School District 42
Maple Ridge & Pitt Meadows
Learning Today, Leading Tomorrow

ENVIRONMENTAL SUSTAINABILITY PLAN 2021-2026

MAPLE RIDGE-PITT MEADOWS SCHOOL DISTRICT

EXECUTIVE SUMMARY

The Maple Ridge Pitt Meadows School District is committing to pursue capital investments that will result in reducing greenhouse gas emissions by 50% by 2030 when compared to 2007.

This environmental sustainability plan includes baseline of the district's Key Performance Indicators (KPI) for all school district facilities. These KPIs are shown in Figure 1.

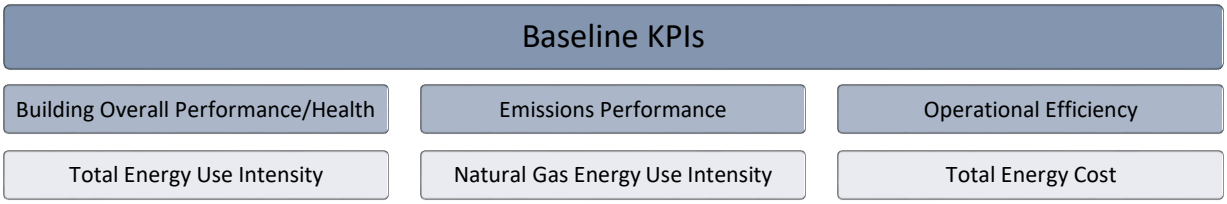


Figure 1: *Shows the three KPIs being measured to verify and assess future progress along with their overarching meaning to the district.*

In order to reduce our carbon footprint, over the next decade, the school district will add energy efficiency measures to all major capital projects. By introducing an energy management rank system, buildings that would most likely benefit from the implementation of energy efficiency measures are identified and prioritized in the plan. The total investment required over 5 years, and the annual operational savings are summarized in Table 1 below.

Table 1: *High level cost and saving opportunities for HVAC and lighting projects identified in the 2021-2026 plan.*

Energy Efficiency Measures	Cost ($)	Savings ($/year)
HVAC Upgrades & Optimization	$ 2,100,000	$ 195,000
Lighting Upgrades	$ 260,000	$ 39,000

If fully funded through to 2026, these EEMs would collectively:

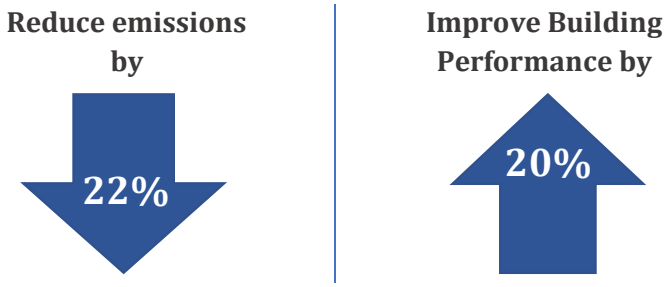


Table of Contents

1 INTRODUCTION

The Maple Ridge – Pitt Meadows School District owns and operates 34 facilities, that house over 15,000 students and nearly 2,500 employees. The annual greenhouse gas emissions for the school district are approximately 3,400 tCO_2e - the equivalent of having an extra 720 cars on the road every year. As an educational institution, we have the opportunity to increase sustainability awareness and support environmental leadership for future generations.

Relative to emission levels in 2007, the Province of British Columbia is working towards reductions of 50 per cent by 2030 for public sector buildings[1]. In SD42, total emissions in 2007 were 4,000 tCO_2e/year, meaning the **2030 emission target is 2,000 tCO_2e/year**.

In order to achieve this goal, the school district will have to reduce emissions by 34% in just 10 years. To put this target into perspective, in the previous 12 years the energy efficiency measures implemented in our school district resulted in a 16% reduction of total emissions.

Besides greenhouse gas emission reduction targets, natural gas, electricity, carbon tax and carbon offset costs are likely to continue to increase in the future and the implementation of additional energy efficiency measures will mitigate the impact of these increased costs on school district operations.

In order to achieve the greenhouse gas emission reduction targets and ensure a sustainable use of resources by the school district, a comprehensive environmental sustainability plan needs to be developed and implemented over the next decade.

The goals of the environmental sustainability plan are:

- to reduce greenhouse gas emissions by 22% by 2026;
- to improve building efficiency by 20% by 2026;
- to provide a prioritized list of facility enhancement projects to be included in the five-year capital plan;
- to support environmental sustainability education;
- to reaffirm the school districts' commitment to be a responsible environmental steward within the Maple Ridge and Pitt Meadows communities.

[1] Details of Clean BC goals for public sector buildings can be found in Appendix A. Link to document: https://blog.gov.bc.ca/app/uploads/sites/436/2019/02/CleanBC_Full_Report_Updated_Mar2019.pdf

2 OBJECTIVES AND SCOPE

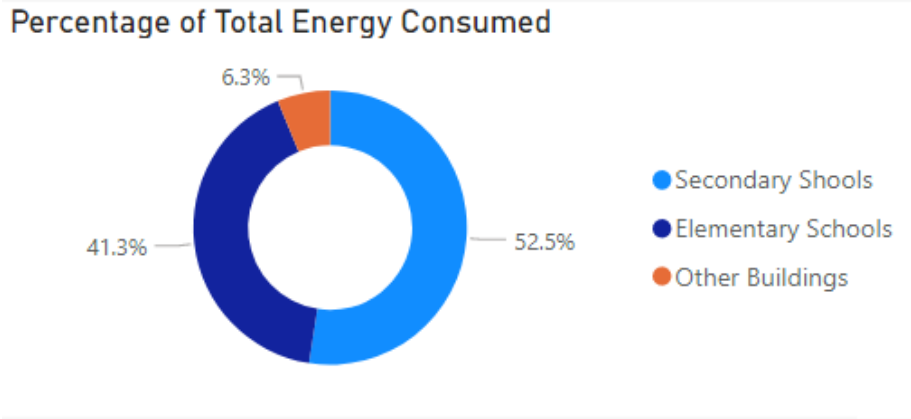
The objective of the environmental sustainability plan is to reduce operational costs related to energy consumption, while aligning the district with long term sustainability requirements set out by the provincial and federal government.

The scope of this plan will cover all school district buildings and their associated energy, and fuel consumption. Facilities will be placed into three distinct groups of buildings:

- Elementary Schools
- Secondary Schools
- Other Buildings

Each building subset will have their own target for energy performance, and emission reduction. As shown in Figure 2 below, nearly 94% of the energy consumed in the district originates from Elementary and Secondary school buildings.

Figure 2: *The breakdown of energy consumption by Facility Type*



3 ENERGY PERFORMANCE – 2019 BASELINE

Fiscal Year 2019 (FY2019) is chosen as the baseline for benchmarking the district's energy performance and for measuring progress towards the energy use reduction targets established through this plan.

3.1 OVERVIEW AND SUMMARY

Three Key Performance Indicators (KPIs) are used to measure the energy performance of the district; Total Energy Use Intensity, Natural Gas Energy Use Intensity, and Cost of Energy. A summary of the current benchmark metrics for FY2019 is provided in Table 2 below.

Table 2: *Summary of baseline energy performance and energy costs for Fiscal Year 2019*

Building Type	Total EUI (eGJ/m²)	Natural Gas EUI (eGJ/m²)	Cost of Energy ($)*
Elementary School	0.50	0.36	$585,520
Secondary School	0.64	0.40	$706,970
Other Building	0.74	0.47	$101,920

*Cost is baselined for FY2020 due to outlier costs in FY2019

3.2 TOTAL ENERGY USE INTENSITY

Total Energy Use Intensity (EUI) is used to understand the health and overall efficiency of a building archetype (elementary, secondary, and other) in terms of total energy use, which includes electricity, natural gas, and propane. Total EUI normalizes total energy consumption of the building over the floor area – allowing for a simplified comparison of building energy performance for all school district facilities.

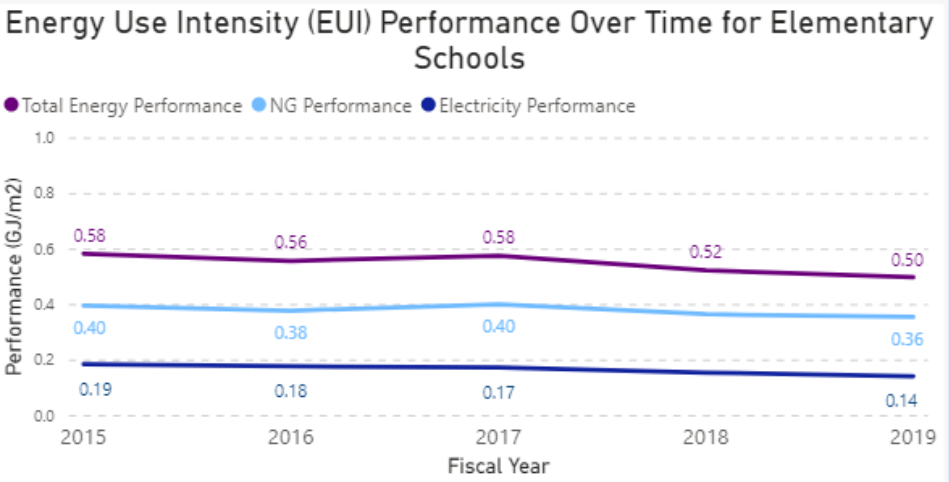
3.2.1 ENERGY USE INTENSITY - TRENDS

The graphs included in the next page show the total Energy Use Intensity (EUI) trends by building type from 2015 to 2019. Improved performance is driven by electricity savings, with natural gas performance remaining largely the same.

