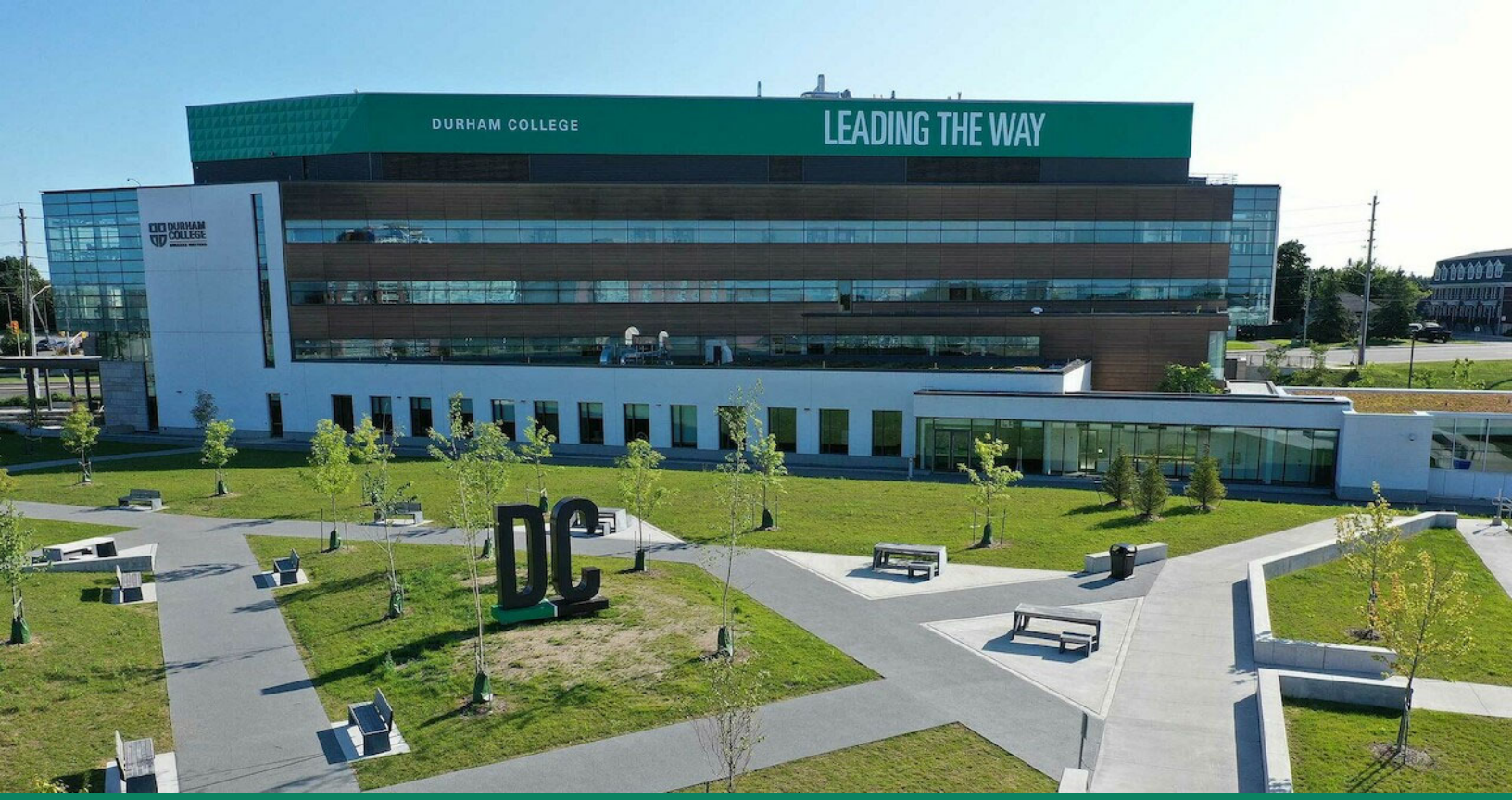

Energy Conservation & Demand Management Plan 2024

DURHAM COLLEGE
SUCCESS MATTERS

Contents

1. Executive Summary

The purpose of this Energy Conservation and Demand Management (ECDM) Plan from Durham 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 Durham College's core values of efficiency, concern for the environment and financial responsibility, this ECDM outlines how Durham College will reduce overall energy consumption, operating costs and greenhouse gas emissions. By following the measures outlined in this document, Durham College 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.

Through past conservation and demand initiatives, Durham College has achieved the following results since 2019:

- 349,417m^3 reduction in natural gas use
- 11,317kWh reduction in electricity use

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

- Energy Use Intensity (EUI) Index for included facilities was 27.91
- Energy-related emissions equaled 4,067 tCO_2e
- GHGi was 3.5 kgCO2e/sq.ft

To maximize the value of energy management activities, Durham College is taking a strategic approach by fully integrating energy considerations into its business decisions, policies, and operations. This proactive management of energy-related costs and risks will deliver significant economic returns and support key organizational objectives.

While this plan highlights notable achievements to date, it is important to acknowledge that these efforts were realized without a dedicated Energy Manager. The successes so far are a testament to the dedication of Durham College staff, who implemented conservation measures despite the challenges posed by the COVID-19 pandemic. During this time, focus and resources were understandably redirected toward maintaining safe and functional environments..

With this continued focus on energy management and by implementing the recommended initiatives, Durham College can expect the following targets by 2030 compared to 2023

:

- 16% reduction in electricity consumption
- 52% reduction in natural gas consumption
- GHG emissions of 1,971 tCO_2e (2,093 tCO_2e reduction)
- GHGi of 1.7 kgCO2e/sq.ft (1.8 (kgCO2e/sq.ft reduction)

Durham College's Energy Performance and Path Forward

The results and the progress of the ECDM activities implemented in r buildings over the past five years, and the projected impact of the new ECDM Plan is presented in the graph and table below.

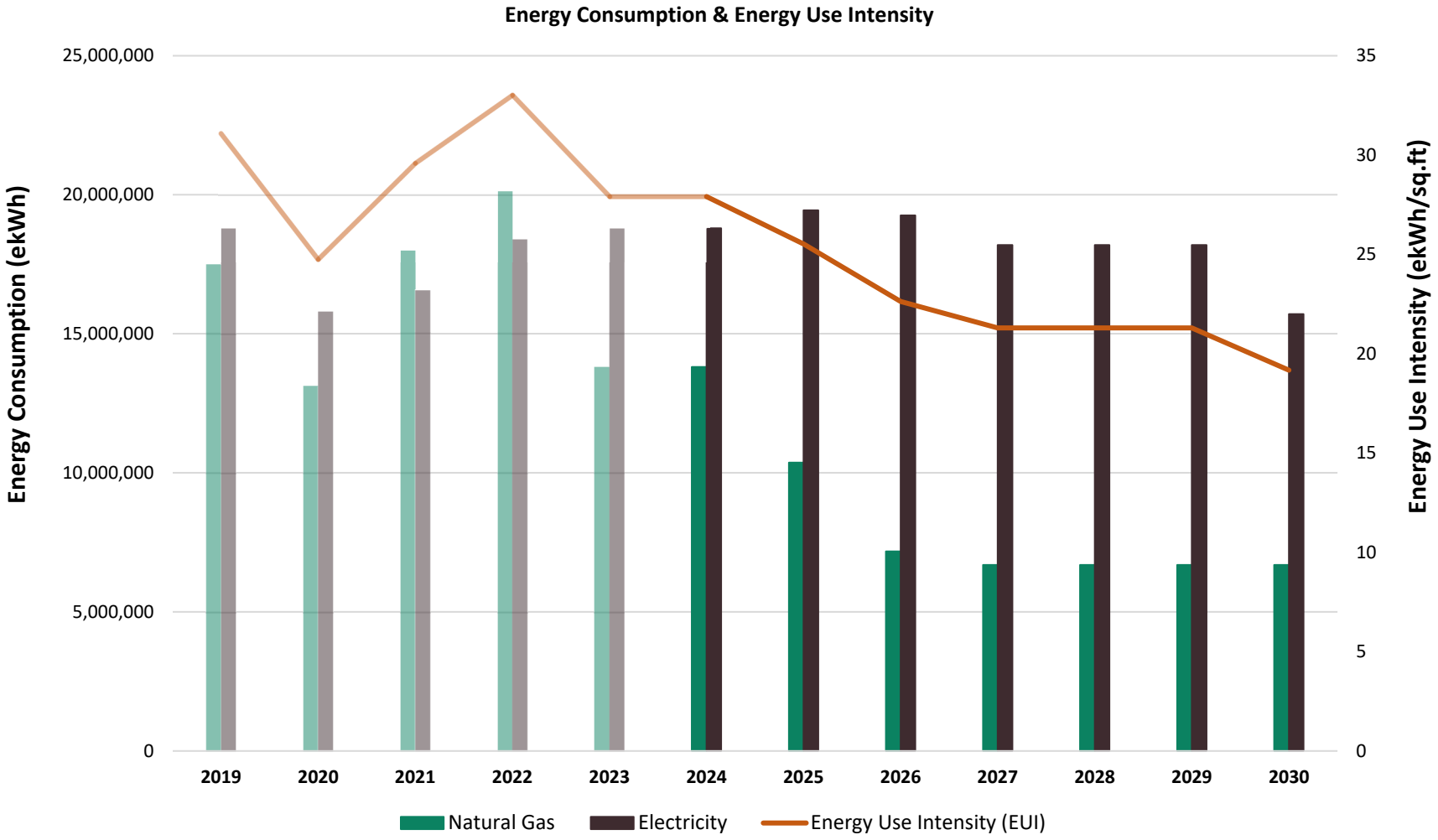

Figure 1. *Energy Consumption Trends & Projections*

ECDM Summary	2019	2020	2021	2022	2023	2024
Electricity Consumption (ekWh)	18,805,026	15,787,061	16,549,358	18,406,233	18,793,709	18,793,709
Natural Gas Consumption (ekWh)	17,493,654	13,130,695	18,003,058	20,136,547	13,803,808	13,803,808
Facility Size (Sq. Ft.)	1,168,087	1,168,087	1,168,087	1,168,087	1,168,087	1,168,087
Energy Utilization Index – EUI (ekWh/Sq. Ft)	31.1	24.8	29.6	33.0	27.9	27.9
Greenhouse Gas Intensity – GHGi ($kgCO_2e$/Sq. Ft)	3.1	2.4	3.2	4.2	3.5	3.2

ECDM Summary	2025	2026	2027	2028	2029	2030
Electricity Consumption (ekWh)	19,440,823	19,253,853	18,188,738	18,188,738	18,188,738	15,704,738
Natural Gas Consumption (ekWh)	10,364,939	7,175,049	6,685,054	6,685,054	6,685,054	6,685,054
Facility Size (Sq. Ft.)	1,168,087	1,168,087	1,168,087	1,168,087	1,168,087	1,168,087
Energy Utilization Index – EUI (ekWh/Sq. Ft)	25.5	22.6	21.3	21.3	21.3	19.2
Greenhouse Gas Intensity – GHGi ($kgCO_2e$/Sq. Ft)	3.1	2.4	2.4	2.2	2.1	1.7

2. 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 rather than the Green Energy Act, 2009.

