2019

ENERGY CONSERVATION & DEMAND MANAGEMENT PLAN

Pembroke Regional Hospital

Hôpital Régional de Pembroke Regional Hospital

Executive Summary

The purpose of this Energy Conservation and Demand Management (ECDM) Plan from Pembroke Regional Hospital 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 Pembroke Regional Hospital's core values of efficiency, concern for the environment and financial responsibility, this ECDM outlines how the hospital 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 sections 4, 5, and 6 of the recently amended Electricity Act, 1998, O. Reg. 507/18.

In the past 5 years, Pembroke Regional Hospital has achieved the following results:

- >6% reduction in the organization's total energy use since 2013

Today, utility and energy related costs are a significant part of overall operating costs. In 2018:

- Energy Use Index (EUI) was 51 ekWh/sq.ft
- Energy-related emissions equaled 2,399 tCO_2e

To obtain full value from energy management activities, Pembroke Regional Hospital 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, Pembroke Regional Hospital can expect to achieve the following targets by 2024:

- ~ 12% reduction in annual electricity consumption
- ~ 26% reduction in annual natural gas consumption
- ~ 18% reduction in annual water consumption
- 679 tCO_2e reduction in annual carbon equivalent emissions

Contents

1. Introduction

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.

The results and the progress of the past five years, and the projected impact of the new ECDM Plan is presented in the chart & table below.

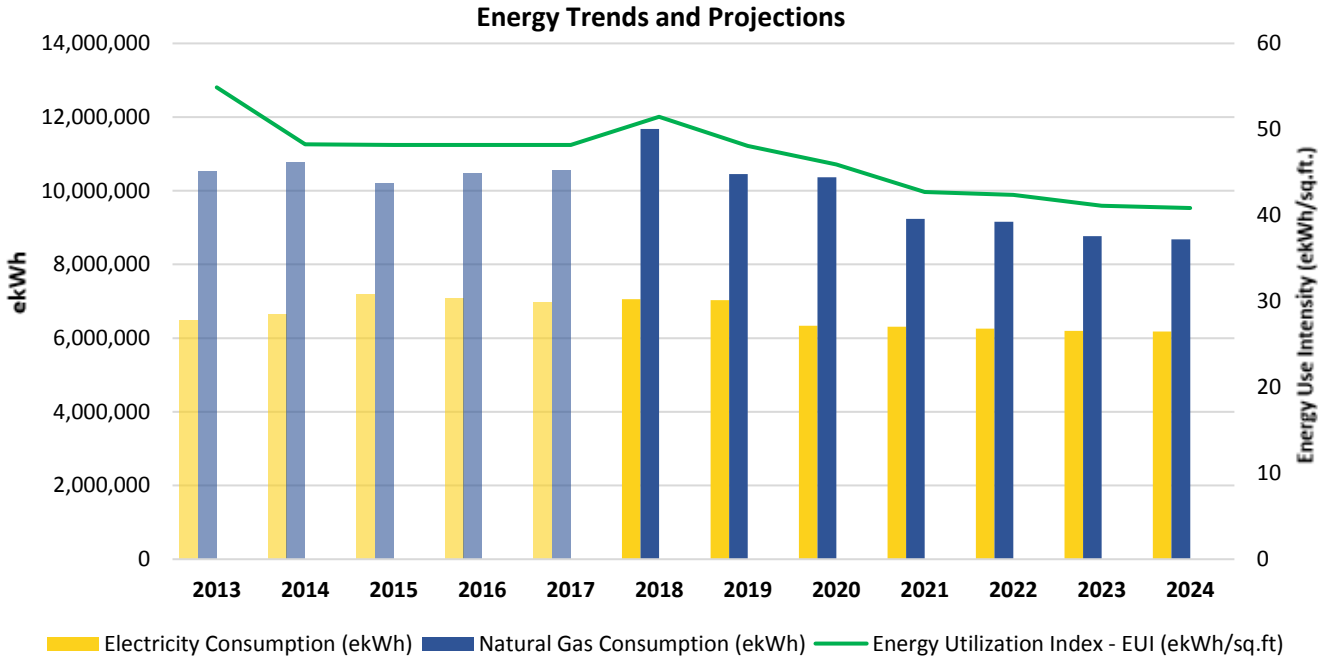


Figure 1. Site-Wide Energy Consumption Trends & Projections

ECDM Program Summary	2013	2014	2015	2016	2017	2018
Electricity Consumption (ekWh)	6,490,034	6,638,504	7,200,722	7,072,071	6,966,738	7,053,551
Natural Gas Consumption (ekWh)	10,525,150	10,786,705	10,205,472	10,468,288	10,567,117	11,676,274
Water Consumption (m3)	43,195	39,462	39,264	40,192	57,452	58,795
Facility Size (Sq. ft.)	310,000	361,155	361,155	363,882	363,882	363,882
Energy Utilization Index - EUI (ekWh/sq.ft)	55	48	48	48	48	51
ECDM Program Projections	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**
Electricity Consumption (ekWh)	7,033,386	6,335,050	6,308,383	6,261,560	6,195,905	6,183,419
Natural Gas Consumption (ekWh)	10,457,414	10,370,601	9,239,001	9,160,400	8,765,815	8,681,863
Water Consumption (m3)	49,389	48,046	48,046	48,046	48,046	48,046
Facility Size (Sq. ft.)	363,882	363,882	363,882	363,882	363,882	363,882
Energy Utilization Index - EUI (ekWh/sq.ft)	48	46	43	42	41	41

Table 1. Site-Wide Energy Consumption Trends & Projections

Pembroke Regional Hospital prides ourselves in the care we provide for our families, our friends, and our neighbors. We strive to provide state-of-the-art technologies and services at our facility, while we continue to grow with our community. As skilled and dedicated healthcare professionals, we recognize that courteous, professional, patient-focused healthcare is what matters most to those we serve and providing you with the best possible healthcare experience is a priority for us.

Our Vision

Delivering the safest and highest quality of care to every person, every encounter, every day.

Our Mission

We are a regional community hospital committed to delivering a wide range of quality health services. Following Catholic tradition, we will meet the physical, emotional, and spiritual needs of all.

Our Values

- Compassion and Caring
- Excellence and Innovation
- Social and Fiscal Responsibility
- Sacredness of Life
- Mutual Respect
- Community Spirit

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.

3. About Pembroke Regional Hospital

Since its founding in 1878, Pembroke Regional Hospital has been on a path of growth and expansion in order to meet the health needs of those in our region. We deliver a broad range of acute, post-acute, outpatient and diagnostic services to a mixed urban and rural population of approximately 55,000 residents. We strive to provide quality care and compassion to all in need.

3.1. Site-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 hospitals (derived from Natural Resources Canada's Commercial and Institutional Consumption of Energy Survey), which was found to be **63.23 ekWh/sq. ft**.

Annual Consumption (EUI)						
Site	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
Pembroke Regional Hospital	55	48	48	48	48	52
Ambulance Building	24	24	24	22	23	22
D'Youville Warehouse	59	58	57	59	54	52

