Energy Conservation & Demand Management Plan 2024

Confederation COLLEGE

Contents

1. Regulatory Update

O. Reg. 397/11: Conservation and Demand Management Plans was introduced in 2013. Under this regulation, public agencies were required to report on energy consumption and greenhouse gas (GHG) emissions and develop Conservation and Demand Management (CDM) plans the following year.

Until recently, O. Reg. 397/11 was housed under the Green Energy Act, 2009 (GEA). On December 7, 2018, the Ontario government passed Bill 34, Green Energy Repeal Act, 2018. The Bill repealed the GEA and all its underlying Regulations, including O. Reg. 397/11. However, it re-enacted various provisions of the GEA under the Electricity Act, 1998.

As a result, the conservation and energy efficiency initiatives, namely CDM plans and broader public sector energy reporting, were re-introduced as amendments to the Electricity Act. The new regulation is now called **O. Reg. 507/18: Broader Public Sector: Energy Conservation and Demand Management Plans (ECDM).**

As of January 1, 2019, O. Reg. 397/11 was replaced by O. Reg. 507/18, and BPS reporting and ECDM plans are under the Electricity Act, 1998 rather than the Green Energy Act, 2009.

As of February 23, 2023, O. Reg. 507/18 was replaced by **O. Reg. 25/23, and BPS Reporting and ECDM Plans** are under the Electricity Act, 1998.

2. Executive Summary

The purpose of this Energy Conservation and Demand Management (ECDM) Plan from Confederation College is to outline specific actions and measures that will promote good stewardship of our environment and community resources in the years to come. The Plan will accomplish this, in part, by looking at future projections of energy consumption and reviewing past conservation measures.

In keeping with Confederation College's core values of efficiency, concern for the environment and financial responsibility, this ECDM outlines how the College will reduce overall energy consumption, operating costs and greenhouse gas emissions. By following the measures outlined in this document, we will be able to provide compassionate service to more people in the community. This ECDM Plan is written in accordance with O. Reg. 25/23 of the recently amended Electricity Act, 1998.

Today, utility and energy related costs are a significant part of overall operating costs. In 2023:

- Energy Use Index was 26.2 ekWh/sq. ft, which is lower than the Ontario average of 27.6 ekWh/sq. ft. Please note that this index comes from buildings' energy use only – kerosene use from the aviation program is not included in Energy Use Index.
- Energy-related emissions equaled 2,485 tCO_2e.

To obtain full value from energy management activities, Confederation College will take a strategic approach to fully integrate energy management into its business decision-making, policies, and operating procedures. This active management of energy-related costs and risks will provide a significant economic return and will support other key organizational objectives.

With this prominent focus on energy management, by implementing recommended initiatives, Confederation College can expect to achieve the following targets by 2029, compared with 2023:

- 23% reduction in electricity consumption
- 85% reduction in natural gas consumption
- 54% decrease of GHG emissions

Blackstone is recommending to Confederation College to prepare a new ECDM plan in 2029 to reflect on the results of the recommended initiatives and prepare for the new reporting cycle.

The results and the progress of the past ten years, and the projected impact of the new ECDM Plan is presented in the graph below. Due to its small proportion as compared to the other fuels, biomass is not depicted in the figure below. Aviation fuel use is not included in the chart below.