3. About Durham College

Figure 2. *Durham College*

An unwavering commitment to student success, high-quality programs led by exceptional professors with real-world experience, graduates who've gone on to outstanding career success and a treasured relationship with the community – Durham College (DC) has been guided by these ideals since 1967.

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

Inspiring learners to create success for themselves and their communities through the best in innovative and transformative education.

Our Mission

Together, we are leading the way.

Our Values

Our values drive our organizational culture and our behavior in delivering our vision and mission. We value:

- Collaboration
- Diversity & Inclusion
- Excellence
- Innovation
- Integrity
- Respect
- Social Responsibility

3.1. Site-Wide Historical Energy Intensity

Energy Utilization Index (EUI) is a measure of how much energy a facility uses per square foot in a year. The following chart depicts Durham College's facilities included in the energy utilization index analysis and overall energy intensity of Durham College's buildings for the period of five years.

Year	2019	2020	2021	2022	2023
Oshawa Campus	32.9	25.3	29.5	34.1	27.5
Whitby Campus	27.2	23.5	29.8	30.6	28.8

Table 2. *Historic Energy Use Intensity*

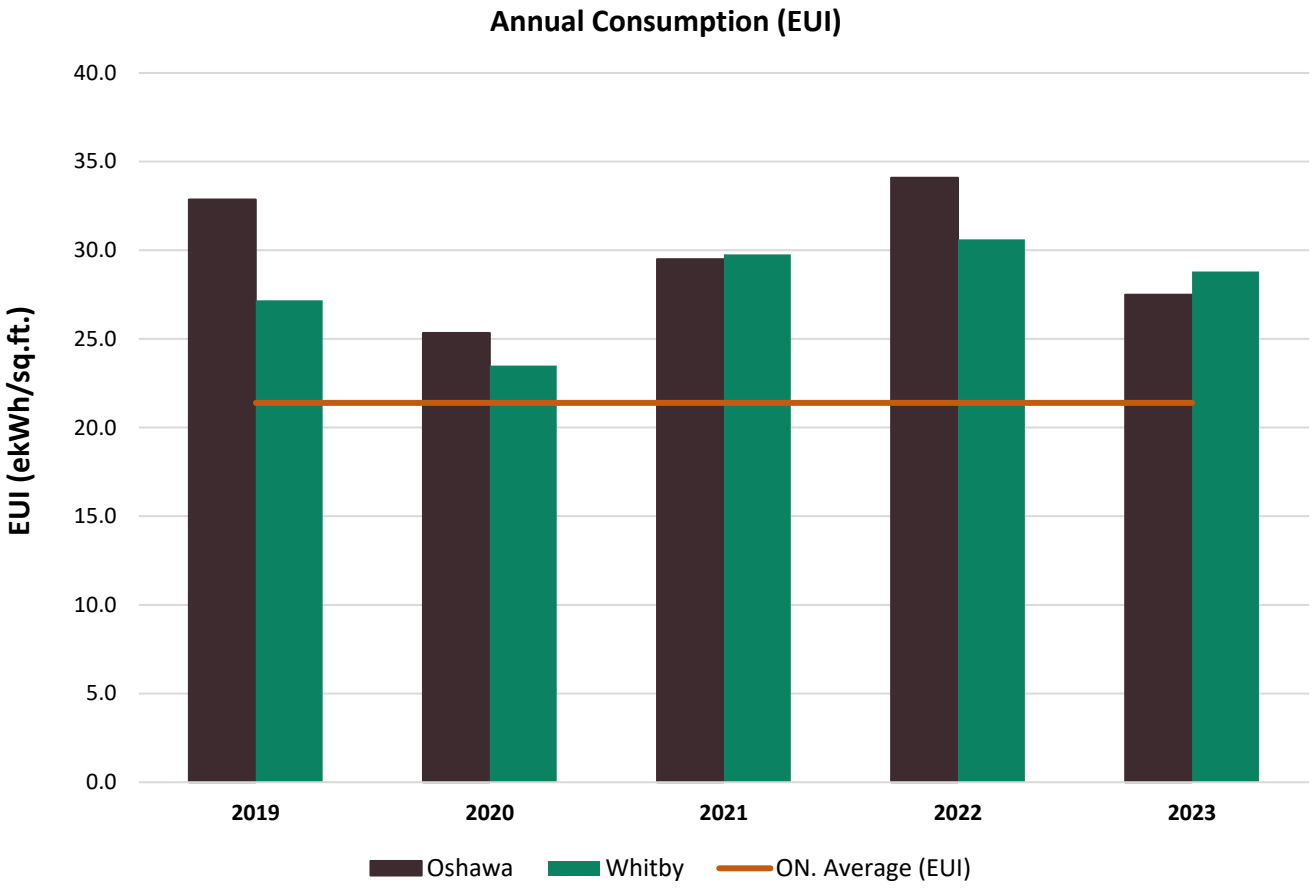

Figure 3. *Historic Annual Energy Utilization Indices*

3.2. Site-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 nuclear power and hydroelectricity, and coal-fired plants have been phased out. Scope 1 (such as natural gas directly used in facilities), and Scope 2 (such as purchased 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.

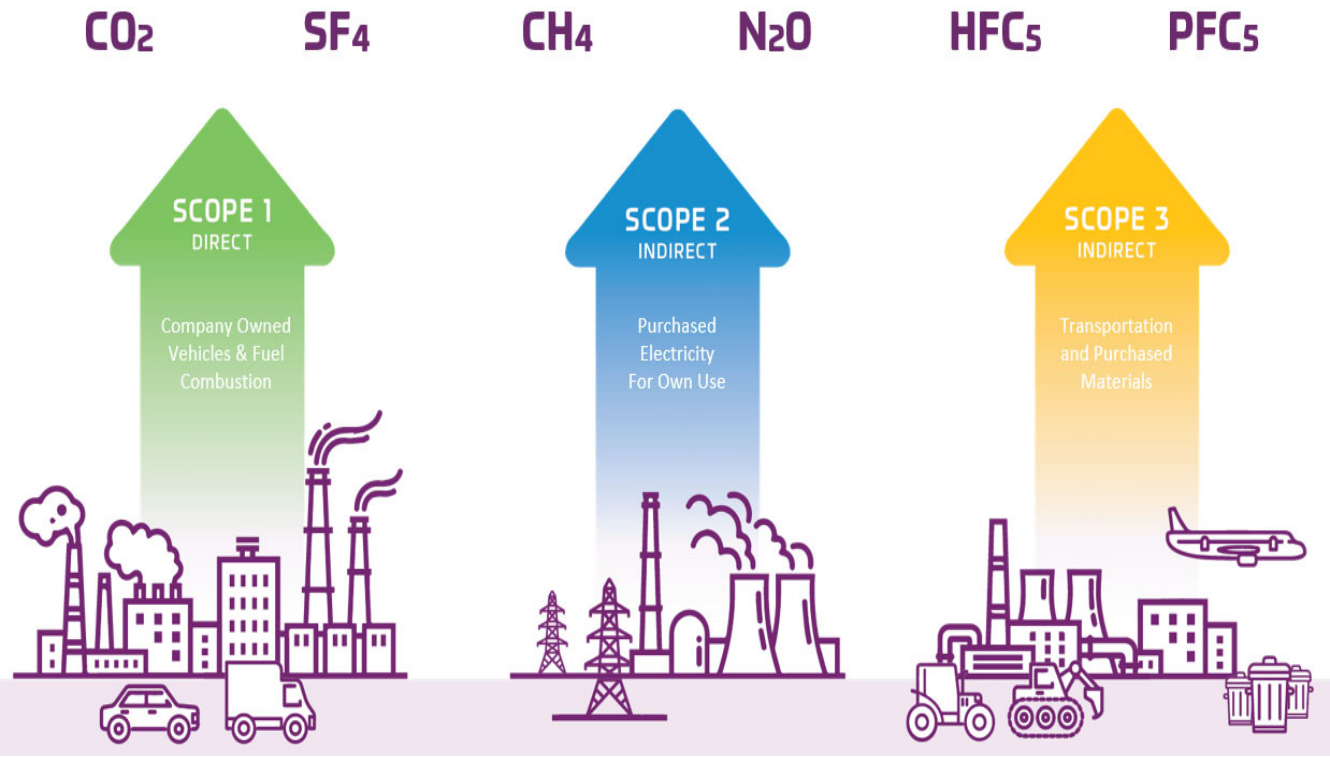

Figure 4. *Examples of Scope 1 and 2*

In order to determine the emissions from each scope, emission factors need to be used, the emissions factors used in this report are provided below. It is important to note the significant increase between 2021 and 2022 is due to nuclear generators coming offline to be refurbished in Ontario. While these nuclear plants are being renovated, the demand is picked up by natural gas plant which renders the grid electricity more carbon intensive.

