



Five-Year Energy Conservation and Demand Management Plan (2019-2023)

Dufferin-Peel Catholic District School Board

June 24, 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 its strategy depends on the funding that is received for each of the five years covered by its 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

Other Variables:

- Programs
 - Child care
 - Before/After School Programs
 - Summer School
 - Community Use
 - Permitted Use
- 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
 - Culture, education and occupants' behaviour
 - HVAC equipment operation practices
 - Commitment and investment on energy management

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	158	160	2
Total Number of Portables/Portapaks	357	322	-35
Total Floor Area (ft ²)	10,746,836	10,999,938	253,102
Average Operating Hours	78	78	0
Average Daily Enrolment	79,709.39	80,242.03	532.64
Percentage of Total Floor Area Air Conditioned	70	70	0

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)	97,248,419	93,216,616
Total Natural Gas (ekWh)	96,872,678	90,689,395
Total Energy Consumption (ekWh)	194,121,097	183,906,011

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

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.

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 4 and 5), and newly implemented programs (refer to the Note to Readers on pages 8-10) which will greatly impact energy consumption.

As a result, weather normalized Energy Intensity⁴ 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/m²).

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.

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.

Table 4: Weather Normalized Values

Weather Normalized Values	Fiscal Year 2012 to 2013 (Baseline Year)	Fiscal Year 2017 to 2018 (Most Recent Data Available)	Variance
Total Energy Consumed (ekWh)	194,437,948	178,938,268	-15,499,680
Energy Intensity (ekWh/ft ²)	18.09	16.27	-1.82

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/ft ²	Conservation Goal Percentage	Actual Energy Savings ekWh/ft ²	Actual Energy Percentage
2013 to 2014	-0.39	-2%	-0.44	-2.40%
2014 to 2015	-0.36	-2%	-0.84	-4.74%
2015 to 2016	-0.32	-2%	0.21	1.23%
2016 to 2017	-0.33	-2%	-0.40	-2.36%
2017 to 2018	-0.33	-2%	-0.36	-2.16%

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, Ventilation, 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 Conservation Goal from Fiscal Year 2013 to 2014 through Fiscal Year 2017 to 2018

Forecasted Cumulative Energy Intensity	(ekWh/ft ²)
Conservation Goal of Fiscal Year 2013 to 2014 through Fiscal Year 2017 to 2018.	1.73
Conservation Goal as a Percentage.	9.6%
Actual Cumulative Energy Intensity	
Achieved Reduction of Energy Intensity from Fiscal Year 2013 to 2014 through Fiscal Year 2017 to 2018 – Weather Normalized	1.82
Achieved % Reduction of Cumulative Energy Intensity - Weather Normalized	10.4%
Variance between Forecasted and Achieved	
Variance in (ekWh/ft ²) - Weather Normalized	0.09
Variance in (%) - Weather Normalized	0.8%

Note: What was achieved in energy conservation in the 2018 school year is **105%** of the conservation goal set up in 2014.

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 A: 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. 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 be done with respect to the related actual energy savings achieved.

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

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

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

Background

1. The Board continues to commit to energy conservation and sustainability. To date the Board's energy management strategy has included the following:
 - 1) Energy management is an important component of the board's multiyear strategical plan and has been integrated into the Board's Long-Term Facilities Master Plan (LTFMP).
 - 2) This report establishes a systematic and strategic approach to specify areas of focus and priority, resource commitment, strategies and initiatives for the next five years.
 - 3) A new roadmap developed through this report would lead us towards our energy conservation targets and convert these goals into action.
 - a. Further investment on energy management;
 - b. Increase efficiency via design, construction and retrofit;
 - c. Eliminate wastes via operational improvement and maintenance;
 - d. Enhance awareness through educational programs.
2. The Board has an energy management position, which includes the following options.
 - In-house including:
 - a. Full time
 - b. Part time
 - c. Shared job function
 - Contracted third party, or
 - None

3. Energy Management Strategies

Energy management strategies mainly fall into three key categories:

1. Design/Construction/Retrofit

2. Operations and Maintenance
3. Occupant Behaviour

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/ft ²	-0.41	-0.41	-0.41	-0.41	-0.41
Percentage Decrease	-2.5%	-2.5%	-2.5%	-2.5%	-2.5%

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/ft ²	-2.03
Percentage Decrease	-12.5%

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:**
100% of Dufferin-Peel Catholic DSB's 151 schools are certified.
2. **Enbridge: The School Energy Challenge**
Four schools participated.
3. **National Sweater Day** (reducing the temperature setting on thermostats while encouraging occupants to wear a sweater)
Three schools participated.