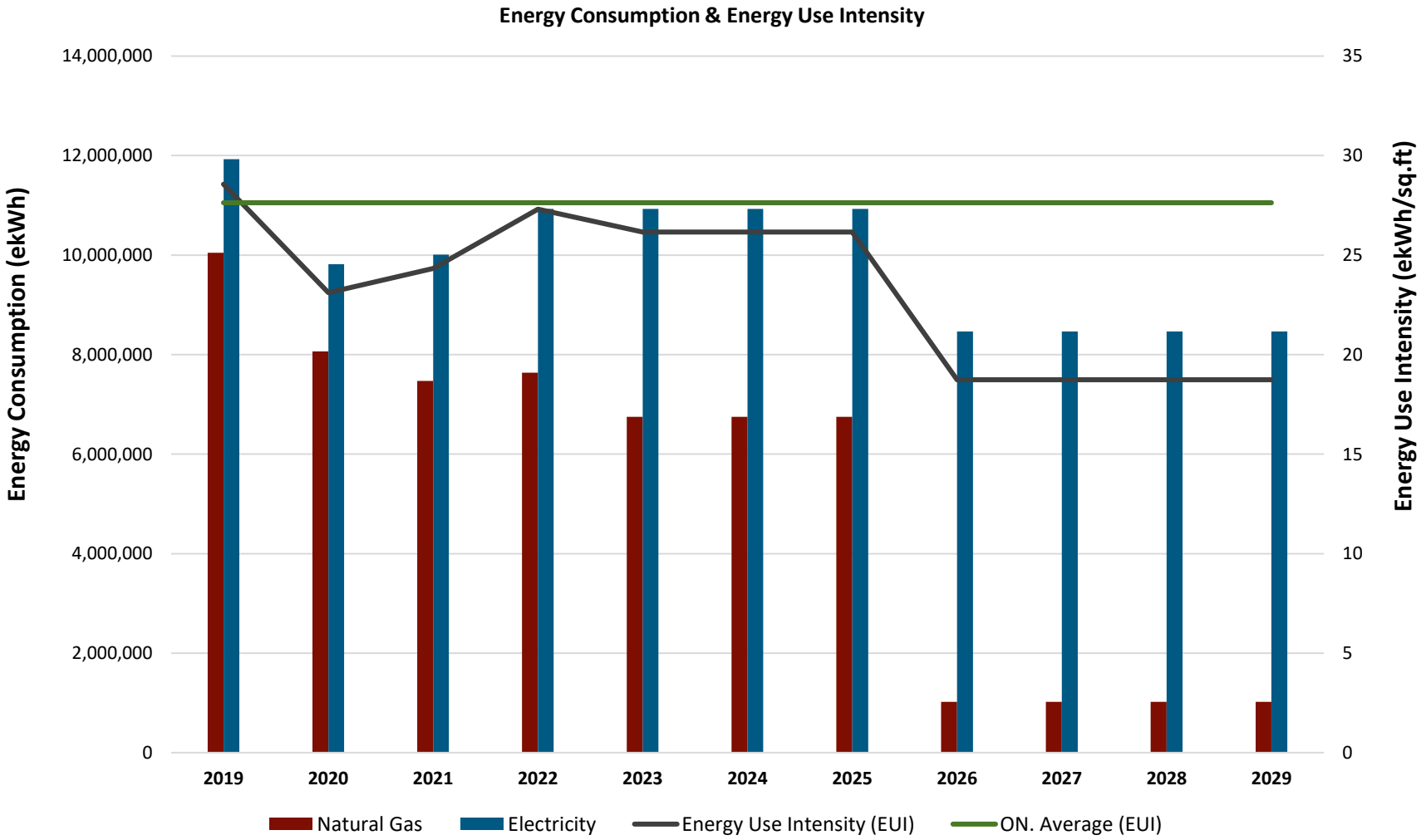

Figure 1. *Site-Wide Energy Consumption Trends & Projections*

3. About Confederation College

Figure 2. *Confederation College*

Located in the heart of Thunder Bay, Confederation College is proud of its beautiful campus, known for its green space, hundreds of established trees, and the McIntyre river that runs through it. We're a culturally diverse, close-knit community of individuals, delivering exceptional education and training to an average of 7,000 combined full and part-time students per year.

Facility Information	
Facility Name	**Confederation College**
Type of Facility	Post-Secondary Educational Institution
Address	1450 Nakina Dr, Thunder Bay, ON P7B 0E5
Gross Area (Sq. Ft)	773,578
Average Operational Hours in a Week	83

Table 1. *Confederation College Facility Information*

In order to obtain full value from energy management activities, and to strengthen our conservation initiatives, a strategic approach must be taken. Our organization will strive to fully integrate energy management into our practices by considering indoor environmental quality, operational efficiency and sustainably sourced resources when making financial decisions.

Our Vision

Confederation College enriches lives through learning.

Negahneewin Vision

Confederation College commits to realizing the Negahneewin Vision through reconciliation and renewed relationships with Indigenous peoples as partners for change in education. This is achieved by building common ground between Indigenous and non-Indigenous peoples through a mutual understanding of history, a shared vocabulary and rich dialogue.

Our Mission

Confederation College inspires students to succeed in their lives and careers.

Our Values

- Courage: Willing to take action or make decisions that may be difficult or challenging.
- Equity: Facilitating fair and just outcomes for all individuals to achieve their full potential.
- Relationships: Supporting team and collaboration with the individuals and communities we serve.

Figure 3. *Confederation College*

4. Campus-Wide Historical Analysis

4.1. Campus-Wide Historical Energy Intensity

Energy Utilization Index is a measure of how much energy a facility uses per square foot. By breaking down a facility's energy consumption on a per-square-foot-basis, we can compare facilities of different sizes with ease. In this case, we are comparing our facility to the industry average for Ontario Colleges (derived from Natural Resources Canada's Commercial and Institutional Consumption of Energy Survey), which was found to be **27.63/sq. ft.** Aviation fuel use is not included in the table and figure below.