Emission Factors	2019	2020	2021	2022	2023	2024
Natural Gas (tCO_2e/m^3)	0.001921	0.001921	0.001921	0.001921	0.001921	0.001921
Electricity (tCO_2e/kWh)	0.000025	0.000026	0.000026	0.000071	0.000083	0.000066

Emission Factors	2025	2026	2027	2028	2029	2030
Natural Gas (tCO_2e/m^3)	0.001921	0.001921	0.001921	0.001921	0.001921	0.001921
Electricity (tCO_2e/kWh)	0.000088	0.000077	0.000087	0.000075	0.000069	0.000048

Table 3. *GHG Emissions Factors*

The greenhouse gas emissions for Durham College have been tabulated and are represented in the table and graph below.

GHG Emissions	2019	2020	2021	2022	2023
Scope 1 (natural gas)	3,182	2,389	3,275	3,663	2,511
Scope 2 (electricity)	470	407	434	1,299	1,556
Total Scope 1 & 2 Emissions	**3,652**	**2,796**	**3,709**	**4,963**	**4,067**

Table 4. *Historic Greenhouse Gas Emissions*

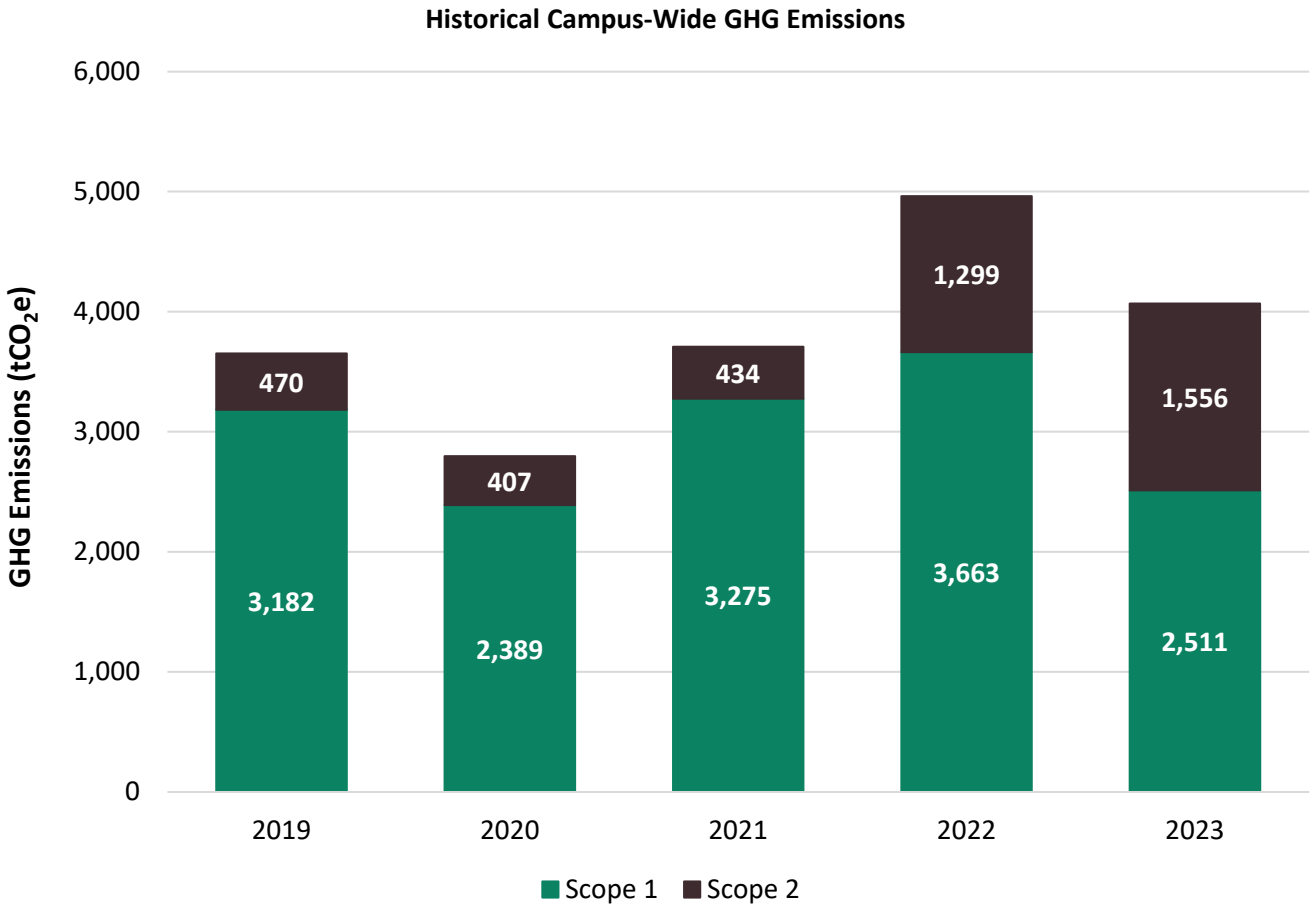

Figure 5. *Historical GHG Emissions*

Greenhouse Gas Intensity (GHGi) refers to the amount of greenhouse gases emitted against the area of the facilities. GHGi is calculated in $kgCO_2e/sq.ft$, it is measure of a facility's GHG emissions performance and can be used to compare different buildings that are the same type of facility and create baselines.

	2019	2020	2021	2022	2023
Oshawa Campus GHG Emissions (tCO2e)	2,557	1,833	2,492	3,455	2,639
Whitby Campus GHG Emissions (tCO2e)	1,095	963	1,216	1,507	1,428
Oshawa Campus GHGi (kgCO2e/sq.ft)	3.2	2.3	3.1	4.3	3.3
Whitby Campus GHGi (kgCO2e/sq.ft)	3.0	2.6	3.3	4.1	3.9
Ontario Average GHGi (kCO2e/sq.ft)	2.3	2.0	2.0	-*	-*
Total Emissions Intensity – Durham College GHGi	**3.1**	**2.4**	**3.2**	**4.2**	**3.5**

Table 5. *GHG Consumption and GHGi*

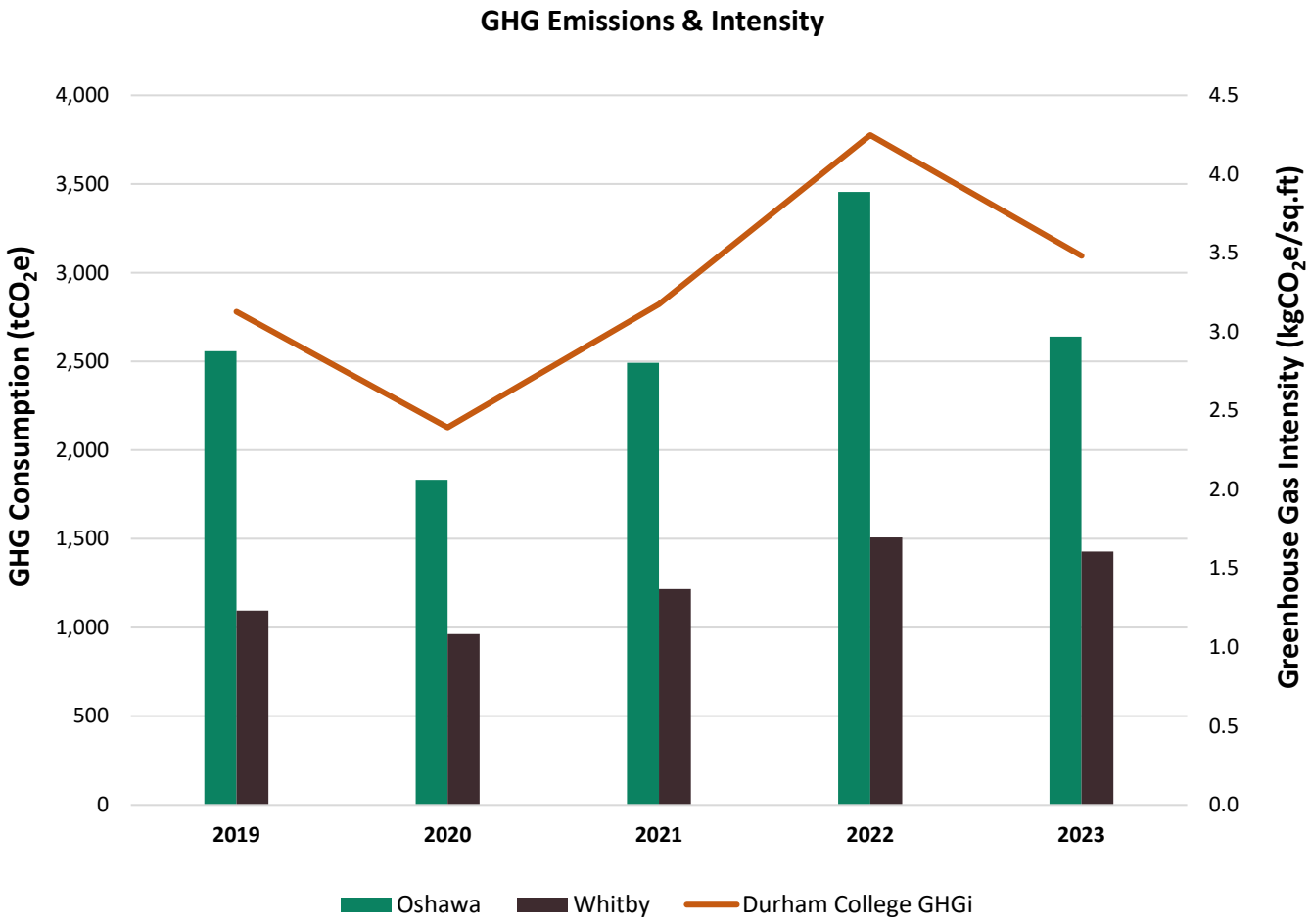

Figure 6. *GHG Emissions and Intensity*

4. Site Analysis

The following section will introduce each of our sites and provide a brief description about the building and its operations, energy & greenhouse gas (GHG) emissions trends, and specific conservation measures.