Table 2. Historic Energy Utilization Indices for all Sites

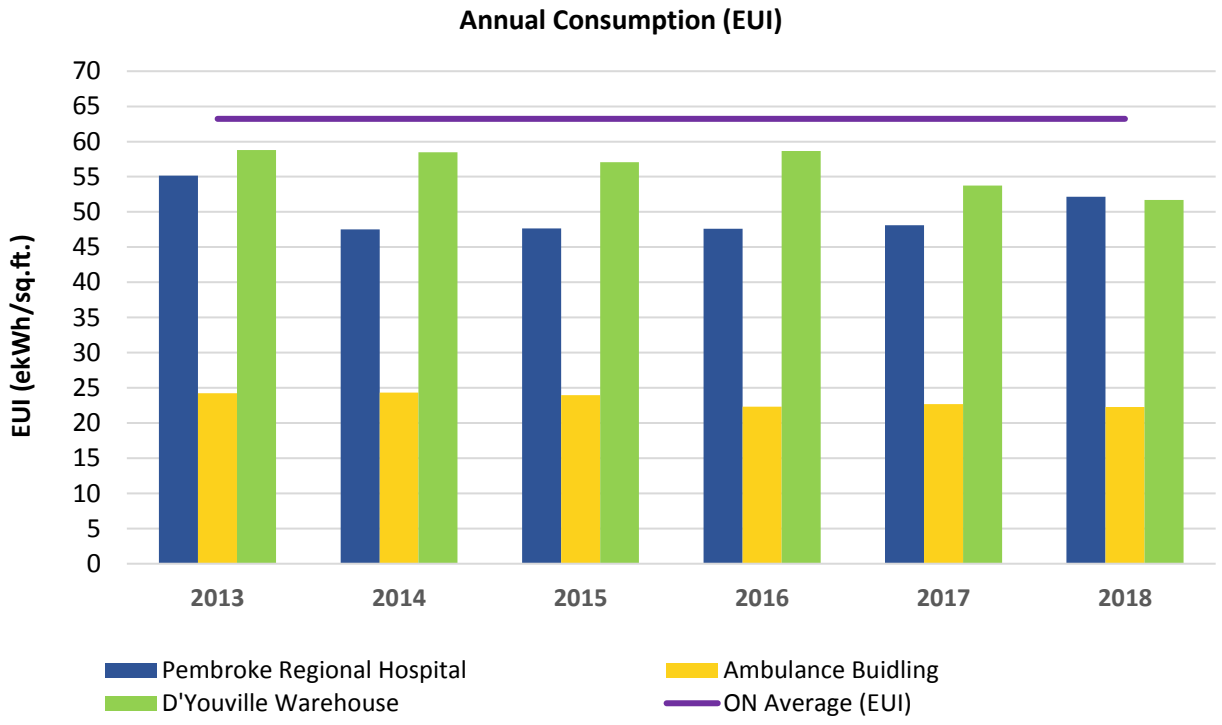


Figure 2. Historic Annual Energy Utilization Indices for all Sites

3.2. Site-Wide Historical GHG Emissions

O.Reg 507.18 requires that Pembroke Regional Hospital must report the greenhouse gas (GHG) emissions related to facilities utility consumption. 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.

The GHG Protocol Corporate Standard classifies an organizations GHG emissions into three 'scopes' outlined in Figure 3. Scope 1 represents the direct emissions from sources owned or controlled by Pembroke Regional Hospital, and Scope 2 consists of indirect emissions from the consumption of purchased energy generated upstream from the organization (the Ontario grid). Scope 3 emissions are all indirect emissions (not included in scope 2) that occur in the value chain of the reporting company, including both upstream and downstream emissions. Only scope 1 & 2 emissions are included in the ECDM plan reporting.

Electricity from the Ontario grid is relatively "clean", as the majority is derived from low-GHG hydroelectricity, and coal-fired plants have been phased out. In other jurisdictions, the grid could be more energy intensive if fossil fuels are burnt to produce the electricity. The Scope 1 (natural gas) and Scope 2 (electricity) emissions for Pembroke Regional Hospital have been converted to their equivalent tonnes of greenhouse gas emissions in the table on the following page.

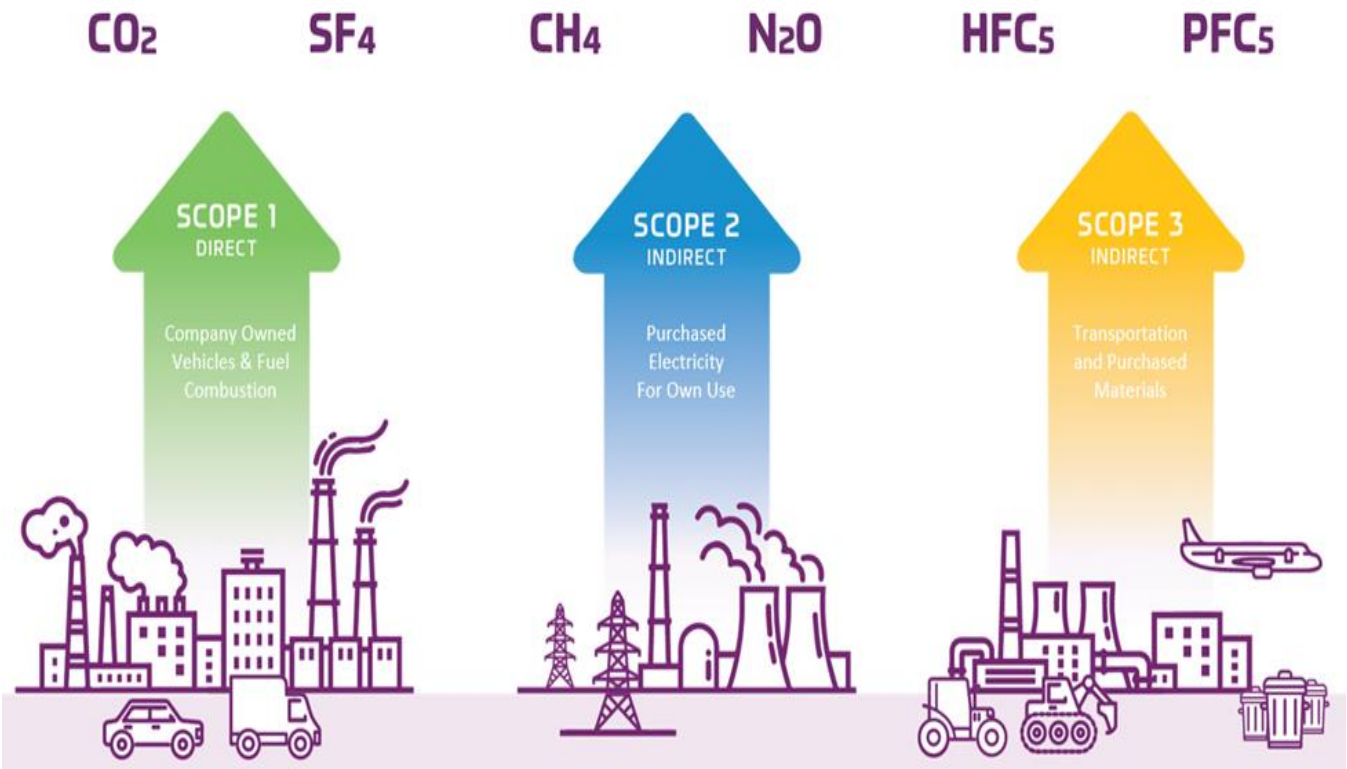


Figure 3. *Examples of Scope 1, 2 and 3*

The site-wide GHG emissions for Pembroke have been tabulated and are represented in the table and graph below.

GHG Emissions	2013	2014	2015	2016	2017	2018
Natural Gas	2,293	2,349	2,223	2,280	2,302	2,543
Electricity	266	272	295	290	286	289
Total	**2,559**	**2,622**	**2,518**	**2,570**	**2,587**	**2,832**