Annual Consumption (EUI)					
Campus	**2019**	**2020**	**2021**	**2022**	**2023**
Thunder Bay	28.56	23.06	24.36	27.23	25.24
Kenora	28.43	25.81	22.36	30.92	21.13
Total	**28.56**	**23.11**	**24.32**	**27.30**	**25.17**

Table 2. *Historic Energy Use Intensity for the College*

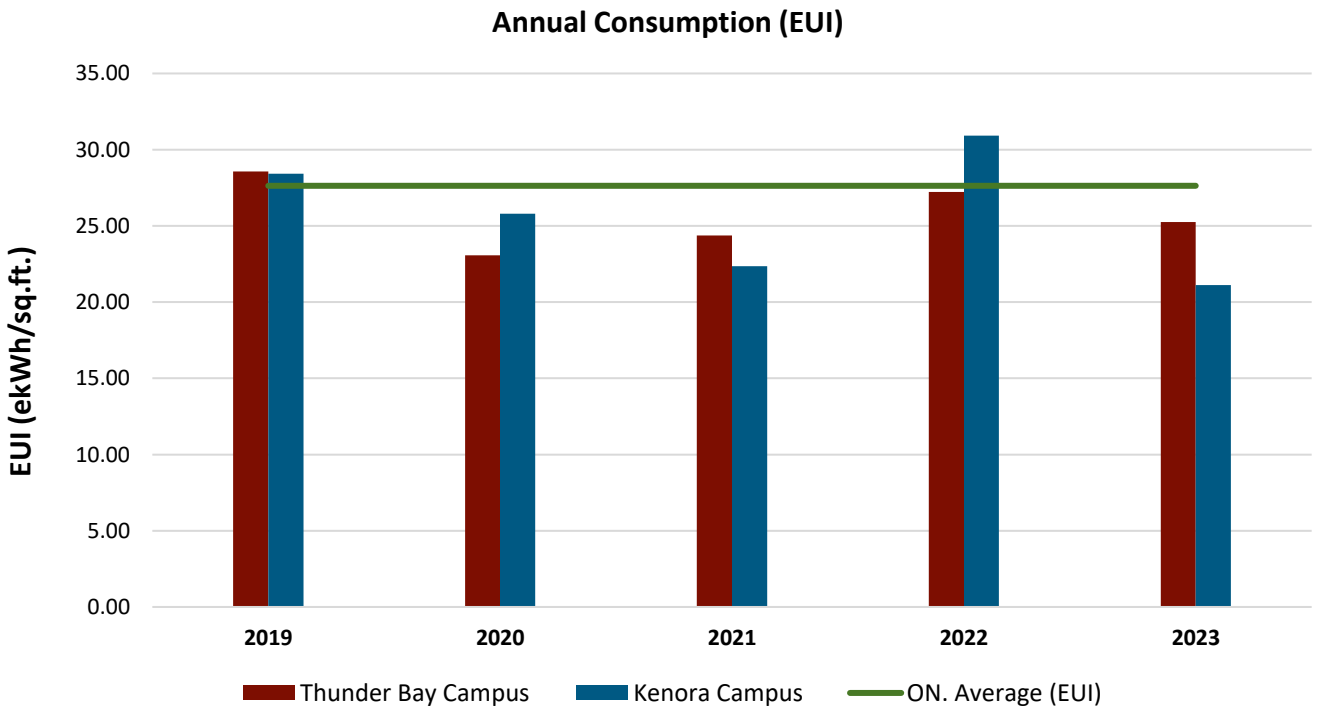

Figure 4. *Historic Annual Energy Utilization Indices for all Campuses*

4.2. Campus-Wide Historical GHG Emissions

Greenhouse gas (GHG) emissions are expressed in terms of equivalent tonnes of Carbon Dioxide (tCO_2e). The GHG emissions associated with a facility are dependent on the fuel source — for example, hydroelectricity produces fewer greenhouse gases than coal-fired plants, and light fuel oil produces fewer GHGs than heavy oil.

Electricity from the grid in Ontario is relatively "clean", as the majority is derived from low-GHG hydroelectricity, and coal-fired plants have been phased out. Scope 1 (natural gas) and Scope 2 (electricity) consumptions have been converted to their equivalent tonnes of greenhouse gas emissions in the table below. Scope 1 represents the direct emissions from sources owned or controlled by the institution, and Scope 2 consists of indirect emissions from the consumption of purchased energy generated upstream from the institution.