4.1. Oshawa Campus

***Figure 7**. Oshawa Campus*

Facility Information	
Facility Name	**Durham College Oshawa Campus**
Type of Facility	Post-Secondary Education Institution
Address	2000 Simcoe Street N, Oshawa, ON
Gross Area (Sq. Ft)	623,040
Average Operational Hours in a Week	168
Number of Floors	4

***Table 6.** Oshawa Campus Facility Information*

4.1.1. Utility Consumption Analysis

Utilities to the site are electricity and natural gas. The following table summarizes the accounts for each utility.

Utility	2019	2020	2021	2022	2023
Electricity (kWh)	14,207,100	11,896,384	11,583,961	13,561,911	13,776,574
Natural Gas (m^3)	1,146,345	794,293	1,139,294	1,300,240	780,148

Table 7*.Historic Annual Consumption for the Oshawa Campus*

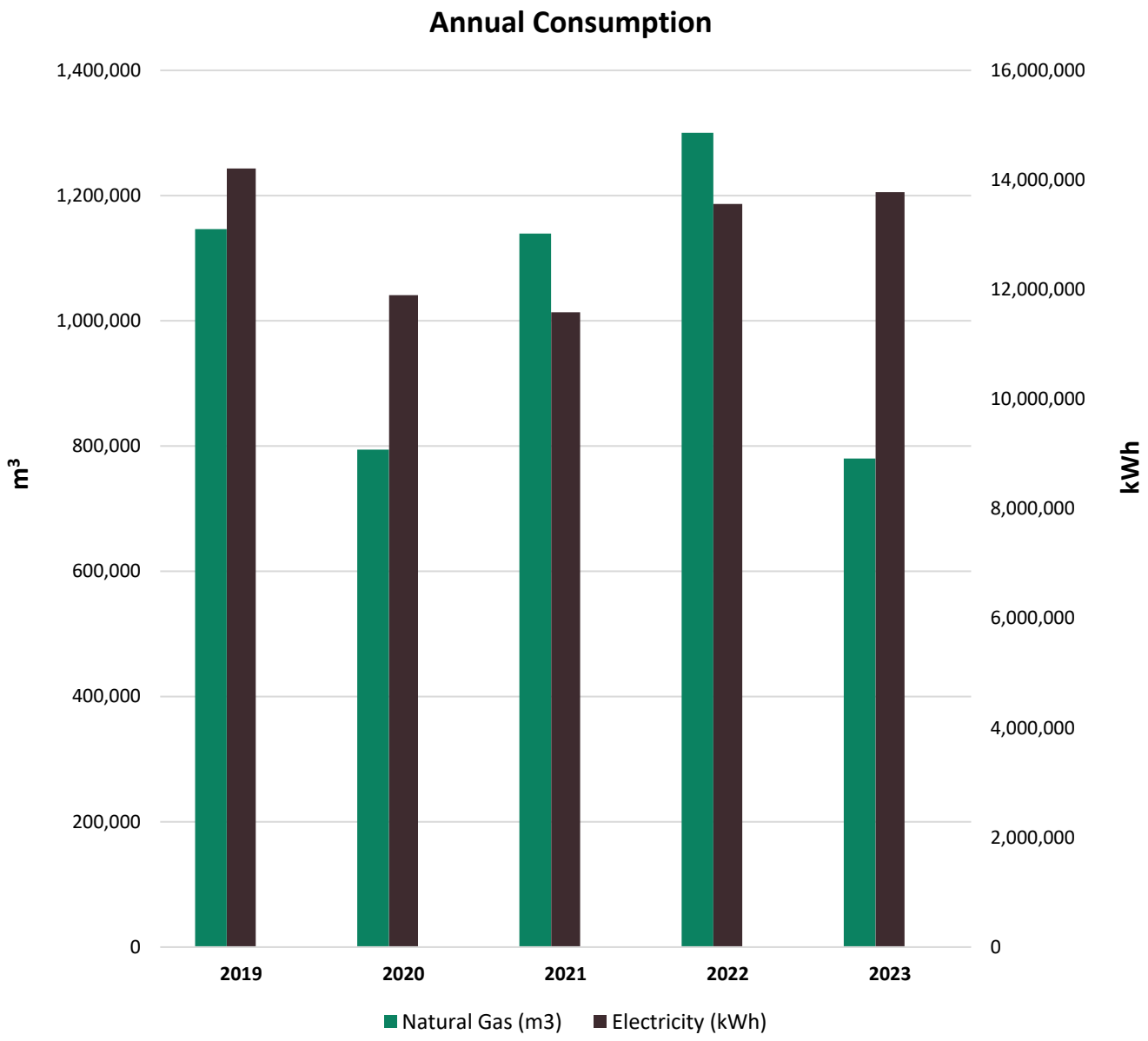

Figure 8. *Historic Annual Utility Consumption for the Oshawa Campus*

4.1.2. GHG Emissions Analysis

The greenhouse gas emissions are calculated based on the energy consumption data analyzed in the following table.

Utility Source (tCO2e)	2019	2020	2021	2022	2023
Electricity (Scope 2)	355	307	303	957	1,141
Natural Gas (Scope 1)	2,202	1,526	2,189	2,498	1,499
Totals	2,557	1,833	2,492	3,455	2,639
GHGi (kgCO2e/sq.ft)	3.2	2.3	3.1	4.3	3.3

Table 8. *Historic Annual Greenhouse Gas Emissions for the Oshawa Campus*

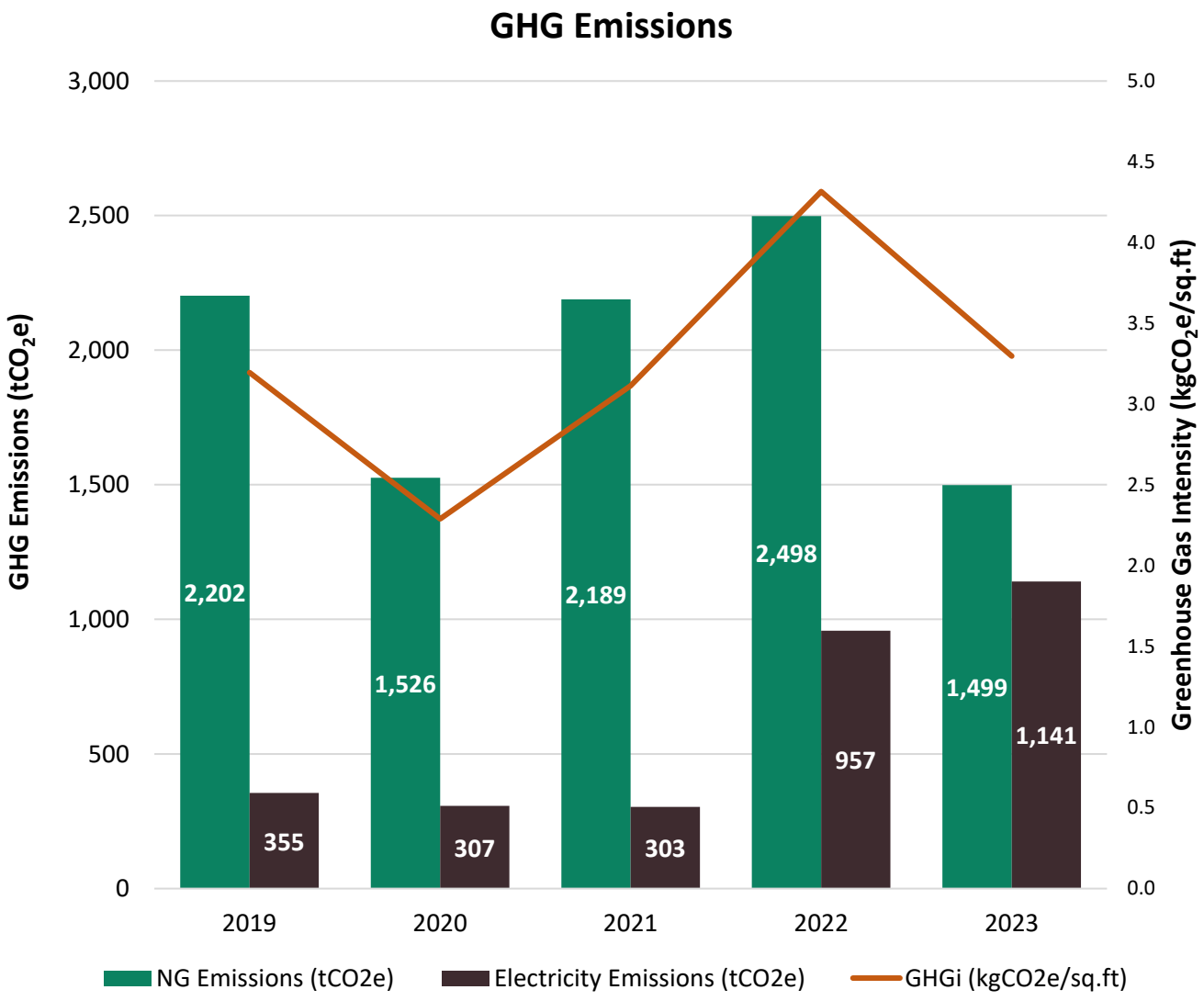

Figure 9*. Historic Annual Greenhouse Gas Emissions for the Oshawa Campus*

4.1.3. Proposed Conservation Measures

Our energy analysis has revealed several conservation strategies for the facility. Oshawa Campus' proposed energy saving initiatives are summarized in the table below outlining the targeted utilities. These measures will remain in place until a more efficient and cost-effective technology is found.