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

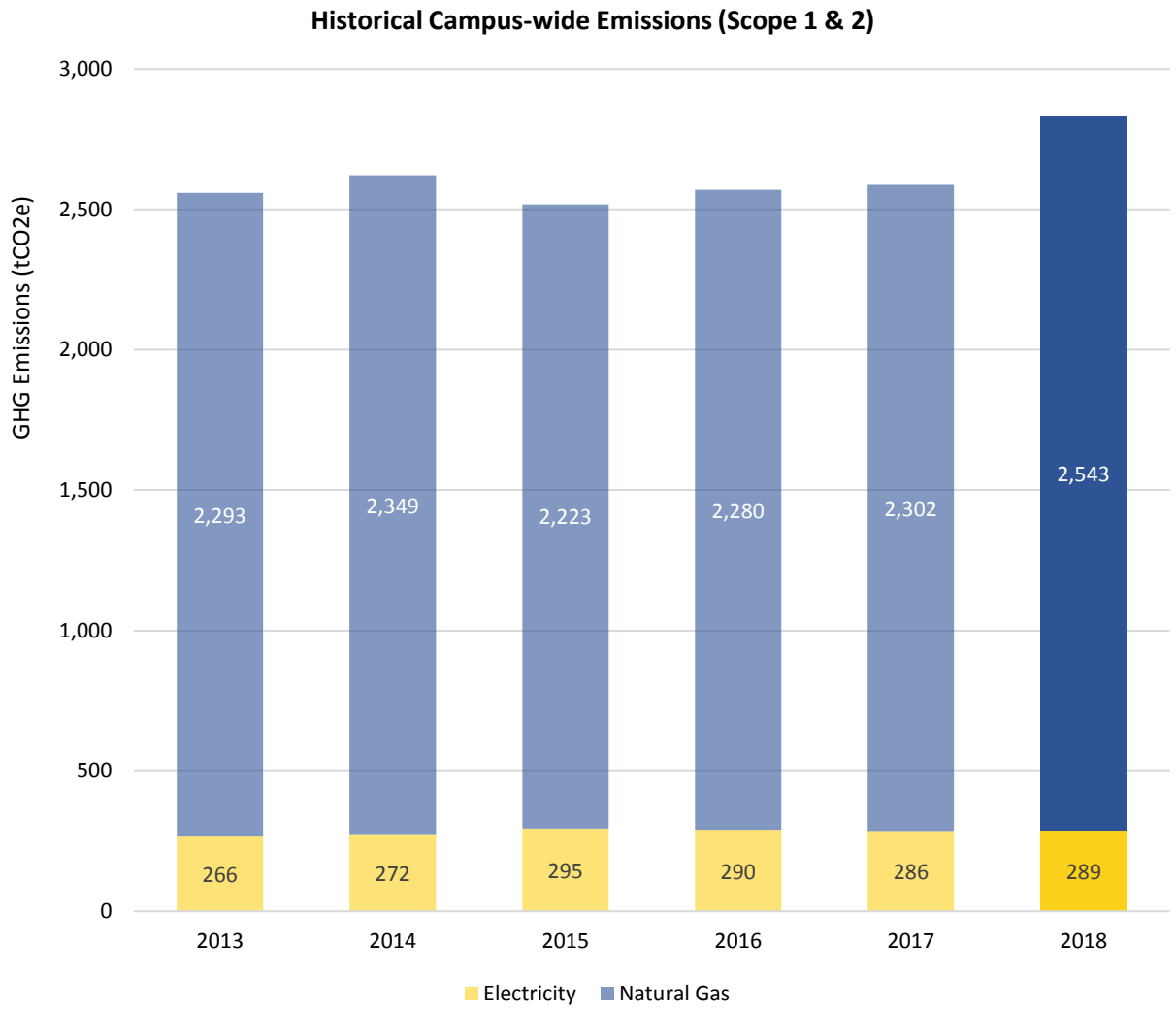


Figure 4. *Historic Greenhouse Gas Emissions for all Sites*

3.3. Past Conservation Measures

Over the last five years since the previous ECDM plan, Pembroke Regional Hospital has worked on reducing energy consumption. Some of the initiatives undertaken were:

- Replacing fluorescent and incandescent lighting fixture with LED ones
- Conducting steam trap audits and replacement of faulty traps
- Installing variable speed drives for the chillers
- Installing radiant heat panels to replace hot water radiators
- Replacing natural gas space heaters with more energy efficient ones
- Installing new windows in all of Tower C
- Installing new stairwell windows in Tower A
- Installing a timer on the kitchen exhaust fan
- Replacing R22 ductless split air conditioning units where feasible
- Window tinting in Tower A to reduce cooling demand

Picture 1. *Pembroke Regional Hospital*

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. Pembroke Regional Hospital

Picture 2. Pembroke Regional Hospital

Pembroke Regional Hospital is located approximately 150 kilometers north-west of Ottawa and serves the residents in the City of Pembroke, the Town of Petawawa, and surrounding municipalities. We provide acute services in emergency and intensive care, medical/surgical care, acute mental health, orthopedics and obstetrics.

Facility Information	
Facility Name	**Pembroke Regional Hospital**
Type of Facility	Healthcare Services
Address	705 Mackay Street, Pembroke, ON
Gross Area (Sq. Ft)	316,882
Average of Operational Hours in a Week	168
Number of Floors	5
Number of Beds	142

Table 4. Pembroke Regional Hospital Facility Information

4.1.1. Utility Consumption Analysis

Utilities to the site are electricity, natural gas and water. The following table summarizes the accounts for each utility. Consumption for each respective utility has been adjusted to fit a regular calendar year (365 days).

Annual Consumption (units)						
Utility	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
Electricity (kWh)	6,171,967	6,291,821	6,831,968	6,769,484	6,683,117	6,785,888
Natural Gas (m^3)	807,335	836,417	787,951	801,856	828,675	942,666
Water (m3)	32,913	28,393	28,314	30,168	44,928	45,525

Table 5. Historic Annual Utility Consumption for the Pembroke Regional Hospital

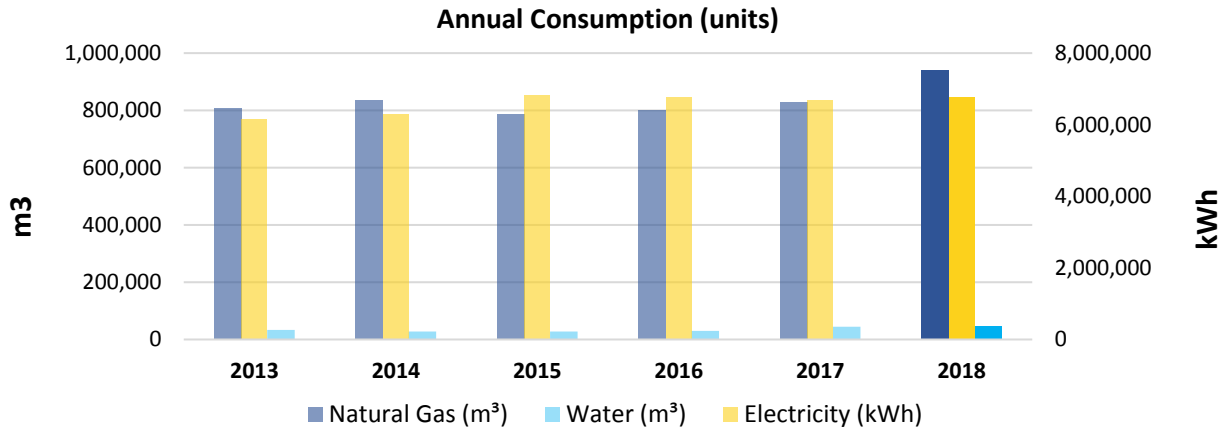


Figure 5. Historic Annual Utility Consumption for the Pembroke Regional Hospital

4.1.2. GHG Emissions Analysis

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

GHG Emissions (tCO2e)						
Utility Source	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
Electricity	253	258	280	278	274	278
Natural Gas	1,817	1,882	1,773	1,804	1,865	2,121
Totals	**2,070**	**2,140**	**2,053**	**2,082**	**2,139**	**2,399**

Table 6. Historic Annual Greenhouse Gas Emissions for the Pembroke Regional Hospital

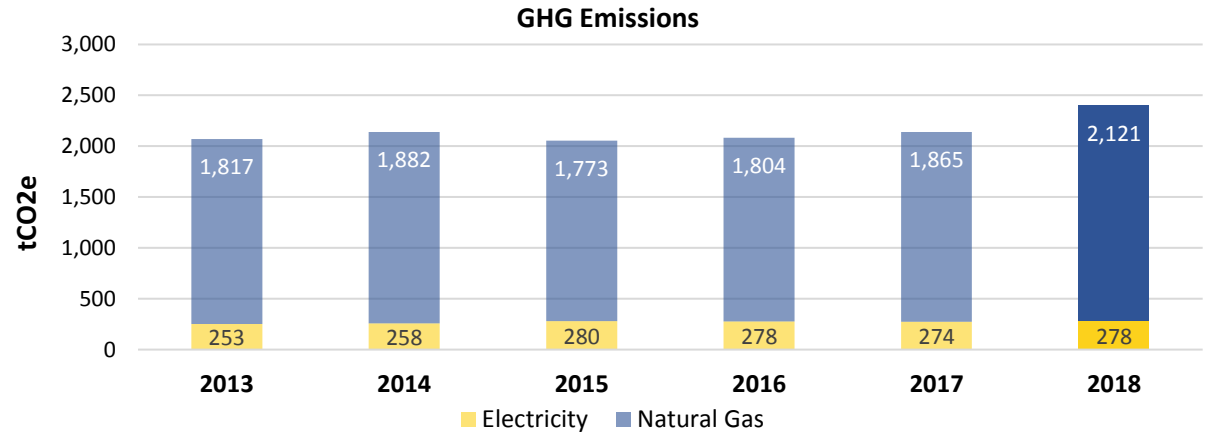


Figure 6. Historic Annual Greenhouse Gas Emissions for the Pembroke Regional Hospital

4.1.3. Proposed Conservation Measures

The Hospital has an energy audit completed in 2018 and the analysis revealed several conservation strategies for the facility. Pembroke Regional Hospital's proposed energy and water 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. The implementation of any of these measures will depend on capital funding available to the Hospital and the payback.