Key Takeaways:

- Elementary Schools:
  - *Total EUI Trends:* *Improved* by **14%** since 2015
  - Breakdown: Electricity accounted for **56%** of the improvement
- Secondary Schools:
  - Total EUI Trends: *Improved* by **10%** since 2015
  - Breakdown: Electricity accounted for **86%** of the improvement
- Other Buildings:
  - *Total EUI Trends:* *Improved* by **18%** since 2015
  - Breakdown*:* Electricity accounted for **31%** of the improvement

Analysis

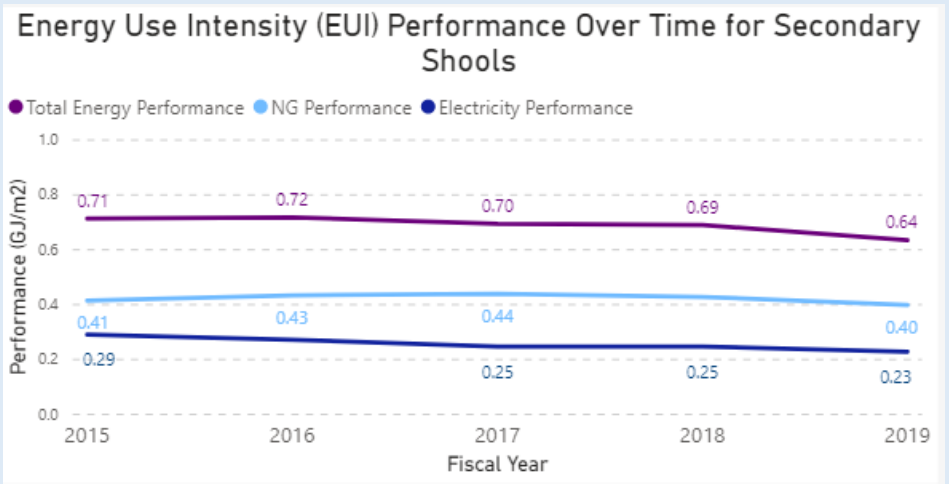


Elementary Schools
Total EUI Trend

Electricity performance has **improved by 26%.**

Natural gas EUI has **improved by 10%.**

Total EUI has improved by **14% since 2015.**

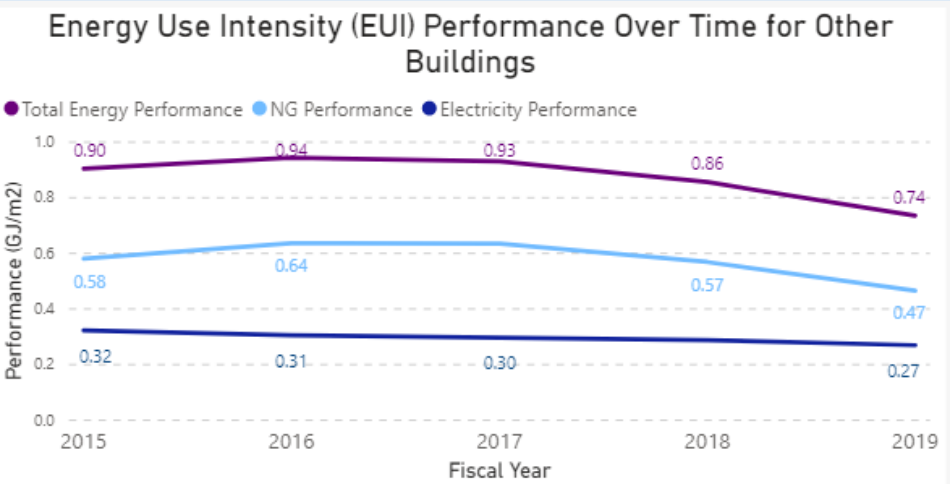


Secondary Schools
Total EUI Trend

Electricity EUI has **improved by 21%.**

Natural gas EUI has **improved by 2%.**

Total EUI has improved **by 10% since 2015.**



"Other" Buildings
Total EUI Trend

Electricity EUI has improved **16% since 2015.**

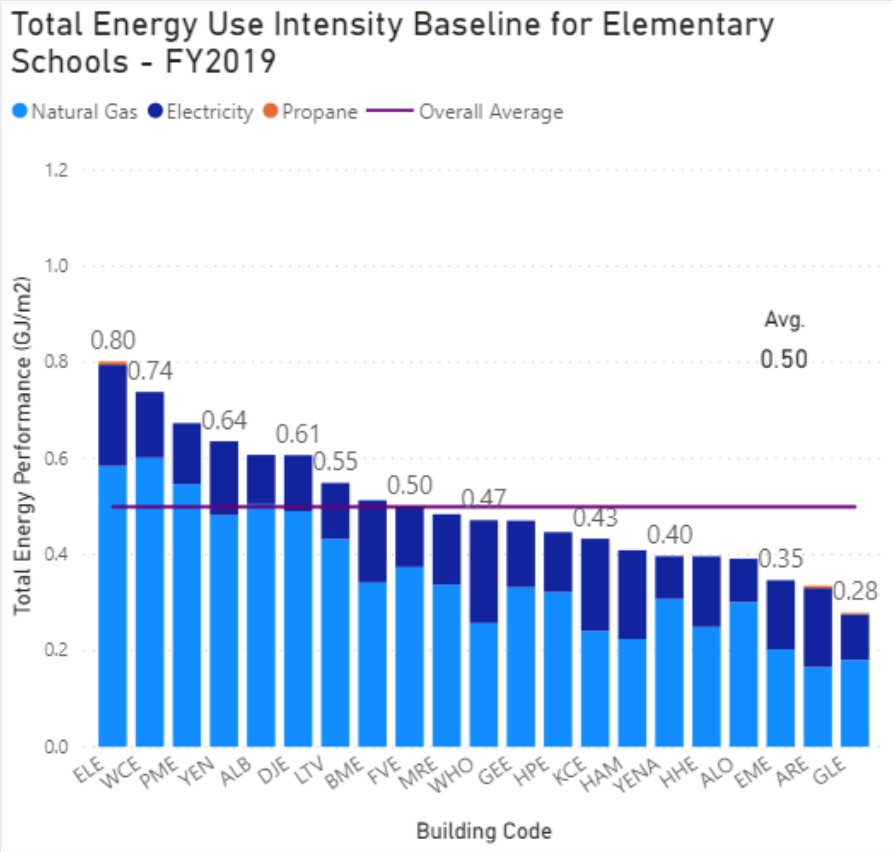
Natural gas EUI has improved **19% since 2015.**

Total EUI has improved by **18% since 2015.**

3.2.2 TOTAL EUI – BASELINE 2019

Total EUI metrics show the combined natural gas, electricity, and propane EUI of individual buildings for each building type. Results are summarized as key takeaways with detailed graphs further below.

Analysis

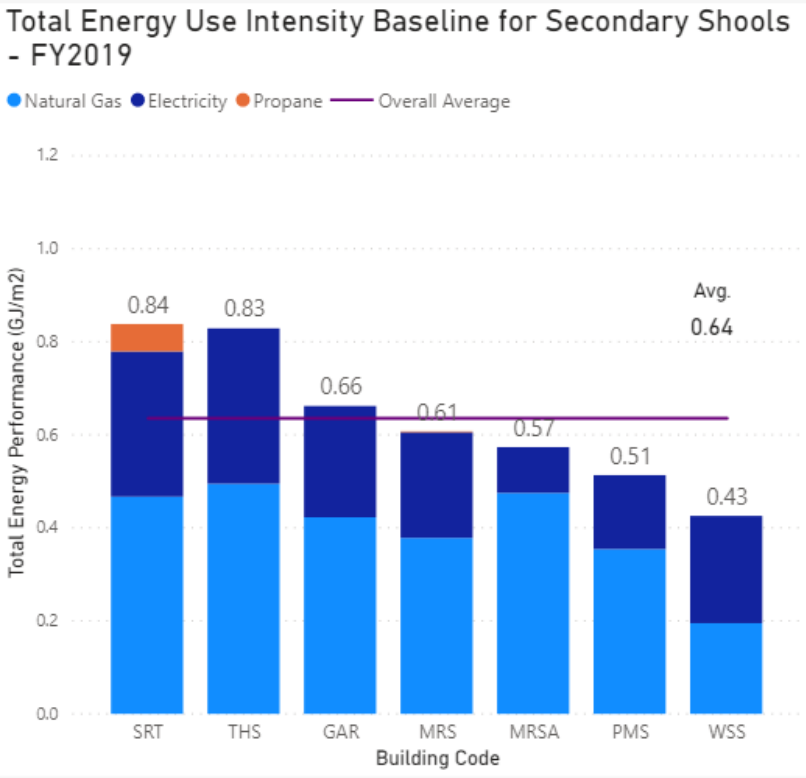


Elementary Schools
Total EUI Analysis

Total EUI Avg: **0.50 eGJ/m²**

There are just 7 schools above the average with 12 below, indicating that there are a few poorly performing schools driving the overall average up.

The poorest performers are Eric Langton, Webster's Corners, and Pitt-Meadows Elementary. The natural gas EUI, alone is enough to surpass the group average of 0.5 eGJ/m² for these buildings.

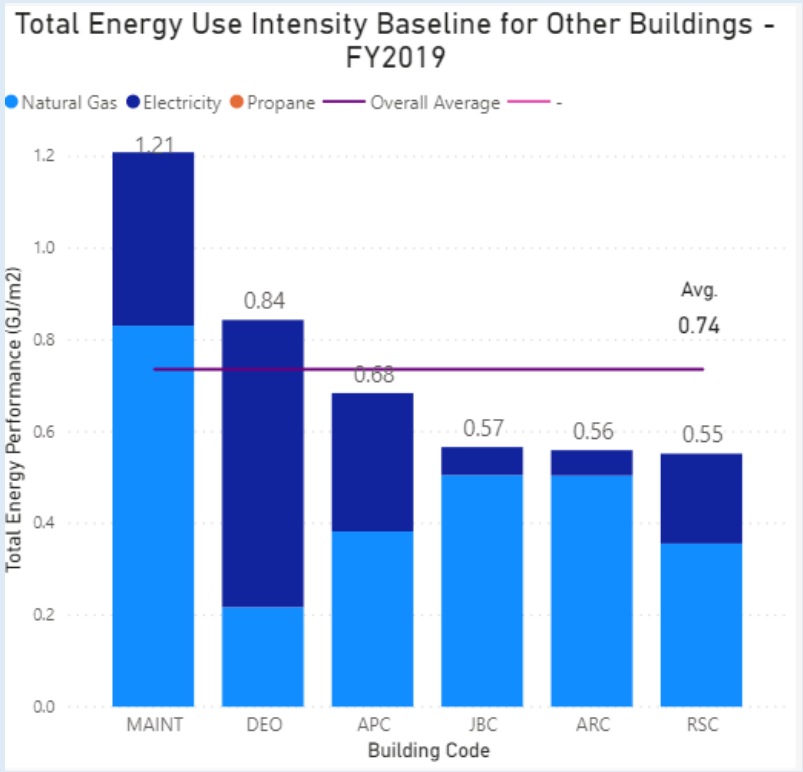


Secondary Schools
Total EUI Analysis

Total EUI Avg: **0.64 eGJ/m²**

Samuel Robertson Technical Secondary, and Thomas Haney Secondary are the worst performing secondary schools. The 12 portables on site at SRT use propane and this is an area of potential improvement.