C. Energy Efficiency Incentives

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

Yes No

If yes, between Fiscal Year 2013 to 2014 and Fiscal Year 2017 to 2018, the Board has applied for \$1,064,730 (approved \$693,068) in 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).

Yes No

D. Energy Procurement

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

Yes 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 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:

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

2. The Board uses the following methodologies to cut down electrical Demand:

- Equipment scheduling
- 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 **Dufferin-Peel Catholic District School Board's** senior management has reviewed and approved this Energy Conservation and Demand Management Plan.



Marianne Mazzorato, Ed. D.
Director of Education

June 24, 2019

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

Appendix A: Summary of Investment by Type - Fiscal Year 2013/2014 to Fiscal Year 2017/2018

	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	\$ 1,776,258	\$ 1,698,917	\$ 3,041,741	\$ 9,078,842	\$ 6,488,593	22,084,351
Operations and Maintenance Investments Total	\$ -	\$ -	\$ -	\$ -	\$ 616,707	616,707
Occupant Behaviour Investments Total	\$ 5,000	\$ 5,000	\$ 5,000	\$ 5,000	\$ 5,000	25,000
Total Investment Per Fiscal Year	\$ 1,781,258	\$ 1,703,917	\$ 3,046,741	\$ 9,083,842	\$ 7,110,300	22,726,058

End of worksheet.

Appendix B: Design, Construction and Retrofit Strategies

Lighting	Quantity of Time that Measure will be in place (years)	2018-2019		2019-2020		2020-2021		2021-2022		2022-2023		2018/2019-2022/2023		Energy Payback Period	%related to Electricity	%related to Natural Gas
		Estimated Cost of Implementation	Estimated Annual Energy Savings from all projects (ekWh)	Estimated Cost of Implementation	Estimated Annual Energy Savings from all projects (ekWh)	Estimated Cost of Implementation	Estimated Annual Energy Savings from all projects (ekWh)	Estimated Cost of Implementation	Estimated Annual Energy Savings from all projects (ekWh)	Estimated Cost of Implementation	Estimated Annual Energy Savings from all projects (ekWh)	Estimated Total Accumulated Energy Savings (ekWh)				
High Efficiency Lighting Systems	15	\$ 2,000,000	1,632,653	\$ 2,000,000	1,632,653	\$ 2,000,000	1,632,653	\$ 2,000,000	1,632,653	\$ 2,000,000	1,632,653	24,489,796	7	100	0	
Outdoor Lighting	15	\$ -	-	\$ -	-	\$ -	-	\$ -	-	\$ -	-	-	7	100	0	
Occupancy Sensors	10	\$ -	-	\$ -	-	\$ -	-	\$ -	-	\$ -	-	-	5	100	0	
Other (Describe)		\$ -	-	\$ -	-	\$ -	-	\$ -	-	\$ -	-	-	0		100	

H.V.A.C.	Quantity of Time that Measure will be in place	2018-2019		2019-2020		2020-2021		2021-2022		2022-2023		2018/2019-2022/2023		Energy Payback Period	%related to Electricity	%related to Natural Gas
		Estimated Cost of Implementation	Estimated Annual Energy Savings from all projects (ekWh)	Estimated Cost of Implementation	Estimated Annual Energy Savings from all projects (ekWh)	Estimated Cost of Implementation	Estimated Annual Energy Savings from all projects (ekWh)	Estimated Cost of Implementation	Estimated Annual Energy Savings from all projects (ekWh)	Estimated Cost of Implementation	Estimated Annual Energy Savings from all projects (ekWh)	Estimated Total Accumulated Energy Savings (ekWh)				
Efficient Boilers (near condensing)	30	\$ 800,000	1,482,820	\$ 800,000	1,482,820	\$ 800,000	1,482,820	\$ 800,000	1,482,820	\$ 800,000	1,482,820	22,242,202	15	5	95	
High-efficiency Boilers (condensing)	15	\$ -	-	\$ -	-	\$ -	-	\$ -	-	\$ -	-	-	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	\$ 500,000	65,472	\$ 500,000	65,472	\$ 500,000	65,472	\$ 500,000	65,472	\$ 500,000	65,472	982,077	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	
Deaerification Fans	10	\$ -	-	\$ -	-	\$ -	-	\$ -	-	\$ -	-	-	7	100	0	
Other (Describe)		\$ -	-	\$ -	-	\$ -	-	\$ -	-	\$ -	-	-	0		100	