Measure	Estimated Annual Savings				Project Cost	Simple Payback (Years)	Implementation Year
	Electricity (kWh)	Natural Gas (m^3)	Cost ($)	Emissions (tCO_2e)			
Pumping upgrade	84,629	-1,354	$11,848	4	$307,449	25.9	2026
Refurbishment of custom indoor AHU with heat pump technology	-194,885	46,401	-$11,044	72	$664,065	N/A	2027
500 kW Solar Rooftop	621,000	0	$86,199	30	$1,000,000	11.6	2030
Installing metering and energy management system including BTU/flow meters	153,093	16,235	$24,796	45	$480,592	19.4	2025
Replacement of RTUs with heat pump hybrid units	-940,178	223,852	-$53,277	358	$1,903,500	N/A	2026
Replacement of gas fired boilers serving SW wing with air source heat pump	-1,381,250	265,000	$24,797	388	$2,226,000	89.8	2025
Conversion of AHU from CV to VAV	419,170	33,241	$70,318	96	$405,000	5.8	2026
Conversion of lights from fluorescent to LED	264,671	-4,399	$24,798	15	$1,101,492	44.4	2025
BAS commissioning of AHU with VFD which are serving single space to work as VAV terminal device	161,685	52,555	$41,030	115	$81,000	2.0	2025
Total	**-812,065**	**631,531**	**$219,466**	**1,122**	**$8,169,098**	**37.2**	**-**

Table 9. *Targeted Utilities and Proposed Conservation Measures for the Oshawa Campus*

4.1.4. Utility Consumption Forecast

By implementing the energy conservation measures stated in the previous section, the forecasted electricity and natural gas use could be forecasted based on the utility savings generated from individual measures. The forecasted utility consumption is tabulated below. The percentage of change is based off the data from the baseline year of 2023.

Fuel	2024		2025		2026		2027		2028		2029		2030	
	Units	% Change	Units	% Change	Units	% Change	Units	% Change	Units	% Change	Units	% Change	Units	% Change
Natural Gas (m^3)	780,148	0%	450,757	42%	195,018	75%	148,617	81%	148,617	81%	148,617	81%	148,617	81%
Electricity (kWh)	13,776,574	0%	14,578,375	-6%	15,014,754	-9%	15,209,639	-10%	15,209,639	-10%	15,209,639	-10%	12,725,639	8%

Table 10. *Forecast of Annual Utility Consumption for the Oshawa Campus*

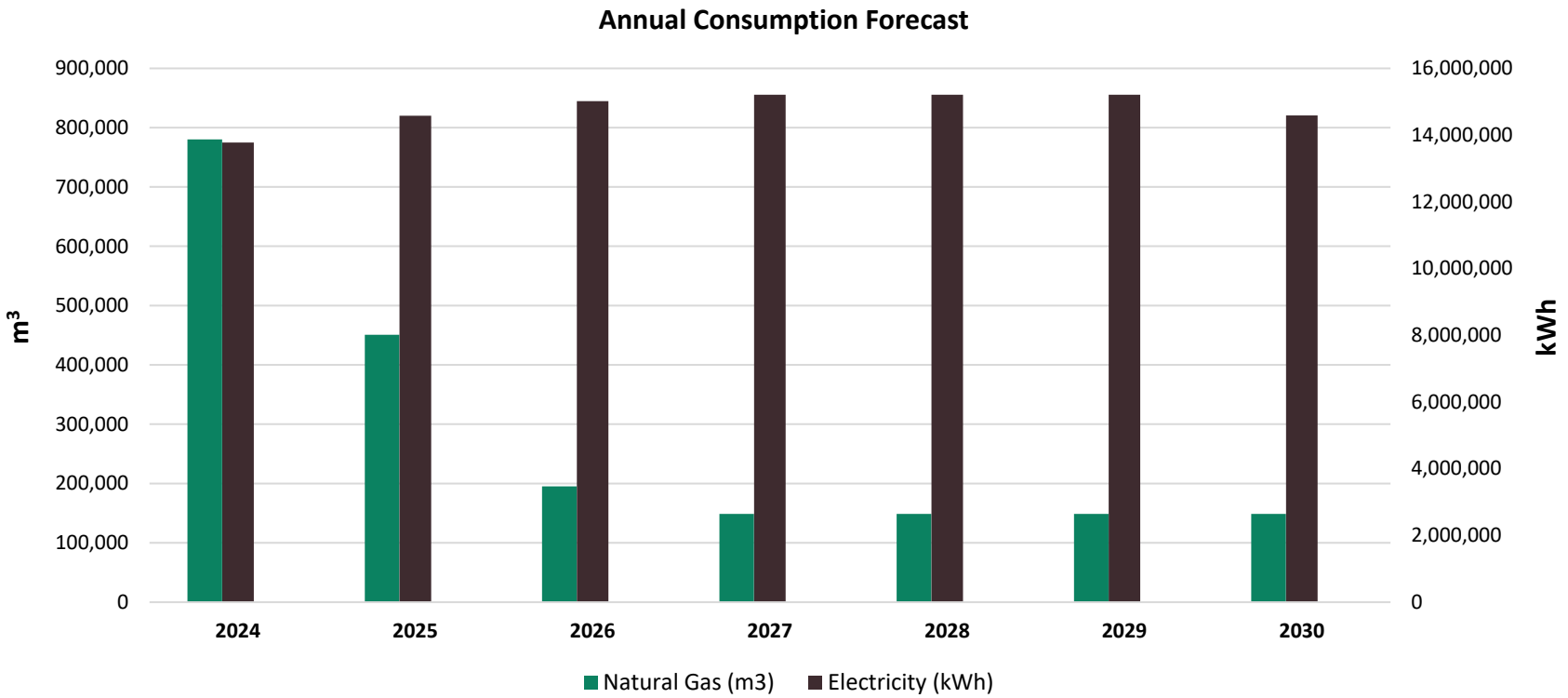

Figure 10. *Forecast of Annual Utility Consumption for the Oshawa Campus*

4.1.5. GHG Emissions Forecast

The forecasted greenhouse gas emissions are calculated based on the forecasted energy consumption data analyzed in the previous section and are tabulated in the following table. The percentage of reduction is based off the data from the baseline year of 2023.

Utility Source (tCO_2e)	2024	2025	2026	2027	2028	2029	2030
Natural Gas (Scope 1)	1,499	866	375	285	285	285	285
Electricity (Scope 2)	902	1,280	1,152	1,325	1,147	1,054	612
Totals	2,401	2,146	1,526	1,610	1,432	1,340	898
Reduction from Baseline Year	9%	19%	42%	39%	46%	49%	66%