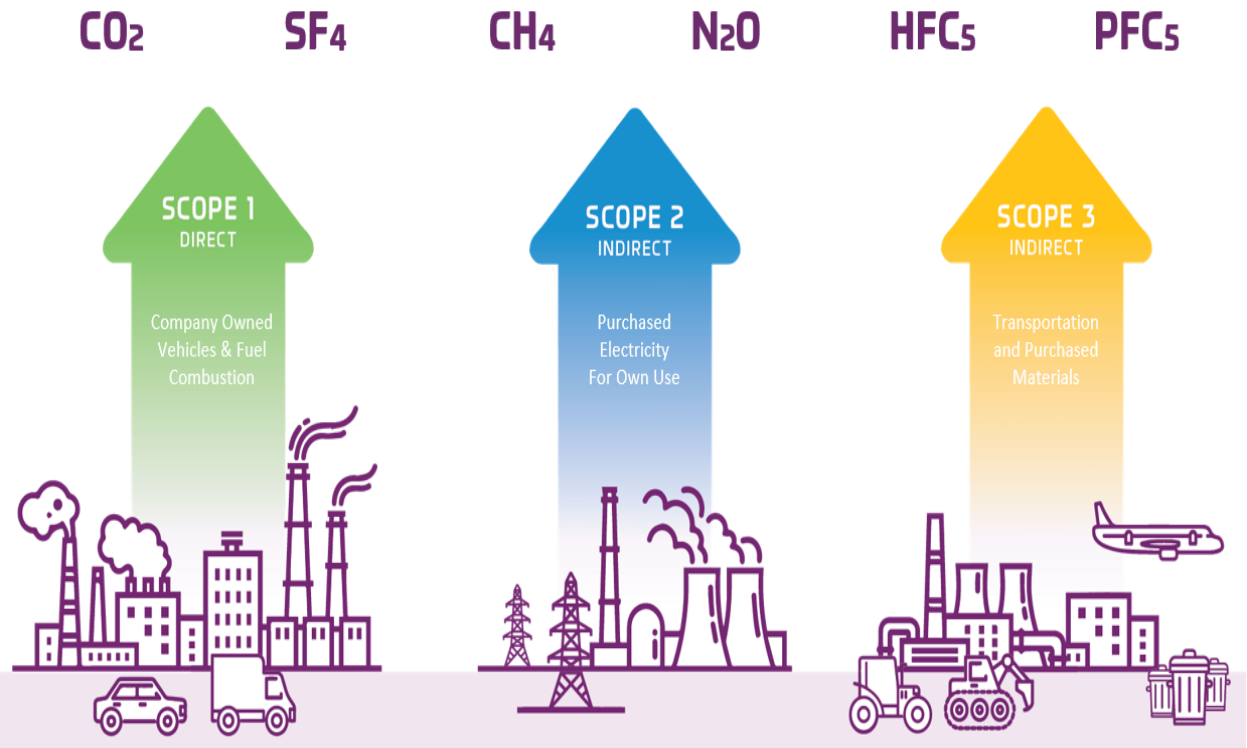

Figure 5. *Examples of Scope 1 and 2*

The campus-wide greenhouse gas emissions for Confederation College have been tabulated and are represented in the table and graph below. Aviation fuel use is included in the table and figure below.

GHG Emissions	2019	2020	2021	2022	2023
Scope 1	2,223	2,006	1,572	1,800	1,648
Scope 2	298	253	262	772*	905*
Total Scope 1 & 2 Emissions	**2,521**	**2,259**	**1,834**	**2,571**	**2,553**

Table 3. *Historic Greenhouse Gas Emissions for all Campuses*

The values obtained in Table 3 were calculated using Confederation College's actual consumptions and the emission factors described in Table 4.

Fuel (Units)	Scope	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Natural Gas (gCO_2e/m^3)	**1**	1,921	1,921	1,921	1,921	1,921	1,921	1,921	1,921	1,921	1,921	1,921
Electricity (gCO_2e/kWh)	**2**	25	26	26	71*	83*	66*	88*	77*	87*	75*	69*
Biomass (gCO_2e/GJ)	**1**	1,143	1,143	1,143	1,143	1,143	1,143	1,143	1,143	1,143	1,143	1,143
Kerosene (gCO_2e/L)	**1**	2,569	2,569	2,569	2,569	2,569	2,569	2,569	2,569	2,569	2,569	2,569

Table 4. *Emission factor for all Campuses*

*Note that the electricity grid has become dirty due to the renovation of the nuclear power plants in Ontario, and utilizing natural gas plants to handle the demand while the nuclear plants are offline.