Controls	Quantity of Time that Measure will be in place	2018-2019		2019-2020		2020-2021		2021-2022		2022-2023		2018/2019-2022/2023		Energy Payback Period	%related to Electricity	%related to Natural Gas
		Estimated Cost of Implementation	Estimated Annual Energy Savings from all projects (ekWh)	Estimated Cost of Implementation	Estimated Annual Energy Savings from all projects (ekWh)	Estimated Cost of Implementation	Estimated Annual Energy Savings from all projects (ekWh)	Estimated Cost of Implementation	Estimated Annual Energy Savings from all projects (ekWh)	Estimated Cost of Implementation	Estimated Annual Energy Savings from all projects (ekWh)	Estimated Total Accumulated Energy Savings (ekWh)				
Building Automation Systems - New	10	\$ -	-	\$ -	-	\$ -	-	\$ -	-	\$ -	-	-	15	50	50	
Building Automation Systems - Upgrade	10	\$ 500,000	327,359	\$ 500,000	327,359	\$ 500,000	327,359	\$ 500,000	327,359	\$ 500,000	327,359	4,910,385	15	50	50	
Real-time energy data for operators to identify and diagnose building issues	10	\$ -	-	\$ -	-	\$ -	-	\$ -	-	\$ -	-	-	3	50	50	
Voltage Harmonizers	15	\$ -	-	\$ -	-	\$ -	-	\$ -	-	\$ -	-	-	7	100	0	
Other (Describe)		\$ -	-	\$ -	-	\$ -	-	\$ -	-	\$ -	-	-	0		100	

Building Envelope	Quantity of Time that Measure will be in place	2018-2019		2019-2020		2020-2021		2021-2022		2022-2023		2018/2019-2022/2023		Energy Payback Period	%related to Electricity	%related to Natural Gas
		Estimated Cost of Implementation	Estimated Annual Energy Savings from all projects (ekWh)	Estimated Cost of Implementation	Estimated Annual Energy Savings from all projects (ekWh)	Estimated Cost of Implementation	Estimated Annual Energy Savings from all projects (ekWh)	Estimated Cost of Implementation	Estimated Annual Energy Savings from all projects (ekWh)	Estimated Cost of Implementation	Estimated Annual Energy Savings from all projects (ekWh)	Estimated Total Accumulated Energy Savings (ekWh)				
Glazing	30	\$ -	-	\$ -	-	\$ -	-	\$ -	-	\$ -	-	-	80	20	80	
Increased Wall Insulation	50	\$ -	-	\$ -	-	\$ -	-	\$ -	-	\$ -	-	-	40	20	80	
New Roof	25	\$ -	-	\$ -	-	\$ -	-	\$ -	-	\$ -	-	-	200	20	80	
New Windows	30	\$ -	-	\$ -	-	\$ -	-	\$ -	-	\$ -	-	-	80	20	80	
Treatments	10	\$ -	-	\$ -	-	\$ -	-	\$ -	-	\$ -	-	-	10	20	80	
Shading Devices	30	\$ -	-	\$ -	-	\$ -	-	\$ -	-	\$ -	-	-	20	100	0	
Other (Describe)		\$ -	-	\$ -	-	\$ -	-	\$ -	-	\$ -	-	-	0		100	

Design, Construction & Retrofit Strategies Total	Quantity of Time that Measure will be in place	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)	
Total		\$ 3,800,000	3,508,304	\$ 3,800,000	3,508,304	\$ 3,800,000	3,508,304	\$ 3,800,000	3,508,304	\$ 3,800,000	3,508,304	52,624,561	

Keys	
colour: yellow	= Default value
colour: blue	= Calculated Value
\$ 0.175	= cost of 1 ekWh electricity
\$ 0.0087	= cost of 1 ekWh natural gas
0.0050	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

FILE THIS ROW TO REPORT ANNUAL PROGRESS OF ENERGY CONSERVATION GOALS AS MEASURED THROUGH THE BUDGET YEAR.

