Grand Erie District School Board

2024 Energy Conservation and Demand Management Plan

Prepared by Grand Erie District School Board's Operations, Energy and Sustainability Division

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Education Sector Background

Funding and Energy Management Planning

Each year Ontario school boards receive approximately $1.4 billion in school renewal funding from the Ministry of Education. In addition, school boards may receive time-limited funds for special initiatives.

Each Spring, the Ministry typically announces each board's funding allocations, for the upcoming school board Fiscal Year (FY) (September 1st to August 31st).

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

Note on School Board Fiscal Years

School boards operate on fiscal years aligned with the start of school years. This means each fiscal year begins on September 1st.

Example: FY2019 = September 1st, 2018 – August 31st, 2019.

Fiscal Year	Dates Covered
FY2018 (Baseline)	September 1st, 2017 – August 31st, 2018
FY2019	September 1st, 2018 – August 31st, 2019
FY2020	September 1st, 2019 – August 31st, 2020
FY2021	September 1st, 2020 – August 31st, 2021
FY2022	September 1st, 2021 – August 31st, 2022
FY2023	September 1st, 2022 – August 31st, 2023

Asset Portfolios and Energy Management Planning

A school board's asset portfolio can experience important changes throughout the five-year period of these types of plans. A variety of these changes will impact a board's energy consumption on a year-to-year basis. The following is a list of some of the most common variables and metrics that change in the education sector:

Facility Variables	Operational Variables

• Age of the building
• Number of floors
• Orientation of building
• Major additions
• Increase or decrease in portables
• Building equipment (HVAC, plumbing, lighting, electrical systems)
• Building Function:
  ○ Elementary School, Secondary School, Administrative Building, Maintenance/ Operations Building
	• Community use and permits
	• Programs:
	  ○ Childcare, Before/After school programs, summer school
	• Occupancy:
	  ○ Increase or decrease in number of students, change in operational hours, new programs.
	• Occupant Behaviour
	  ○ Turning off lights, opening and closing windows, and reducing the running of water are examples of behaviours that can increase or decrease energy consumption

PART 1 – Review of Progress and Achievements in the Past Five Years

Part 1 reviews Grand Erie District School Board's energy performance over the past five years.

Important Disclaimer:

Grand Erie's natural gas consumption data has been impacted by on-going meter read estimates and adjustments from our natural gas service provider. As a result, please note:

1. Natural gas data may be adjusted for the years below in future reports
2. Natural gas consumption data appears to be underestimated in FY2023

A. Grand Erie's Asset Portfolio

The following table outlines the energy related variables and metrics in Grand Erie's asset portfolio that changed from the baseline of FY2018 to the end of the five-year reporting period of FY2023.

Table 1: Grand Erie's Asset Portfolio

Key Metrics	FY 2018 (Baseline Year)	FY 2023	Variance
Total Number of Buildings	76	75	-1
Total Number of Portables	79	95	+16
Total Floor Area (ft^2)	3,984,959	3,984,475	-484
Total Floor Area (m^2)	370,215	370,170	-45
Average Operating Hours	80	80	0
Average Daily Enrolment	26,138	27,155	+1,017
% of Total Floor Area Air Conditioned	30%	30%	0%
Number of Facilities with Mechanical Ventilation*	67	68	+1

* Includes partial and full mechanical ventilation. FY2018 not available, 2021 data used for baseline year.

B. Energy Usage Data for Grand Erie

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	FY2018 (Baseline Year)	FY2023
Total Electricity (kWh)	21,484,638	19,354,602
Total Natural Gas (ekWh)	49,297,952	38,199,092
Total Heating Fuel (Type 1 and 2) (ekWh)	0	0
Total Heating Fuel (Type 4 and 6) (ekWh)	0	0
Total Propane (ekWh)	180,868	158,641
Total District Heat (ekWh)	0	0
Total District Cool (ekWh)	0	0

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

C. Weather Normalized Energy Consumption Values

In Ontario, 25% to 35% of energy consumption for a facility is affected by weather. To demonstrate the effect of weather, the following table shows the Heating Degree Days (HDD)[2] and Cooling Degree Days (CDD)[3] for Grand Erie's closest weather station "Hamilton Airport".

Table 3: Hamilton Airport Degree-days

Ontario Degree Days	FY2018	FY2019	FY2020	FY2021	FY2022	FY2023
HDD	3,369	3,536	3,219	3,091	3,180	3,014
CDD	587	481	576	514	515	393

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. This allows an "apples-to-apples" 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 which will greatly impact energy consumption.

