



District School Board of Niagara
Energy Conservation and Demand Management Plan
2018/2019 – 2022/2023



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Executive Summary

The District School Board of Niagara's (DSBN) "Energy Conservation and Demand Management Plan 2018/2019 – 2022/2023" is written to meet the legislative requirements laid out by the Province of Ontario in O. Reg. 507/18: Broader Public Sector: Energy Reporting and Conservation and Demand Management Plans. This report is the second 5-year term for energy conservation and demand management, the first of which was created for the 2013/2014-2017/2018 period.

The DSBN remains committed to advance energy efficiency within our 104 facilities, and with the 3,000+ staff and 30,000+ students which utilize our facilities on a daily basis. As detailed in the report, the goal of the first 5-year term was a 5% reduction in weather-normalized energy utilization index (EUI) (ekWh/ft²) which was reached. In fact, the DSBN, through implementation of sector best practices and prudent fiscal management, was able to reach an 8.7% reduction in weather-normalized EUI. These energy savings also produced an annual cost avoidance for the DSBN of roughly \$305,000 in utility costs. Along with the approximately \$402,000 received in utility-provided incentives, energy management at the DSBN has produced nearly three-quarters of a million dollars in value. For the upcoming 5-year period, an additional reduction in weather-normalized EUI of 5% was selected as the goal. This was chosen to reflect the fact that processes are in the place to replicate the success of the previous 5 years at additional facilities, while striving to include additional projects to not only reduce energy use but improve the indoor learning environment for staff and students. These projects are summarized in the Appendices attached to this report.

The on-going completion of capital and operational projects to reduce energy use in DSBN's facilities will be guided by a philosophy of sustainability and natural resource conservation. This philosophy, combined with a focus on preventative maintenance and operations' best practices, will lead to continued utility cost savings, greenhouse gas reductions, and exceptional indoor learning environments.

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 the Spring 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

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 2012/2013 to the end of the five-year reporting period Fiscal Year 2017/2018.

Table 1: Board's Asset Portfolio

| Key Metrics | Fiscal Year 2012/2013 (Baseline Year) | Fiscal Year 2017/2018 | Variance |
|-------------------------------------|--|-----------------------|----------|
| Total Number of Buildings | 128 | 109 | -19 |
| Total Number of Portables/Portapaks | 61 | 64 | 3 |
| Total Floor Area (ft ²) | 6,365,683 | 6,152,220 | -213,333 |
| Average Operating Hours | 61 | 61 | - |
| Average Daily Enrolment | 33,934 | 37,614 | 3,680 |

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 2012/2013 (Baseline year) | Fiscal Year 2017/2018 |
|--------------------------|--|-----------------------|
| Total Electricity (kWh) | 34,940,030 | 30,087,630 |
| Total Natural Gas (ekWh) | 87,630,860 | 80,600,400 |

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

| Utility | Fiscal Year 2012/2013 (Baseline year) | Fiscal Year 2017/2018 |
|----------------------|--|-----------------------|
| Total Propane (ekWh) | 42,345 | 179,560 |

C. Weather Normalized Energy Consumption Values

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

To demonstrate the affect 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 2012/2013 | Fiscal Year 2013/2014 | Fiscal Year 2014/2015 | Fiscal Year 2015/2016 | Fiscal Year 2016/2017 | Fiscal Year 2017/2018 |
|---------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| 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.

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.

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).

Table 4: Weather Normalized Values

| Weather Normalized Values | Fiscal Year 2012/2013 (Baseline Year) | Fiscal Year 2017/2018 (Most Recent Data Available) |
|--|--|---|
| Total Energy Consumed (ekWh) | 118,710,700 | 104,736,400 |
| Energy Intensity (ekWh/ft ²) | 18.65 | 17.02 |
| Energy Intensity (ekWh/m ²) | 200.7 | 183.3 |

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. The DSBN’s conservation goal as stated in the 2014 Conservation and Demand Management Plan was to reduce weather normalized energy intensity (ekWh/ft²) by 5% over five years. This goal is reflected in the Goal Percentage in Table 5 below.

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

| Fiscal Year | Energy Intensity Conservation Goal (ekWh/ft ²) | Energy Intensity Conservation Goal (ekWh/m ²) | Conservation Goal Percentage | Actual Energy Intensity Reduction (ekWh/ft ²) | Actual Energy Intensity Reduction (ekWh/m ²) | Actual Energy Percentage |
|-------------|--|---|------------------------------|---|--|--------------------------|
| 2013/2014 | 0.20 | 2.0 | 1.0 | 0.37 | 4.0 | 2.0 |
| 2014/2015 | 0.20 | 2.0 | 1.0 | 0.58 | 6.3 | 3.2 |
| 2015/2016 | 0.20 | 2.0 | 1.0 | -0.92 | -9.9 | -5.2 |
| 2016/2017 | 0.20 | 2.0 | 1.0 | 0.75 | 8.1 | 4.0 |
| 2017/2018 | 0.20 | 2.0 | 1.0 | 0.84 | 9.0 | 4.7 |

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 school 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, DSBN 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 consistently requesting 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 2013/2014 through Fiscal Year 2017/2018

| Cumulative Energy Intensity | (ekWh/ft ²) | (ekWh/m ²) | Variance |
|---|-------------------------|------------------------|----------|
| Forecasted Cumulative Energy Intensity Conservation Goal of Fiscal Year 2013/2014 through Fiscal Year 2017/2018 | 1.00 | 10.0 | |
| Forecasted Cumulative Energy Intensity Conservation Goal as a Percentage | | | 5.0% |
| Actual Cumulative Energy Intensity Reduced or Increased from Fiscal Year 2013/2014 through Fiscal Year 2017/2018 – Weather Normalized | 1.62 | 17.5 | |
| | | | |

| Cumulative Energy Intensity | (ekWh/ft ²) | (ekWh/m ²) | Variance |
|--|-------------------------|------------------------|----------|
| Variance between 2014 Forecast Cumulative Conservation Goal and Actual Cumulative Energy Intensity– Weather Normalized | 0.62 | 7.5 | |
| % of Cumulative Energy Intensity Conservation Goal Achieved - Weather Normalized | | | 8.7% |

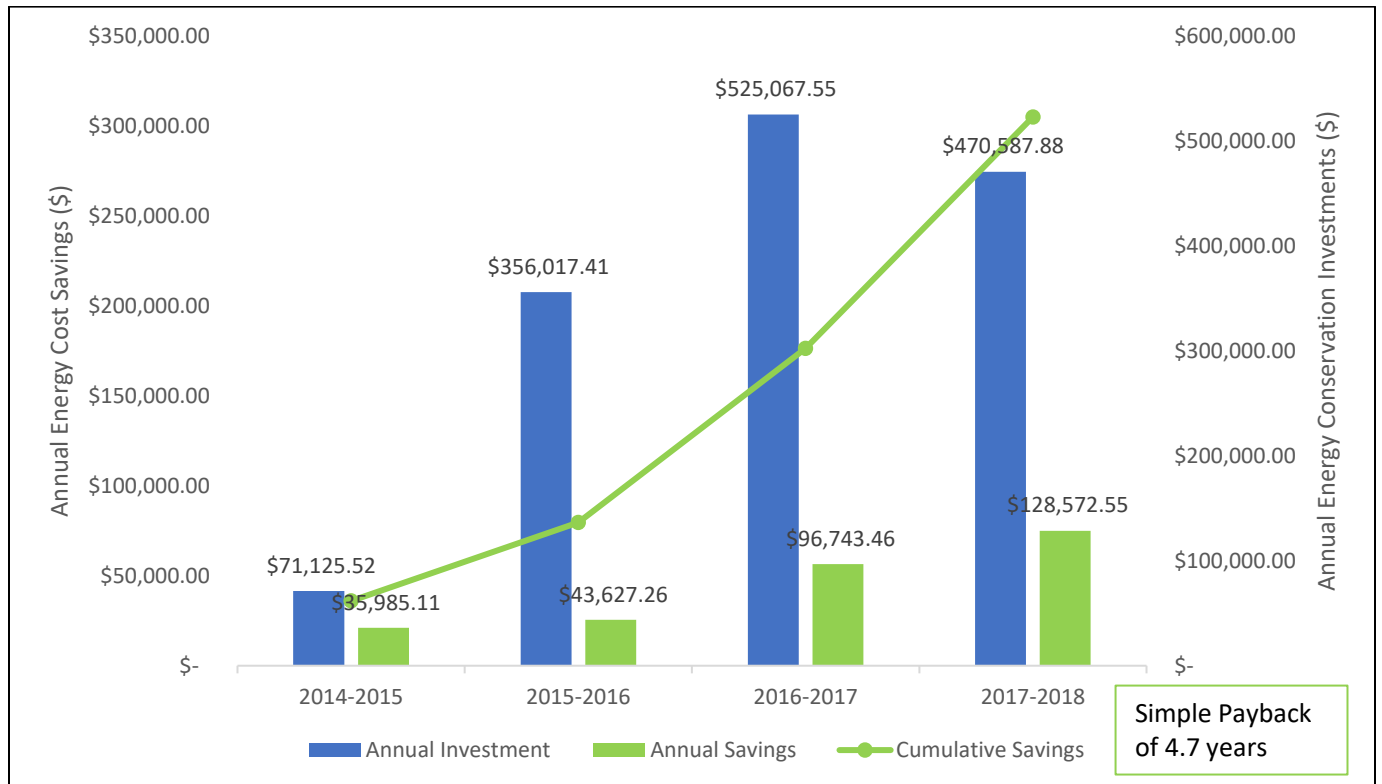
F. Measures Implemented from Fiscal Year 2012/2013 to Fiscal Year 2017/2018