Appendix C: Operations and Maintenance Strategies		2018-2019		2019-2020		2020-2021		2021-2022		2022-2023		2018/2019-2022/2023	Energy Payback Period	% related to Electricity	% related to Natural Gas
Policy and Planning	Quantity of Time that Measure will be in place (years)	Estimated Cost of Implementation	Estimated Annual Energy Savings from all projects (kWh)	Estimated Cost of Implementation	Estimated Annual Energy Savings from all projects (kWh)	Estimated Cost of Implementation	Estimated Annual Energy Savings from all projects (kWh)	Estimated Cost of Implementation	Estimated Annual Energy Savings from all projects (kWh)	Estimated Cost of Implementation	Estimated Annual Energy Savings from all projects (kWh)	Estimated Total Accumulated Energy Savings (kWh)			
New School Design/Construction Guidelines and Specifications	5	\$ -	-	\$ -	-	\$ -	-	\$ -	-	\$ -	-	-	5	50	50
Day and Night Temperature Guidelines for all Schools	10	\$ 100,000	345,304	\$ 100,000	345,304	\$ 100,000	345,304	\$ 100,000	345,304	\$ 100,000	345,304	5,179,558	5	20	80
Nighttime Backout of Blinds - Interior	10	\$ -	-	\$ -	-	\$ -	-	\$ -	-	\$ -	-	-	7	100	-
Nighttime Backout of Blinds - Exterior	10	\$ -	-	\$ -	-	\$ -	-	\$ -	-	\$ -	-	-	7	100	-
Fluorescent Only Energy Star Certified Appliances	5	\$ -	-	\$ -	-	\$ -	-	\$ -	-	\$ -	-	-	5	100	-
Demand Ventilation (servicing)	3	\$ -	-	\$ -	-	\$ -	-	\$ -	-	\$ -	-	-	5	50	50
HVAC Optimization (coil cleaning, re-calibration of equipment)	3	\$ 110,000	540,142	\$ 110,000	540,142	\$ 110,000	540,142	\$ 110,000	540,142	\$ 110,000	540,142	8,102,138	2	50	50
Commissioning (intro and re)	10	\$ -	-	\$ -	-	\$ -	-	\$ -	-	\$ -	-	-	10	50	50
Other (Describe)		\$ -	-	\$ -	-	\$ -	-	\$ -	-	\$ -	-	-	0		100

Energy Audits		2018-2019		2019-2020		2020-2021		2021-2022		2022-2023		2018/2019-2022/2023	Energy Payback Period	% related to Electricity	% related to Natural Gas
Quantity of Time that Measure will be in place	Estimated Cost of Implementation	Estimated Annual Energy Savings from all projects (kWh)	Estimated Cost of Implementation	Estimated Annual Energy Savings from all projects (kWh)	Estimated Cost of Implementation	Estimated Annual Energy Savings from all projects (kWh)	Estimated Cost of Implementation	Estimated Annual Energy Savings from all projects (kWh)	Estimated Cost of Implementation	Estimated Annual Energy Savings from all projects (kWh)	Estimated Total Accumulated Energy Savings (kWh)				
Walk Through Audit	5	\$ -	-	\$ -	-	\$ -	-	\$ -	-	\$ -	-	-	1000	50	50
Engineering Audit	5	\$ -	-	\$ -	-	\$ -	-	\$ -	-	\$ -	-	-	1000	50	50
Other (Describe)		\$ -	-	\$ -	-	\$ -	-	\$ -	-	\$ -	-	-	0		100

Operations and Maintenance Strategies Total		2018-2019		2019-2020		2020-2021		2021-2022		2022-2023		2018/2019-2022/2023			
Quantity of Time that Measure will be in place	Estimated Cost of Implementation	Estimated Annual Energy Savings from all projects (kWh)	Estimated Cost of Implementation	Estimated Annual Energy Savings from all projects (kWh)	Estimated Cost of Implementation	Estimated Annual Energy Savings from all projects (kWh)	Estimated Cost of Implementation	Estimated Annual Energy Savings from all projects (kWh)	Estimated Cost of Implementation	Estimated Annual Energy Savings from all projects (kWh)	Estimated Total Accumulated Energy Savings (kWh)				
Total		\$ 210,000	985,446	\$ 210,000	985,446	\$ 210,000	985,446	\$ 210,000	985,446	\$ 210,000	985,446	12,865,000			

Keys	
\$0.172	= cost of 1 kWh electricity
\$0.029	= cost of 1 kWh natural gas
\$0.002	= cost of 1 cfm of air
\$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.