***Table 11**. Forecast of Annual Greenhouse Gas Emissions for the Oshawa Campus*

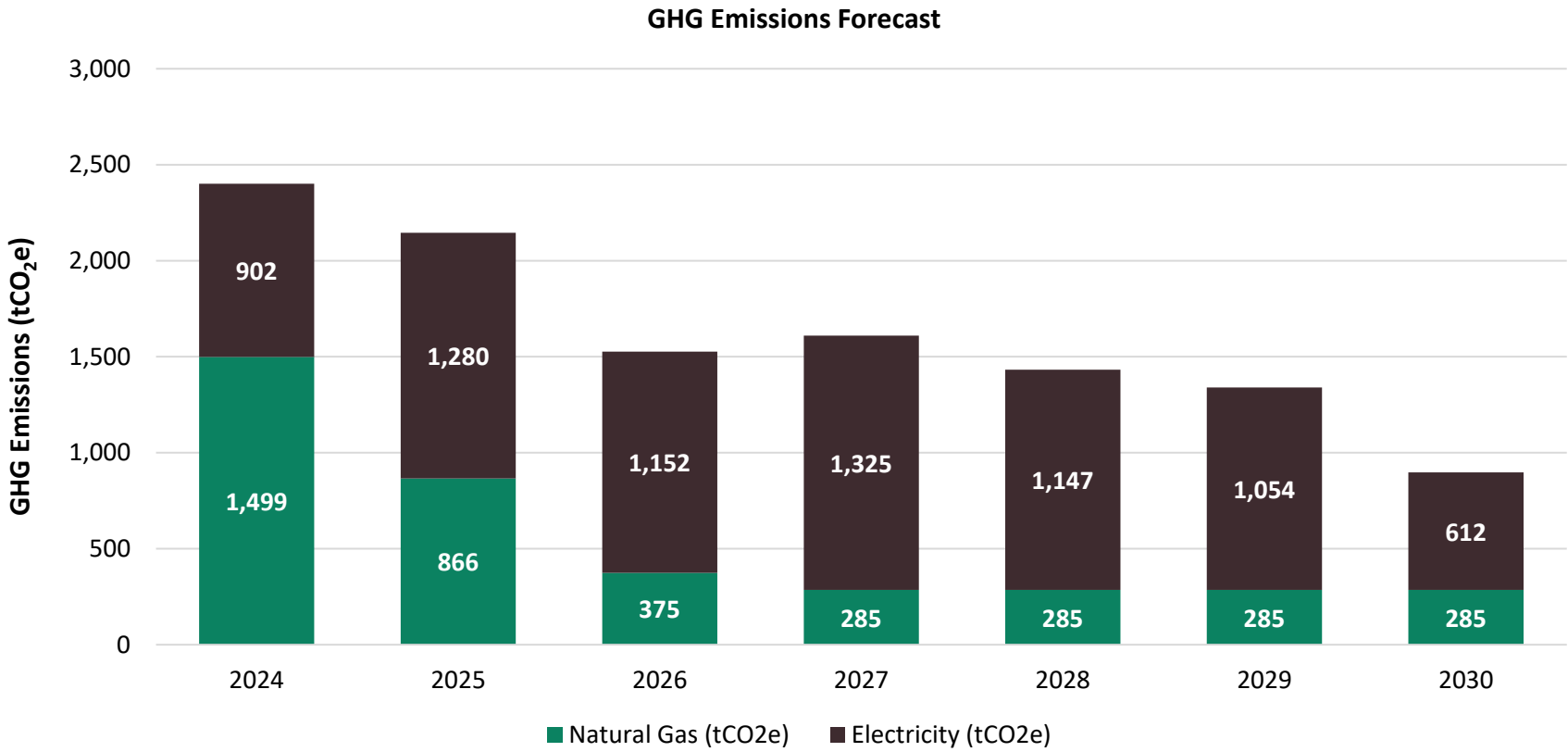

***Figure 11.** Forecast of Annual Greenhouse Gas Emissions for Oshawa Campus*

4.2. Whitby Campus

***Figure 12**. Whitby Campus*

Facility Information	
Facility Name	**Durham College Whitby Campus**
Type of Facility	Post-Secondary Education Institution
Address	1610 Champlain Avenue, Whitby, ON
Gross Area (Sq. Ft)	240,619
Average Operational Hours in a Week	168
Number of Floors	2

***Table 12.** Whitby Campus Site Facility Information*

4.2.1. Utility Consumption Analysis

Utilities to the site are electricity and natural gas. The following table summarizes the accounts for each utility.

Utility	2019	2020	2021	2022	2023
Electricity (kWh)	4,597,926	3,890,677	4,965,397	4,844,322	5,017,135
Natural Gas (m^3)	510,251	449,144	565,541	606,630	527,031

***Table 13**. Historic Annual Consumption for the Whitby Campus*

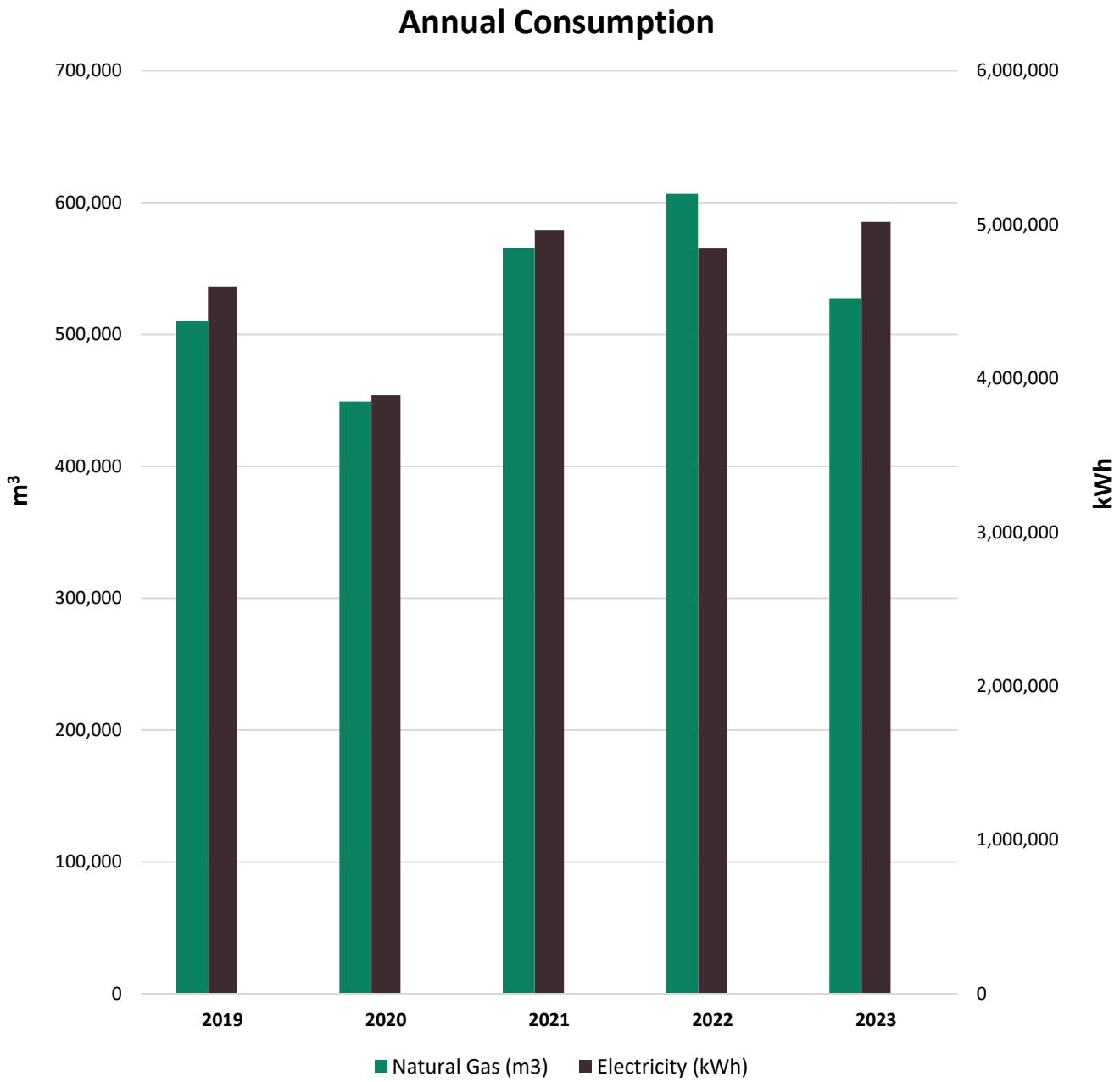

***Figure 13.** Historic Annual Utility Consumption for the Whitby Campus*

4.2.2. GHG Emissions Analysis

The greenhouse gas emissions are calculated based on the energy consumption data analyzed in the following table.

Utility Source (tCO2e)	2019	2020	2021	2022	2023
Electricity (Scope 2)	115	100	130	342	415
Natural Gas (Scope 1)	980	863	1,086	1,165	1,012
Totals	**1,095**	**963**	**1,216**	**1,507**	**1,428**
GHGi (kgCO2e/sq.ft)	3.0	2.6	3.3	4.1	3.9

Table 14. *Historic Annual Greenhouse Gas Emissions for the Whitby Campus*

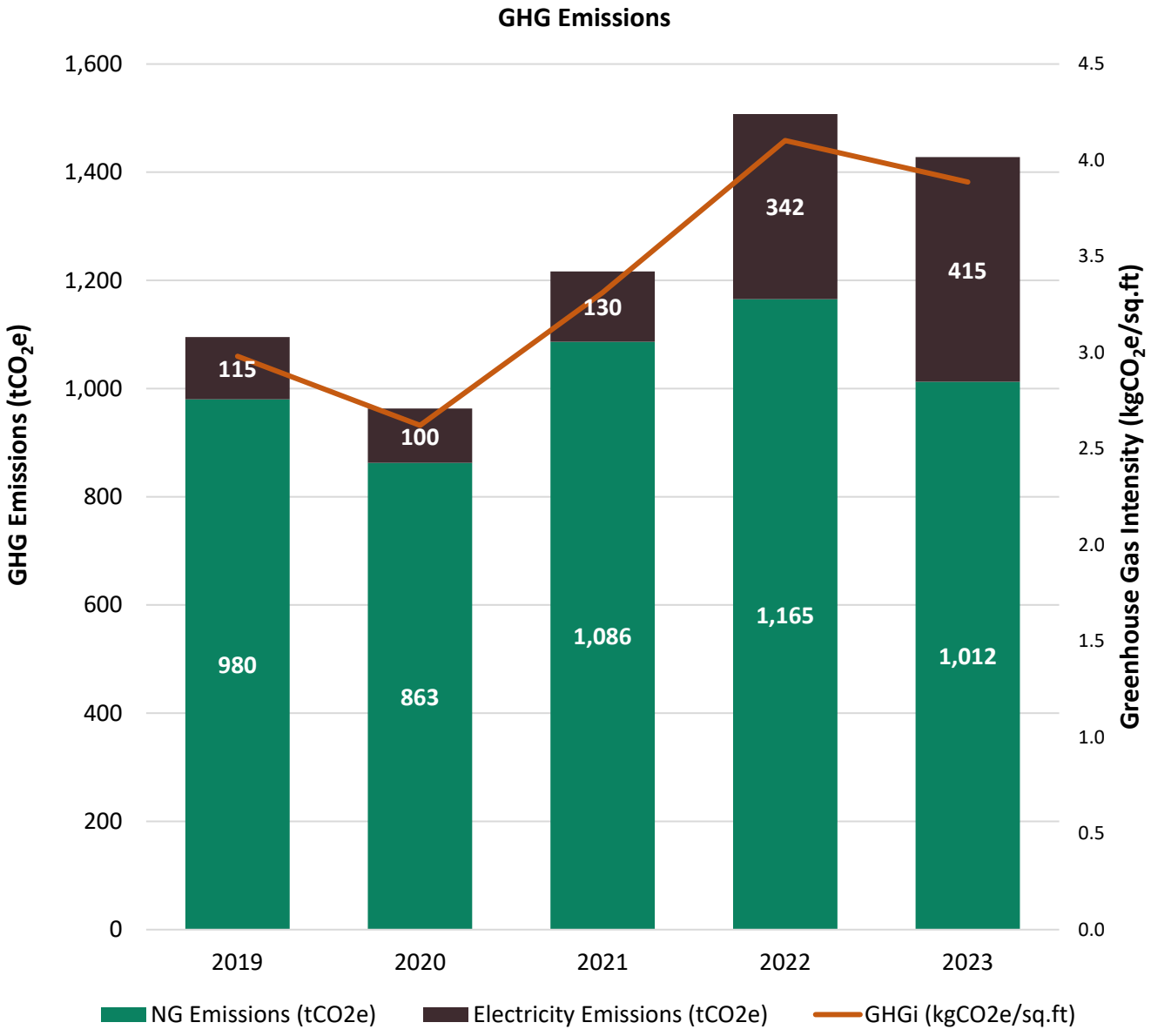

Figure 14*. Historic Annual Greenhouse Gas Emissions for the Whitby Campus*

4.2.3. Proposed Conservation Measures

Our energy analysis has revealed several conservation strategies for the facility. Whitby Campus' proposed energy saving initiatives are summarized in the table below outlining the targeted utilities. These measures will remain in place until a more efficient and cost-effective technology is found.