Measure	Impacted Utility	Estimated Annual Savings		Simple Payback (years)	Year of Implementation
		kWh	m3		
Lighting Upgrade	Electricity	611,523	0	9.04	2019
Lighting Controls	Electricity	7,925	0	73.09	2020
Stream pressure Control	Natural Gas	0	35,235	6.15	2020
Recommissioning & Schedule Adjustment	Electricity & Natural Gas	46,823	7,609	6.82	2021
Install Variable Frequency Drives (VFDs)	Electricity & Natural Gas	65,655	34,625	14.88	2022
Piping Insulation	Electricity & Natural Gas	12,486	8,127	18.22	2023
Instantaneous DHW	Natural Gas	0	7,690	7.30	2020
Replace Kitchen MUA Unit	Natural Gas	0	3,573	144.18	2022
Condensate Heat Recovery from Boilers	Electricity & Natural Gas	18,742	7,620	46.51	2020
Green Roof Installation	Natural Gas	0	59,000	0.50	2020
Total		**763,154**	**163,479**		

Table 7. *Proposed Conservation Measures for the Pembroke Regional Hospital*

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 2018.

Annual Consumption												
	2019		2020		2021		2022		2023		2024	
	Units	% Change (from 2018)	Units	% Change (from 2018)	Units	% Change (from 2018)	Units	% Change (from 2018)	Units	% Change (from 2018)	Units	% Change (from 2018)
Electricity (kWh)	6,174,365	9.01%	6,147,698	9.40%	6,100,875	10.09%	6,035,220	11.06%	6,022,734	11.25%	6,022,734	11.25%
Natural Gas (m^3)	942,666	0.00%	833,121	11.62%	825,512	12.43%	787,314	16.48%	779,187	17.34%	779,187	17.34%
Water (m3)	45,525	0.00%	45,525	0.00%	45,525	0.00%	45,525	0.00%	45,525	0.00%	45,525	0.00%

Table 8. Forecast of Annual Utility Consumption for the Pembroke Regional Hospital

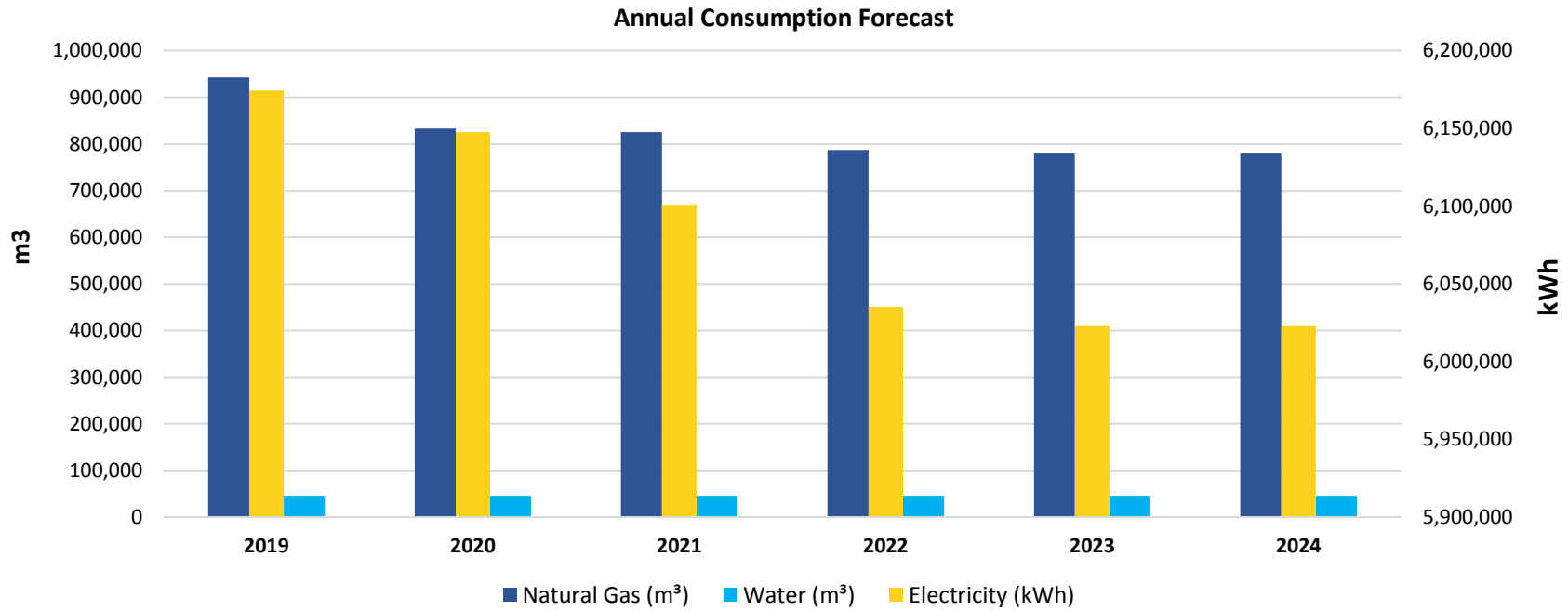


Figure 7. Forecast of Annual Utility Consumption for the Pembroke Regional Hospital

4.1.5. GHG Emissions Forecast

The forecasted greenhouse gas emissions for Pembroke Regional Hospital 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 2018.

GHG Emissions (tCO2e)						
Utility Source	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**
Electricity	253	252	250	247	247	247
Natural Gas	1,782	1,575	1,560	1,488	1,473	1,473
Totals	**2,035**	**1,827**	**1,810**	**1,735**	**1,720**	**1,720**
Reduction from Baseline Year (2018)	15.19%	23.86%	24.54%	27.67%	28.33%	28.33%

Table 9. Forecast of Annual Greenhouse Gas Emissions for the Pembroke Regional Hospital