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 II: Investments in Energy Management Strategies – Fiscal Year 2013/2014 to Fiscal Year 2017/2018**. 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

Additional measures were implemented by DSBN through activities targeted by the Energy Coordinator with the express purpose of addressing the board’s energy conservation goal of a 5% reduction in energy intensity by 2018/2019. A list of these projects, their costs, energy savings, energy cost savings, and simple payback can be found in **Appendix III: DSBN Energy Conservation Measures – Fiscal Year 2014/2015 to Fiscal Year 2017/2018**. These measures are also summarized in the below graph. Also note, the Energy Coordinator was hired in September 2014, so no additional measures were implemented in the 2012/2013 and 2013/2014 fiscal years.

Graph 1: DSNB Energy Conservation Measures (2014/2015 - 2017/2018)



Some highlights of the achievements in energy efficiency from the 2012/2013 – 2017/2018 period include:

- 1) All Secondary School gymnasium lighting retrofitted to LED fixtures with occupancy control and manual dimming capabilities.
- 2) All interior lighting with a load greater than one hundred watts retrofitted to LED lamps or fixtures. This includes all Secondary School automotive, carpentry, etc. shops, cafeterias, and auditoriums.
- 3) Board-wide implementation of facility water consumption monitoring and leak detection.
- 4) Training for Maintenance and Operations staff on energy efficiency programs such as; low voltage lighting controls, portable classroom HVAC system design and efficient operation, and water end-use technologies and sustainability.
- 5) Strategic resource management for the efficient purchase of natural gas and electricity commodities.
- 6) Purchasing Department policy changes to prioritize Energy Star small appliance purchases.
- 7) Facilities Department specifications for heating systems to standardize condensing boilers.

Part II: Energy Conservation and Demand Management Plan for Fiscal Year 2018/2019 to Fiscal Year 2022/2023

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.

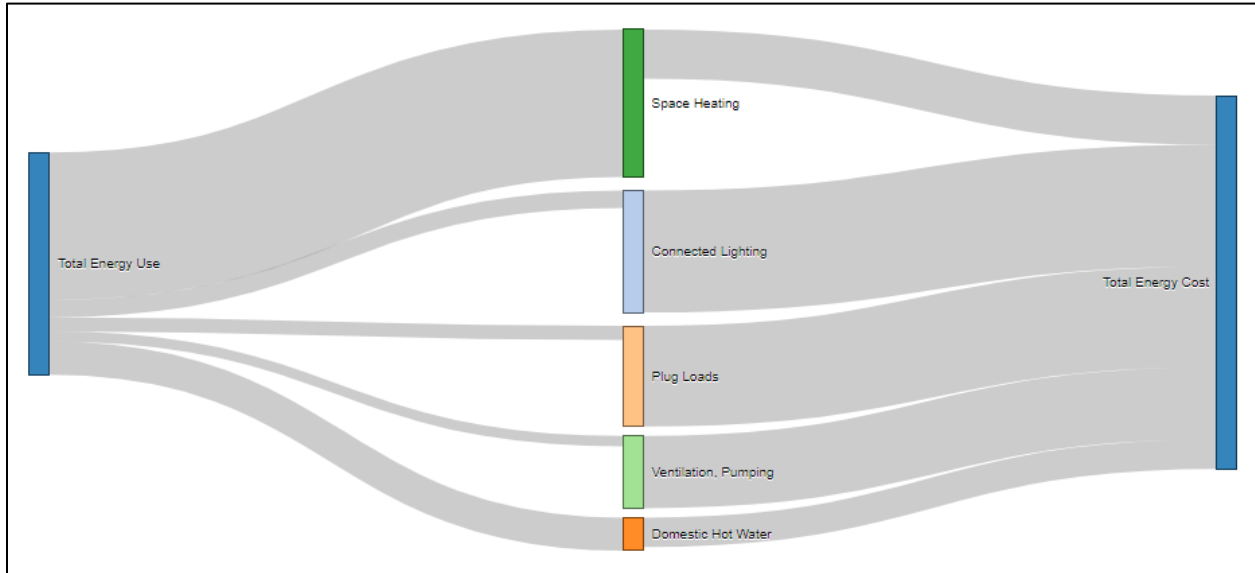
Background

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

The DSBN has been guided by a philosophy centred on reducing the consumption of natural resources through energy efficiency programs, raising awareness, and strategic capital investments. While, simultaneously, reducing the burden of long-term operating and maintenance costs at the lowest possible capital investment by utilizing strategic planning and purchasing, and capitalizing on utility-provided retrofit incentives. This philosophy has resulted in providing simple and concise energy efficiency projects which encompass improvements at all DSBN facilities.

The following diagram demonstrates the energy and cost flows for a typical DSBN facility. It helps to simplify the planning process for new energy efficiency programs by visualizing which major facility systems use the most energy versus which systems have the highest operating costs. In all energy efficiency and conservation programs, the trade-off between reducing energy use and energy costs needs to be examined to find the optimal balance for capital and operational investment dollars.

Figure 1: Typical DSBN Facility Flow Diagram⁵



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 fall into four key categories:

1. Design/Construction/Retrofit

2. Operations and Maintenance

3. Occupant Behaviour

⁵ Sankey from Excel: acknowledgement for d3.js and sankey diagram to Mike Bostok

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 **Appendix IV: Calculating Energy Conservation Goals - Fiscal Year 2018/2019 to Fiscal Year 2022/2023, Part A: Design, Construction, and Retrofit.**

Some highlights of Design/Construction/Retrofit projects/programs over the next five years include:

- All elementary gymnasium lighting converted to LED fixtures with occupancy sensors and manual dimming. This will allow energy savings and improve lighting for presentations and performances.
- On-going investment in condensing boilers at select facilities which currently utilize atmospheric boiler systems.
- New window installations utilizing high-performance window specifications, along with improving door insulation and air sealing values.
- Significant investments in new roofs with improved roof insulation values.

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 **Appendix IV: Calculating Energy Conservation Goals - Fiscal Year 2018/2019 to Fiscal Year 2022/2023, Part B: Operations and Maintenance.**

Some highlights of Operations and Maintenance projects/programs over the next five years include:

- Updating controls of outdoor lighting to turn off all exterior lighting when the building is unoccupied.
- Recommissioning select Building Automation Systems (BAS) to optimize HVAC system setpoints and schedules.

- Cleaning building radiator heating systems and ensuring valves and thermostats are working properly.

Occupant Behaviour

Definition

Strategies that the Board uses to educate 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 **Appendix IV: Calculating Energy Conservation Goals - Fiscal Year 2018/2019 to Fiscal Year 2022/2023, Part C: Occupant Behaviour**.

Some highlights of Occupancy Behaviour programs over the next five years include:

- Continuing the use of RETScreen Expert energy management software to set benchmarks and complete project analysis for on-going energy efficiency programs.

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 2018/2019 | Fiscal Year 2019/2020 | Fiscal Year 2020/2021 | Fiscal Year 2021/2022 | Fiscal Year 2022/2023 |
|---|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| ekWh/ft ² | 0.17 | 0.17 | 0.17 | 0.17 | 0.17 |
| ekWh/m ² | 1.8 | 1.8 | 1.8 | 1.8 | 1.8 |
| Percentage Decrease | 1 | 1 | 1 | 1 | 1 |

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 2018/2019 through Fiscal Year 2022/2023 |
|------------------------------|---|
| ekWh/ft ² | 0.85 |
| ekWh/m ² | 9.0 |
| Percentage Decrease | 5 |

The DSBN has employed industry-leading energy management software call RETScreen Expert to manage the portfolio of schools to meet the above goals. The DSBN continues to have a strategic partnership with Natural Resources Canada (holder of the RETScreen patent) to ensure the portfolio is up-to-date with the latest energy management tools. Utilizing this software, the DSBN can manage our facility portfolio in the most efficient way possible, while keeping administrative costs to a minimum.

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. 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 2013/2014 and Fiscal Year 2017/2018, the Board has applied for \$402,073 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

C. 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:

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:

D. 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)

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

I confirm that District School Board of Niagara senior management has reviewed and approved this Energy Conservation and Demand Management Plan.