Measure	Estimated Annual Savings				Project Cost	Simple Payback (Years)	Implementation Year
	Electricity (kWh)	Natural Gas (m^3)	Cost ($)	Emissions (tCO2e)			
Lighting Upgrade to LED Fixtures	154,688	-3,740	$20,655	6	$176,597	8.6	2025
500kW Solar Rooftop	1,260,000	0	$174,896	110	$2,000,000	11.4	2030
Commissioning Corrective Measures	600,003	46,334	$61,927	135	N/A	N/A	2026
Pumping upgrade	23,346	0	$3,268	2	$90,802	27.8	2026
Total	**2,038,037**	**42,594**	**$260,746**	**253**	**$2,267,399**	**8.7**	**-**

Table 15. *Targeted Utilities and Proposed Conservation Measures for the Whitby Campus*

4.2.4. Utility Consumption Forecast

By implementing the energy conservation measures stated in the previous section, the forecasted electricity and natural gas use could be forecasted based on the utility savings generated from individual measures. The forecasted utility consumption is tabulated below. The percentage of change is based off the data from the baseline year of 2023.

Fuel	2024		2025		2026		2027		2028		2029		2030	
	Units	% Change	Units	% Change	Units	% Change	Units	% Change	Units	% Change	Units	% Change	Units	% Change
Natural Gas (m^3)	527,031	0%	530,771	-1%	484,437	8%	484,437	8%	484,437	8%	484,437	8%	484,437	8%
Electricity (kWh)	5,017,135	0%	4,862,448	3%	4,239,099	16%	4,239,099	16%	4,239,099	16%	4,239,099	16%	3,618,099	28%

Table 16. *Forecast of Annual Utility Consumption for the Whitby Campus*

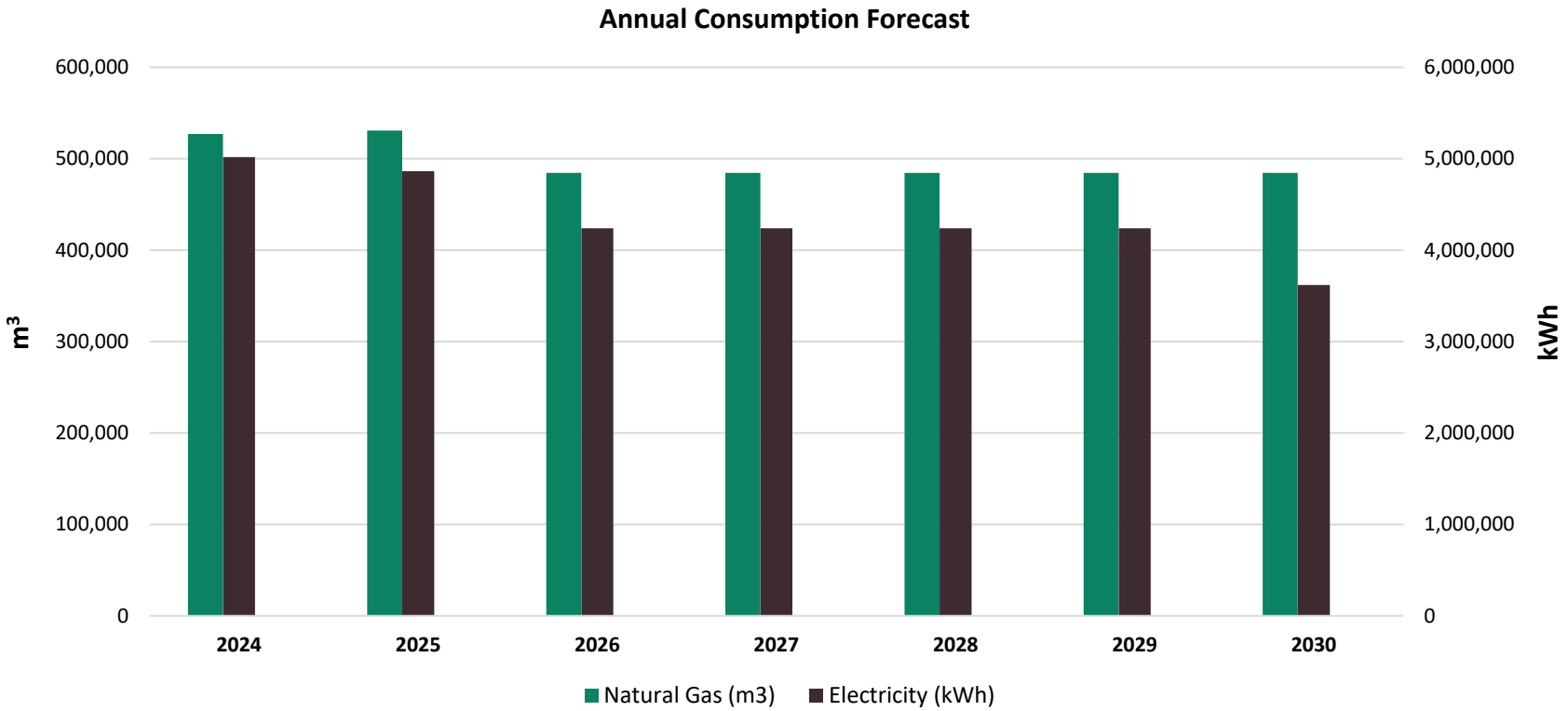

Figure 15. *Forecast of Annual Utility Consumption for the Whitby Campus*

4.2.5. GHG Emissions Forecast

The forecasted greenhouse gas emissions are calculated based on the forecasted energy consumption data analyzed in the previous section and are tabulated in the following table. The percentage of reduction is based off the data from the baseline year of 2023.

Utility Source (tCO_2e)	2024	2025	2026	2027	2028	2029	2030
Natural Gas (scope 1)	1,012	1,020	931	931	931	931	931
Electricity (scope 2)	329	427	325	369	320	294	174
Totals	1,341	1,447	1,256	1,300	1,250	1,224	1,105
Reduction from Baseline Year	6%	-1%	12%	9%	12%	14%	23%

