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Energy Conservation and Demand Management Plan

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 allocation in March for the next school board Fiscal Year which runs from September 1st to August 31st. The Ministry does not provide boards with multi-year funding allocations.

As a result, while a board may have a five-year energy management strategy, the board's ability to implement their strategy is dependent on the funding that'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 significant changes that significantly 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
    - % air conditioned space
- Site Use
    - Elementary school
    - Secondary school
    - Administrative building
    - Maintenance/warehouse facility
    - Community Hubs
- Shared Use Sites (e.g. one building, two or more boards share common areas and/or partnered with a municipality)
    - Swimming pools
    - Libraries
    - Lighted sports fields
    - Enclosed 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

PART I – A REVIEW OF PROGRESS AND ACHIEVEMENTS IN THE PAST FIVE YEARS

A. The Board's Asset Portfolio

The following chart outlines the energy-related variables/metrics in the Board's asset portfolio that changed from the baseline year (FY 2012-13) to the end of the five-year reporting period (FY 2017-18).

	FY 2012-13 (Baseline)	FY 2017-18	Variance
Total Number of Buildings	**220**	**227**	**+7**
Total Number of Portables/Portapaks	**337**	**437**	**+100**
Total Floor Area	**15,100,811**	**16,189,953**	**+1,089,142**
Average Operating Hours	**63.3**	**63.3**	**0**
Average Daily Enrolment	**113,749**	**123,299**	**+9,550**
Other Relevant Changes in the Operation of Assets: _____			

B. Energy Consumption Data for the Board

The chart below lists the "metered"[1] consumption values in the common unit of ekWh.

Utility	Fiscal Year 2012-13 (Baseline)	Fiscal Year 2017-18 (Current)
Total Electricity (kWh)	*85,353,490*	*85,847,957*
Total Natural Gas (ekWh)	*141,874,483*	*145,225,702*
Total Heating Fuel (Type 1 and 2) (ekWh)	*825,099*	*613,719*
Total Heating Fuel (Type 4 and 6) (ekWh)	*0*	*0*
Total Propane (ekWh)	*1,433*	*1,465*
Total Wood (ekWh)	*0*	*0*
Total District Heat (ekWh)	*1,565,014*	*1,325,939*
Total District Cool (ekWh)	*424,314*	*1,091,198*

NOTE TO READERS:
Metered (also known as "raw") consumption data does not take into consideration the impact of weather on energy usage and as a result it does not allow an accurate analysis of energy performance from one year to the next.

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, 25-35% of energy consumption for a facility is impacted by weather.

To put the impact of weather in context, the following chart 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.

Ontario Degree Days	Fiscal Year					
	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18
HDD	3698	4285	4091	3355	3583	3989
CDD	289	217	271	462	303	432

NOTES TO THE READER

1. The balance point for calculating the above HDD and CDD values is 18C.
2. Boards have an energy management tool, the Utility Consumption Database (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 consumption 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' attributes (see Facility Variables listed on pages 1 & 2), and newly implemented programs (see the Note to Readers on pages 5 & 6) which will significant 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 consumption from one year to another as it negates any change in floor areas.

Weather Normalized Values	Fiscal Year 2012-13 (Baseline Year)	Fiscal Year 2017-18 (most recent available data)
Total Energy Consumed (eKWh)	*208,618,396*	*212,230,158*
Energy Intensity (eKWh/ft²)	*13.82*	*13.11*
Energy Intensity (eKWh/m²)	*148.7*	*141.1*

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 (EI) is the quantity of total energy consumed divided by the total floor area. EI is typically expressed as ekWh/ft2, 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 next five fiscal years. The following chart compares the Energy Intensity Conservation Goal with the Actual Energy Intensity Reduced for each year.