As a result, weather normalized energy intensity[4] is the most accurate measurement that allows the evaluation of a board's energy use from one year to another as it cancels out any change in floor area. The unit of measurement used is either equivalent kilowatt hours per square foot (ekWh/ft^2) or equivalent kilowatt hours per square metre (ekWh/m^2).

Table 4: Weather Normalized Values

Weather Normalized Values	FY2018 (Baseline Year)	FY2023
Total Energy Consumed (ekWh)	68,698,352	56,954,716
Energy Intensity (eKWh/ft^2)	17.24	14.29
Energy Intensity (eKWh/m^2)	185.56	153.86
Total GHG Emissions (kgCO_2)	9,356,345	7,440,353
Emissions Intensity (kgCO_2ft^2)	2.35	1.87
Emissions Intensity (kgCO_2/m^2)	25.27	20.10

[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 Ministry's energy management software only applies CDD to meters that demonstrate an increase in consumption due to air conditioning.

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

D. Review of Previous Energy Conservation Goals and Achievements

In 2019, Grand Erie set annual energy conservation goals for the following five fiscal years. The following table compares the energy intensity conservation goal with the actual energy intensity reduced for each year.

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

Fiscal Year	Conservation Goal ekWh/ft²	Conservation Goal ekWh/m²	Conservation Goal Percentage	Actual Energy Savings ekWh/ft²	Actual Energy Savings ekWh/m²	Actual Energy Percentage
FY2019	0.25	2.71	1.44%	-1.34	-14.40	-7.76%
FY2020	0.16	1.67	0.89%	2.17	23.39	11.70%
FY2021	0.16	1.68	0.89%	0.27	2.85	1.62%
FY2022	0.16	1.68	0.89%	1.08	11.61	6.68%
FY2023	0.15	1.66	0.88%	0.77	8.25	5.09%

As a result of significant operational changes from one year to the next from FY2019 to FY2023, an apples-to-apples comparison of Energy Intensity (ekWh/ft² – the quantity of energy consumed per area) is not possible.

- Factors that reduced energy consumption include:
  - temporary school closures in FY2020 and FY2021, due to the pandemic
  - temporary suspension of community use of schools, before/after school programs, childcare programs, continuing education and summer school programs
- Factors that increased consumption include:
  - Implementation of new health and safety factors in FY2021 through FY2023 to address pandemic issues, such as:
    - increased ventilation (intake of fresh air),
    - increased filtration requirements
    - expanded operating hours of HVAC equipment

E. Cumulative Energy Conservation Goal

Grand Erie surpassed the 2019 Energy Conservation and Demand Management Plan's reduction goal of 4.99 % by achieving a 17.32% reduction in energy consumption between FY2018 (baseline year) and FY2023.

The following table compares the 2019 forecasted cumulative energy intensity conservation goal with the actual cumulative energy intensity reduced savings (FY2023).

Table 6: Cumulative Energy Intensity Goal from FY2019 through FY2023

Factor	Cumulative Energy Intensity		Percentage Reduction
	(ekWh/ft2)	(ekWh/m2)	
Forecasted Cumulative Energy Intensity Conservation Goal	0.88	9.40	4.99 %
Actual Cumulative Energy Intensity Reduction Achieved – weather normalized	2.95	31.70	17.32 %
Difference between Forecasted and Actual Reduction	2.07	22.30	12.33 %

F. Measures Implemented from FY2019 to FY2023

A list of the measures implemented, the related costs, and the fiscal year that the measure was implemented within Grand Erie are outlined in ***Appendix A: Investments in Energy Management Strategies between FY2019 and FY2023***.

Appendix A contains the following investment summary tables:

1. Design, Construction and Retrofit Strategies
2. Operations and Maintenance Strategies
3. Occupant Behaviour Strategies
4. Summary of Investments by Fiscal Year

PART 2 – Energy Conservation and Demand Management Plan for Fiscal Year 2024 To Fiscal Year 2028

Part 2 outlines Grand Erie's plan to reduce energy consumption in the next five years.

A. Energy Management Strategies

To date, Grand Erie's energy management strategy has included the following areas of focus:

1. Design, Construction, and Retrofit

   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 Grand Erie's relevant projects over the next five years, please refer to ***Appendix B1: Planned Investments in Energy Management Strategies 2024-2028: Design, Construction and Retrofit Strategies***

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2. Operations and Maintenance

   Operations and maintenance include the strategies Grand Erie uses to make sure that the existing buildings and equipment performs at maximum efficiency.

   For the Grand Erie's relevant projects over the next five years, please refer to ***Appendix B2: Planned Investments in Energy Management Strategies 2024-2028: Operations and Maintenance***

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3. Occupant Behaviour

   Strategies that Grand Erie uses to teach occupants, including staff, students and community users, with an emphasis on changing specific actions to reduce energy consumption.