Full Name: Graeme McKenzie

Job Title: Energy Coordinator

Date: June 26, 2019

Appendix I:
Energy Consumption and Greenhouse Gas
Emissions – Fiscal Year 2017/2018

| | | | | | | | | | | | | | | | |
|---------------------------------------|---|-------------------------|---------------------|---------|------------|-------------|----|----|---|-----------------|-----|---------------|-------------|---------------|----------|
| Oakwood PS | School | 255 Omer Ave | Port Colborne | L3K 3Z1 | 24,589.08 | Square feet | 60 | No | 0 | 75,803.51450 | kWh | 31,653.78723 | Cubic Meter | 61,156.75399 | 16.76406 |
| Ontario PS | School | 550 Allanburg Rd | Thorold | L2V 1A8 | 27,585.85 | Square feet | 60 | No | 0 | 121,279.99890 | kWh | 40,908.04271 | Cubic Meter | 79,439.75148 | 20.15677 |
| Orchard Park PS | School | 3691 Dorchester Rd | Niagara Falls | L2J 3A6 | 33,746.62 | Square feet | 60 | No | 0 | 232,854.25659 | kWh | 76,277.64335 | Cubic Meter | 148,240.48494 | 30.92209 |
| Park PS | School | 217 Main St E | Grimsby | L3M 1P5 | 16,527.53 | Square feet | 60 | No | 0 | 67,457.99822 | kWh | 38,535.16526 | Cubic Meter | 74,022.51235 | 28.86101 |
| Parliament Oak PS - Sold Feb 2018 | School | 325 King St | Niagara-On-The-Lake | L0S 1J0 | 16,326.22 | Square feet | 60 | No | 0 | 23,275.54816 | kWh | 30,014.07504 | Cubic Meter | 57,148.04108 | 20.96373 |
| Parnall PS | School | 507 Geneva St | St. Catharines | L2N 2H7 | 35,563.96 | Square feet | 60 | No | 0 | 149,865.29346 | kWh | 67,392.02349 | Cubic Meter | 130,005.54905 | 24.35310 |
| Peace Bridge PS | School | 105 Torrance St | Fort Erie | L2A 2C1 | 35,627.88 | Square feet | 60 | No | 4 | 197,220.96321 | kWh | 37,128.35828 | Cubic Meter | 73,607.40486 | 16.61095 |
| Pelham Centre PS - Closed July 2017 | School | 1165 Centre St | Fenwick | L0S 1C0 | 20,356.94 | Square feet | 60 | No | 0 | 133,047.25330 | kWh | 8,647.83218 | Cubic Meter | 18,651.27640 | 11.05051 |
| Pine Grove PS | School | 690 Lake St | St. Catharines | L2N 4J5 | 39,343.06 | Square feet | 60 | No | 2 | 168,776.57428 | kWh | 44,809.67469 | Cubic Meter | 87,637.87801 | 16.39435 |
| Plymouth PS | School | 111 First St | Welland | L3B 4S1 | 34,555.40 | Square feet | 60 | No | 0 | 135,310.77124 | kWh | 58,310.44798 | Cubic Meter | 112,583.91305 | 21.84959 |
| Port Colborne HS | School | 211 Elgin St | Port Colborne | L3K 3K4 | 200,225.00 | Square feet | 80 | No | 0 | 681,462.00000 | kWh | 259,557.93708 | Cubic Meter | 502,515.17358 | 17.18060 |
| Port Weller PS | School | 273 Parnell Rd | St. Catharines | L2M 1W4 | 28,790.59 | Square feet | 60 | No | 0 | 106,669.73340 | kWh | 51,587.80896 | Cubic Meter | 99,378.47754 | 22.74818 |
| Power Glen PS | School | 34 Westland St | St. Catharines | L2S 4C1 | 44,140.86 | Square feet | 60 | No | 0 | 254,184.00000 | kWh | 45,857.35438 | Cubic Meter | 91,096.02718 | 16.79953 |
| Prince of Wales PS (SC) | School | 95 Facer St | St. Catharines | L2M 5J6 | 33,942.05 | Square feet | 60 | No | 0 | 130,939.89490 | kWh | 42,810.15500 | Cubic Meter | 83,203.03322 | 17.26227 |
| Prince of Wales PS (TH) | School | 40 Pine St | Thorold | L2V 3L4 | 40,638.61 | Square feet | 60 | No | 0 | 145,162.18408 | kWh | 64,547.30586 | Cubic Meter | 124,545.89469 | 20.45239 |
| Prince Philip PS (NF) | School | 3112 Dorchester Rd | Niagara Falls | L2J 2Z7 | 33,171.13 | Square feet | 60 | No | 3 | 177,091.56152 | kWh | 49,517.87398 | Cubic Meter | 96,683.15936 | 21.20387 |
| Prince Philip PS (SC) | School | 600 Vine St | St. Catharines | L2M 3V1 | 38,534.63 | Square feet | 60 | No | 0 | 149,020.18884 | kWh | 30,006.14031 | Cubic Meter | 59,308.17026 | 12.14281 |
| Princess Elizabeth PS | School | 330 Scholfield Ave | Welland | L3B 1P2 | 33,568.64 | Square feet | 60 | No | 2 | 139,480.51647 | kWh | 57,053.62601 | Cubic Meter | 110,279.85976 | 22.21817 |
| Princess Margaret PS | School | 6624 Culp St | Niagara Falls | L2G 2C4 | 64,016.42 | Square feet | 60 | No | 0 | 238,114.03711 | kWh | 133,559.54975 | Cubic Meter | 256,630.18748 | 25.89266 |
| Quaker Road PS | School | 333 Quaker Rd | Welland | L3C 3G7 | 39,693.96 | Square feet | 60 | No | 0 | 184,227.62701 | kWh | 56,221.02086 | Cubic Meter | 109,479.74950 | 19.69398 |
| Queen Mary PS (closed) & St Cathari | School | 34 Catherine St | St. Catharines | L2R 5E7 | 229,491.60 | Square feet | 80 | No | 0 | 1,082,075.48572 | kWh | 300,275.33241 | Cubic Meter | 586,426.39263 | 18.62088 |
| Richmond Street PS | School | 153 Richmond St | Thorold | L2V 3H3 | 48,098.85 | Square feet | 60 | No | 2 | 178,464.65839 | kWh | 58,428.83549 | Cubic Meter | 113,554.21562 | 16.62063 |
| Ridgeway-Crystal Beach HS - Closed | School | 576 Ridge Rd | Ridgeway | L0S 1N0 | 80,434.07 | Square feet | 80 | No | 0 | 106,709.00000 | kWh | 80,891.63746 | Cubic Meter | 154,781.76613 | 12.01490 |
| River View PS | School | 3300 Cattell Dr | Niagara Falls | L2G 6M9 | 34,169.91 | Square feet | 60 | No | 2 | 186,062.66699 | kWh | 49,589.84570 | Cubic Meter | 96,974.41322 | 20.86902 |
| Ross PS | School | 358 Niagara St | Welland | L3C 1K9 | 44,252.80 | Square feet | 60 | No | 1 | 148,143.77086 | kWh | 41,292.16324 | Cubic Meter | 80,630.66966 | 13.26442 |
| Senator Gibson PS | School | 4944 John St | Beamsville | L0R 1B6 | 50,184.79 | Square feet | 60 | No | 1 | 278,449.41895 | kWh | 60,800.45896 | Cubic Meter | 119,767.60738 | 18.42437 |
| Simcoe Street PS | School | 4760 Simcoe St | Niagara Falls | L2E 1V6 | 34,120.09 | Square feet | 60 | No | 0 | 123,816.23474 | kWh | 41,546.06555 | Cubic Meter | 80,689.88649 | 16.56967 |
| Sir Winston Churchill SS | School | 101 Glen Morris Dr | St. Catharines | L2T 2N1 | 121,076.61 | Square feet | 80 | No | 2 | 706,126.00000 | kWh | 121,906.58048 | Cubic Meter | 242,694.44008 | 16.53269 |
| Smith PS | School | 18 Oakes Rd N | Grimsby | L3M 4B1 | 31,224.25 | Square feet | 60 | No | 4 | 212,805.00000 | kWh | 31,381.44886 | Cubic Meter | 63,011.71540 | 17.49666 |
| Smithville PS (Formerly South Lincoln | School | 260 Canborough St | Smithville | L0R 2A0 | 61,046.98 | Square feet | 80 | No | 0 | 244,413.25195 | kWh | 67,519.45404 | Cubic Meter | 131,881.96326 | 15.75827 |
| St Davids PS | School | 1344 York Rd | St. Davids | L0S 1P0 | 33,573.58 | Square feet | 60 | No | 0 | 247,390.34052 | kWh | 38,356.26734 | Cubic Meter | 76,796.75275 | 19.51035 |
| St. Catharines Service Centre | Administrative offices and related facilities | 9 Wright St | St. Catharines | L2P 3J3 | 24,740.88 | Square feet | 60 | No | 0 | 110,814.74536 | kWh | 32,331.61414 | Cubic Meter | 63,043.89611 | 18.36749 |
| St. Johns Adventure Campus | Other | 2984 Holland Rd RR#1 Rd | Fonthill | L0S 1E0 | 3,319.92 | Square feet | 40 | No | 0 | 13,488.19997 | kWh | | | 11,985.37542 | 20.21300 |
| Stamford Collegiate SS | School | 5775 Drummond Rd | Niagara Falls | L2G 4L2 | 149,192.64 | Square feet | 80 | No | 0 | 750,475.19922 | kWh | 210,155.81883 | Cubic Meter | 410,307.98528 | 20.00075 |
| Steele Street PS | School | 214 Steele St | Port Colborne | L3K 4X7 | 38,088.53 | Square feet | 60 | No | 0 | 140,064.60916 | kWh | 30,114.71073 | Cubic Meter | 59,358.52282 | 12.08020 |
| Stevensville PS | School | 3521 Main St E | Stevensville | L0S 1S0 | 39,625.72 | Square feet | 60 | No | 1 | 203,306.00000 | kWh | 71,787.30246 | Cubic Meter | 139,239.79948 | 24.38430 |
| Sven H Dohnberg Centre | Administrative offices and related facilities | 535 Lake St. Bldg 3 St | St. Catharines | L2N 4H7 | 5,751.91 | Square feet | 80 | No | 0 | | | 7,046.16641 | Cubic Meter | 13,321.67245 | 13.01917 |
| Thorold SS | School | 50 Ormond St N | Thorold | L2V 1Z1 | 131,595.80 | Square feet | 80 | No | 0 | 533,742.11328 | kWh | 149,308.19781 | Cubic Meter | 291,518.78118 | 16.11416 |
| Twenty Valley PS | School | 4057 Victoria Ave | Vineland | L0R 2C0 | 49,639.03 | Square feet | 60 | No | 0 | 218,687.77734 | kWh | 29,674.56800 | Cubic Meter | 59,886.40065 | 10.75892 |
| Valley Way PS | School | 5315 Valley Way | Niagara Falls | L2E 1X4 | 20,618.91 | Square feet | 60 | No | 0 | 114,941.36888 | kWh | 52,097.34193 | Cubic Meter | 100,484.89709 | 32.42753 |
| Victoria PS | School | 5635 Heritage Dr | Niagara Falls | L2J 4B3 | 19,726.16 | Square feet | 60 | No | 0 | 75,682.99966 | kWh | 25,061.46284 | Cubic Meter | 48,691.04283 | 17.33894 |
| Walker Living Campus | Other | 1 Taylor R Rd | Niagara-on-the-Lake | L0S 1J0 | 10,401.10 | Square feet | 10 | No | 0 | 38,615.35411 | kWh | | | 17,859.66712 | 15.78475 |
| Welland Centennial SS | School | 240 Thorold Rd W | Welland | L3C 3W2 | 145,483.19 | Square feet | 80 | No | 0 | 1,044,932.00000 | kWh | 248,549.55327 | Cubic Meter | 487,989.72999 | 25.33943 |
| Welland Service Centre | Administrative offices and related facilities | 120 Federal Rd | Welland | L3B 3P2 | 10,427.13 | Square feet | 60 | No | 0 | 56,320.09534 | kWh | 11,108.36934 | Cubic Meter | 21,976.00802 | 16.72343 |
| Wellington Heights PS | School | 9 Alsop Ave | Fenwick | L0S 1E0 | 33,452.18 | Square feet | 60 | No | 0 | 150,686.52734 | kWh | 31,396.24322 | Cubic Meter | 61,965.16068 | 14.47914 |
| Westdale PS | School | 130 Rykert St | St. Catharines | L2S 2B4 | 42,093.13 | Square feet | 60 | No | 1 | 161,989.18774 | kWh | 49,776.24861 | Cubic Meter | 96,910.40855 | 16.41598 |
| Westlane SS | School | 5960 Pitton Rd | Niagara Falls | L2H 1T5 | 142,346.70 | Square feet | 80 | No | 0 | 670,871.32227 | kWh | 197,894.80293 | Cubic Meter | 385,749.98971 | 19.48800 |
| Westmount PS | School | 73 Ann St W | Thorold | L2V 2J8 | 23,403.65 | Square feet | 60 | No | 0 | 90,636.21875 | kWh | 41,932.64997 | Cubic Meter | 80,846.82553 | 22.91468 |
| William E Brown PS | School | 31870 Lee St | Wainfleet | L0S 1V0 | 25,085.80 | Square feet | 60 | No | 0 | 78,054.73389 | kWh | 46,876.13652 | Cubic Meter | 89,975.48015 | 22.97092 |
| William Hamilton Merritt PS | School | 114 Linwell Rd | St. Catharines | L2N 6N8 | 32,674.38 | Square feet | 60 | No | 0 | 118,047.02356 | kWh | 26,416.24335 | Cubic Meter | 51,985.24034 | 12.20507 |
| Winger PS | School | 53220 Winger Rd | Wainfleet | L0S 1V0 | 26,236.71 | Square feet | 60 | No | 0 | 249,038.82861 | kWh | 14,361.33417 | Cubic Meter | 31,459.79980 | 15.30938 |
| Woodland PS | School | 1511 7th St Louth | St. Catharines | L2R 6P9 | 27,007.86 | Square feet | 60 | No | 0 | 106,318.71814 | kWh | 42,054.17378 | Cubic Meter | 81,347.85759 | 20.48519 |