Maple Ridge Secondary Annex uses a disproportionate amount of natural gas compared to electricity to run the building.



Other Buildings
Total EUI Analysis

Total EUI Avg: **0.74eGJ/m²**

Maintenance, and the District Education Office are the worst performing buildings in this category.

The Maintenance building's EUI is double the average for Secondary schools, and is a prime area for improvement.

The DEO uses a disproportionate amount of electricity due to the office environment, with central heating and cooling being supplemented by individual heaters or fans.

Most of the energy use at James Best Centre and Alouette River Campus is natural gas.

3.3 NATURAL GAS ENERGY USE INTENSITY

Natural Gas Energy Use Intensity (EUI) sums the total natural gas consumed by a building and normalizes it over the floor area, in units of eGJ/m^2. By normalizing consumption over floor area, the performance of a building can be easily compared relative to one another. This KPI is used as a proxy for each school's emissions performance, as 88% of emissions released by our district are created from the use of natural gas.

In the analysis there are two metrics shown on the figures:

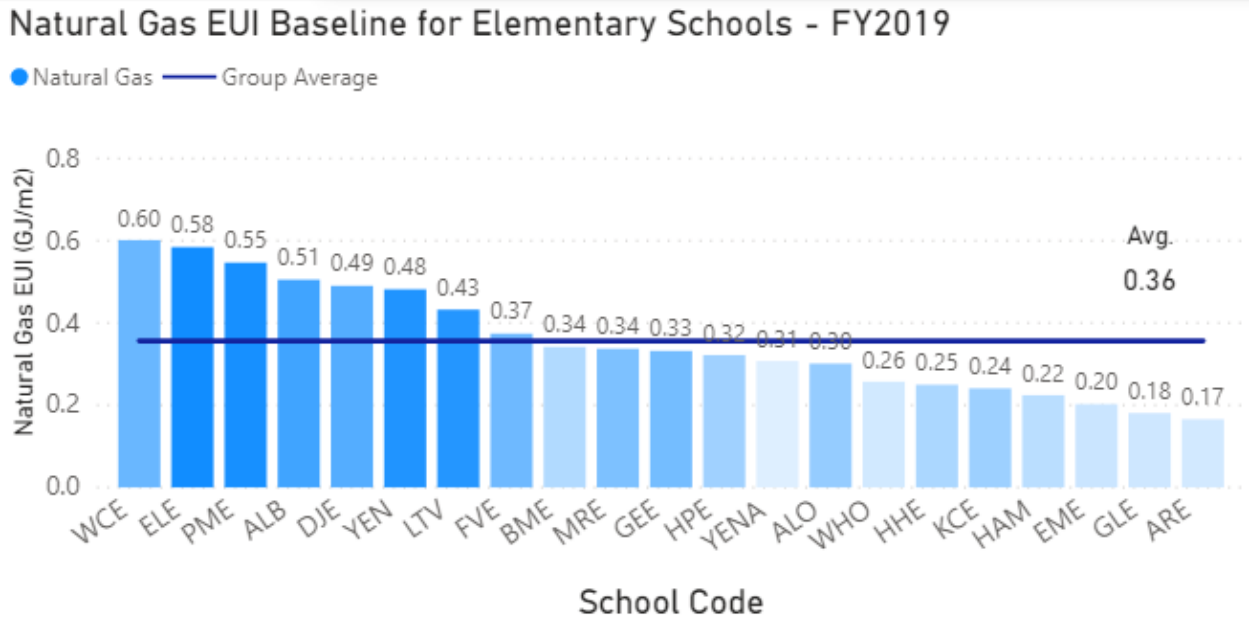
1. Natural Gas EUI shown with simple bar graphs and actual values.
2. Natural Gas Consumption shown with shades of blue;
    a. Dark blue = highest consumers of natural gas within their grouping
    b. Light blue = lowest consumers of natural gas within their grouping

Natural gas total consumption is important in identifying schools that have a high opportunity for improvement, and therefore emission reductions – saving 5% of a large number is more impactful than 5% of a small number.

Key Takeaways:

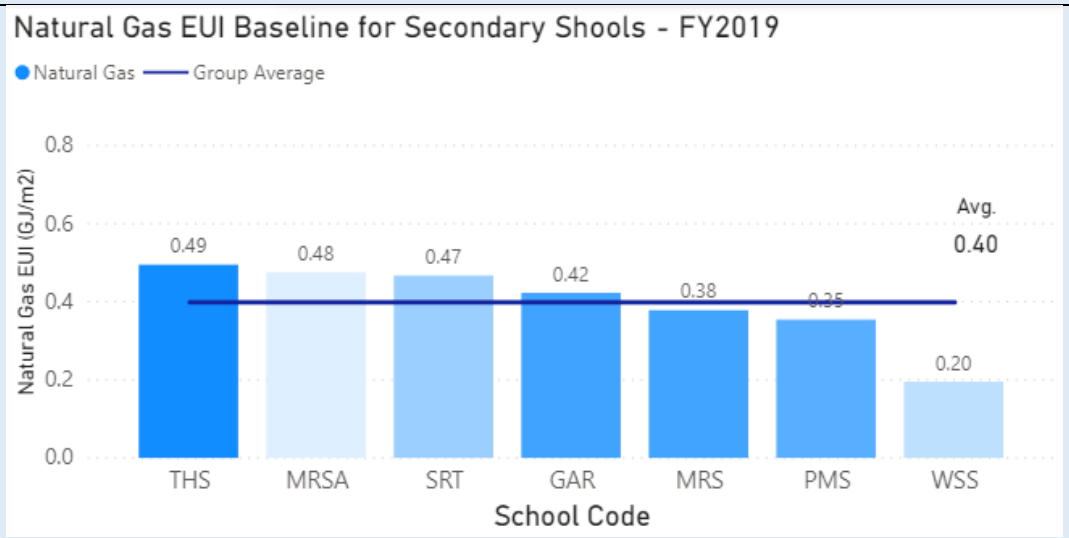
- Elementary Schools:
    - *Average natural gas EUI:* **0.36 eGJ/m^2** (72% of Total EUI)
    - *Worst performers*: **Webster's Corners, and Eric Langton Elementary**
    - *Highest consumers:* **Eric Langton and Pitt Meadows Elementary**
- Secondary Schools:
    - *Average natural gas EUI:* **0.40 eGJ/m^2** (64% of Total EUI)
    - *Worst performers*: **Thomas Haney, and Maple Ridge Secondary**
    - *Highest consumers:* **Thomas Haney, and Garibaldi Secondary**
- Other Buildings:
    - *Average natural gas EUI:* **0.47 eGJ/m^2** (63% of Total EUI)
    - *Worst performers*: **Maintenance Building, and James Best Centre**
    - *Highest consumers:* **Riverside Centre, and Maintenance Building**

Analysis



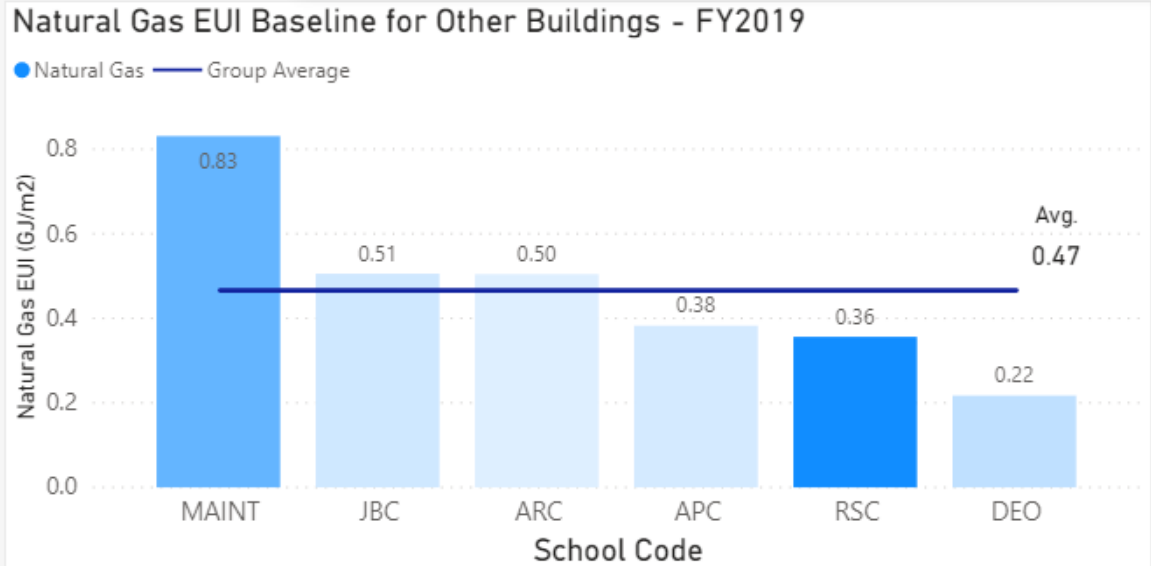
Elementary Schools
Natural Gas EUI Analysis

Average: **0.36 eGJ/m²**
It's noted that the top 4 schools with the highest natural gas consumption (darkest blue) are also above the average in Natural Gas EUI performance. These are likely high value targets for energy saving opportunities and emission reductions.