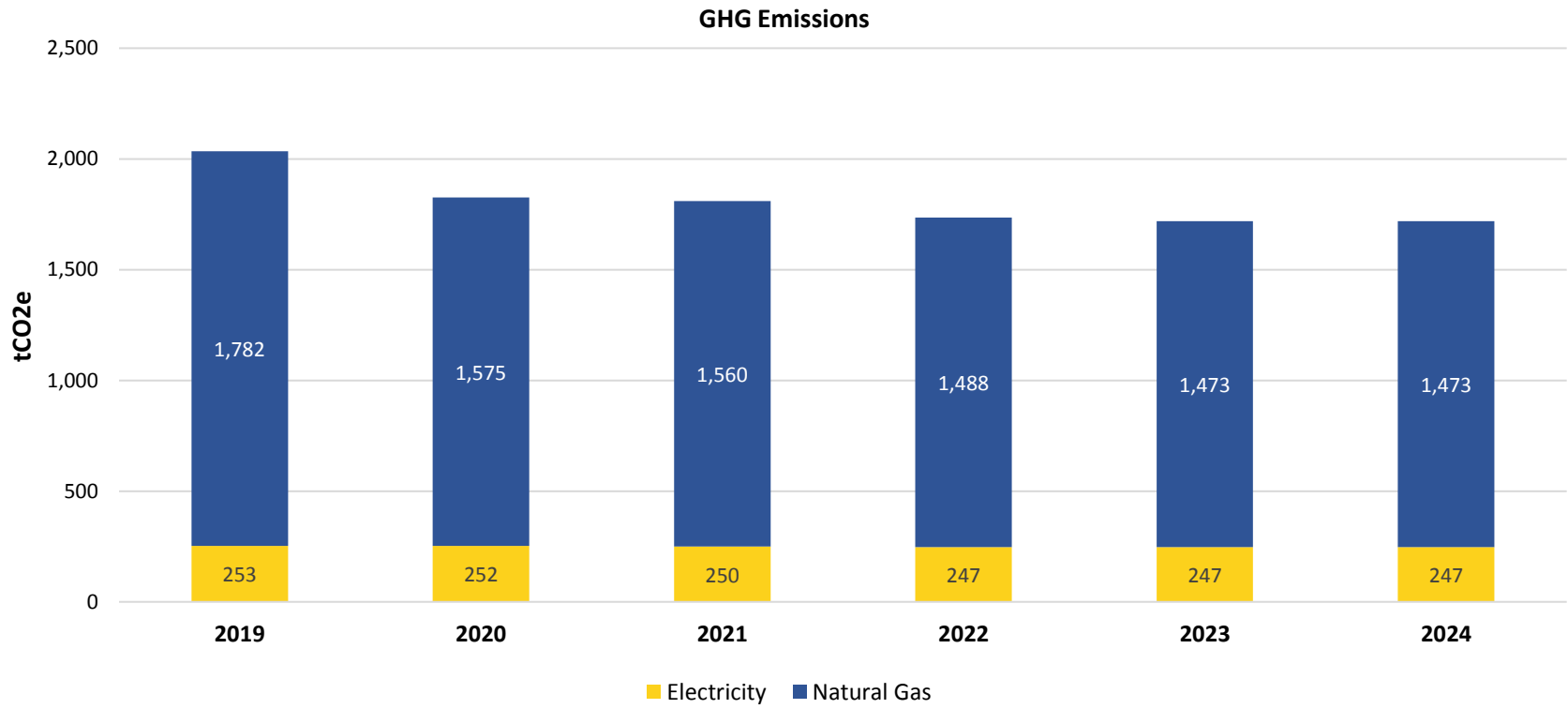


Figure 8. Forecast of Annual Greenhouse Gas Emissions for the Pembroke

4.2. Ambulance Building

Picture 3. Pembroke Regional Hospital – Ambulance Building

At this time the Ambulance Building has no proposed measures, but they will continue to monitor opportunities for sustainability initiatives. Due to this there will be no forecasting data provided. The historical data can be found below in sections 4.2.1 and 4.2.1.

Facility Information	
Facility Name	**Pembroke Regional Hospital – Ambulance Building**
Type of Facility	Healthcare Services
Address	721 Mackay Street, Pembroke, ON
Gross Area (Sq. Ft)	5,000
Average of Operational Hours in a Week	168
Number of Floors	1

Table 10. Ambulance Building 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. Consumption for each respective utility has been adjusted to fit a regular calendar year (365 days).

Annual Consumption (units)						
Utility	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
Electricity (kWh)	35,782	34,782	35,484	34,044	33,069	35,103
Natural Gas (m³)	7,948	8,074	7,844	7,215	7,478	7,095

Table 11. Historic Annual Utility Consumption for the Ambulance Building

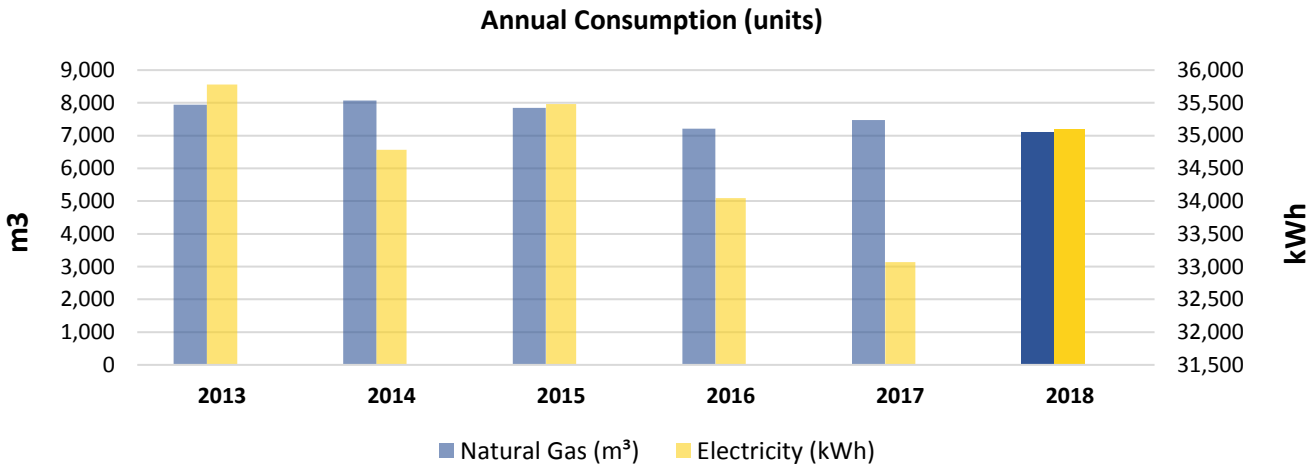


Figure 9. Historic Annual Utility Consumption for the Ambulance Building

4.2.2. GHG Emissions Analysis

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

GHG Emissions (tCO2e)						
Utility Source	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
Electricity	1	1	1	1	1	1
Natural Gas	15	15	15	14	14	13
Totals	**16**	**17**	**16**	**15**	**15**	**15**