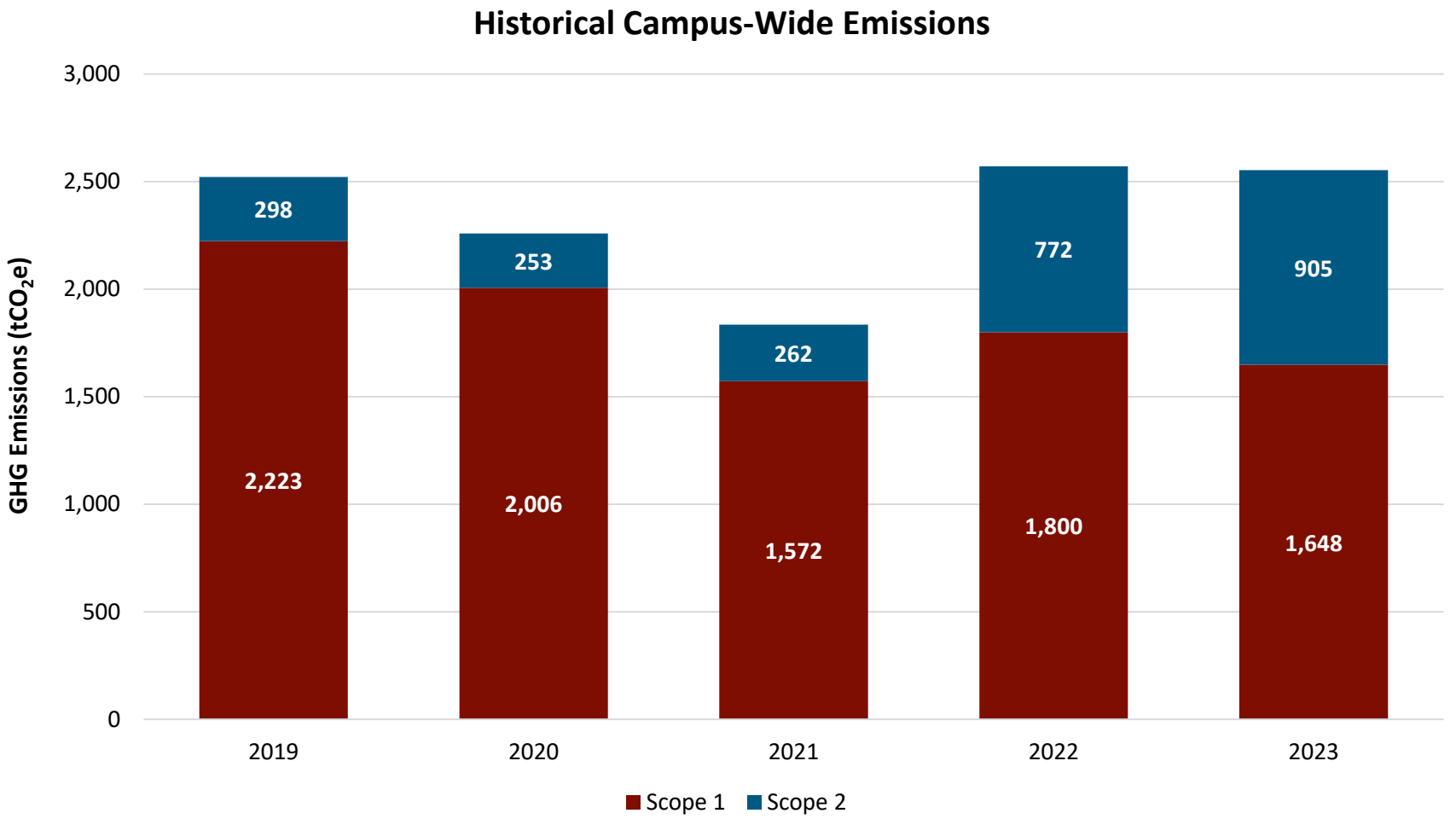

Figure 6. *Historic GHG Emissions for all Campuses*

5. Measures

5.1. Energy Conservation and GHG Reduction Strategies to Date

To date, Confederation College has:

- Implemented a lighting retrofit program including dimming, light harvesting, and motion sensors
- Advanced controls for heating and ventilation system
- REACH addition was constructed to meet LEED Silver standards
- Installed new biomass heating system for the Shuniah Building (BLRC)
- Continue with retrofit lighting and mechanical features for better energy efficiency

5.2. Proposed Energy Conservation and GHG Reduction Measures

Our energy analysis has revealed a potential for several conservation and GHG reduction strategies for the facility. Confederation College Main Campus's proposed initiatives are summarized in the table below outlining the targeted utilities. The implementation for these measures is dependent on funding availability, government incentives and operational decisions.

Measure	Estimated Annual Savings				Project Cost	Simple Payback (Years)	Implementation Year
	Electricity (kWh)	Natural Gas (m^3)	Biomass (GJ)	Cost ($)			
BAS Replacements and Controls Optimization	2,042,550	104,474	0	$161,632	$3,684,951	22.8	2026
Electrification of Boiler Plant for Shuniah	-1,847,340	273,688	-2,322	-$5,031	$1,375,995	N/A	2026
Ground Source Heat Pump & Air Heat Recovery	-366,984	174,781	-6,506	$36,316	$8,832,180	243.2	2026
Install a 475 kW Rooftop System	530,200	0	0	$47,262	$1,130,500	23.9	2026
Install a 2MW Ground Mount Solar System	2,104,000	0	0	$195,227	$9,416,522	48.2	2026
Install a 1.5MW NG Genset	0	-10,027	0	$386,591	$2,499,000	6.5	2026
Total	**2,462,426**	**542,916**	**-8,828**	**$821,997**	**$26,939,148**	**32.8**	**-**

Table 5. *Proposed Energy Conservation and GHG Reduction Measures*

5.3. Measure Descriptions

BAS Replacements and Controls Optimization
The intent of the BAS project is to replace the entire building automation system, creating an intuitive enterprise graphical environment for the Facilities Management and Operations team, and modernizing the field level to controls to create a dependable, easily maintainable system. The open, non-proprietary software and components will remove the on-going necessity to be aligned with only one vendor/service company.