Fiscal Year	Consumption normalized		Conservation Goal			Actual Energy Savings		
	ekWh	ekWh/m²	ekWh/ft²	ekWh/m²	%	ekWh/ft²	ekWh/m²	%
2012-13	214,918,357	153.2						
2013-14	212,293,806	148.2	0.147	1.58	1.0%	0.465	5.00	3.3%
2014-15	210,570,761	143.1	0.211	2.27	1.5%	0.474	5.10	3.4%
2015-16	216,720,788	147.3	0.187	2.01	1.4%	-0.390	-4.20	-2.9%
2016-17	213,800,676	144.2	0.213	2.29	1.6%	0.288	3.10	2.1%
2017-18	212,230,158	141.1	0.190	2.04	1.4%	0.288	3.10	2.1%

NOTE TO READERS:
The Conservation Goals were forecasted in Spring 2014. Since then a number of factors, which impact energy consumption, have been introduced to the education sector that may either increase or limit a board's ability to achieve the forecasted Conservation Goals.

Some of these factors include:

Full Day Kindergarten (FDK)

The introduction of FDK resulted in many new spaces being created through new additions or extensive renovations of existing facilities which resulted in more floor area and in some cases more energy-intensive designs due to factors such as higher ventilation requirements, the implementation of air conditioning etc. which 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 support the introduction of FDK spaces. However Before and After School Programs require a facility's HVAC system to operate for an extended period of time on a daily basis, which increases 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. As a result of this funding, the use of spaces in schools, typically gymnasiums and libraries, increased to maximum utilization. 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 increases overall energy intensity.

Community Hubs

In 2016, the Ministry of Education introduced funding for boards to implement Community Hubs within their asset portfolios. As a result, many schools now offer a wider 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 operate from 6:00 a.m. until 11:00 p.m. during weekdays and are open for large quantities of time on weekends. As a result, a facility's HVAC system must operate for significantly longer to support community hubs and overall energy consumption/intensity is increased.

Air Conditioning

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

Compliance with current Ontario Building Code (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 current OBC standards which may result in increased energy consumption.

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

E. Cumulative Energy Conservation Goals

The chart below compares the 2014 Forecasted Cumulative Energy Intensity Conservation Goal with the Actual Cumulative Energy Intensity Reduced Savings.

		(ekWh/ft2)	(ekWh/m2)	Variance
2014 Board Plan	**Forecasted Cumulative Energy Intensity Conservation Goal FY 2013-14 to FY 2017-18**	0.948	10.19	
	Forecasted Cumulative Energy Intensity Conservation Goal as a Percentage			6.9%
FY 2017-18	**Actual Cumulative Energy Intensity Reduced/Increased between FY 2013-14 to FY 2017-18 - weather normalized**	1.125	12.1	
Variance	**2014 Forecasted Cumulative Conservation Goal and Actual Cumulative Energy Intensity Reduced/Increased - weather normalized**	0.177	1.910	
	% of Cumulative Energy Intensity Conservation Goal Achieved - weather normalized			119%

F. Measures Implemented from FY 2012-13 to FY 2017-18

A list of the measures implemented, the associated costs, and the fiscal year that the measure was implemented within the Board are outlined in *Appendix: Progress and Achievements to Date*, tabs:

- Total Investment in Design, Construction and Retrofit Strategies
- Total Investment in Operations and Maintenance Strategies
- Total Investment in Occupant Behaviour Strategies
- Total Investment in Renewable Energy
- Summary of Total Investments

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 determine the associated actual energy savings achieved.

PART II – ENERGY CONSERVATION AND DEMAND MANAGEMENT PLAN FOR FY 2018-19 TO FY 2023-24

Part II outlines the board's plan to reduce energy consumption through renewable energy and energy management strategies including: Design/Construction/Retrofit; Operations and Maintenance; and Occupant Behaviour.

Background

1. To date the Board's energy management strategy has included the following:
   Focused collaboration between operations, maintenance and designers. Prefer smaller and proven incremental changes rather then large and higher risk energy projects. Prefer to upgrade rather than "like for like" replacement.