Appendix II:
Investments in Energy Management Strategies
– Fiscal Year 2013/2014 to Fiscal Year
2017/2018

Appendix II: Investments in Energy Management Strategies – Fiscal Year 2013/2014 to Fiscal Year 2017/2018

Press TAB to move to 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 ...) | \$ 487,405 | \$ 35,794 | \$ 725,898 | \$ 1,160,727 | \$ 930,387 |
| Daylight Sensors | \$ - | \$ - | \$ - | \$ - | \$ - |
| Outdoor Lighting | \$ - | \$ - | \$ 103,775 | \$ 13,137 | \$ - |
| 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) | \$ - | \$ - | \$ - | \$ - | \$ - |
| High-efficiency Boilers (condensing) | \$ 358,066 | \$ 110,490 | \$ 385,381 | \$ 547,493 | \$ 1,341,529 |
| High-efficiency Boiler Burners | \$ - | \$ - | \$ - | \$ - | \$ - |
| Geothermal | \$ - | \$ - | \$ - | \$ - | \$ - |
| Heat Recovery/Enthalpy Wheels | \$ - | \$ - | \$ - | \$ - | \$ - |
| Economizers | \$ - | \$ - | \$ - | \$ - | \$ - |
| Energy Efficient HVAC Systems | \$ 676,804 | \$ 973,394 | \$ 1,562,296 | \$ 6,646,691 | \$ 10,017,781 |
| 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 | \$ - | \$ - | \$ - | \$ 11,595 | \$ - |
| 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 | \$ 1,914,141 | \$ 291,434 | \$ 559,043 | \$ - | \$ - |
| New Roof | \$ 1,419,325 | \$ 1,549,044 | \$ 1,618,336 | \$ 1,966,293 | \$ 1,817,652 |
| New Windows | \$ 127,496 | \$ 262,713 | \$ 89,339 | \$ 1,157,220 | \$ 546,752 |
| Treatments | \$ 30,556 | \$ 33,166 | \$ 8,163 | \$ 94,151 | \$ 51,085 |
| Shading Devices | \$ - | \$ - | \$ - | \$ - | \$ - |
| Other (Describe) | \$ - | \$ - | \$ - | \$ - | \$ - |
| Total Investment in Design, Construction and Retrofit Strategies | \$ 5,013,793 | \$ 3,256,037 | \$ 5,052,231 | \$ 11,597,307 | \$ 14,705,186 |

Appendix II: Investments in Energy Management Strategies – Fiscal Year 2013/2014 to Fiscal Year 2017/2018

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 | \$ 10,000 | \$ 10,000 | \$ 10,000 | \$ 10,000 | \$ 10,000 |
| 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 | \$ 2,500 | \$ 17,268 | \$ 22,045 | \$ - | \$ - |
| Engineering Audit | \$ - | \$ - | \$ - | \$ - | \$ - |
| Other (Describe) | | | | | |
| Total Investment in Operations and Maintenance Strategies | \$ 12,500 | \$ 27,268 | \$ 32,045 | \$ 10,000 | \$ 10,000 |

Appendix II: Investments in Energy Management Strategies – Fiscal Year 2013/2014 to Fiscal Year 2017/2018

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 | \$ 10,000 | \$ 10,000 | \$ 10,000 | \$ 10,000 | \$ 10,000 |
| 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 | \$ 10,000 | \$ 10,000 | \$ 10,000 | \$ 10,000 | \$ 10,000 |