Table 12. Historic Annual Greenhouse Gas Emissions for the Ambulance Building

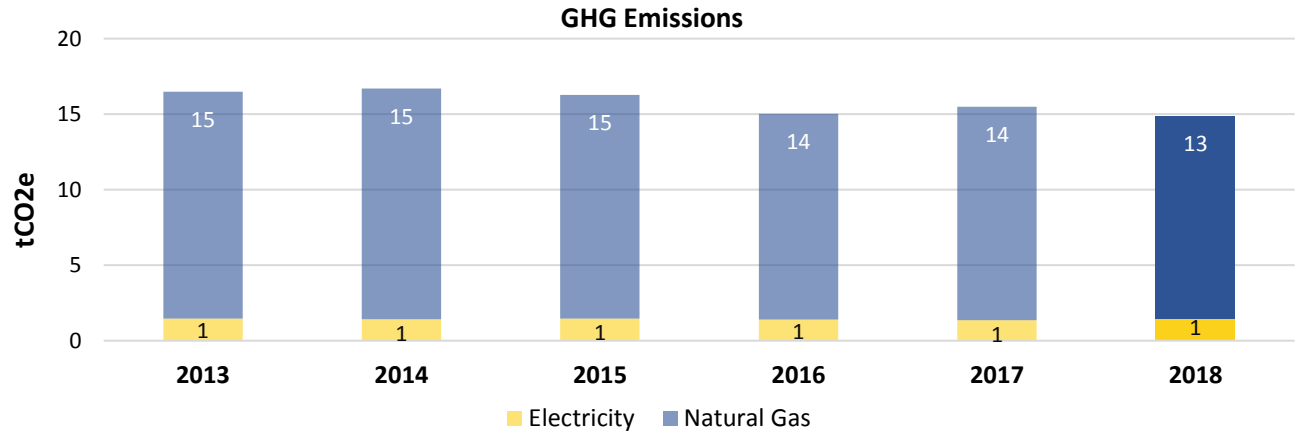
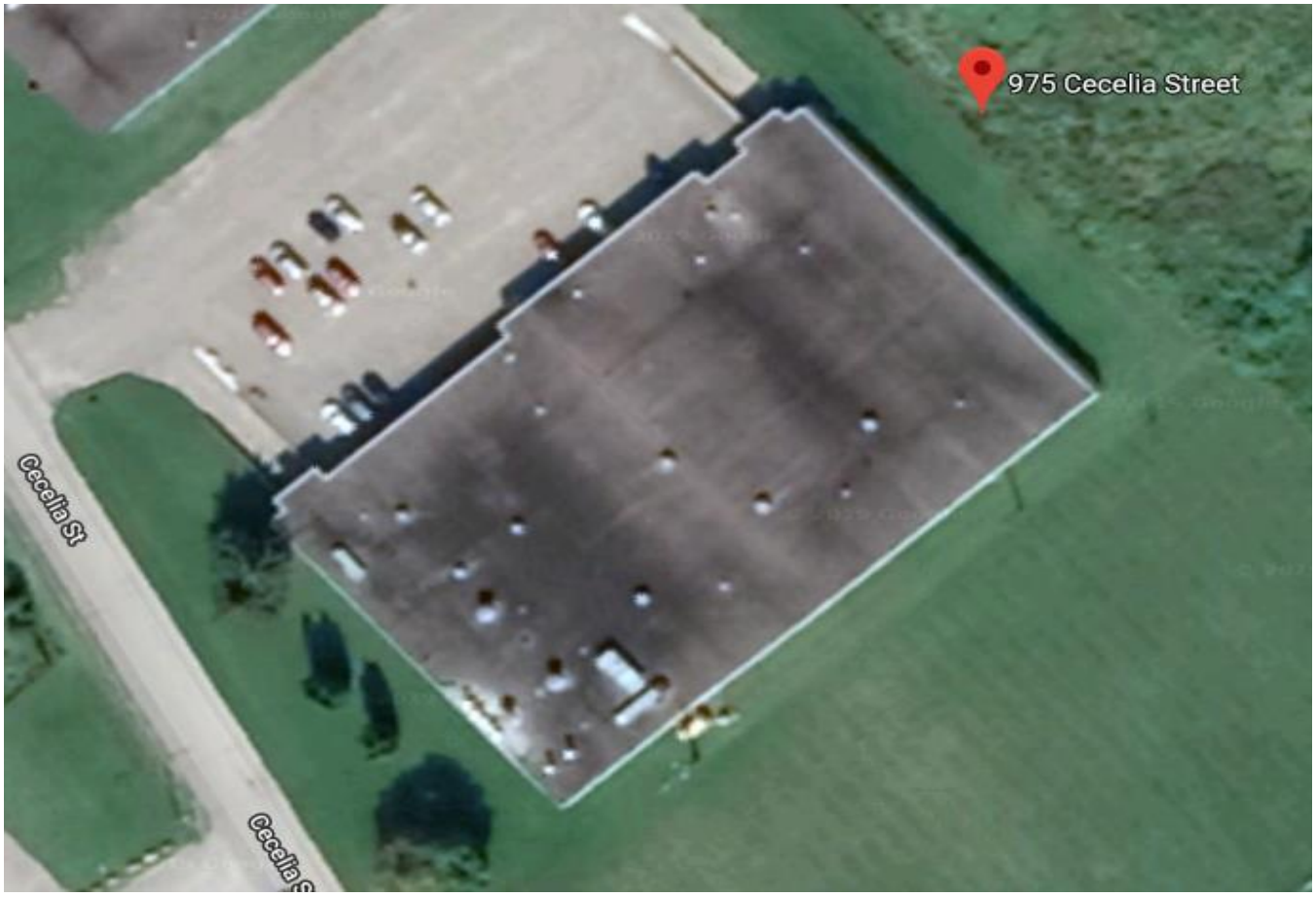


Figure 10. Historic Annual Greenhouse Gas Emissions for the Ambulance Building

4.3. D'Youville Warehouse



Picture 4. Pembroke Regional Hospital – D'Youville Warehouse

Facility Information	
Facility Name	**D'Youville Warehouse - Pembroke Regional Hospital**
Type of Facility	Healthcare Services Storage
Address	975 Cecelia Street, Pembroke, ON
Gross Area (Sq. Ft)	42,000
Average of Operational Hours in a Week	40
Number of Floors	1

Table 13. D'Youville Warehouse Facility Information

4.3.1. Utility Consumption Analysis

Utilities to the site are electricity, natural gas and water. The following table summarizes the accounts for each utility. Consumption for each respective utility has been adjusted to fit a regular calendar year (365 days).

Annual Consumption (units)						
Utility	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
Electricity (kWh)	282,285	311,901	333,270	268,543	250,552	232,560
Natural Gas (m³)	203,608	199,720	192,150	204,316	186,801	180,566
Water (m3)	10,282	11,069	10,950	10,024	12,524	13,270

Table 14. Historic Annual Utility Consumption for the D'Youville Warehouse

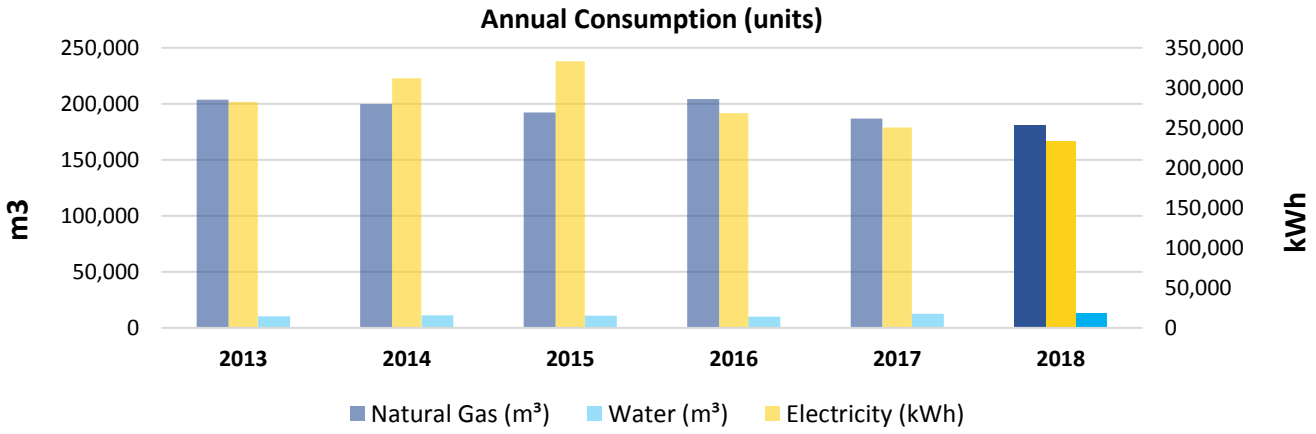


Figure 11. Historic Annual Utility Consumption for the D'Youville Warehouse

4.3.2. GHG Emissions Analysis

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

GHG Emissions (tCO2e)						
Utility Source	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
Electricity	12	13	14	11	10	10
Natural Gas	458	449	432	460	420	406
Totals	**470**	**462**	**446**	**471**	**431**	**416**

Table 15. Historic Annual Greenhouse Gas Emissions for the D'Youville Warehouse

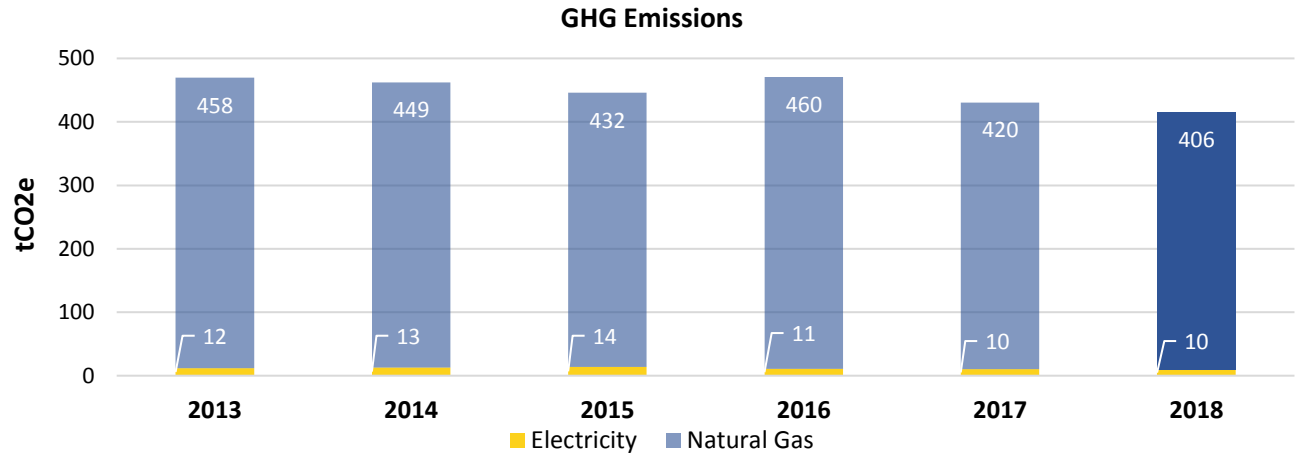


Figure 12. Historic Annual Greenhouse Gas Emissions for the D'Youville Warehouse

4.3.3. Utility Consumption Forecast

The D'Youville Warehouse has no proposed measures at this time, but they will continue to monitor opportunities for sustainability initiatives. However, the Laundry Facility was closed this year which resulted in a substantial decrease in consumption. The forecasted utility consumption is tabulated below. The percentage of change is based off the data from the baseline year of 2018.