Appendix D: Occupant Behaviour Strategies

Training and Education	Quantity of Time that Measure will be in place (years)	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)	Energy Payback Period	% related to Electricity	% related to Natural Gas
Building Operator Training	3	\$ -	-	\$ -	-	\$ -	-	\$ -	-	\$ -	-	-	3	60	40
Energy Benchmarking Program	5	\$ 10,000	98	\$ 10,000	98	\$ 10,000	98	\$ 10,000	98	\$ 10,000	98	1,473	1000	50	50
Building Automation Training (site specific)	3	\$ 6,500	55,813	\$ 6,500	55,813	\$ 6,500	55,813	\$ 6,500	55,813	\$ 6,500	55,813	837,197	1	60	40
Ongoing Training and Awareness Programs for Energy Conservation	5	\$ 15,000	9,354	\$ 15,000	9,354	\$ 15,000	9,354	\$ 15,000	9,354	\$ 15,000	9,354	140,305	10	90	10
Detailed Information on Building Operational Costs	1	\$ 10,000	98	\$ 10,000	98	\$ 10,000	98	\$ 10,000	98	\$ 10,000	98	1,473	1000	50	50
Detailed Information on Energy Consumption (e.g. via the Utility Consumption Database or other database)	1	\$ 10,000	98	\$ 10,000	98	\$ 10,000	98	\$ 10,000	98	\$ 10,000	98	1,473	1000	50	50
Participate in Environmental Programs, such as EcoSchools, Earthcare	1	\$ 10,000	12,472	\$ 10,000	12,472	\$ 10,000	12,472	\$ 10,000	12,472	\$ 10,000	12,472	187,073	5	90	10
Other Tools (Define)		\$ -	-	\$ -	-	\$ -	-	\$ -	-	\$ -	-	-	0		100
Occupant Behaviour Strategies Total		\$ 61,500	77,933	\$ 61,500	77,933	\$ 61,500	77,933	\$ 61,500	77,933	\$ 61,500	77,933	1,168,995			

Keys	
\$0.175	= cost of 1 ekWh electricity
\$0.0287	= cost of 1 ekWh natural gas
0.0955	m ³ = 1 ekWh
\$0.30	= cost of 1 m ³ 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.

Appendix E: Conservation Goal

	FY 2018		
Total Building Area (includes portables) (m²)	1,021,920	Enter from UCD - use square meters	1 ft² = 0.0929 m²
Total Building Area (includes portables) (ft²)	10,999,938	Enter from UCD - use square feet	
Energy Consumption for the board (ekWh)	178,938,268	Enter from UCD	

	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	\$ 3,800,000	3,508,304	\$ 3,800,000	3,508,304	\$ 3,800,000	3,508,304	\$ 3,800,000	3,508,304	\$ 3,800,000	3,508,304	52,624,561
Appendix C: Operations and Maintenance Strategies Total	\$ 210,000	885,446	\$ 210,000	885,446	\$ 210,000	885,446	\$ 210,000	885,446	\$ 210,000	885,446	13,281,694
Appendix D: Occupant Behaviour Strategies Total	\$ 61,500	77,933	\$ 61,500	77,933	\$ 61,500	77,933	\$ 61,500	77,933	\$ 61,500	77,933	1,168,995
TOTAL	\$ 4,071,500	4,471,683	\$ 4,071,500	4,471,683	\$ 4,071,500	4,471,683	\$ 4,071,500	4,471,683	\$ 4,071,500	4,471,683	67,075,249
Percentage reduction		2.50		2.50		2.50		2.50		2.50	12.50
Conservation Goal (ekWh/m²)		4.38		4.38		4.38		4.38		4.38	21.88
Conservation Goal (ekWh/ft²)		0.41		0.41		0.41		0.41		0.41	2.03

Note
Check the total in cell B15 to confirm validity of estimated amount to be spent during that year

Note
Check the total in cell D15 to confirm validity of estimated amount to be spent during that year

Note
Check the total in cell F15 to confirm validity of estimated amount to be spent during that year

Note
Check the total in cell H15 to confirm validity of estimated amount to be spent during that year

Note
Check the total in cell J15 to confirm validity of estimated amount to be spent during that year

End of worksheet.