Secondary Schools
Natural gas EUI Analysis

Average: **0.40 eGJ/m²**
Natural gas EUI is relatively consistent throughout the buildings with three schools above the average, and three schools below the average. Although Maple Ridge Secondary Annex is a poor performing school, it consumes relatively little natural gas compared to other secondary schools.
It's noted that Westview Secondary is a much better performer in natural gas EUI because the majority of heating is provided from electric heat pumps rather than natural gas boilers.



"Other" Buildings
Natural Gas EUI Baseline for 2019

Average: **0.47eGJ/m²**

Maintenance is by far the worst performing building with the natural gas use intensity of 0.83 eGJ/m², which is nearly double the group average. It's also worth noting that Maintenance and Riverside Centre are the largest consumers of natural gas and are likely key areas to focus in this category to reduce emissions and improve operational efficiency.

3.4 ENERGY COST

Due to the extremely variable cost of natural gas for FY2019, this year was deemed unfit as a baseline, instead, FY2020 is used for the total energy cost KPI analysis.

Total energy cost provides a snapshot of how well our energy efficiency measures are affecting our operational performance over time, and also provide a single data point to compare operational costs moving forward. This section will provide a quick view of utility price trends over time, and the total cost of energy for each building and grouping.

3.4.1 UTILITY PRICE TRENDS

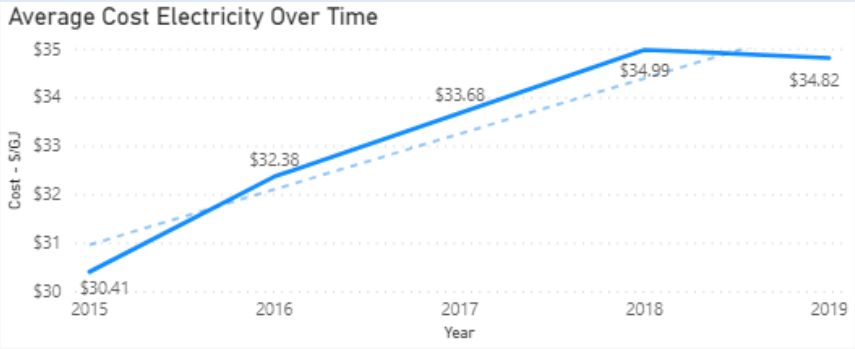
Trends taken between FY2015 and FY2019 are analyzed to understand how the cost of both electricity and natural gas have changed in the past 5 years.

These numbers do not capture the month to month variability that was particularly observed for the cost of natural gas in FY2019, cause by a ruptured pipeline. Since these events, the district has moved to a rate structure with FortisBC that should reduce these large supply based market fluctuations.

Key Takeaways

- Natural Gas Cost
  - *Increased* **by 2%** since 2015 but with noticeable ups and downs in the market
- Electricity Cost
  - *Increased* **by 14.5%** since 2015

Analysis



Utility Cost – Trends

Natural Gas has seen an overall increase **of 2% since 2015**. There was a sharp drop-off in 2016, of 15%, which has been taken back by high natural gas prices in 2019. This reflects the volatility inherent in the natural gas market.

It's noted that **electricity has seen 14.5% increase** in cost/GJ of consumption since 2015. This increase has been relatively measured and predictable year over year.

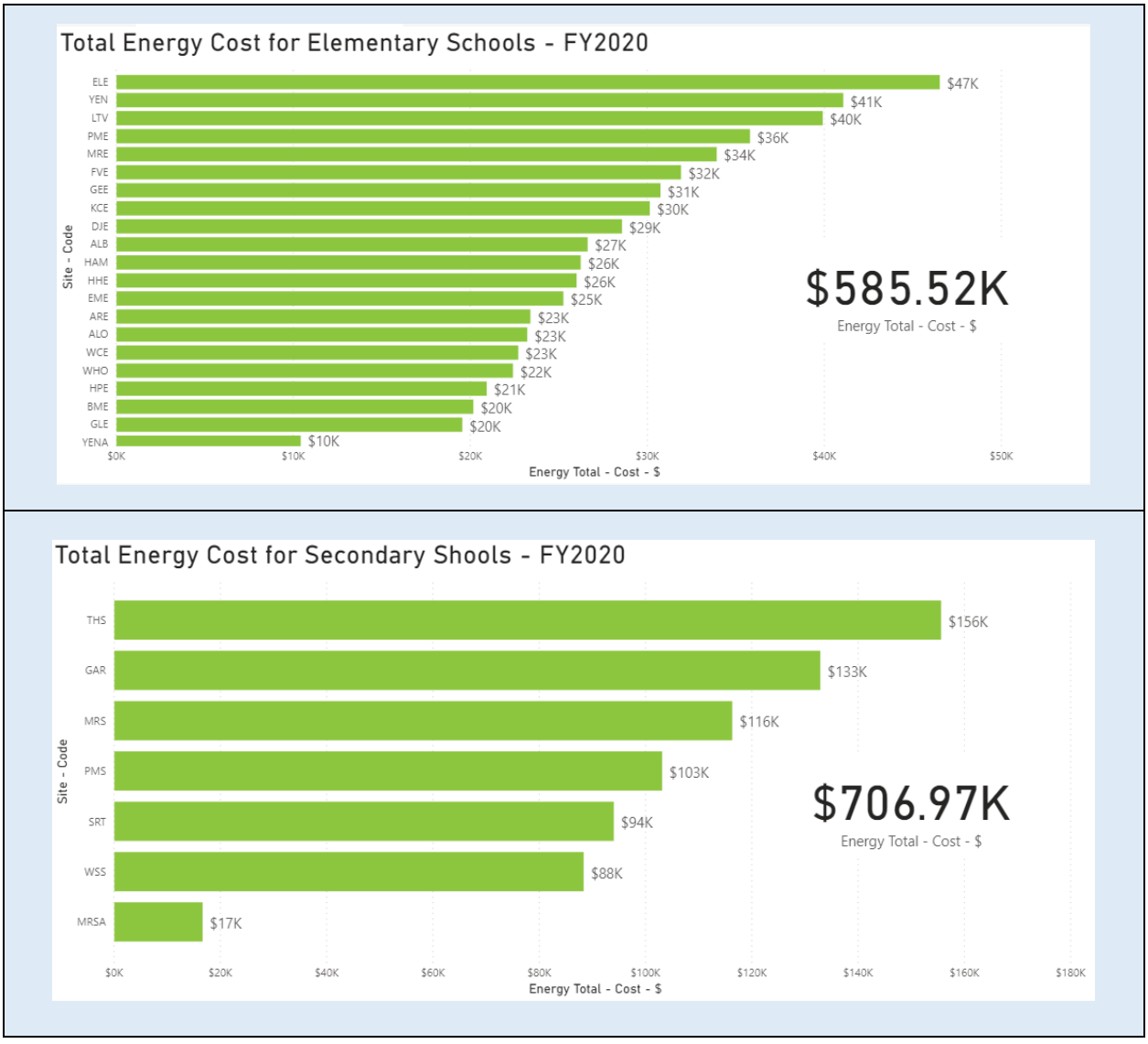
3.4.2 TOTAL ENERGY COST

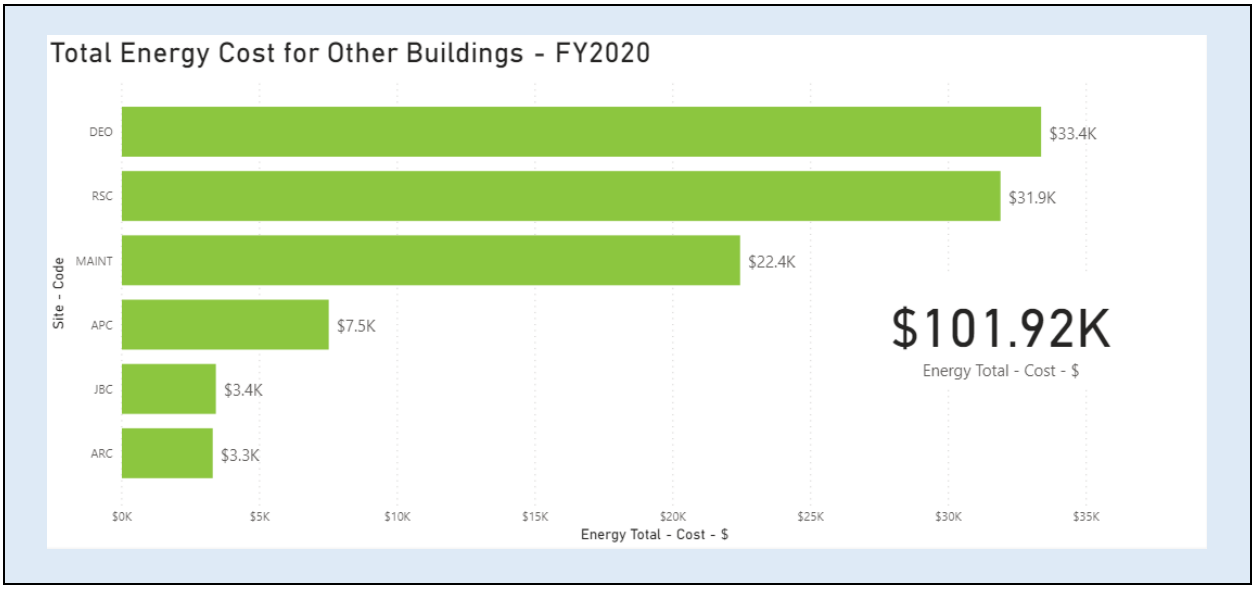
The total cost of energy is benchmarked for FY2020 and summarized here.