   For Grand Erie's relevant projects over the next five years, please refer to ***Appendix B3: Planned Investments in Energy Management Strategies 2024-2028: Occupant Behaviour***

Example projects over the past 5 years:

- Lighting retrofits to replace previously existing lighting with energy efficient LED technology
- Incorporation of building automation systems (BAS) to better control HVAC and lighting systems to minimize energy consumption associated with those systems
- Strategic HVAC upgrades such as the purchase of condensing boilers, use of energy recovery wheels, and heat pump systems to reduce natural gas consumption.
- Installation of a geothermal heating system at one of our largest secondary schools.

B. Energy Management Position

Grand Erie has an energy management position which is an in-house, full-time position with additional shared job functions.

C. Environmental Programs

In FY2023, schools within Grand Erie participated in environmental programs.

- EcoSchools: 13 schools participated

D. Energy Efficiency Incentives

- Grand Erie applies to incentive programs to support the implementation of energy efficient projects on a regular basis.

  ☒ Yes ☐ No

  Between FY2019 and FY2023, Grand Erie has applied for $175,000 in incentive funding from different agencies to support the implementation of energy efficient projects.

- Grand Erie uses external resources, such as Independent Electricity System Operator (IESO) Service Representatives and/or Enbridge Service Representatives, to apply for incentives.

  ☒ Yes ☐ No

  ☒ IESO Service Representative

  ☒ Enbridge Service Representative

E. Energy Procurement

- Grand Erie participates in a consortia arrangement to purchase electricity.

  ☒ Yes ☐ No

  OECM's Strategic Electricity Management and Advisory Services

- Grand Erie participates in a consortia arrangement to purchase natural gas.

  ☒ Yes ☐ No

  Ontario Education Collaborative Marketplaces (also known as OECM)

- Grand Erie participates in a consortia arrangement to purchase alternative utilities (fuel oil, propane, wood, district heat, district cool).

  ☐ Yes ☒ No

F. Demand Management

- Grand Erie uses the following method(s) to monitor electrical Demand:

  ☒ Invoices

  ☒ Real-time data

- Grand Erie uses the following methodologies to cut down electrical Demand:

  ☒ Equipment scheduling

  ☒ Phased/staged use of equipment

G. Future Energy Conservation Goals

Grand Erie 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	FY2024	FY2025	FY2026	FY2027	FY2028
ekWh/ft^2	1.28	0.20	0.20	0.20	0.20
ekWh/m^2	13.80	2.14	2.14	2.14	2.14
Percentage Decrease	7.20%	1.12%	1.12%	1.12%	1.12%

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

Table 8: Cumulative Conservation Goal

Cumulative Conservation Goal	Fiscal Year 2024 through Fiscal Year 2028
ekWh/ft^2	2.08
ekWh/m^2	22.36
Percentage Decrease	11.68%

A detailed overview of the investments planned to achieve this reduction target can be found in ***Appendix B: Planned Investments in Energy Management Strategies between Fiscal Year 2024 and Fiscal Year 2028.***

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

I confirm that Grand Erie District School Board's senior management has reviewed and approved this Energy Conservation and Demand Management Plan.

Full Name: Rafal Wyszynski

Job Title: Superintendent of Business and Treasurer

Date: May 31, 2024

Appendix A: Investments in Energy Management Strategies between Fiscal Year 2019 and Fiscal Year 2023.

Appendix A1: Investments in Energy Management Strategies 2019-2023: Design, Construction and Retrofit Strategies

	FY2019	FY2020	FY2021	FY2022	FY2023
Lighting					
High Efficiency Lighting Systems	$126,886	-	-	-	-
HVAC					
High-Efficiency Boilers (Condensing)	$3,499	$200,656	$886,784	$5,566,086	$4,626,446
Energy Efficient HVAC Systems	$1,219,286	$1,305,865	$8,371,731	$4,111,379	$2,377,260
Controls					
Building Automation Systems - Upgrade	$1,687	$271	$16,535	$2,028	$1,492
Building Envelope					
Increased Wall Insulation	$2,884,772	$2,354,338	$1,086,181	$530,701	$820,832
New Roof	$2,006,753	$3,613,954	$5,309,459	$4,202,399	$4,260,874
New Windows and Doors	$504,596	$790,117	$1,437,671	$1,295,423	$396,131
Shading Devices	$1,226	$1,020	$1,737	$1,904	$1,612
Total Investments	**$6,748,705**	**$8,266,221**	**$17,110,098**	**$15,709,921**	**$12,484,645**

