

# **Draft Energy Conservation and Demand Management Plan**

**The plan is due by July 1, 2019.**

# Table of Contents

Education Sector Background .....	4
Funding and Energy Management Planning.....	4
Asset Portfolios and Energy Management Planning.....	4
PART I: A REVIEW OF PROGRESS & ACHIEVEMENTS in the PAST FIVE YEARS...	6
A. The Board’s Asset Portfolio .....	6
B. Energy Consumption Data for the Board .....	7
C. Weather Normalized Energy Consumption Values .....	7
D. Review of Previous Energy Conservation Goals and Achievements .....	9
Full Day Kindergarten (also known as FDK) .....	10
Before and After School Programs.....	10
Community Use of Schools .....	10
Community Hubs .....	10
Air Conditioning.....	11
Compliance with current Ontario Building Code (also known as OBC) .....	11
E. Cumulative Energy Conservation Goal.....	12
F. Measures Implemented from Fiscal Year 2012 to 2013 to Fiscal Year 2017 to 2018.....	13
PART II – ENERGY CONSERVATION and DEMAND MANAGEMENT PLAN for FISCAL YEAR 2018 to 2019 to FISCAL YEAR 2023 to 2024.....	14
Background.....	155
Renewal Energy .....	15
Design/Construction/Retrofit .....	15
Operations and Maintenance .....	15
Occupant Behaviour .....	16
A. Future Energy Conservation Goals.....	16

B. Environmental Programs .....	18
C. Energy Efficiency Incentives.....	19
D. Energy Procurement.....	19
E. Demand Management.....	20
F. Senior Management Approval of this Energy Conservation and Demand Management Plan.....	20

## Table of Figures

Table 1: Board's Asset Portfolio .....	6
Table 2: Metered Consumption Values.....	7
Table 3: Asset Portfolio Chart .....	8
Table 4: Weather Normalized Values.....	9
Table 5: Cumulative Energy Intensity Conservation Goal and Actual Energy Intensity.....	9
Table 6: Cumulative Energy Intensity Conservation Goal from Fiscal Year 2013 to 2014 through Fiscal Year 2017 to 2018.....	12
Table 7: Annual Energy Intensity Conservation Goals .....	16
Table 8: Cumulative Conservation Goal .....	17

## Education Sector Background

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### 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 1<sup>st</sup> to August 31<sup>st</sup>). 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**

<b>Key Metrics</b>	<b>(Baseline Year) Fiscal Year 2012 to 2013</b>	<b>Fiscal Year 2017 to 2018</b>	<b>Variance</b>
<b>Total Number of Buildings</b>	48	49	1
<b>Total Number of Portables/Portapaks</b>	126	98	-28
<b>Total Floor Area</b>	1,754,744.50	1,792,466.75	37,722.25
<b>Average Operating Hours</b>	47	47	0
<b>Average Daily Enrolment</b>	9,514.75	10,032.00	517.25
<b>Other Relevant Changes in the Operation of Assets:</b>			

#### **NOTE TO USERS: (delete this note before posting)**

1. The data in Table 1: Board's Asset Portfolio is contained in the new Utility Consumption Database (also known as UCD) report **5-Year Energy Master Plan** which was created to support boards in meeting the regulatory reporting requirement.
2. The row Other Relevant Changes in the Operation of Assets is available for boards to identify an operational element that impacts energy use, such as:
  - a. Total Floor Area Occupied by Child Care, Before and After School, Community Use
  - b. Percentage of Total Floor Area Air Conditioned
  - c. Net-metering of any renewable energy (if applicable)
    - Boards can delete the Renewable Energy sheet from the **Investments in Energy Efficiency FY 2013 to FY 2018** Excel template if this category isn't applicable.

## B. Energy Usage Data for the Board

The following table lists the “metered”<sup>1</sup> 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)	12,085,120.00	11,909,840
Total Natural Gas (ekWh)	13,807,400	12,704,830
Total Heating Fuel (Type 1 and 2) (ekWh)		
Total Heating Fuel (Type 4 and 6) (ekWh)		
Total Propane (ekWh)		
Total Wood (ekWh)		
Total District Heat (ekWh)		
Total District Cool (ekWh)		

### **NOTE TO USERS: (delete this note before posting)**

- Metered (also known as “raw”) consumption data is unable to measure the impact of weather on energy usage and as a result it does not allow an accurate analysis of energy performance from one year to the next.

## 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)<sup>2</sup> and Cooling Degree Days (CDD)<sup>3</sup> for the six most common Environment Canada weather stations in the Ontario education sector.

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

<sup>2</sup> 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.

<sup>3</sup> 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
<b>HDD</b>	3698	4285	4091	3355	3583	3989
<b>CDD</b>	289	217	271	462	303	432

**NOTE TO USERS: (delete this note before posting)**

1. The balance point for calculating the above HDD and CDD values is 18 degrees Celsius.
2. Boards have an energy management tool, the UCD, which calculates the balance point for each meter based on energy consumption patterns. The actual HDD and CDD values for each meter are based on the data from the closest Environment Canada weather station to the facility and are used to calculate weather normalized values.