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 | \$ 5,013,793 | \$ 3,256,037 | \$ 5,052,231 | \$ 11,597,307 | \$ 14,705,186 | 39,624,555 |
| Operations and Maintenance Investments Total | \$ 12,500 | \$ 27,268 | \$ 32,045 | \$ 10,000 | \$ 10,000 | 91,813 |
| Occupant Behaviour Investments Total | \$ 10,000 | \$ 10,000 | \$ 10,000 | \$ 10,000 | \$ 10,000 | 50,000 |
| Total Investment Per Fiscal Year | \$ 5,036,293 | \$ 3,293,305 | \$ 5,094,276 | \$ 11,617,307 | \$ 14,725,186 | 39,766,368 |

Appendix III:
DSBN Energy Conservation Measures –
Fiscal Year 2014/2015 to Fiscal Year 2017/2018

ECM Database

| Fiscal Year 2015-2018 | | General | | | Finance | | Energy & Cost Savings | | | |
|-------------------------------|----------------|---|---------------------------------|---------------------|--------------------------|---------------------|-----------------------|--------------------------|-----------------|--|
| Facility | Municipality | Measure Name | Date of Installation/Completion | Cost Installed (\$) | Cost with Incentive (\$) | Demand Savings (kW) | Energy Savings (kWh) | Annual Cost Savings (\$) | Payback (Years) | |
| Pine Grove PS | St. Catharines | Lighting Retrofit | Sep-14 | \$24,000 | \$17,519 | 14.6 | 58,355 | \$6,609.37 | 2.65 | |
| Pine Grove PS | St. Catharines | Occupancy Sensors | Sep-14 | \$3,508 | \$2,692.59 | 1.6 | 53,333 | \$5,102.67 | 0.53 | |
| Jeanne Sauve PS | St. Catharines | Energy Audit | Nov-14 | \$5,964 | \$3,055 | 0.0 | - | \$0.00 | - | |
| Education Centre | St. Catharines | Driveway Lighting Removal / Horizon Partnership | Jan-15 | \$0 | \$0 | 1.2 | 5,256 | \$744.65 | Immediate | |
| DSBN Academy | St. Catharines | Outdoor Lighting Retrofit | May-15 | \$8,180 | \$6,720 | 0.0 | 5,602 | \$691.85 | 9.71 | |
| Jeanne Sauve PS | St. Catharines | E12-Decommission Tech Wing Air Compressor | Jun-15 | \$0 | \$0 | 8.1 | 2,417 | \$619.33 | Immediate | |
| Jeanne Sauve PS | St. Catharines | E15-Eliminate Electric Room Heater | Jun-15 | \$82 | \$82 | 0.9 | 104 | \$47.08 | 1.74 | |
| Education Centre | St. Catharines | Atrium Lighting Retrofit | Jul-15 | \$13,200 | \$11,400 | 4.5 | 15,375 | \$2,257.06 | 5.05 | |
| St. Catharines Service Centre | | Electric baseboard shutdown | Jul-15 | \$277 | \$277 | 120.0 | 70,236 | \$9,620.61 | 0.03 | |
| Welland Service Centre | | Electric baseboard shutdown | Jul-15 | \$337 | \$176 | 40.0 | 23,412 | \$3,206.87 | 0.05 | |
| Ridgeway/Crystal Beach HS | Fort Erie | Fieldhouse Lighting Retrofit | Jul-15 | \$643 | \$0 | 0.5 | 2,040 | \$310.01 | Immediate | |
| Gordon PS | Welland | Gym Lighting Retrofit | Aug-15 | \$8,729 | \$8,729 | 0.6 | 1,322 | \$181.07 | 48.21 | |
| Richmond St. PS | Thorold | Gym Lighting Retrofit | Aug-15 | \$14,973 | \$12,013 | 7.4 | 16,986 | \$3,279.18 | 5.54 | |
| Ridgeway/Crystal Beach HS | Fort Erie | Theatre Lighting Retrofit | Aug-15 | \$6,439 | \$3,655 | 14.5 | 5,220 | \$1,670.44 | 5.26 | |
| AN Myer SS | Niagara Falls | Theatre Lighting Retrofit | Aug-15 | \$8,225 | \$4,807 | 8.5 | 6,408 | \$1,644.93 | 6.07 | |
| Pine Grove PS | St. Catharines | Energy Audit | Sep-15 | \$3,823 | \$1,912 | - | - | \$0.00 | - | |
| Burleigh Hill PS | St. Catharines | Energy Audit | Sep-15 | \$3,208 | \$1,604 | - | - | \$0.00 | - | |
| Park PS | Grimsby | Energy Audit | Sep-15 | \$3,208 | \$1,604 | - | - | \$0.00 | - | |
| Peace Bridge PS | Fort Erie | Energy Audit | Sep-15 | \$3,823 | \$1,912 | - | - | \$0.00 | - | |
| Valley Way PS | Niagara Falls | Energy Audit | Sep-15 | \$3,208 | \$1,604 | - | - | \$0.00 | - | |
| McKay PS | Port Colborne | Interior Lighting Retrofit | Nov-15 | \$2,527 | \$2,311 | 0.4 | 1,074 | \$157.72 | 23.05 | |
| Port Weller PS | St. Catharines | Interior Lighting Retrofit | Nov-15 | \$895 | \$895 | 0.1 | 853 | \$116.83 | 7.66 | |
| Centennial SS | Welland | Energy Audit | Nov-15 | \$0 | \$0 | - | - | \$0.00 | - | |
| St. Catharines Service Centre | St. Catharines | Warehouse LED Retrofit | Nov-15 | \$0 | \$0 | 3.3 | 10,782 | \$1,476.87 | Immediate | |
| Education Centre | St. Catharines | Boardroom sign controls | Jan-16 | \$17 | \$17 | 0.0 | 199 | \$24.73 | 0.69 | |
| Sir Winston Churchill SS | St. Catharines | Auditorium Lighting Retrofit | Mar-16 | \$4,147 | \$3,107 | 2.6 | 4,059 | \$708.27 | 4.39 | |
| Grimsby SS | Grimsby | Shop Lighting T12 Removal | Mar-16 | \$4,527 | \$4,527 | 10.3 | 24,881 | \$941.58 | 4.81 | |
| EL Crossley SS | Pelham | Outdoor Lighting Retrofit | Apr-16 | \$16,335 | \$12,447 | 0.0 | 25,914 | \$3,306.63 | 3.76 | |
| Education Centre | St. Catharines | Outdoor Lighting Retrofit | Apr-16 | \$14,760 | \$11,796 | 0.0 | 19,716 | \$2,434.93 | 4.84 | |
| Edith Cavell PS | St. Catharines | Energy Audit | Apr-16 | \$4,480 | \$2,240 | - | - | \$0.00 | - | |
| Grapeview PS | St. Catharines | Energy Audit | Apr-16 | \$5,110 | \$2,555 | - | - | \$0.00 | - | |
| Parnall PS | St. Catharines | Energy Audit | Apr-16 | \$4,158 | \$2,079 | - | - | \$0.00 | - | |
| Port Weller PS | St. Catharines | Energy Audit | Apr-16 | \$3,818 | \$1,909 | - | - | \$0.00 | - | |
| Westdale PS | St. Catharines | Energy Audit | Apr-16 | \$4,480 | \$2,240 | - | - | \$0.00 | - | |
| Laura Secord SS | St. Catharines | Theatre Lighting Retrofit | Apr-16 | \$1,360 | \$409 | 2.8 | 7,346 | \$1,132.55 | 0.36 | |
| Princess Margaret PS | Niagara Falls | T12 Removal | Apr-16 | \$112 | \$112 | 0.5 | 1,093 | \$43.04 | 2.60 | |
| EL Crossley SS | Wainfleet | T12 Removal | May-16 | \$4,458 | \$4,458 | 1.4 | 3,279 | \$172.68 | 25.82 | |
| Ross PS | Welland | T12 Removal | May-16 | \$5,360 | \$5,360 | 3.4 | 8,270 | \$449.08 | 11.94 | |
| Plymouth PS | Welland | T12 Removal | May-16 | \$6,297 | \$6,297 | 10.1 | 24,511 | \$1,278.03 | 4.93 | |
| W.E. Brown PS | Wainfleet | T12 Removal | May-16 | \$897 | \$897 | 1.5 | 3,707 | \$267.02 | 3.36 | |
| Education Centre | St. Catharines | Boardroom Lighting Retrofit | Jun-16 | \$2,159 | \$2,159 | 17.5 | 17,450 | \$1,551.36 | 1.39 | |
| EL Crossley SS | Wainfleet | T12 Removal | Jun-16 | \$4,458 | \$4,458 | 3.5 | 9,244 | \$839.66 | 5.31 | |
| Jeanne Sauve PS | St. Catharines | Outdoor Lighting Retrofit | Aug-16 | \$12,308 | \$10,588 | 0.0 | 19,446 | \$2,401.58 | 4.41 | |
| Quaker Rd. PS | Welland | Interior Lighting Retrofit | Aug-16 | \$35,030 | \$35,030 | 6.7 | 16,111 | \$2,064.82 | 16.97 | |
| Governor Simcoe SS | St. Catharines | Gym Lighting Retrofit | Aug-16 | \$18,306 | \$16,626 | 4.1 | 13,121 | \$1,946.83 | 8.54 | |
| St. Catharines Collegiate | St. Catharines | Gym Lighting Retrofit | Aug-16 | \$61,020 | \$55,820 | 13.1 | 72,727 | \$10,024.68 | 5.57 | |
| Pine Grove PS | St. Catharines | Gym Lighting Retrofit | Aug-16 | \$19,712 | \$18,952 | 1.3 | 3,172 | \$399.58 | 47.43 | |
| Cherrywood Acres PS | Niagara Falls | Gym Lighting Retrofit | Aug-16 | \$13,058 | \$11,757 | 1.2 | 3,206 | \$416.14 | 28.25 | |
| Jeanne Sauve PS | St. Catharines | Gym Lighting Retrofit | Aug-16 | \$64,830 | \$60,990 | 10.0 | 26,707 | \$4,091.21 | 14.91 | |
| Princess Elizabeth PS | Welland | Interior Lighting Retrofit | Aug-16 | \$26,484 | \$20,321 | 14.1 | 15,372 | \$2,105.44 | 9.65 | |
| Senator Gibson PS | Lincoln | Outdoor Lighting Retrofit - Phase 2 | Aug-16 | \$7,626 | \$7,172 | 0.0 | 8,801 | \$1,086.92 | 6.60 | |
| Lakeview PS | Grimsby | Outdoor Lighting Retrofit - Phase 2 | Aug-16 | \$9,153 | \$8,210 | 0.0 | 8,251 | \$1,099.03 | 7.47 | |
| Centennial SS | Welland | T12 Removal | Aug-16 | \$11,294 | \$11,294 | 3.4 | 8,270 | \$518.47 | 21.78 | |
| Pine Grove PS | St. Catharines | T12 Removal | Aug-16 | \$7,299 | \$7,299 | 11.0 | 26,545 | \$1,179.13 | 6.19 | |
| W.E. Brown PS | Wainfleet | Library Lighting Retrofit | Aug-16 | \$13,048 | \$13,048 | 6.8 | 16,334 | \$1,392.44 | 9.37 | |
| Ferndale PS | St. Catharines | Outdoor Lighting Retrofit - Phase 2 | Sep-16 | \$11,838 | \$10,927 | 0.0 | 13,531 | \$1,263.03 | 8.65 | |
| Steele St PS | Port Colborne | T12 Removal | Dec-16 | \$0 | \$4,332 | 0.6 | 1,560 | \$237.01 | 18.28 | |
| St. Catharines Service Centre | St. Catharines | Complete LED Retrofit | Feb-17 | \$34,359 | \$31,081 | 12.3 | 31,079 | \$4,257.06 | 7.30 | |
| Pine Grove PS | St. Catharines | Interior Lighting Retrofit - T8 LED Lamps | Mar-17 | \$10,473 | \$7,283 | 11.1 | 26,719 | \$4,142.85 | 1.76 | |
| Peace Bridge PS | Fort Erie | Interior Lighting Retrofit - T8 LED Lamps | Mar-17 | \$11,189 | \$7,259 | 12.2 | 29,504 | \$5,242.92 | 1.38 | |
| Grand Ave. PS | Grimsby | Interior Lighting Retrofit - T8 LED Lamps | Mar-17 | \$14,670 | \$9,534 | 13.7 | 33,000 | \$5,691.69 | 1.68 | |
| Lakeview PS | Grimsby | Interior Lighting Retrofit - T8 LED Lamps | Mar-17 | \$13,601 | \$9,001 | 14.1 | 34,007 | \$5,864.74 | 1.53 | |
| Stevensville PS | Fort Erie | T12 Removal | Mar-17 | \$15,153 | \$15,153 | 5.5 | 13,361 | \$1,080.17 | 14.03 | |
| Welland Service Centre | Welland | Complete LED Retrofit | Mar-17 | \$13,560 | \$10,737 | 9.0 | 22,658 | \$3,103.36 | 3.46 | |
| Grand Ave. PS | Grimsby | Library Lighting Retrofit | Mar-17 | \$3,915 | \$3,915 | 2.9 | 7,000 | \$1,217.38 | 3.22 | |
| Grand Ave. PS | Grimsby | Interior Lighting Retrofit - Lobby | Apr-17 | \$466 | \$466 | 0.3 | 653 | \$36.07 | 12.92 | |
| Prince Philip PS (NF) | Niagara Falls | Interior Lighting Retrofit - Stage | Apr-17 | \$92 | \$92 | 0.8 | 1,872 | \$147.81 | 0.62 | |
| AN Myer SS | Niagara Falls | Gym Lighting Retrofit | Aug-17 | \$46,160 | \$42,760 | 7.9 | 36,401 | \$5,284.73 | 8.09 | |
| Stamford Collegiate SS | Niagara Falls | Gym Lighting Retrofit | Aug-17 | \$45,160 | \$42,040 | 7.2 | 45,138 | \$6,293.82 | 6.68 | |
| EL Crossley SS | Wainfleet | Gym Lighting Retrofit | Aug-17 | \$60,908 | \$56,268 | 11.0 | 61,965 | \$10,375.49 | 5.42 | |
| Westlane SS | Niagara Falls | Gym Lighting Retrofit | Aug-17 | \$58,309 | \$52,989 | 12.7 | 67,346 | \$9,585.96 | 5.53 | |

