -	-	$ -	-	-	1	60	40
Ongoing Training and Awareness Programs for Energy Conservation	5	$ -	-	$ -	-	$ -	-	$ -	-	$ -	-	-	10	90	10
Detailed Information on Building Operational Costs	1	$ -	-	$ -	-	$ -	-	$ -	-	$ -	-	-	1000	50	50
Detailed Information on Energy Consumption (e.g. via the Utility Consumption Database or other database)	1	$ -	-	$ -	-	$ -	-	$ -	-	$ -	-	-	1000	50	50
Participate in Environmental Programs, such as EcoSchools, Earthcare	1	$ -	-	$ -	-	$ -	-	$ -	-	$ -	-	-	5	90	10
Other Tools (Define)		$ -	-	$ -	-	$ -	-	$ -	-	$ -	-	-	0		100
Occupant Behaviour Strategies Total		$ -	-	$ -	-	$ -	-	$ -	-	$ -	-	-			

Keys	
$0.175	= cost of 1 ekWh electricity
$0.0287	= cost of 1 ekWh natural gas
0.0955	m³ = 1 ekWh
$0.30	= cost of 1 m³ of natural gas

End of worksheet.

Calculating Energy Conservation Goals for FY 2019 to FY 2023

Press TAB to move to input area. Press UP or DOWN ARROW in column A to read through the document.

Conservation Goal

	FY 2018	
Total Building Area (includes portables) (m^2)	186,423	**Enter from UCD. - use square meters**
Total Building Area (includes portables) (ft^2)	2,006,702	**Enter from UCD - use square feet**
Energy Consumption for the board (ekWh)	27,665,340	**Enter from UCD**

1 ft^2 = 0.0929 m^2

	2018-2019		2019-2020		2020-2021		2021-2022		2022-2023		2018/2019-2022/2023
	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	$ 2,300,000	545,814	$ 2,300,000	545,814	$ 2,300,000	545,814	$ 2,300,000	545,814	$ 2,200,000	524,233	8,165,635
Appendix C: Operations and Maintenance Strategies Total	$ -	0	$ -	0	$ -	0	$ -	0	$ -	0	0
Appendix D: Occupant Behaviour Strategies Total	$ -	0	$ -	0	$ -	0	$ -	0	$ -	0	0
TOTAL	**$ 2,300,000**	**545,814**	**$ 2,300,000**	**545,814**	**$ 2,300,000**	**545,814**	**$ 2,300,000**	**545,814**	**$ 2,200,000**	**524,233**	**8,165,635**
Percentage reduction		**1.97**		**1.97**		**1.97**		**1.97**		**1.89**	**9.79**
Conservation Goal ($ekWh/m^2$)		**2.93**		**2.93**		**2.93**		**2.93**		**2.81**	**14.52**
Conservation Goal ($ekWh/ft^2$)		**0.27**		**0.27**		**0.27**		**0.27**		**0.26**	**1.35**

Note	Note	Note	Note	Note
Check the total in cell B15 to confirm validity of estimated amount to be spent during that year	**Check the total in cell D15 to confirm validity of estimated amount to be spent during that year**	**Check the total in cell F15 to confirm validity of estimated amount to be spent during that year**	**Check the total in cell H15 to confirm validity of estimated amount to be spent during that year**	**Check the total in cell J15 to confirm validity of estimated amount to be spent during that year**

End of worksheet.