Electrification of Boiler Plant for Shuniah
Decarbonization of the boiler plants through electrification will help the College to achieve GHG reduction goals by reducing gas usage for space heating and ventilation of buildings. Installation of electric boiler for Shuniah building is recommended to decrease gas consumption effectively as a Stage I of the electrification of this building. In addition to the installation of 1MW electric boilers, this measure proposes to add a buffer tank to the existing biomass loop. This measure would enable the two 500kW biomass boilers to modulate properly over the entire heating season, which will further reduce operating hours of natural gas fired boilers.

Ground Source Heat Pump & Air Heat Recovery
Natural gas used for space heating and ventilation is one of the major contributors of the greenhouse gas emissions in the Campus. Ground source heat pump systems (GSHP) are sustainable low carbon heating solutions that can generate heat for the buildings. In addition, GSHP systems have higher cooling efficiencies compared to air sourced heat pump systems. The Geothermal system is under review and will be updated to reflect the suitable and economic heat pump technology for the College following the completion of the Investment Grade Energy Study that Confederation is completing. The operations of the new central heating plant will be optimized by running the GSHP system to generate heat for winter and shoulder months, operating as a 1st stage of heating. It's recommended to run the biomass boilers as secondary system (2nd stage) and electric boiler as tertiary system (3rd stage) to provide additional heat to meet heating requirements of Shuniah building.

Install a 475 kW Rooftop System
Installing a maximum capacity of solar photovoltaic system (PV) panels on the roofs of Shuniah, McInytre, Spruce and Cedar House buildings to generate electricity onsite would be beneficial in generating clean electricity. This will be a behind the meter electricity generation to reduce the electricity consumption and GHG emissions of the Campus. Onsite energy generation will impact (decrease) peak demand and reduce GA charges accordingly.

Install a 2MW Ground Mount Solar System
In addition to the rooftop generation, space has been identified to install a ground mount solar system. Ground mount systems allows us to use free space where feasible and does not limit us to the facilities' rooftops.

Install a 1.5MW NG Genset
Class A electricity customers in the Province of Ontario are subject to Global Adjustment (GA) charges, which are based on the five (5) summer peak demands in KW, calculated through Peak Demand Factor for the previous year and applied through the year as an item in electricity bills. The purpose of adding a 1.5MW natural gas generator is to address Global Adjustment (GA) charges as a result of Ontario's peak demand events.

6. Confederation College Outlook

6.1. Utility Consumption Forecast

By implementing the recommended measures stated in the previous section, in each respective site, Confederation College's campus-wide projected electricity and natural gas use could be forecasted based on the utility savings generated from individual measures. The campus-wide forecasted utility consumption is tabulated below. The percentage of change is based on the data from the baseline year of 2023. Aviation fuel use is included in the table below.

Annual Consumption												
Fuel	2024		2025		2026		2027		2028		2029	
	Units	% Change	Units	% Change	Units	% Change	Units	% Change	Units	% Change	Units	% Change
Natural Gas (m^3)	639,402	0%	639,402	0%	96,486	85%	96,486	85%	96,486	85%	96,486	85%
Electricity (kWh)	10,929,567	0%	10,929,567	0%	8,467,141	23%	8,467,141	23%	8,467,141	23%	8,467,141	23%
Biomass (GJ)	6,428	0%	6,428	0%	15,256	-137%	15,256	-137%	15,256	-137%	15,256	-137%
Kerosene (L)	160,607	0%	160,607	0%	160,607	0%	160,607	0%	160,607	0%	160,607	0%