Annual Consumption												
	2019		2020		2021		2022		2023		2024	
	Units	% Change (from 2018)	Units	% Change (from 2018)	Units	% Change (from 2018)	Units	% Change (from 2018)	Units	% Change (from 2018)	Units	% Change (from 2018)
Electricity (kWh)	125,582	46%	125,582	46%	125,582	46%	125,582	46%	125,582	46%	125,582	46%
Natural Gas (m^3)	54,170	70%	54,170	70%	54,170	70%	54,170	70%	54,170	70%	54,170	70%
Water (m3)	2,521	81%	2,521	81%	2,521	81%	2,521	81%	2,521	81%	2,521	81%

Table 16. Forecast of Annual Utility Consumption for the D'Youville Warehouse

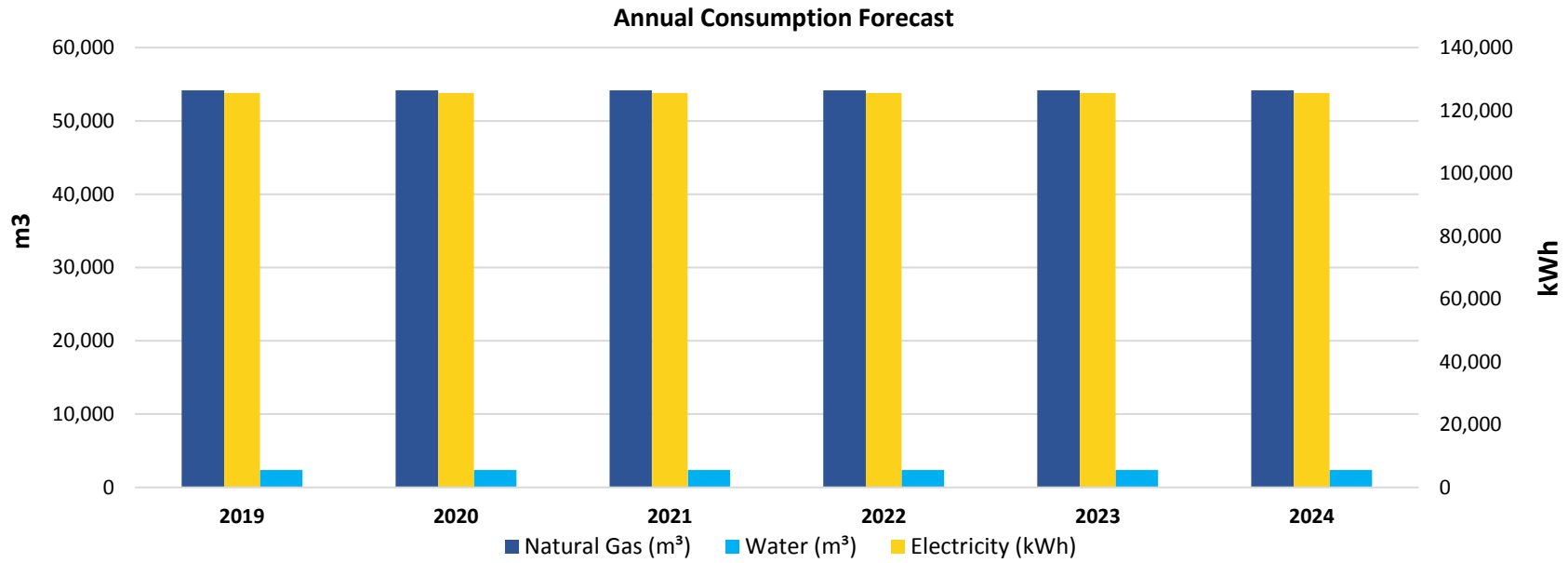


Figure 13. Forecast of Annual Utility Consumption for the D'Youville Warehouse

4.3.4. GHG Emissions Forecast

The forecasted greenhouse gas emissions for the D'Youville Warehouse 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 2018.

GHG Emissions (tCO2e)						
Utility Source	2019	2020	2021	2022	2023	2024
Electricity	5	5	5	5	5	5
Natural Gas	102	102	102	102	102	102
Totals	**108**	**108**	**108**	**108**	**108**	**108**
Reduction from Baseline Year (2018)	74%	74%	74%	74%	74%	74%

Table 17. Forecast of Annual Greenhouse Gas Emissions for the D'Youville Warehouse

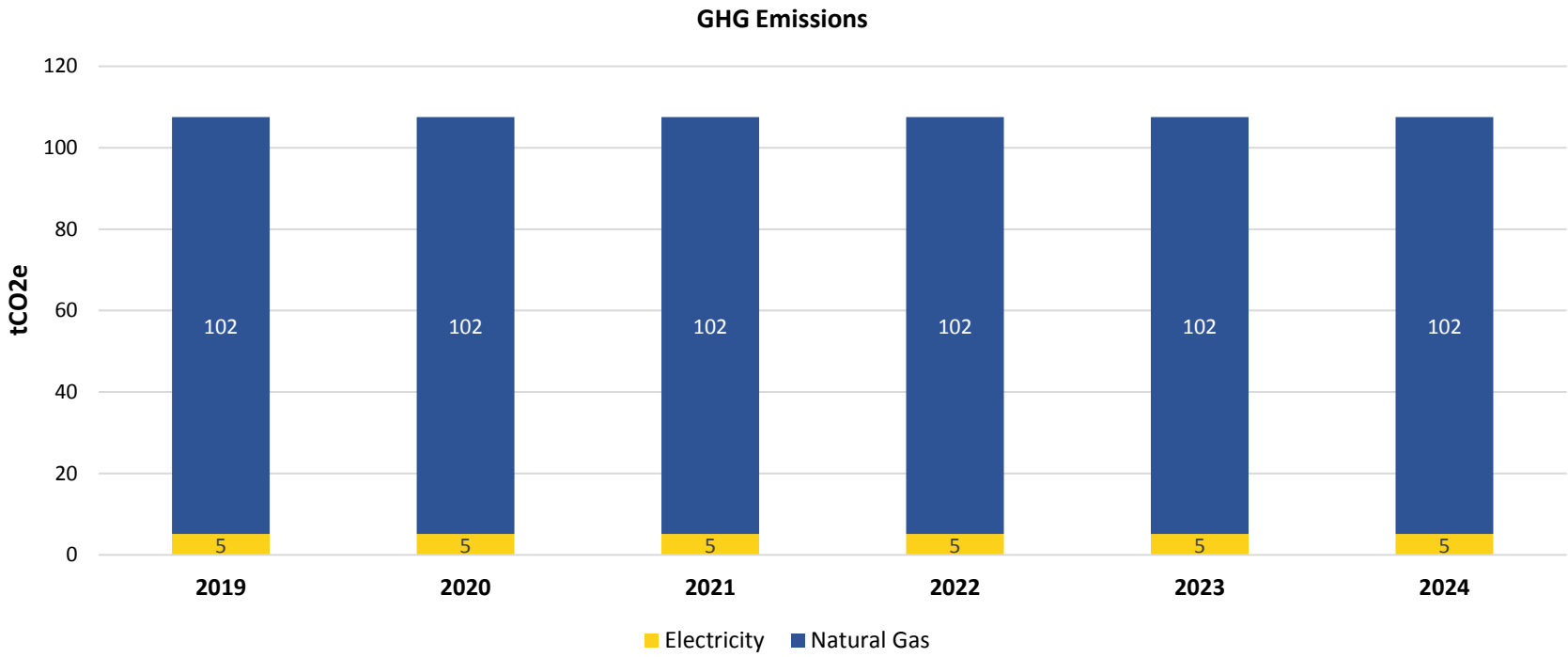


Figure 14. Forecast of Annual Greenhouse Gas Emissions for the D'Youville Warehouse

5. Site Outlook

5.1. Site-Wide Utility Consumption Forecast

By implementing the energy conservation measures stated in the previous sections, in each respective site, Pembroke Regional Hospital's site-wide projected electricity and natural gas use could be forecasted based on the utility savings generated from individual measures. The site-wide forecasted utility consumption is tabulated below. The percentage of change is based off the data from the baseline year of 2018.