2. The Board has an energy management position.
   - ☐ In-house
     - ☐ Full time
     - ☐ Part time
     - ■ Shared job function
   - ☐ Contracted third party
   - ☐ None

3. Energy Management Strategies
   Energy management strategies fall into four key categories:

   - Renewable Energy
   - Design/construction/retrofit
   - Operations and maintenance
   - Occupant Behaviour

Renewable Energy

Renewable energy through solar panels, wind turbines etc. is a strategy to reduce a board's energy consumption from the province's electricity grid.

For a list of the Board's renewable energy projects, please see **Calculating Energy Conservation Goals FY 2019 to FY 2023, Tab A.**

Design/Construction/Retrofit

Definition

Design/construction/retrofit encompasses the original and ongoing intent of how a building and its systems are to perform as a whole through the integration of disciplines such as, architecture and engineering.

For the Board's relevant projects over the next five years, please refer to **Calculating Energy Conservation Goals FY 2019 to FY 2023, Tab B.**

Operations and Maintenance

Definition

Operations and maintenance includes the strategies the Board uses to ensure that the existing buildings and equipment perform at peak efficiency. For the Board's relevant projects over the next five years, please refer to **Calculating Energy Conservation Goals FY 2019 to FY 2023, Tab C.**

Occupant Behaviour

Definition

Strategies that the Board uses to educate occupants, including staff, students and community users, with an emphasis in changing specific behaviours to reduce energy consumption. For the Board's relevant projects over the next five years, please refer to **Calculating Energy Conservation Goals FY 2019 to FY 2023, Tab D.**

A. Future Energy Conservation Goals

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

Annual Energy Intensity Conservation Goals

Annual Energy Intensity Conservation Goal	Fiscal Year				
	2018-19	2019-20	2020-21	2021-22	2022-23
ekWh / ft²	**0.09**	**0.08**	**0.08**	**0.7**	**0.7**
ekWh / m²	1.0	0.9	0.9	0.8	0.8
% decrease	0.7%	0.7%	0.7%	0.7%	0.7%

Cumulative Conservation Goal

The following chart indicates the board's Cumulative Energy Intensity Conservation Goal for the next five fiscal years.

Cumulative Conservation Goal	FY 2018-19 to 2022-23
ekWh / ft²	0.5
ekWh / m²	5.0
Percentage (%) Decrease	3.0%

NOTE TO READERS:

There are numerous 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:

- *Changes in programming*
  - Example

    - Introduction of Before and After School programs to schools meant that the number of hours that a facility's HVAC system operates on a daily basis was expanded by four or more hours per weekday to reflect the longer occupancy hours
- *Changes to Ontario's Building Code*
    - Example
        - Regular changes/updates to Ontario's Building Code can impact energy consumption. 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/cooling of the air (dependent on the season) to meet standard classroom temperatures
- *Changes to school board funding models*
    - Forecasted Conservation Goals are based on current funding models being in place throughout the next five years.
    - Boards' funding is determined on an annual basis. Any changes to the funding model will impact forecasted values.
- *Changes in technology*
    - Forecasted Conservation Goals are based on current technologies and associated energy savings. If new technologies become available, anticipated energy savings may increase.

B. Environmental Programs

1. In 2018-19 schools within the Board that participated in environmental programs.
    - ■ EcoSchools — 108 schools participating
    - ■ Enbridge School Energy Challenge — 7 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

    Between Fiscal Year 2013-14 and Fiscal Year 2017-18, the Board has applied for $31,582.47 in incentive funding from various 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,

   ■ OECM'S Natural Gas Management and Advisory Services
   ☐ 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 reduce 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 York Region District School Board's senior management has reviewed and approved this Energy Conservation and Demand Management Plan.

_____ June 27, 2019

Pierre Schipper, P. Eng. Date
Manager of Facilities Services (Operations)