***Table 17**. Forecast of Annual Greenhouse Gas Emissions for the Whitby Campus*

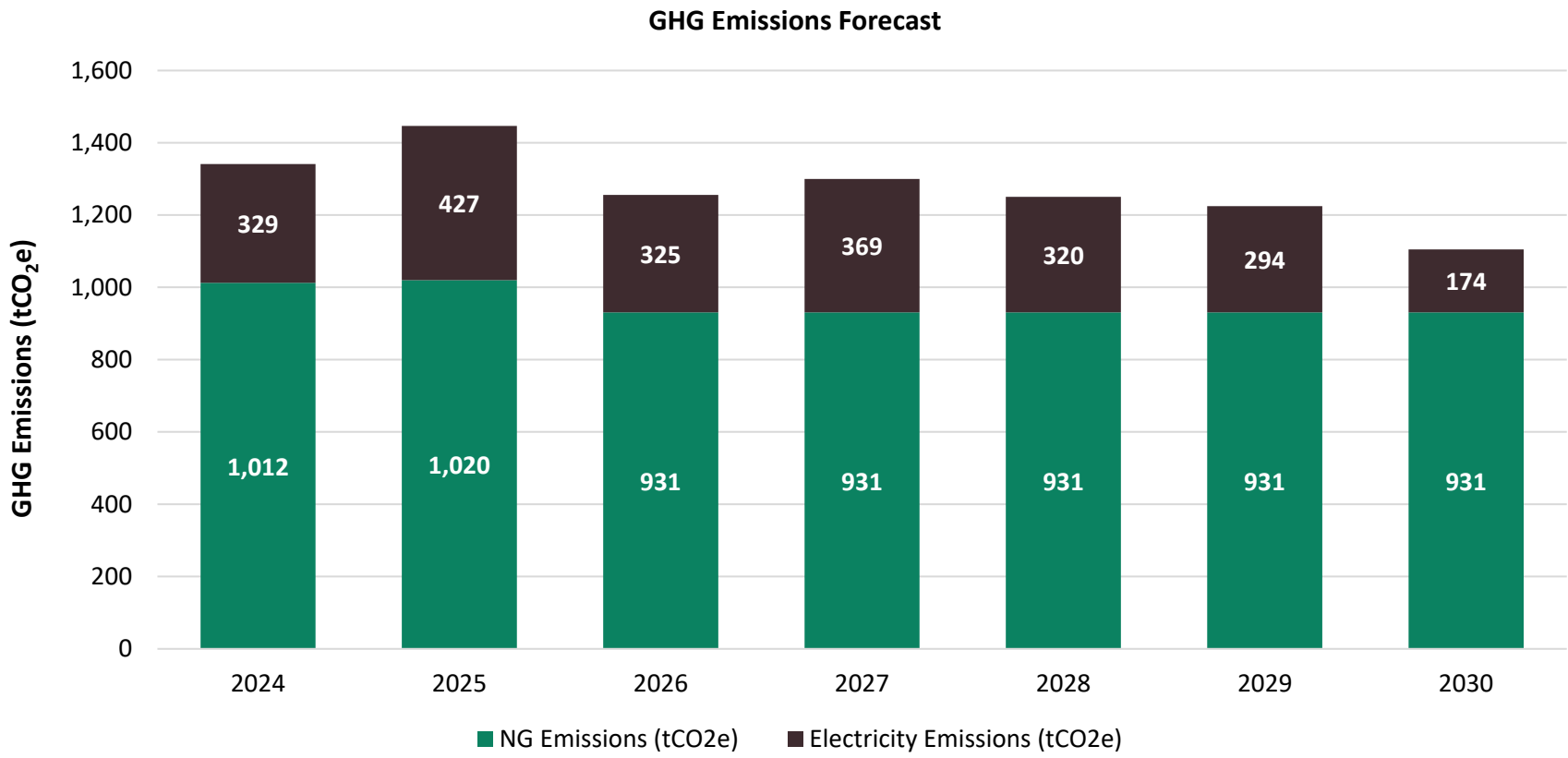

***Figure 16.** Forecast of Annual Greenhouse Gas Emissions for the Whitby Campus*

5. Durham College Outlook

5.1. Utility Consumption Forecast

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

Fuel	2024		2025		2026		2027		2028		2029		2030	
	Units	% Change	Units	% Change	Units	% Change	Units	% Change	Units	% Change	Units	% Change	Units	% Change
Natural Gas (m^3)	1,307,179	0%	981,528	25%	679,455	48%	633,054	52%	633,054	52%	633,054	52%	633,054	52%
Electricity (kWh)	18,793,709	0%	19,440,823	-3%	19,253,853	-2%	19,448,738	-3%	19,448,738	-3%	19,448,738	-3%	18,206,738	3%

Table 18. *Forecast of Annual Utility Consumption*

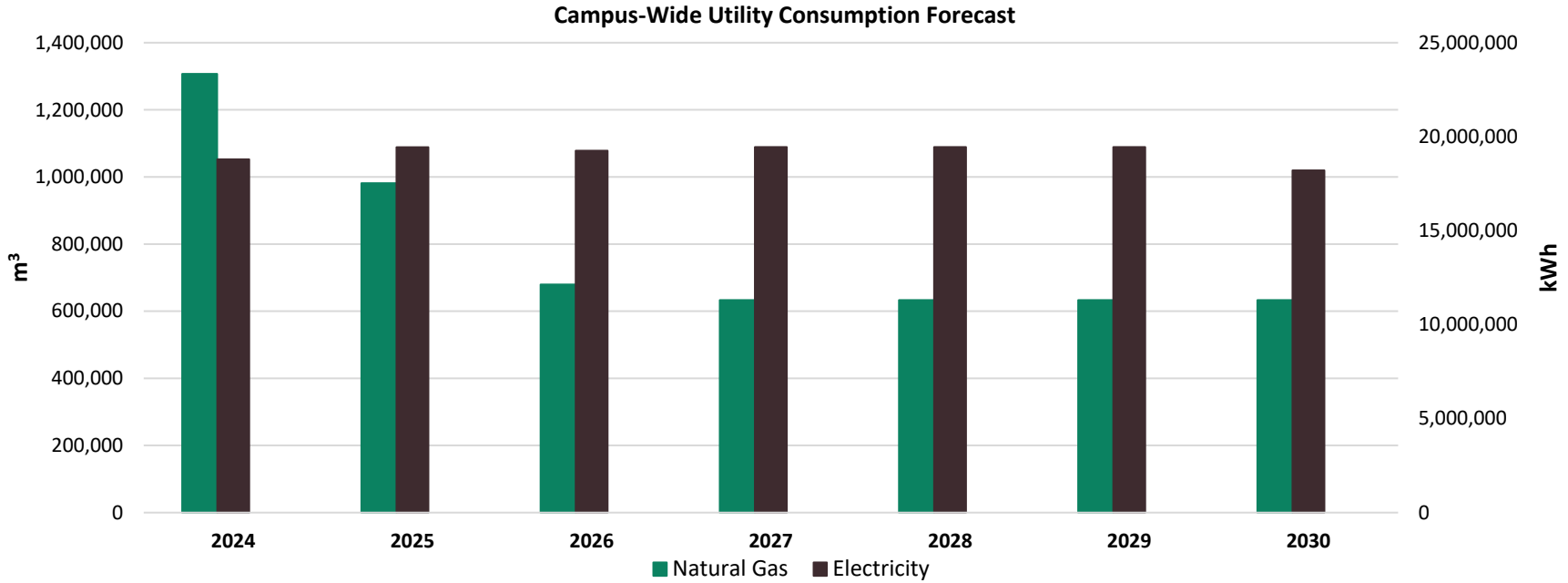

Figure 17. *Forecast of Annual Energy Consumption*

5.2. Site-Wide GHG Emissions Forecast

The organizational GHG emissions for Durham College are calculated based on the forecasted Site-wide energy consumption data analyzed in the previous section and are tabulated in the following table. The percentage reduction is based on the baseline year of 2023.

Utility Source (tCO_2e)	2024	2025	2026	2027	2028	2029	2030
Natural Gas (scope 1)	2,511	1,886	1,305	1,216	1,216	1,216	1,216
Electricity (scope 2)	1,231	1,707	1,477	1,694	1,466	1,348	876
Totals	3,742	3,592	2,782	2,910	2,683	2,564	2,092
Reduction from Baseline Year	8%	12%	32%	28%	34%	37%	49%

Figure 18. *Forecast of Annual Greenhouse Gas Emissions*

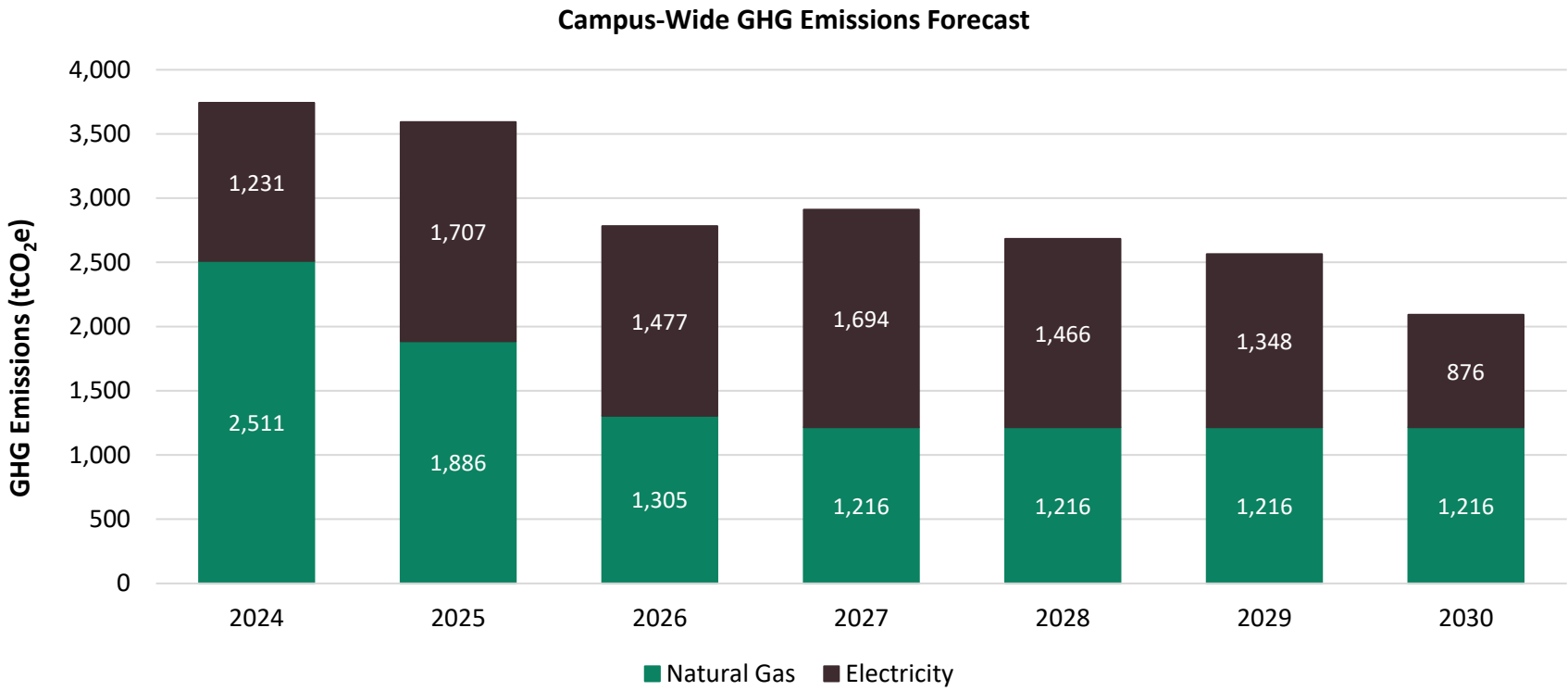

Table 19. *Forecast of Annual Greenhouse Gas Emissions*

6. Closing Comments

Thank you to all who contributed to Durham College's Energy Conservation & Demand Management Plan. We consider our facilities 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 educational services while integrating environmental stewardship into all aspects of facility operations.

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

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

7. Appendix

7.1. Glossary

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 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.
Greenhouse Gas	GHG	Greenhouse gas means a gas that contributes to the greenhouse effect by absorbing infrared radiation, e.g., carbon dioxide and chlorofluorocarbons.
Greenhouse Gas Intensity	GHGi	Measurement that reflects a facility's greenhouse gas emissions in $kgCO_2e$ against its square footage.
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.

7.2. Tables and Figures

Tables

Figures