Key Takeaways

- Elementary Schools
  - 4 Schools account for 27% of costs; **Yennadon, Eric Langton, Pitt Meadows, and Kanaka Creek Elementary Schools**
- Secondary Schools
  - 3 Schools account for 56% of costs: **Thomas Haney, Maple Ridge, and Garibaldi Secondary Schools**
- "Other" Buildings
  - 2 Buildings Account for 66% of Costs; **Riverside Centre, and the District Education Office**

Analysis



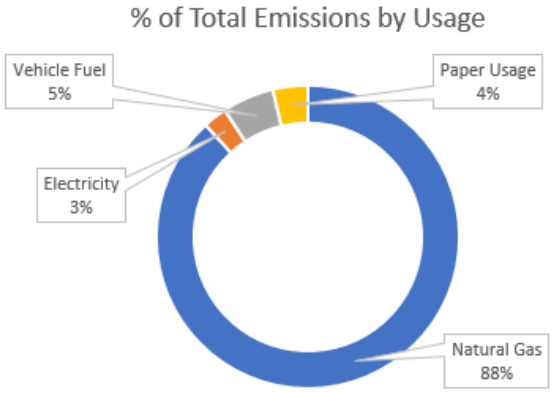

Total Energy Cost for Other Buildings - FY2020
DEO
RSC
MAINT
APC
JBC
ARC
$33.4K
$31.9K
$22.4K
$7.5K
$3.4K
$3.3K
Site - Code
$0K
$5K
$10K
$15K
$20K
$25K
$30K
$35K
Energy Total - Cost - $
$101.92K
Energy Total - Cost - $

4 2021-2026 PLAN

4.1 EMISSION PROFILE

When emissions are broken down into subsets**, the largest contributor is natural gas** accounting for **88% of all emissions**, with vehicle fuel in second accounting for 5.7%, paper use in third at 3.9%, and finally electricity at just 2.6% of overall emissions – shown in Figure 3.

Figure 3: *The general emissions profile for 2019*



In 2019, 88% of greenhouse gas emissions stem from the use of natural gas for heating school district facilities. In order to reach the 2030 GHG reduction targets the 2021-2026 plan prioritizes the implementation of natural gas conservation measures.

Vehicle related emissions are the second largest contributor of emissions (5%). Looking at fuel usage, gasoline accounts for 74% of emissions, while diesel accounts for 26%. To reduce our vehicle related emissions the 2021-2026 plan will focus on replacing end of life vehicles with lower emission vehicles and incorporating electric vehicles in the school district fleet will be prioritized where feasible.

4.2 ENERGY EFFICIENCY MEASURES

In this section, energy efficiency measures (EEMs) are analyzed and presented in a 5-year plan that requires an estimated one-time capital investment of $2.3M and will result in estimated annual utilities cost savings of $0.24M.

4.2.1 HVAC ENERGY EFFICIENCY MEASURES

80% of the energy used in our Elementary and Secondary schools is for heating and ventilation (HVAC). The proposed energy efficiency measures focus on a wholistic upgrade opportunity where project scope is added on to other, larger, provincially funded projects such as boiler upgrades.

The 2021-2026 plan includes projects focused on:

- **Control setpoint optimizations** – optimizing each area of the building to use the correct amount of heating, and fresh air to supply end users.
- **Variable Frequency Drive installations** – installation of motors that can adjust airflow with occupancy levels.
- **Upgraded pipe routing** – improves system efficiency by maximizing the heat transferred to the building.
- **Sensor installations** – installation of occupancy, CO_2 sensors, and other automated feedback systems to ensure minimal operation when rooms are not occupied.
- **Fuel switching propane to electricity** – replacing propane furnaces with heat pumps in portables.
- **Boiler Additive** – Adding a boiler water additive that improves efficiency of the buildings.

The projects included in the 2021-2026 plan were prioritized based in the following criteria:

- Existing capital projects related to the HVAC system.
- An energy management score higher than the median of 17 - See Appendix B for score details
- Return on investment of proposed projects in the form of payback.

The proposed list of projects is shown in Table 3. Additional projects may be added to the plan based on detailed analysis of school district facilities and funding received from the province for other capital projects in the same facility.

***Table 3**: HVAC EEMs to be completed between 2021 and 2026*

Year Planned	School	Project Name	Cost	Savings per Year	Payback
2026	DJE	HVAC Upgrade	$ 112,500.00	$ 7,607.35	15.4
	MRSS	HVAC Upgrade	$ 381,000.00	$ 21,174.75	
	THSS	HVAC Upgrade	$ 211,500.00	$ 16,941.20	
2025	MRE	HVAC Upgrade	$ 115,000.00	$ 7,218.96	14.2
	SRT	HVAC Upgrade w/o Boiler*	$ 90,000.00	$ 7,179.43	
2024	THSS	HVAC Optimization	$ 60,000.00	$ 7,789.66	7.7
2023	YEN	HVAC Upgrade	$ 150,000.00	$ 9,134.35	13.9
	ALB	HVAC Upgrade	$ 147,500.00	$ 8,525.84	
	WSS	HVAC Upgrade	$ 112,500.00	$ 5,416.75	
	SRT	Portable Furnace Replacement**	$ 153,270.00	$ 17,381.54	

2022	WCE	HVAC Upgrade	$ 117,500.00	$ 9,568.14	7.7
	HPE	HVAC Upgrade	$ 87,500.00	$ 6,067.90	
	GAR	HVAC Upgrade	$ 179,500.00	$ 28,817.37	
	PMSS	HVAC Upgrade	$ 140,000.00	$ 23,646.90	
2021	ALB	Boiler Additive	$ 3,400.00	$ 2,743.95	6.9
	LVE	Boiler Additive	$ 3,400.00	$ 3,042.96	
	YEN	Boiler Additive	$ 2,710.00	$ 3,172.28	
	PME	HVAC Upgrade	$ 35,000.00	$ 9,799.60	
		Totals	**$ 2,102,280**	**$ 195,289**	**10.8**

This plan does not include potential incentives from BC Hydro, or Fortis BC that would otherwise improve the business case. From years 2021 to 2026 there are 19 projects that involve performing upgrades to existing end of life equipment. All "HVAC Upgrade" projects listed have an end of life boiler upgrade required in the planned year and is the main reason for the timing of each.

Savings and costs are calculated using level 1 energy audit assessments done by RockyPoint Engineering and have a likely accuracy of +/- 25% depending on the project.

4.2.2 LIGHTING ENERGY EFFICIENCY MEASURES

The energy management plan implemented between 2015 to 2019 performed lighting upgrades on nearly every building in School District 42. These savings had an estimated ongoing electricity savings of nearly 4.4M kWh, a 39% reduction in electricity consumption compared to 2015. When analyzing the actual district consumption, the savings are just 2.5M kWh, a 23% reduction. The expectation for this plan is to implement lighting audits to analyze patterns and recognize behavioral and operational changes that are required in order to realize the originally estimated energy savings.

Additionally, when lighting projects are up for bulb replacement – typically about 10 years after implementation – these lights will be replaced with high efficiency LEDs that will further reduce our energy consumption. The schools up for LED bulb replacements are shown in Table 4 below.

Table 4: *Schools available for TLED upgrades when current T8 light bulbs are at end of life.*

School	Cost ($)*	Electricity Savings (kWh/yr)	Savings ($)	Payback
Thomas Haney Secondary	$39,469	81,660	$9,000	4.4
Webster's Corners Elementary	$8,081	16,720	$1,800	4.5
Samuel Robertson Technical School	$26,844	55,540	$6,100	4.4
Harry Hooge Elementary	$13,253	27,420	$3,000	4.4
Yennadon Elementary	$9,589	19,840	$2,200	4.4
Maple Ridge Secondary Annex	$9,502	19,660	$2,200	4.3
Glenwood Elementary	$8,748	18,100	$2,000	4.4
District Education Office	$3,383	7,000	$800	4.2
Riverside Centre	$140,000	130,217	$12,000	11.7
Total	**$258,871**	**376,157**	**$39,100**	**6.6**

*Cost is based on 6 $/bulb replaced, and 40 $/hr labor cost

5 EVALUATING THE IMPACT

5.1 GREENHOUSE GAS EMISSIONS REDUCTIONS

A comparison of emissions from the district between status quo and if the HVAC efficiency measures identified are implemented. Both results are plotted in Figure 4 below, with the 2030 goal of 2,000 tCO_2e shown in green.

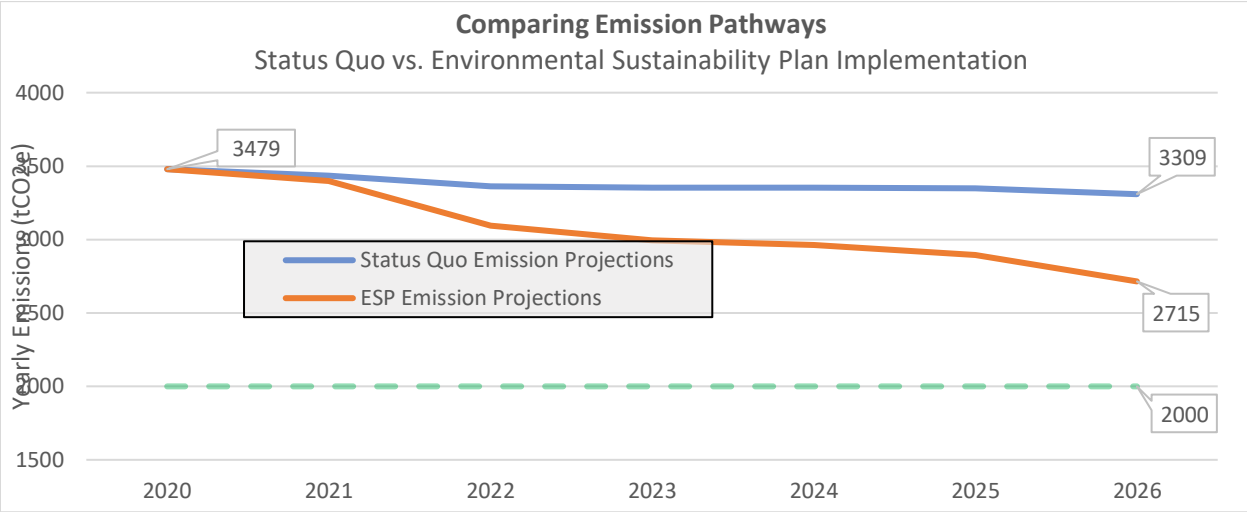


***Figure 4**: Compares a status quo emission pathway to the potential emission pathway if HVAC projects are implemented through to 2026.*

Figure 4 shows that without any comprehensive plan, and looking at boiler improvements only, a reduction of 170 tCO_2e (37 cars off the road) can be expected. If the Environmental Sustainability Plan (ESP) is implemented as intended, then this investment would lead to a reduction of 764 tCO_2e (160 cars off the road) by 2026. This still leaves some improvement required for 2030, but is a significant improvement over the status quo and with added effort in reducing vehicle emissions, and continued incorporation of the energy management score in facility planning processes, we'd expect to surpass this estimation in 2026. To ensure alignment with 2030 targets, continual monitoring and updates to these projections are required, with an update to this plan needed in 2026.