| | | | | | | | | | |
|--------------------------|----------------|---|--------|-----------|-----------|-------|---------|-------------|------|
| Richmond St. PS | Thorold | Interior Lighting Retrofit | Aug-17 | \$102,500 | \$94,796 | 29.1 | 87,007 | \$15,472.54 | 6.13 |
| DSBN Academy | St. Catharines | Gym Lighting Retrofit | Aug-17 | \$29,885 | \$28,515 | 6.7 | 24,995 | \$3,620.27 | 7.88 |
| Laura Secord SS | St. Catharines | Gym Lighting Retrofit | Aug-17 | \$28,400 | \$25,840 | 6.5 | 31,262 | \$4,378.32 | 5.90 |
| Sir Winston Churchill SS | St. Catharines | Gym Lighting Retrofit | Aug-17 | \$28,900 | \$26,392 | 5.6 | 28,619 | \$3,980.26 | 6.63 |
| Thorold SS | Thorold | Gym Lighting Retrofit | Aug-17 | \$49,681 | \$45,041 | 7.3 | 33,431 | \$5,316.71 | 8.47 |
| Quaker Rd. PS | Welland | Interior Lighting Retrofit - Kindergarten | Aug-17 | \$646 | \$646 | 0.9 | 2,058 | \$151.26 | 4.27 |
| Eastdale SS | Welland | Interior Lighting Retrofit - Phase 2 | Sep-17 | \$440,483 | \$395,168 | 88.5 | 352,184 | \$50,904.51 | 7.76 |
| Applewood PS | St. Catharines | Summer Cooling Scheduling | Sep-17 | \$0 | \$0 | 0.0 | 2,477 | \$912.55 | 0.00 |
| Governor Simcoe SS | St. Catharines | Summer Cooling Scheduling | Sep-17 | \$0 | \$0 | 118.7 | 133,124 | \$17,833.26 | 0.00 |
| Jeanne Sauve PS | St. Catharines | Summer Cooling Scheduling | Sep-17 | \$0 | \$0 | 33.9 | 30,880 | \$4,221.16 | 0.00 |
| Laura Secord SS | St. Catharines | Summer Cooling Scheduling | Sep-17 | \$0 | \$0 | 19.4 | 6,481 | \$920.03 | 0.00 |
| Sir Winston Churchill SS | St. Catharines | Summer Cooling Scheduling | Sep-17 | \$0 | \$0 | 65.6 | 48,222 | \$6,760.13 | 0.00 |
| Carleton PS | St. Catharines | Timeclock Retrofit | Nov-17 | \$0 | \$3,417 | - | 22,127 | \$3,111.92 | 1.10 |
| Gracefield PS | St. Catharines | Administrative Lighting Retrofit | Jan-18 | \$593 | \$593 | 0.2 | 574 | \$80.69 | 7.35 |
| John Marshall PS | Niagara Falls | Interior Lighting Retrofit - T8 LED Lamps | Mar-18 | \$6,541 | \$2,326 | 8.4 | 38,727 | \$5,571.93 | 0.42 |
| Victoria PS | Niagara Falls | Interior Lighting Retrofit - T8 LED Lamps | Mar-18 | \$4,240 | \$1,670 | 5.1 | 23,613 | \$3,481.27 | 0.48 |
| Oakwood PS | Port Colborne | Interior Lighting Retrofit - T8 LED Lamps | Mar-18 | \$1,089 | \$429 | 1.3 | 6,064 | \$977.10 | 0.44 |
| Crossroads PS | NOTL | Interior Lighting Retrofit - T8 LED Lamps | Mar-18 | \$11,420 | \$5,145 | 11.6 | 53,474 | \$7,312.04 | 0.70 |
| William H Merritt PS | St. Catharines | Interior Lighting Retrofit - T8 LED Lamps | Mar-18 | \$6,888 | \$2,713 | 8.4 | 38,360 | \$5,394.90 | 0.50 |
| Thorold SS | Thorold | Shop Lighting Retrofit | Mar-18 | \$6,193 | \$5,285 | 1.4 | 4,578 | \$901.03 | 5.87 |
| Walker Living Campus | NOTL | Interior + Exterior Lighting Retrofit | Mar-18 | \$1,671 | \$1,109 | 5.2 | 16,973 | \$2,408.90 | 0.46 |
| EL Crossley SS | Wainfleet | Interior Lighting Retrofit | Jul-18 | \$43,934 | \$41,858 | 14.9 | 47,948 | \$9,462.21 | 4.42 |
| Orchard Park PS | Niagara Falls | Library Lighting Retrofit | Aug-18 | \$0 | \$1,382 | 1.6 | 3,961 | \$646.58 | 2.14 |
| Port Colbourne HS | Port Colborne | Shop Lighting Retrofit | Aug-18 | \$9,492 | \$9,492 | 14.4 | 45,778 | \$7,672.34 | 1.24 |