Table 6. *Forecast of Annual Utility Consumption for all Campuses*

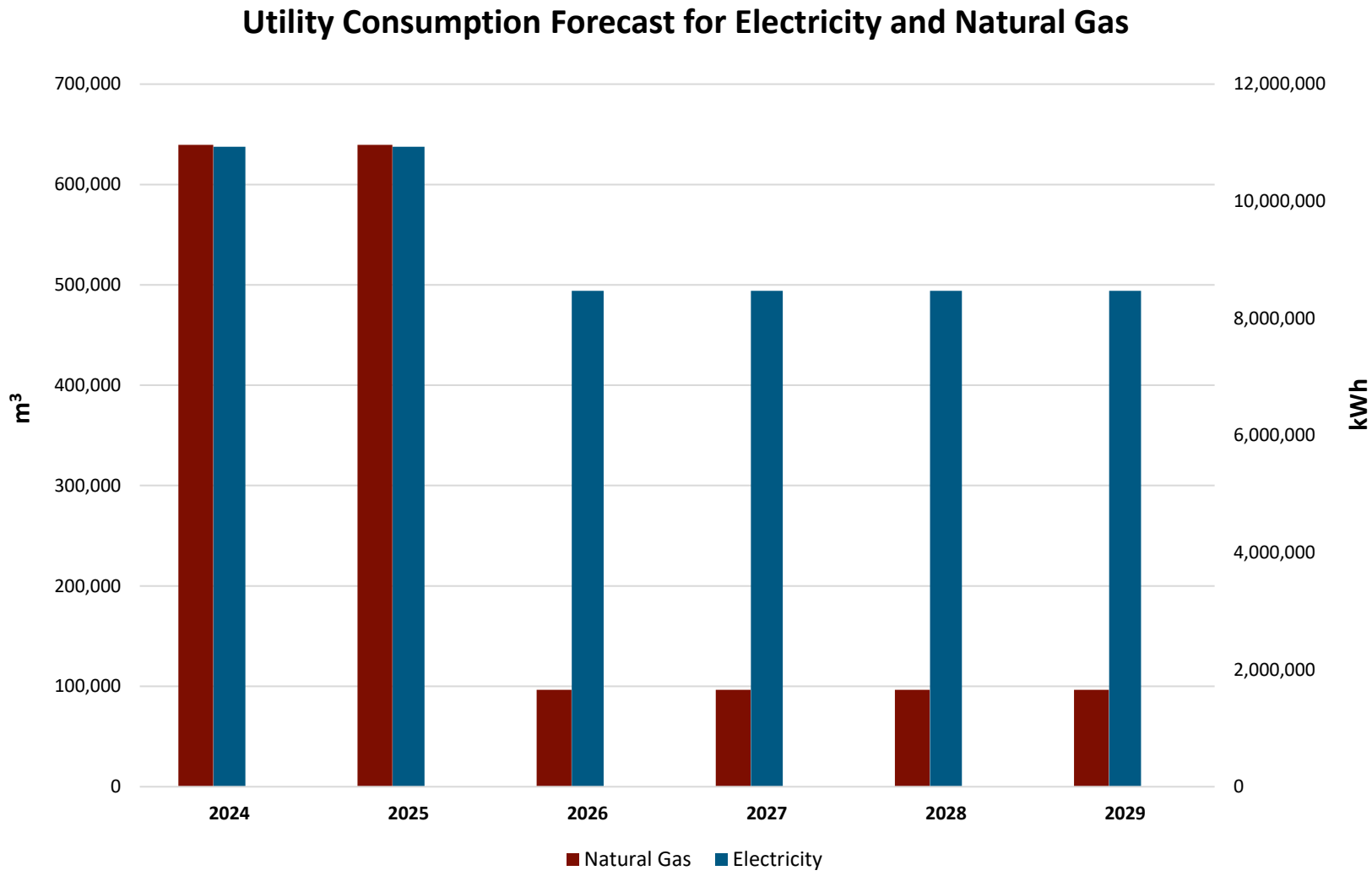

Figure 7. *Forecast of Annual Utility Consumption for all Campuses*

6.2. Campus-Wide GHG Emissions Forecast

The organizational GHG (greenhouse gas) emissions for Confederation College are calculated based on the forecasted campus-wide energy consumption data analyzed in the previous section and are tabulated in the following table. The percent of reduction is based on the data from the baseline year of 2023. Aviation fuel use is included in the table and figure below.

GHG Emissions (tCO_2e)						
Utility Source	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**
Natural Gas (tCO_2e)	1,228	1,228	185	185	185	185
Electricity (tCO_2e)	716	960	649	737	638	587
Biomass (tCO_2e)	7	7	17	17	17	17
Kerosene (tCO_2e)	413	413	413	413	413	413
Totals	**2,364**	**2,608**	**1,265**	**1,353**	**1,254**	**1,202**
Reduction from Baseline Year	**7%**	**-2%**	**50%**	**47%**	**51%**	**53%**