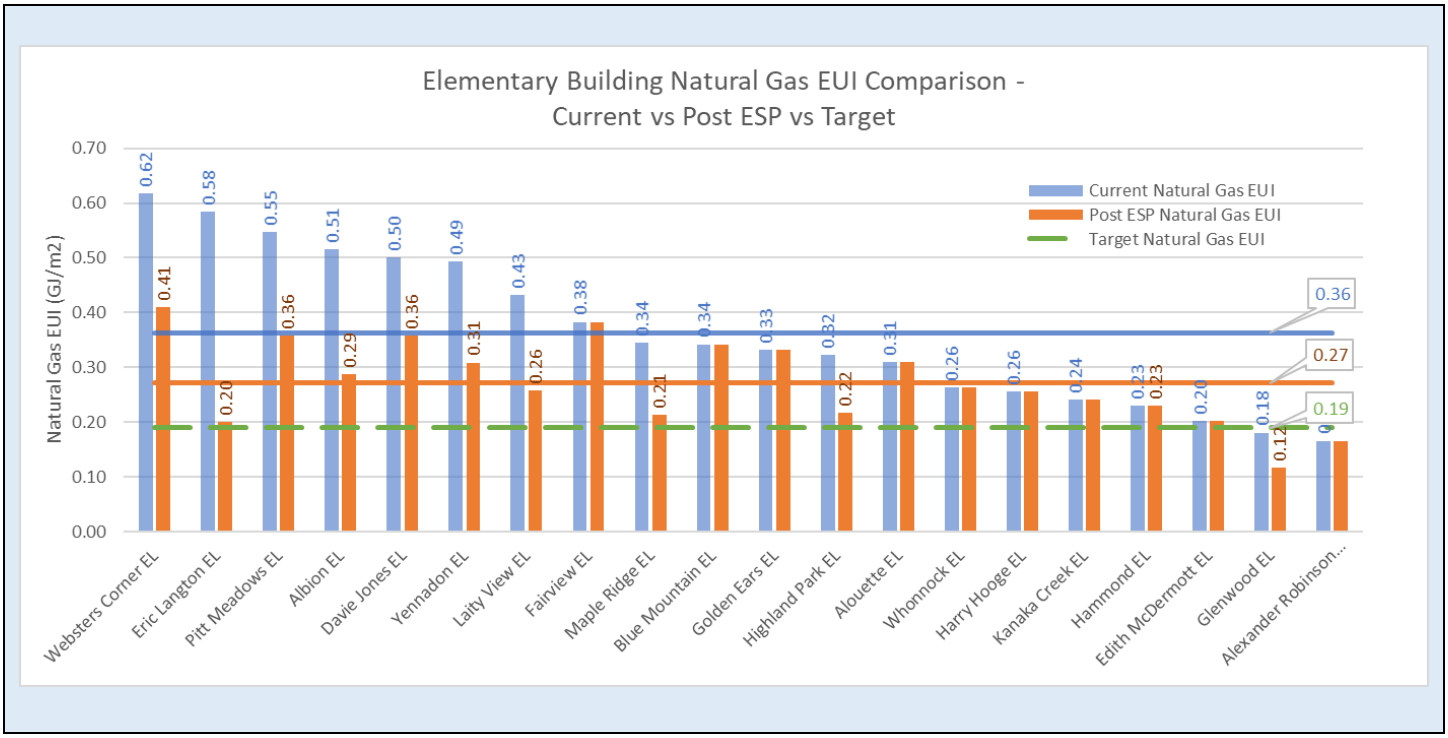
5.2 BUILDING PERFORMANCE

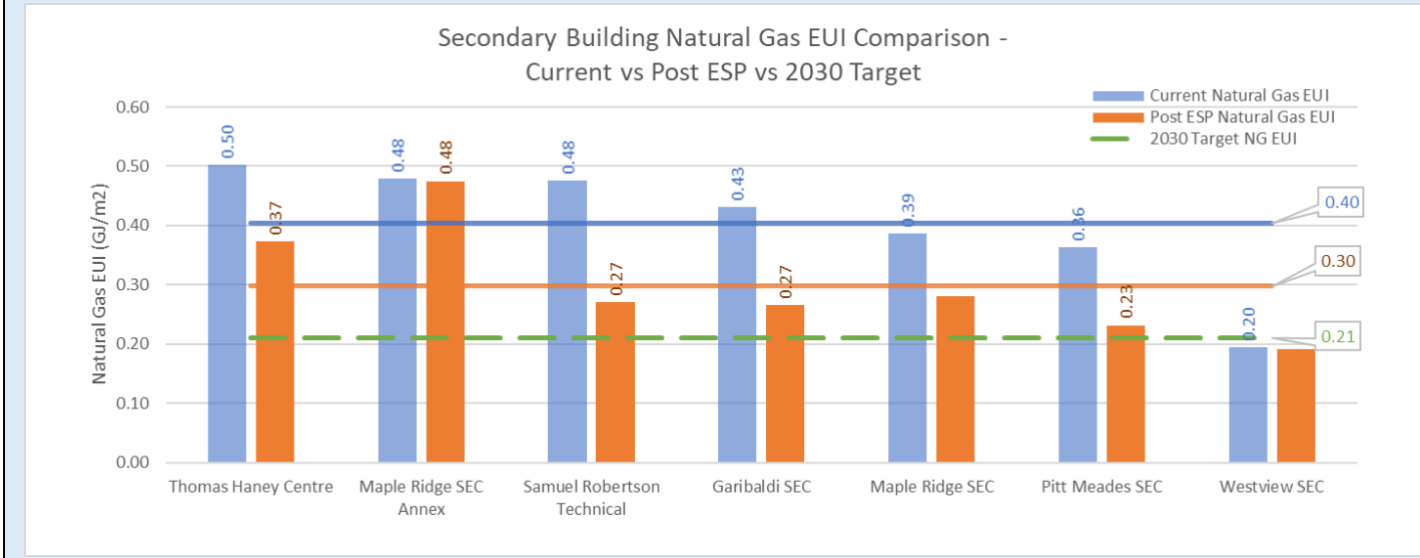
This section aims to provide some insight into what the district energy profile might look like if this plan is implemented. In the analysis the current energy performance of the district is compared with a scenario where; (1) the proposed HVAC projects are completed, (2) existing lighting projects get moved to the newest technology, and (3) Eric Langton Elementary is replaced with a higher performing building by 2026.

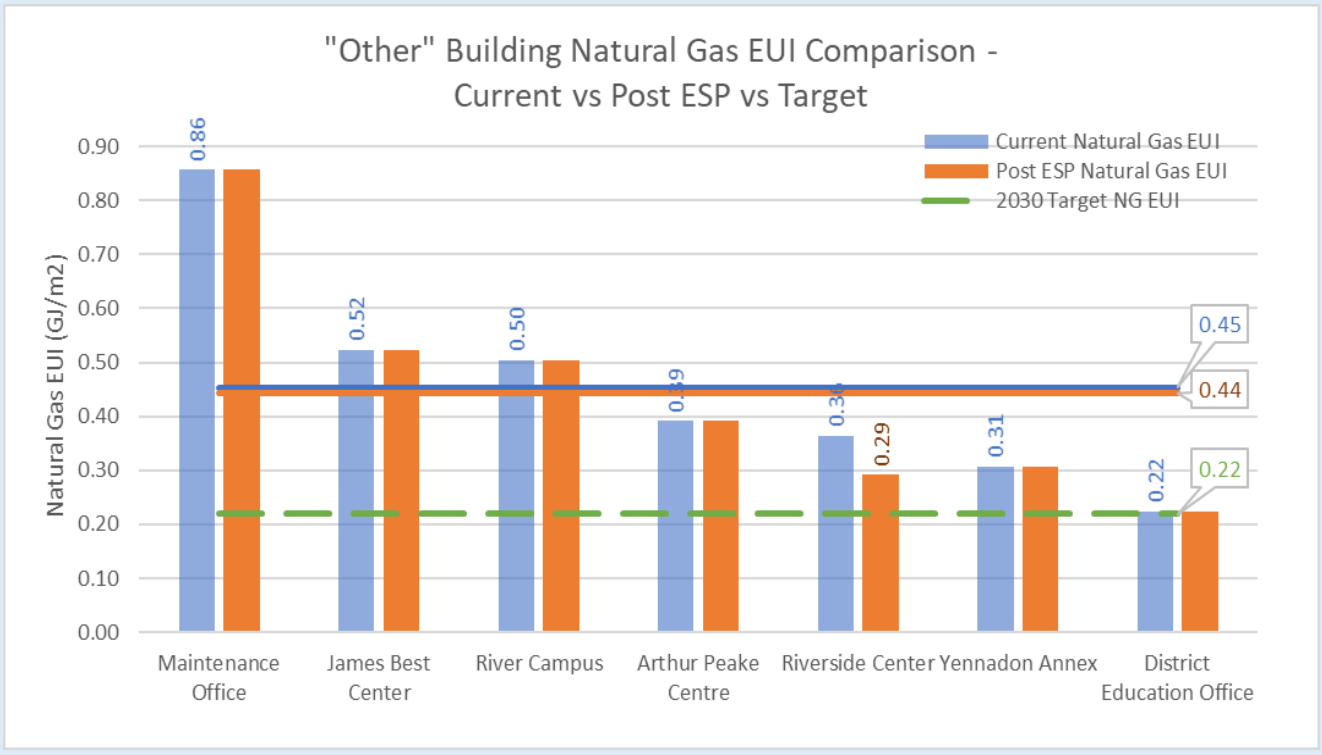
Key Takeaways

- Elementary Schools:
  - Natural Gas EUI is **improved by 25%**
    - Realizing **57% of the required savings** needed to hit the 2030 target
  - Total EUI is **improved by 19%**
- Secondary Schools:
  - Natural Gas EUI is **improved by 26%**
    - Realizing **53% of the required savings** needed to hit the 2030 target
  - Total EUI is **improved by 20%**
- Other Buildings:
  - Natural Gas EUI is **improved by 2%**
  - Total EUI is **improved by 4%**