Appendix A2: Investments in Energy Management Strategies 2019-2023: Operations and Maintenance Strategies

	FY2019	FY2020	FY2021	FY2022	FY2023
Policy and Planning					
Water Leak Detection	-	-	$15,300	$29,352	$7,104
Total Investments	**-**	**-**	**$15,300**	**$29,352**	**$7,104**

Appendix A3: Investments in Energy Management Strategies 2019-2023: Occupant Behaviour Strategies

	FY2019	FY2020	FY2021	FY2022	FY2023
Training and Education					
Ongoing Training and Awareness Programs for Energy Conservation	$1,000	$1,000	$1,000	$1,000	$1,000
Provide Detailed Information on Energy Consumption	$500	$500	$500	$500	$500
Participate in Environmental Programs, such as EcoSchools	$25,000	$25,000	$25,000	$25,000	$25,000
Total Investments	**$26,500**	**$26,500**	**$26,500**	**$26,500**	**$26,500**

Appendix A4: Investments in Energy Management Strategies 2019-2023: Summary of Investments by Fiscal Year

	FY2019	FY2020	FY2021	FY2022	FY2023
Design, Construction and Retrofit Strategies	$6,748,705	$8,266,221	$17,110,098	$15,709,921	$12,484,645
Operations and Maintenance Strategies	-	-	$15,300	$29,352	$7,104
Occupant Behaviour Strategies	$26,500	$26,500	$26,500	$26,500	$26,500
Total Investments	**$6,775,205**	**$8,292,721**	**$17,151,898**	**$15,765,773**	**$12,518,249**

Appendix B: Planned Investments in Energy Management Strategies between Fiscal Year 2024 and Fiscal Year 2028.

Appendix B1: Planned Investments in Energy Management Strategies 2024-2028: Design, Construction and Retrofit Strategies

	FY2024	FY2025	FY2026	FY2027	FY2028
Lighting					
High Efficiency Lighting Systems	$25,000	-	-	-	-
					HVAC
High-Efficiency Boilers (Condensing)	$2,000,000	-	-	-	-
Geothermal	$200,000	$200,000	$200,000	$200,000	$200,000
Energy Efficient HVAC Systems	$500,000	$500,000	$500,000	$500,000	$500,000
Variable Frequency Drives (VFD)	$50,000	$50,000	$50,000	$50,000	$50,000
Controls					
Building Automation Systems – Upgrade	$20,000	$20,000	$20,000	$20,000	$20,000
Real-time energy data for operators to Identify and diagnose building issues	$10,000	$10,000	$10,000	$10,000	$10,000
Building Envelope					
Increased Wall Insulation	$500,000	$500,000	$500,000	$500,000	$500,000
New Roof	$1,000,000	$1,000,000	$1,000,000	$1,000,000	$1,000,000
New Windows and Doors	$500,000	$500,000	$500,000	$500,000	$500,000
Shading Devices	$2,000	$2,000	$2,000	$2,000	$2,000
Total Investments	**$4,807,000**	**$2,782,000**	**$2,782,000**	**$2,782,000**	**$2,782,000**

Appendix B2: Planned Investments in Energy Management Strategies 2024-2028: Operations and Maintenance

	FY2024	FY2025	FY2026	FY2027	FY2028
Policy and Planning					
Water Leak Detection	$10,000	$10,000	$10,000	$10,000	$10,000
Total Investments	**$10,000**	**$10,000**	**$10,000**	**$10,000**	**$10,000**

Appendix B3: Planned Investments in Energy Management Strategies 2024-2028: Occupant Behaviour

	FY2024	FY2025	FY2026	FY2027	FY2028
Training and Education					
Ongoing Training and Awareness Programs for Energy Conservation	$1,000	$1,000	$1,000	$1,000	$1,000
Provide Detailed Information on Energy Consumption	$500	$500	$500	$500	$500
Participate in Environmental Programs, such as EcoSchools	$25,000	$25,000	$25,000	$25,000	$25,000
Total Investments	**$26,500**	**$26,500**	**$26,500**	**$26,500**	**$26,500**

Appendix B4: Planned Investments in Energy Management Strategies 2024-2028: Total Investment by Fiscal Year

	FY2024	FY2025	FY2026	FY2027	FY2028
Design, Construction and Retrofit Strategies	$4,807,000	$2,982,000	$2,982,000	$2,982,000	$2,982,000
Operations and Maintenance Strategies	$10,000	$10,000	$10,000	$10,000	$10,000
Occupant Behaviour Strategies	$26,500	$26,500	$26,500	$26,500	$26,500
Total Investments	**$4,843,500**	**$3,018,500**	**$3,018,500**	**$3,018,500**	**$3,018,500**