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<sup>4</sup> 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/ft<sup>2</sup>) or equivalent kilowatt hours per square metre (ekWh/m<sup>2</sup>).

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<sup>4</sup> 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/ft<sup>2</sup>), gigajoule per square metre (GJ /m<sup>2</sup>), 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)
Total Energy Consumed (ekWh)	26,313,810	24,266,270
Energy Intensity (eKWh/ft2)	15	13.54
Energy Intensity (eKWh/m2)		

**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	0.20		2.68	-0.72		4.82
2014 to 2015	0.20		0.78	0.30		-2.09
2015 to 2016	0.40		-4.02	0.72		-4.91
2016 to 2017	0.20		3.32	-1.09		7.16
2017 to 2018	0.20		7.78	-0.65		4.61

**NOTE TO USERS: (delete this note before posting)**

1. The above data is available in the new UCD report **5-Year Energy Master Plan**.
2. Ensure weather normalized data is selected to calculate the Energy Intensity values used in “Actual Energy Savings”.

## **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/ft <sup>2</sup> )	(ekWh/m <sup>2</sup> )	Variance
Forecasted. Cumulative Energy Intensity Conservation Goal of Fiscal Year 2013 to 2014 through Fiscal Year 2017 to 2018 <i>Source: Board's 2014 Plan (to be input by Board)</i>	1.20		Do not write in this cell
Forecasted Cumulative Energy Intensity Conservation Goal as a Percentage <i>Source: Board's 2014 Plan (to be input by Board)</i>	Do not write in this cell	Do not write in this cell	
Actual Cumulative Energy Intensity Reduced or Increased from Fiscal Year 2013 to 2014 through Fiscal Year 2017 to 2018 – Weather Normalized	-1.46		Do not write in this cell
Variance between 2014 Forecast Cumulative Conservation Goal and Actual Cumulative Energy Intensity– Weather Normalized	0.26		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	121.49

### **NOTE TO USERS: (delete this note before posting)**

- The data in table 6 is available in the new UCD report “**5-Year Energy Master Plan**”

**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 USERS: (delete this note before posting)**

The **Renewable Energy Investments** sheet is available for boards use. If your board has not invested in this category, the board may choose to delete both the “**Renewable Energy Investments**” line in the above text and the applicable sheet in the Excel template – **Investments in Energy Efficiency between Fiscal Year 2013 and Fiscal Year 2018**.

**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:

(Prose box: Board to insert text – regarding philosophy)

#### **NOTE TO USERS: (delete this note before posting)**

- This section is optional. Boards may choose to delete.

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** – Building Automated Systems

Contracted third party, or **(ie. Building Automated Systems)**

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**.

### **NOTE TO USERS: (delete this note before posting)**

**Appendix A: Renewable Energy** sheet is available for boards use. If your board does not plan on investing in this category, the board may choose to delete both the section above and the applicable sheet in the Excel template – **Calculating Energy Conservation Goals Fiscal Year 2019 to Fiscal Year 2023**.

## 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 <sup>2</sup>	2022.23	277.06	272.99	273	288.34
ekW/m <sup>2</sup>					
Percentage Decrease	2%	2%	2%	2%	2%

### **NOTE TO USERS: (delete this note before posting)**

To determine values, use the Excel template - **Calculating Energy Conservation Goals Fiscal Year 2019 to Fiscal Year 2023. Annual Conservation Goals Values** are contained in **Appendix E: Summary of Conservation Goals** and are to be inserted in the **Annual Energy Intensity Conservation Goals Chart**. The list is as follows:

- Appendix B: Design, Construction and Retrofit Strategies
- Appendix C: Operations and Maintenance Strategies
- Appendix D: Occupant Behaviour Strategies, and
- Appendix E: Summary of Conservation Goals

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
<b>ekWh/ft2</b>	3133.61
<b>ekWh/m2</b>	
<b>Percentage Decrease</b>	

**NOTE TO USERS: (delete this note before posting)**

To determine values, use the Excel template - **Calculating Energy Conservation Goals Fiscal Year 2019 to Fiscal Year 2023** – the **Cumulative Conservation Goal Value** is contained on **Appendix E: Summary of Conservation Goals** (when the Appendices B, C and D are completed) are to be inserted in Cumulative Conservation Goal chart. The list is as follows:

- Appendix B: Design, Construction and Retrofit Strategies
- Appendix C: Operations and Maintenance Strategies
- Appendix D: Occupant Behaviour Strategies
- Appendix E: Summary of Conservation Goals

**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:  
38 number of schools participate
2. Earth Care Schools:  
38 number of schools participate
3. Enbridge: The School Energy Challenge  
N/A number of schools participate
4. Other: The School Energy Challenge  
The name of the program is \_\_\_\_\_  
N/A Number of 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.

Yes       No

If yes, between Fiscal Year 2013 to 2014 and Fiscal Year 2017 to 2018, the Board has applied for \$\_(board to insert)\_ 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 (insert Board's name) senior management has reviewed and approved this Energy Conservation and Demand Management Plan.

Full Name: Dan Tackaberry

Job Title: Facilities Planning Coordinator

Date: July 18, 2019