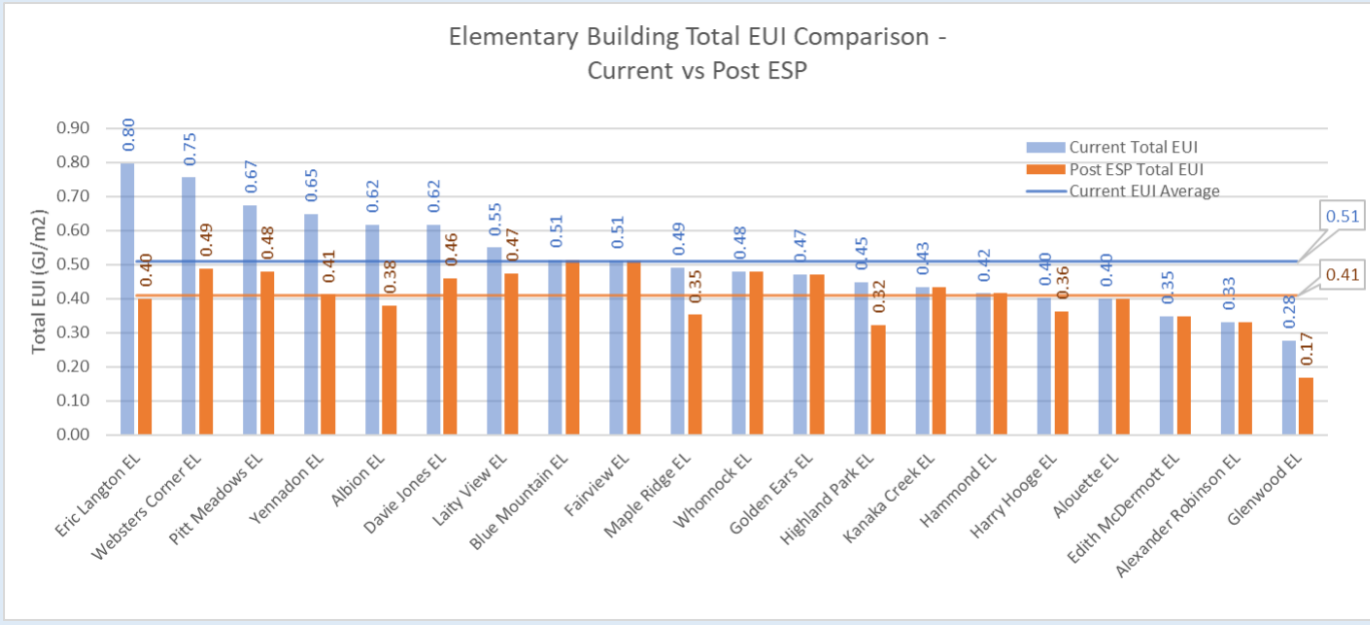
Analysis – Natural Gas EUI

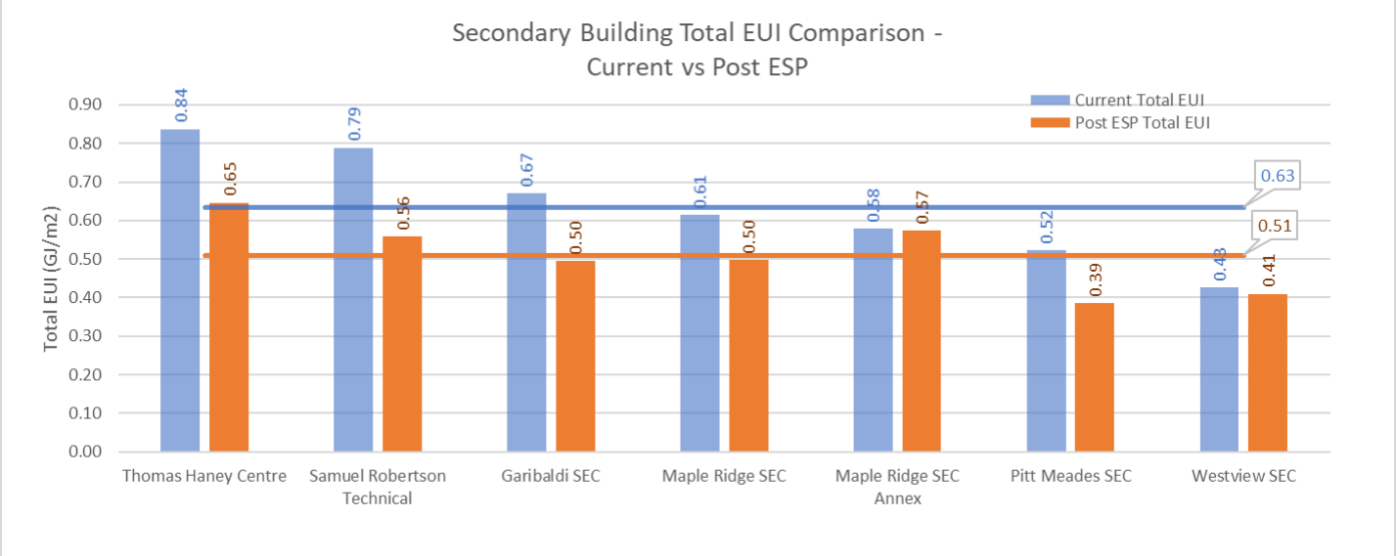


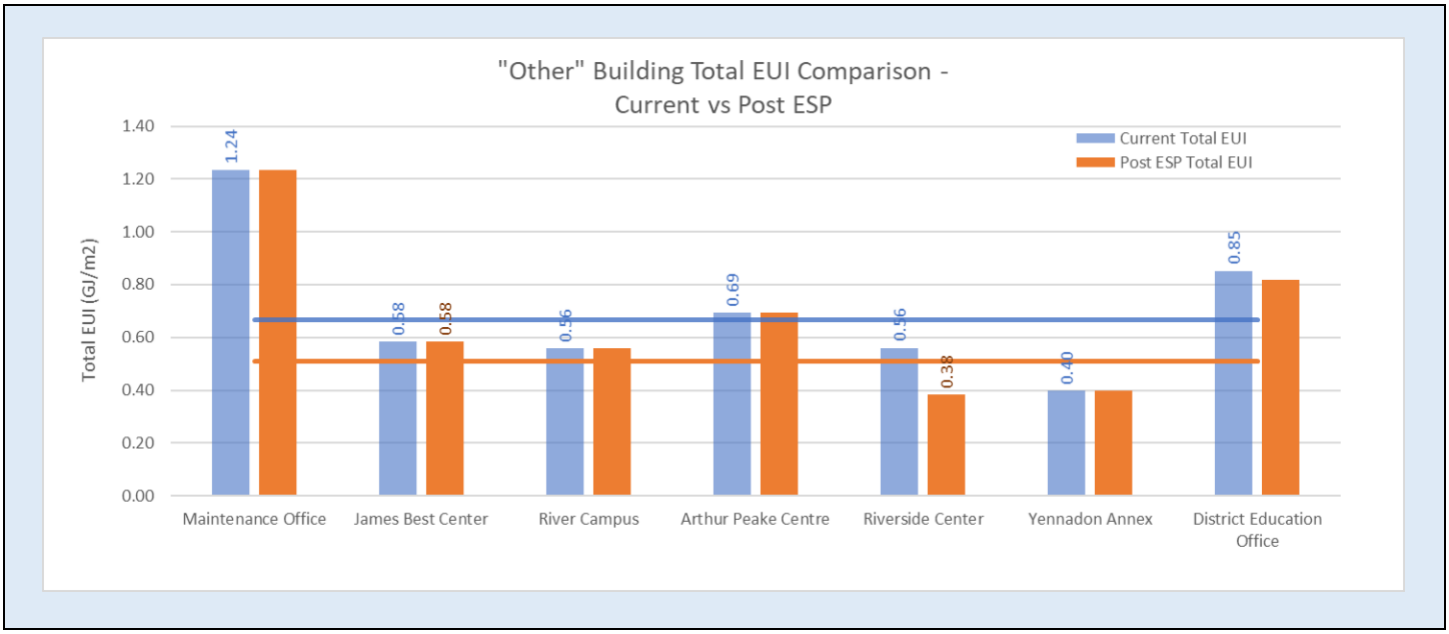

Secondary Building Natural Gas EUI Comparison -
Current vs Post ESP vs 2030 Target
Current Natural Gas EUI
Post ESP Natural Gas EUI
2030 Target NG EUI
Natural Gas EUI (GJ/m2)
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0.50
0.37
0.48
0.48
0.48
0.27
0.43
0.27
0.39
0.36
0.23
0.20
0.40
0.30
0.21
Thomas Haney Centre
Maple Ridge SEC Annex
Samuel Robertson Technical
Garibaldi SEC
Maple Ridge SEC
Pitt Meades SEC
Westview SEC


"Other" Building Natural Gas EUI Comparison -
Current vs Post ESP vs Target
Current Natural Gas EUI
Post ESP Natural Gas EUI
2030 Target NG EUI
Natural Gas EUI (GJ/m2)
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0.86
0.52
0.50
0.39
0.36
0.29
0.31
0.22
0.45
0.44
0.22
Maintenance Office
James Best Center
River Campus
Arthur Peake Centre
Riverside Center
Yennadon Annex
District Education Office

Analysis – Total EUI






"Other" Building Total EUI Comparison -
Current vs Post ESP
Current Total EUI
Post ESP Total EUI
Total EUI (GJ/m2)
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
1.24
0.58
0.58
0.56
0.69
0.56
0.38
0.40
0.85
Maintenance Office
James Best Center
River Campus
Arthur Peake Centre
Riverside Center
Yennadon Annex
District Education Office

6 RISK ASSESSMENT

As with any plan there are inherent risks involved in implementation due to unforeseen costs, timeline adjustments, and various other constraints. The risks most relevant to the Environmental Sustainability Plan are outlined here.