| Conservation Measures Cost | Demand Savings Total for Period (kW) | Energy Savings Total for Period (kWh) | Conservation Measures Annual Savings | Simple Payback (years) |
|----------------------------|--------------------------------------|---------------------------------------|--------------------------------------|------------------------|
| \$1,422,798.36 | 927.3 | 2,175,214 | \$304,928.37 | 4.7 |

| |
|------------------|
| Savings (kgCO2e) |
| 87,009 |

2015 National Inventory Report Update

Natural Gas

1 m³ = 0.0373 GJ

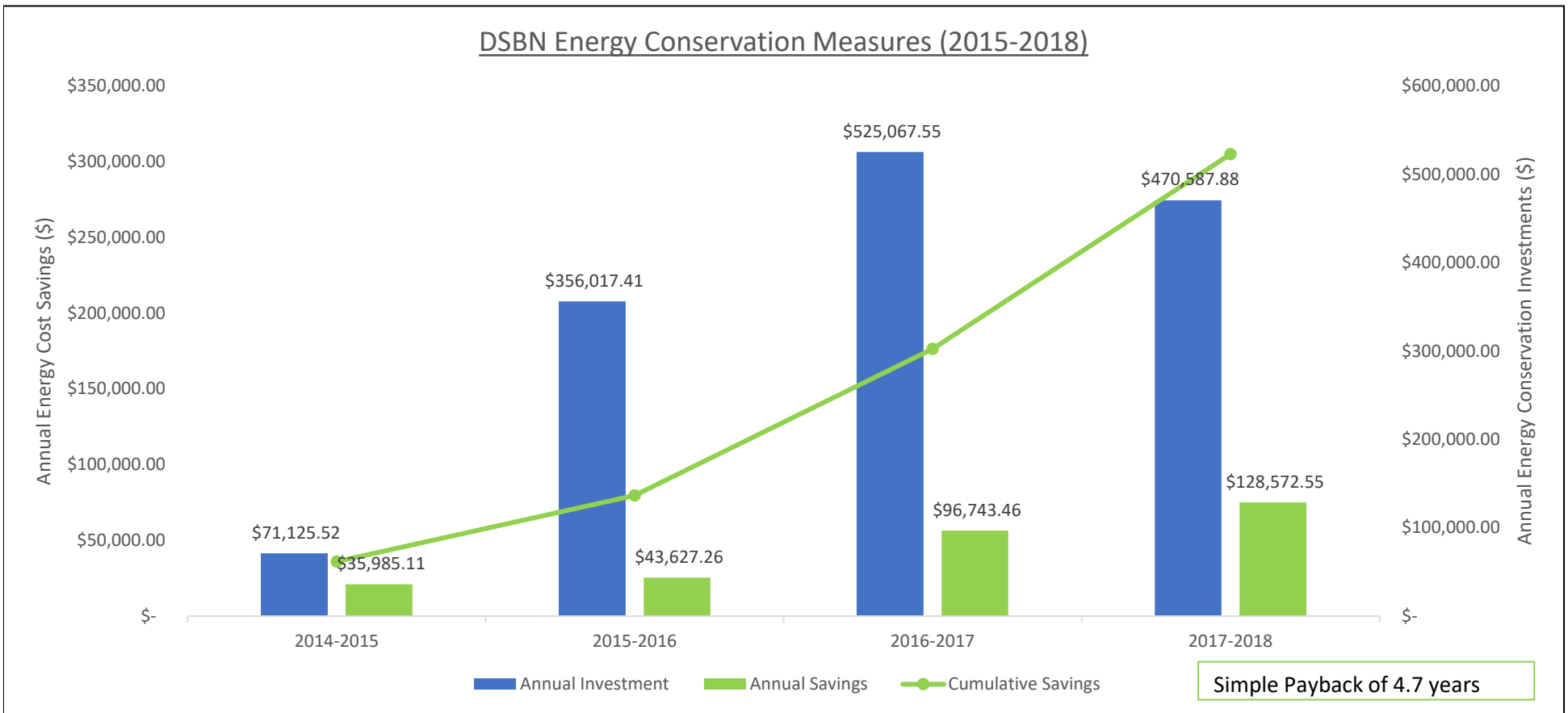
1 GJ = 52 kg CO₂

Electricity

1 kWh = 0.04 kg CO₂e

| | | Investment | Savings | Cumulative Savings |
|------|-----------|---------------|---------------|--------------------|
| FY13 | 2012-2013 | | | |
| FY14 | 2013-2014 | | | \$ - |
| FY15 | 2014-2015 | \$ 71,125.52 | \$ 35,985.11 | \$ 35,985.11 |
| FY16 | 2015-2016 | \$ 356,017.41 | \$ 43,627.26 | \$ 79,612.37 |
| FY17 | 2016-2017 | \$ 525,067.55 | \$ 96,743.46 | \$ 176,355.82 |
| FY18 | 2017-2018 | \$ 470,587.88 | \$ 128,572.55 | \$ 304,928.37 |

TOTAL \$ 1,422,798.36 \$ 304,928.37 4.7 simple payback



Appendix IV:
Calculating Energy Conservation Goals – Fiscal
Year 2018/2019 to Fiscal Year
2022/2023

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 (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) | | | | |
| High Efficiency Lighting Systems | 15 | \$ 381,490 | 349,688 | \$ - | 965,000 | \$ 882,003 | 225,000 | \$ - | 205,448 | \$ - | - | 5,889,307 | 7 | 100 | 0 | |
| Outdoor Lighting | 15 | \$ - | - | \$ 50,000 | 50,270 | \$ 100,000 | 91,386 | \$ - | - | \$ - | - | 475,276 | 7 | 100 | 0 | |
| Occupancy Sensors | 10 | \$ - | - | \$ - | - | \$ - | - | \$ - | - | \$ - | - | - | 5 | 100 | 0 | |
| Other (Describe) | | \$ - | - | \$ - | - | \$ - | - | \$ - | - | \$ - | - | - | 0 | | | |

| 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 (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) | | | | |
| Efficient Boilers (near condensing) | 10 | \$ - | - | \$ - | - | \$ - | - | \$ - | - | \$ - | - | - | 10 | 5 | 95 | |
| High-efficiency Boiler Burners | 15 | \$ 1,275,000 | 4,125,611 | \$ 615,000 | 1,990,001 | \$ 540,000 | 1,747,318 | \$ 190,000 | 614,797 | \$ 190,000 | 614,797 | 35,674,402 | 10 | 5 | 95 | |
| Condensate Heat Recovery/Enthalpy Wheels | 30 | \$ - | - | \$ - | - | \$ - | - | \$ - | - | \$ - | - | - | 5 | 20 | 80 | |
| Economizers | 15 | \$ - | - | \$ - | - | \$ - | - | \$ - | - | \$ - | - | - | 7.5 | 50 | 50 | |
| Energy Efficient HVAC systems | 30 | \$ - | - | \$ - | - | \$ 1,400,000 | 208,713 | \$ - | - | \$ 635,000 | 79,994 | 699,133 | 75 | 50 | 50 | |
| Energy Efficient Rooftop Units | 15 | \$ 80,000 | 22,148 | \$ 1,600,000 | 590,608 | \$ 300,000 | 110,738 | \$ - | - | \$ - | - | 2,805,369 | 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 | 25 | 25 | |
| Demand Ventilation | 10 | \$ - | - | \$ - | - | \$ - | - | \$ - | - | \$ - | - | - | 5 | 50 | 50 | |
| Entrance Heater Controls | 20 | \$ - | - | \$ - | - | \$ - | - | \$ - | - | \$ - | - | - | 5 | 50 | 50 | |
| Destratification Fans | 10 | \$ - | - | \$ - | - | \$ - | - | \$ - | - | \$ - | - | - | 7 | 100 | 0 | |
| Other (Describe) | | \$ - | - | \$ - | - | \$ - | - | \$ - | - | \$ - | - | - | 0 | | | |