Annual Consumption												
	2019		2020		2021		2022		2023		2024	
	Units	% Change (from 2018)	Units	% Change (from 2018)	Units	% Change (from 2018)	Units	% Change (from 2018)	Units	% Change (from 2018)	Units	% Change (from 2018)
Electricity (kWh)	6,335,050	10%	6,308,383	11%	6,261,560	11%	6,195,905	12%	6,183,419	12%	6,183,419	12%
Natural Gas (m^3)	1,003,930	11%	894,385	21%	886,776	22%	848,578	25%	840,451	26%	840,451	26%
Water (m3)	48,046	18%	48,046	18%	48,046	18%	48,046	18%	48,046	18%	48,046	18%

Table 18. Forecast of Annual Utility Consumption for all Sites

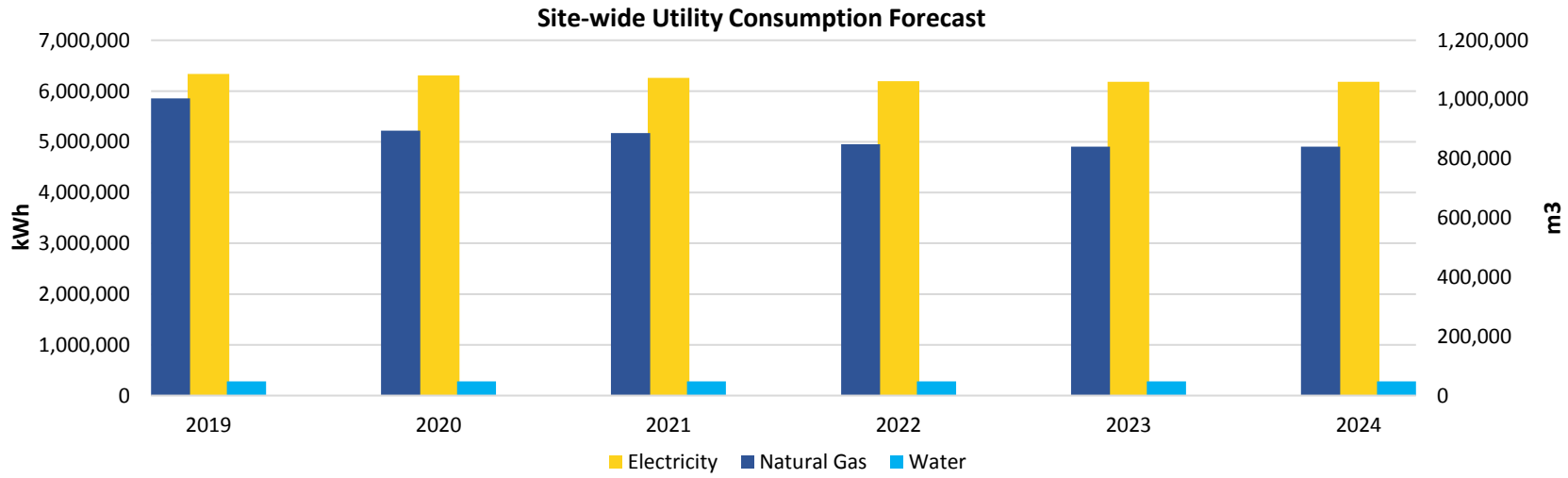


Figure 15. Forecast of Annual Utility Consumption for all Sites

5.2. Site-Wide GHG Emissions Forecast

The site-wide forecasted greenhouse gas emissions for Pembroke Regional Hospital are calculated based on the site-wide 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 2018.

GHG Emissions (tCO2e)						
Utility Source	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**
Natural Gas	1,897	1,690	1,676	1,604	1,588	1,588
Electricity	260	259	257	254	254	254
Totals	**2,157**	**1,949**	**1,933**	**1,858**	**1,842**	**1,842**
Reduction from Baseline Year (2018)	23.84%	31.19%	31.76%	34.41%	34.97%	34.97%

Table 19. *Forecast of Annual Greenhouse Gas Emissions for all Sites*

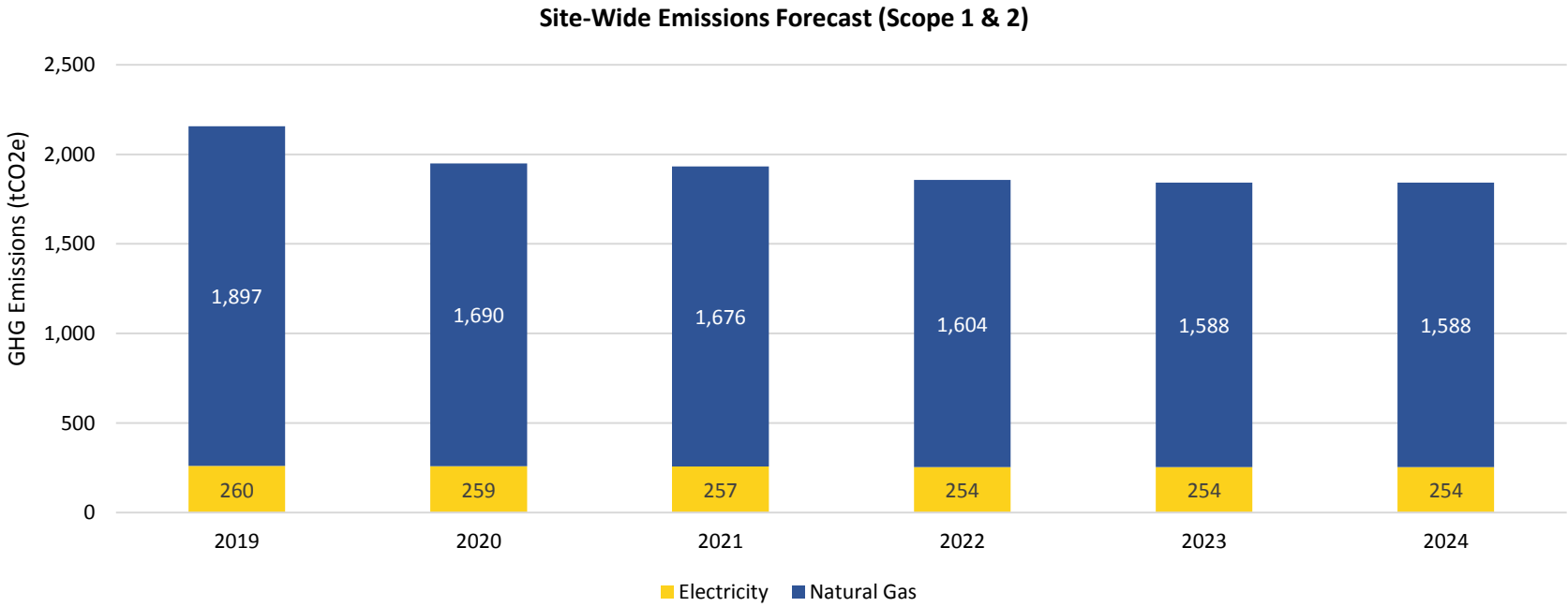


Figure 16. *Forecast of Annual Greenhouse Gas Emissions for all Sites*

6. Closing Comments

Thank you to all who contributed to Pembroke Regional Hospital's Energy Conservation & Demand Management Plan. We consider our facility a primary source of care, 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 healthcare services while integrating environmental stewardship into all aspects of facility operations.

On behalf of the Senior Management Team here at Pembroke Regional Hospital, we approve this Energy Conservation & Demand Management Plan.

7. Appendix

7.1. 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.

7.2. List of Pictures, Tables and Figures

Pictures

Tables

Figures