- The possibility that funds will not be available for the existing capital plans, forcing the timing of the energy efficiency measures to change.
- Major events (such as COVID-19) could force drastic changes to the workings of our buildings, rendering some of these preliminary estimations incorrect.
- This plan does not account for new schools to be built, and the added burden of any new buildings must be factored into these estimations as they're built.
- There are constant fluctuations in electricity and natural gas pricing, and the potential savings outlined in these estimations may become inaccurate if major changes occur.
- Capital funding for buildings in the "Other" category is limited, therefore there may not be enough planned capital projects to support emission and energy reduction targets.

7 CONCLUSION

The Maple Ridge-Pitt Meadows school district has committed to carbon neutrality, with clear strategic direction to be effective, efficient, and sustainable. The Environmental Sustainability Plan aims to provide the planning framework for meeting the provincially set goal to reduce greenhouse gas emissions by 50% by 2030. With an estimated incremental investment of $2.36 M over the next 5 years, the plan will:

- Reduce annual operational costs by $0.24 M per year
- Reduce greenhouse gas emissions by 22%
- Provide more stable and reliable energy systems
- Foster a culture of environmental sustainability

GLOSSARY OF TERMS

Term	Definition
DDC	Direct Digital Control is the system that controls heating and ventilation in buildings.
EUI	Energy Use Intensity – Taking an energy consumption of a building and normalizing it by dividing it by the floor area. Has units of GJ/m^2.
EEM	Energy Efficiency Measure is any type of modification, update, or improvement to energy using systems in a building that results in a more efficient use of energy.
GHG	Green House Gases – These are emissions that contribute to global warming by trapping energy inside the earth's atmosphere.
GJ	GigaJoule – a measure of energy. This is the standard way to measure natural gas and is the energy metric chosen to represent the district in this report.
HVAC	Heating Ventilation and Air Conditioning
LED	Light Emitting Diode
NG	Natural Gas
School ID	An abbreviate school identification code. Details can be found in Appendix A for specific school ID correlations.
tCO_2e	Tons of CO_2 equivalent – this is the most common metric to quantify greenhouse gasses. All emissions are converted into tCO_2e terms when assessing targets and savings.
TLED	Tubular Light-Emitting Diode; light fixtures designed to directly replace other ceiling tubular lighting fixtures without the need to replace other components.

APPENDIX A

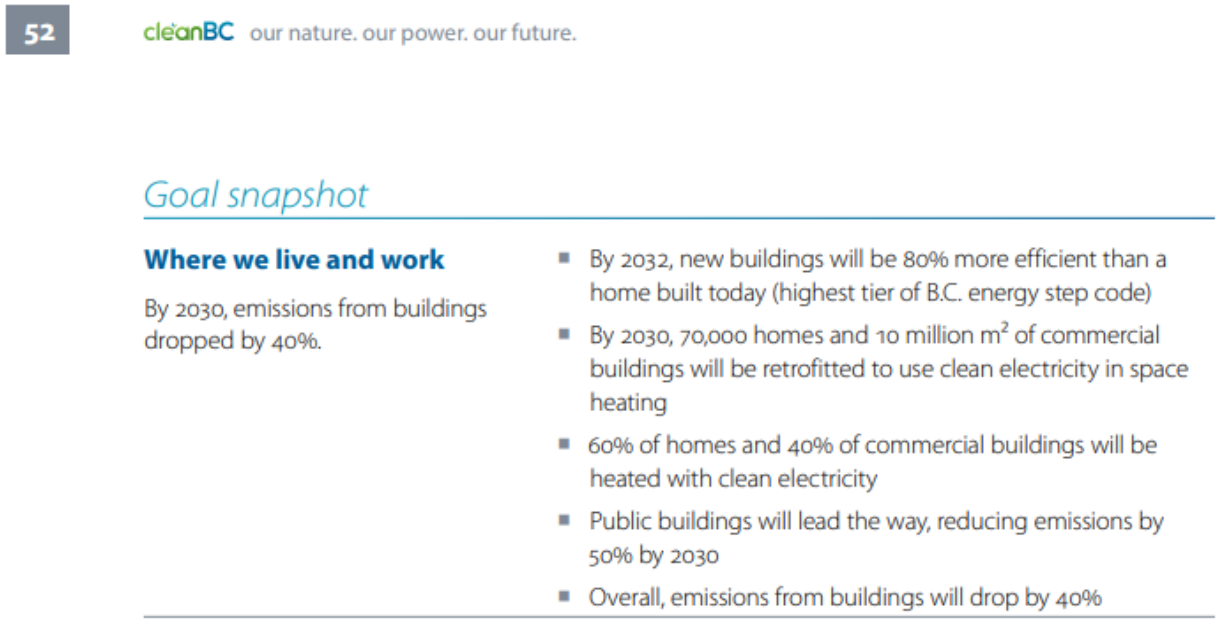


***Figure 5**: Goal snapshot taken from CleanBC Document outlining goals for public sector buildings. this is found on Page 52 of the CleanBC document. (BC Government, 2019).*

APPENDIX B

In order to prioritize buildings for potential upgrades and improvements to their energy consumption, a high-level understanding of how they compare to other schools must be done. In order to simplify this comparison a ranking system is devised. The system ranks each school from 1 to 34, with 1 being the best performing school overall, and 34 being the poorest performer overall, and therefore the most likely to benefit from an Energy Efficiency Measure (EEM). Factors and their respective weightings are shown in Table 5 below.

***Table 5:** Energy Management Rank factors and their respective weighted values.*

Factors Considered	Meaning	Weighting
FCI - Facility Condition Index	The likelihood projects will be funded through the ministry	**40%**
EUI - Energy Use Intensity	Total energy use intensity is a proxy for building energy performance	**25%**
Natural Gas Consumption	Overall natural gas consumption per year	**25%**
Electricity Consumption	Overall Electricity consumption per year	**10%**

Energy management score for schools in School District 42 are shown in Table 6 below. If a building has an EM score of 34 to 17 (50th percentile), then it qualifies to add additional energy analysis and modelling to any capital projects that would potentially affect the energy consumption of the building. The energy efficiency measures identified through analysis will be implemented based on their economic merit once the tendering process is completed.

Table 6: *The full Energy Management Score table.*

Building	FCI Rank	Total EUI Rank	Electricity Consumption Rank	Natural Gas Consumption Rank	**EM Score**
Pitt Meadows Secondary	29	16	29	31	**34**
Eric Langton Elementary	21	30	25	28	**33**
Thomas Haney Centre	14	31	34	34	**32**
Pitt Meadows Elementary	25	27	17	27	**31**
District Education Office	32	33	28	4	**30**
Garibaldi Secondary	17	26	32	33	**29**
Davie Jones Elementary	28	23	11	23	**28**
Maple Ridge Secondary Annex	31	20	8	22	**27**
Webster's Corners Elementary	20	29	7	21	**26**
Arthur Peak Centre	33	28	4	2	**25**
Albion Elementary	19	24	9	24	**24**
Westview Secondary	18	8	31	29	**23**
Maple Ridge Elementary	24	13	20	17	**22**
Samuel Robertson Technical Secondary	1	32	30	30	**21**
Fairview Elementary	22	14	15	20	**19.5**
Maple Ridge Secondary	5	22	33	32	**19.5**
Alouette River Campus	34	18	1	1	**18**
James Best Centre	30	21	2	3	**17**
Yennadon Elementary	6	25	24	26	**16**
Highland Park Elementary	26	10	10	14	**15**
Riverside Elementary	13	19	26	19	**14**
Blue Mountain Elementary	23	15	13	11	**13**
Laity View Elementary	9	17	19	25	**12**
Golden Ears Elementary	12	11	21	18	**11**
Maintenance Facility	3	34	12	12	**10**
Glenwood Elementary	27	1	5	8	**9**
Kanaka Creek Elementary	10	9	27	15	**8**
Harry Hooge Elementary	15	6	18	13	**7**
Alouette Elementary School	16	5	6	16	**6**
Hammond Elementary	11	7	23	10	**5**
Alexander Robinson Elementary	8	2	22	6	**4**
Edith McDermott Elementary	7	3	14	9	**3**
Whonnock Elementary	2	12	16	7	**2**
Yennadon Elementary Annex	4	4	3	5	**1**
ċəsqənelə Elementary					**1**

Table 7: Schools and their associated School ID.

Site - Name	Code
Eric Langton EL	ELE
Pitt Meadows EL	PME
Davie Jones EL	DJE
Maple Ridge SEC Annex	MRSA
Webster's Corners EL	WCE
Albion EL	ALB
Maple Ridge EL	MRE
Fairview EL	FVE
Yennadon EL	YEN
Highland Park EL	HPE
Blue Mountain EL	BME
Laity View EL	LVE
Golden Ears EL	GEE
Glenwood EL	GLE
Kanaka Creek EL	KCE
Harry Hooge EL	HHE
Alouette EL	ALO
Hammond EL	HAM
Alexander Robinson EL	ARE
Edith McDermott EL	EME
Whonnock EL	WHO
C'usqunela EL	CES
Site - Name	
Pitt Meadows SEC	PMSS
Thomas Haney Centre	THSS
Garibaldi SEC	GAR
Westview SEC	WSS
Samuel Robertson Technical	SRT
Maple Ridge SEC	MRSS
Site - Name	
District Education Office	DEO
Riverside Centre	RSC
Arthur Peake Centre	APC
James Best Centre	JBC
River Campus	ARC
Maintenance Office	MAINT
Yennadon Annex	YENA