| 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 (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) | | | | |
| Building Automation Systems - New | 10 | \$ - | - | \$ - | - | \$ - | - | \$ - | - | \$ - | - | - | 10 | 30 | 50 | |
| Building Automation Systems - Upgrade | 10 | \$ - | - | \$ - | - | \$ - | - | \$ - | - | \$ - | - | - | 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 | | | |

| 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 (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) | | | | |
| Glazing | 30 | \$ - | - | \$ - | - | \$ - | - | \$ - | - | \$ - | - | - | 10 | 20 | 50 | |
| Increased Wall Insulation | 50 | \$ - | - | \$ - | - | \$ - | - | \$ - | - | \$ - | - | - | 40 | 20 | 80 | |
| New Roof | 25 | \$ 2,695,000 | 265,998 | \$ 1,925,000 | 189,828 | \$ 2,620,000 | 265,363 | \$ 365,000 | 36,993 | \$ - | - | 2,885,878 | 200 | 20 | 80 | |
| New Windows | 30 | \$ 320,000 | 78,890 | \$ 120,000 | 29,584 | \$ 1,675,000 | 412,937 | \$ 750,000 | 184,897 | \$ 650,000 | 135,591 | 2,256,981 | 80 | 20 | 80 | |
| Treatments | 10 | \$ 30,000 | 69,169 | \$ 50,000 | 98,612 | \$ 20,000 | 39,445 | \$ - | - | \$ - | - | 808,618 | 10 | 20 | 80 | |
| Shading Devices | 30 | \$ - | - | \$ - | - | \$ - | - | \$ - | - | \$ - | - | - | 20 | 100 | 0 | |
| Other (Describe) | | \$ - | - | \$ - | - | \$ - | - | \$ - | - | \$ - | - | - | 0 | | | |

| 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 | | Energy Payback Period | %related to Electricity | %related to Natural Gas |
|--|--|----------------------------------|---|----------------------------------|---|----------------------------------|---|----------------------------------|---|----------------------------------|---|--|--|-----------------------|-------------------------|-------------------------|
| | | 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 | | \$ 4,661,490 | 4,890,328 | \$ 5,330,000 | 3,830,905 | \$ 6,880,000 | 3,072,243 | \$ 1,305,000 | 835,686 | \$ 1,275,000 | 829,382 | 51,484,035 | | | | |

| Keys | |
|----------------|--|
| colour: yellow | = Default value |
| colour: blue | = Calculated Value |
| \$ 0.156 | = cost of 1 kWh electricity |
| \$ 0.0943 | = cost of 1 kWh natural gas |
| \$ 0.0960 | = m ³ = 1 kWh (as per NRCan conversion table) |
| \$ 0.25 | = cost of 1 m ³ of natural gas |

Appendix IV: Calculating Energy Conservation Goals - Fiscal Year 2018/2019 to Fiscal Year 2022/2023

Photo: Mike Hume for Seattle. Photo of an energy efficiency audit for a building in the district.

Operations and Maintenance Strategies

| Policy and Planning | 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 (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) | 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 | \$ 5,000 | 4,570 | \$ 5,000 | 4,570 | \$ 5,000 | 4,570 | \$ 5,000 | 4,570 | \$ 5,000 | 4,570 | 68,540 | 7 | 100 | - |
| Picousa Only Energy Star Certified Appliances | 5 | \$ 10,000 | 12,798 | \$ 10,000 | 12,798 | \$ 10,000 | 12,798 | \$ 10,000 | 12,798 | \$ 10,000 | 12,798 | 191,938 | 5 | 100 | - |
| Demand Ventilation (scheduling) | 3 | \$ - | - | \$ - | - | \$ - | - | \$ - | - | \$ - | - | - | 5 | 50 | 50 |
| HVAC Optimization (coil cleaning, recalibration of equipment) | 3 | \$ 50,000 | 276,848 | \$ 50,000 | 276,848 | \$ 50,000 | 276,848 | \$ 50,000 | 276,848 | \$ 50,000 | 276,848 | 2,491,828 | 2 | 50 | 50 |
| Commissioning (retro and re) | 10 | \$ 75,000 | 83,054 | \$ 75,000 | 83,054 | \$ 75,000 | 83,054 | \$ 75,000 | 83,054 | \$ 75,000 | 83,054 | 747,489 | 10 | 50 | 50 |
| Other (Describe) | - | \$ - | - | \$ - | - | \$ - | - | \$ - | - | \$ - | - | - | 0 | - | 100 |

| Energy Audits | 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 (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) | Energy Payback Period | % related to Electricity | % related to Natural Gas |
| Walk Through Audit | 5 | \$ 20,947 | 22 | \$ - | - | \$ - | - | \$ - | - | \$ - | - | 1,158 | 100 | 50 | 50 |
| Engineering Audit | 5 | \$ - | - | \$ - | - | \$ - | - | \$ - | - | \$ - | - | - | 1000 | 50 | 50 |
| Other (Describe) | - | \$ - | - | \$ - | - | \$ - | - | \$ - | - | \$ - | - | - | 0 | - | 100 |

| Operations and Maintenance 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 (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 | | \$ 150,947 | 397,268 | \$ 150,947 | 397,268 | \$ 150,947 | 397,268 | \$ 150,947 | 397,268 | \$ 150,947 | 397,268 | 3,388,981 | | | |

| Keys | |
|---------|-------------------------------|
| \$1,100 | = cost of 1 kWh electricity |
| \$6,024 | = cost of 1 kWh natural gas |
| \$,000 | = \$1 k kWh |
| \$9.24 | = cost of 1 yr of natural gas |

Photo: Mike Hume for Seattle.

Appendix IV: Calculating Energy Conservation Goals - Fiscal Year 2018/2019 to Fiscal Year 2022/2023

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

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 | 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 Operator Training | 3 | \$ - | - | \$ - | - | \$ - | - | \$ - | - | \$ - | - | - | 3 | 60 | 40 |
| Energy Benchmarking Program | 5 | \$ 10,000 | 111 | \$ 10,000 | 111 | \$ 10,000 | 111 | \$ 10,000 | 111 | \$ 10,000 | 111 | 1,661 | 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 | | \$ 10,000 | 111 | \$ 10,000 | 111 | \$ 10,000 | 111 | \$ 10,000 | 111 | \$ 10,000 | 111 | 1,661 | | | |

| Keys | |
|----------|---|
| \$0.156 | = cost of 1 ekWh electricity |
| \$0.0243 | = cost of 1 ekWh natural gas |
| 0.0955 | m ³ = 1 ekWh |
| \$0.25 | = cost of 1 m ³ of natural gas |

End of worksheet.

Appendix IV: Calculating Energy Conservation Goals - Fiscal Year 2018/2019 to Fiscal Year 2022/2023

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) | 571,573 | Enter from UCD - use square meters |
| Total Building Area (includes portables) (ft ²) | 6,152,350 | Enter from UCD - use square feet |
| Energy Consumption for the board (ekWh) | 110,867,600 | Enter from UCD |

1 ft² = 0.0929 m²

| | 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) | |
| Appendix B: Design, Construction and Retrofit Strategies Total | \$ 4,661,490 | 4,890,393 | \$ 5,330,000 | 3,830,906 | \$ 6,880,000 | 3,072,563 | \$ 1,305,000 | 835,688 | \$ 1,275,000 | 829,382 | 51,494,035 |
| Appendix C: Operations and Maintenance Strategies Total | \$ 160,941 | 377,500 | \$ 140,000 | 377,268 | \$ 15,000 | 17,366 | \$ 15,000 | 17,366 | \$ 15,000 | 17,366 | 3,500,765 |
| Appendix D: Occupant Behaviour Strategies Total | \$ 10,000 | 111 | \$ 10,000 | 111 | \$ 10,000 | 111 | \$ 10,000 | 111 | \$ 10,000 | 111 | 1,661 |
| TOTAL | \$ 4,832,431 | 5,268,004 | \$ 5,480,000 | 4,208,284 | \$ 6,905,000 | 3,090,040 | \$ 1,330,000 | 853,164 | \$ 1,300,000 | 846,859 | 54,996,461 |
| Percentage reduction | | 4.75 | | 3.80 | | 2.79 | | 0.77 | | 0.76 | 12.87 |
| Conservation Goal (ekWh/m ²) | | 1.80 | | 1.80 | | 1.80 | | 1.80 | | 1.80 | 9.00 |
| Conservation Goal (ekWh/ft ²) | | 0.17 | | 0.17 | | 0.17 | | 0.17 | | 0.17 | 0.85 |

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.