Table 7. *Forecast of Annual Greenhouse Gas Emissions for all Campuses*

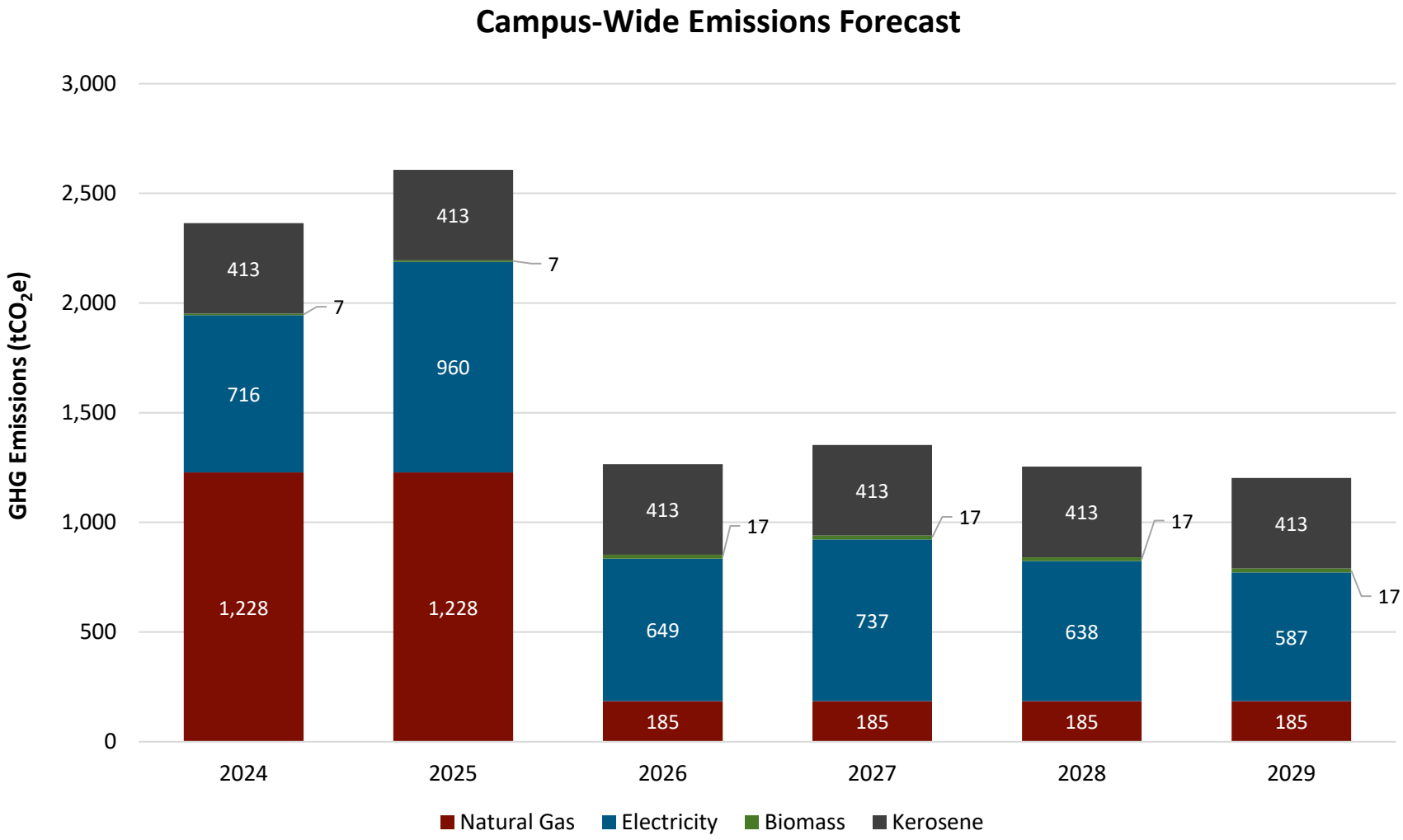

Figure 8. *Forecast of Annual Greenhouse Gas Emissions for all Campuses*

7. Closing Comments

Thank you to all who contributed to Confederation College's Energy Conservation & Demand Management Plan. We consider our facility a primary source of education, and an integral part of the local community. The key to this relationship is being able to use our facilities efficiently and effectively to maximize our ability to provide the highest quality of education services while integrating environmental stewardship into all aspects of facility operations.

On behalf of the Senior Management Team here at Confederation College, we approve this Energy Conservation & Demand Management Plan.

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This ECDM plan was created through a collaborative effort between Confederation College and Blackstone Energy Services.

8. Appendix

8.1. Glossary of terms

Word	Abbreviation	Meaning
Baseline Year		A baseline is a benchmark that is used as a foundation for measuring or comparing current and past values.
Building Automation System	BAS	Building automation is the automatic centralized control of a building's heating, ventilation and air conditioning, lighting and other systems through a building management system or building automation system (BAS)
Carbon Dioxide	CO2	Carbon dioxide is a commonly referred to greenhouse gas that results, in part, from the combustion of fossil fuels.
Energy Usage Intensity	EUI	Energy usage intensity means the amount of energy relative to relative to a buildings physical size typically measured in square feet.
Equivalent Carbon Dioxide	CO2e	CO2e provides a common means of measurement when comparing different greenhouse gases.
GHG Protocol		GHG Protocol refers to the recognized international standards used in the measurement and quantification of greenhouse gases.
Greenhouse Gas	GHG	Greenhouse gas means a gas that contributes to the greenhouse effect by absorbing infrared radiation, e.g., carbon dioxide and chlorofluorocarbons.
Metric Tonnes	t	Metric tonnes are a unit of measurement. 1 metric tonne = 1000 kilograms
Net Zero		A net-zero energy building, is a building with zero net energy consumption, meaning the total amount of energy used by the building on an annual basis is roughly equal to the amount of renewable energy created on the site,
Variable Frequency Drive	VFD	A variable frequency drive is a device that allows for the modulation of an electrical or mechanical piece of equipment.

8.2. List of Tables and Figures

Tables

Figures