

Energy Conservation & Demand Management Plan 2019

Executive Summary

The purpose of this Energy Conservation and Demand Management (ECDM) Plan from Halton Healthcare 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 Halton Healthcare's commitment to 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 reduce operating costs associated with energy consumption. 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, Halton Healthcare has seen facility changes that impact utility consumption and GHG emissions. This includes a 26,405 m² addition at Milton District Hospital and the new construction of Oakville Trafalgar Memorial hospital in 2015 which has an area of 141,823 m². This resulted in the following trends:

- 178,971 GJ increase in total organizational electricity use
- 326,878 GJ increase in total organizational natural gas use
- 4% reduction in the hospital's total energy intensity since 2013

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

- Energy Use Index (EUI) was 2.95 GJ/m²
- Energy-related emissions equaled 21,062 tCO₂e

To obtain full value from energy management activities, Halton Healthcare 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, Halton Healthcare can expect to achieve the following goals and targets by 2024:

- 9% reduction in electricity consumption
- 51% reduction in natural gas consumption
- 9,756 tCO₂e carbon equivalent emissions
- 35% reduction in EUI GJ/m²
- Continuously review opportunities for energy conservation and demand management

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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 above & table below.

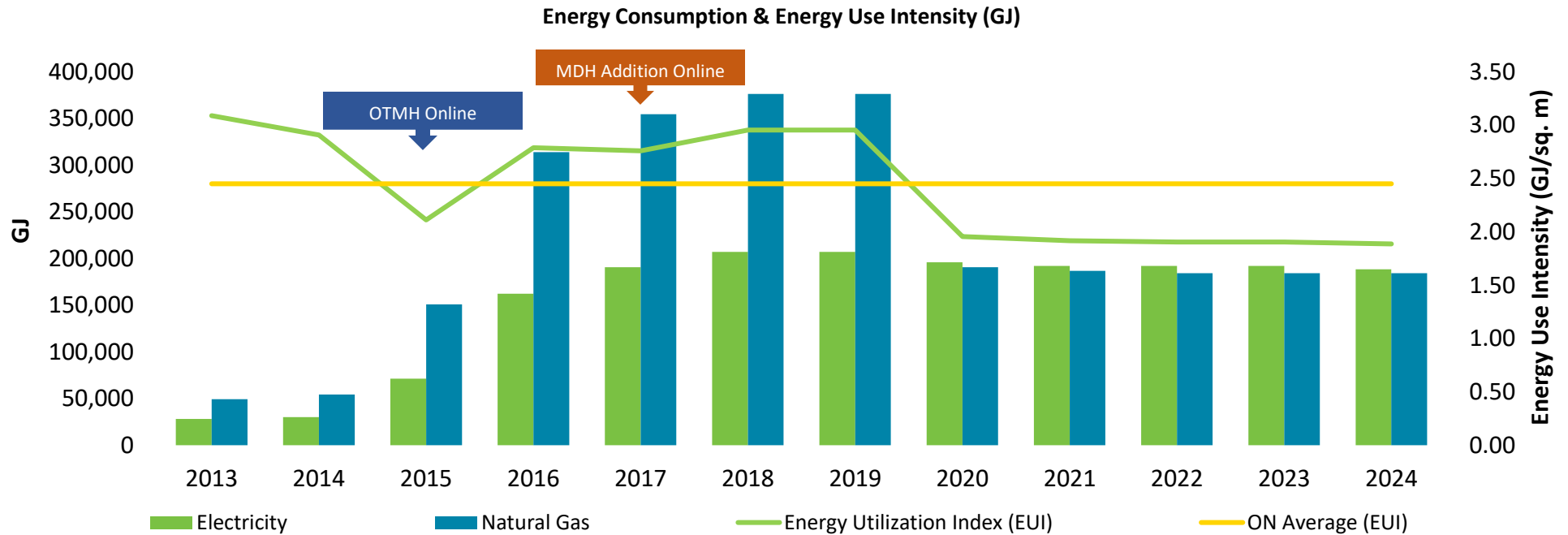


Figure 1. Halton Healthcare's Energy Consumption Trends & Projections

ECDM Program Summary	2013	2014	2015	2016	2017	2018
Electricity Consumption (GJ)	28,089	29,992	71,356	162,392	190,506	207,060
Natural Gas Consumption (GJ)	49,221	54,172	150,732	313,853	354,576	376,099
Facility Size (m2)	25,033	28,951	105,174	170,773	197,513	197,513
Energy Utilization Index - EUI (GJ/m2)	3.1	2.9	2.1	2.8	2.8	2.95
ECDM Program Projections	2019	2020	2021	2022	2023	2024
Electricity Consumption (GJ)	195,886	192,002	192,002	192,002	188,425	195,886
Natural Gas Consumption (GJ)	190,508	186,653	184,183	184,183	184,183	190,508
Facility Size (m2)	197,513	197,513	197,513	197,513	197,513	197,513
Energy Utilization Index - EUI (GJ/m2)	2.0	1.9	1.9	1.9	1.9	2.0

Table 1. Halton Healthcare's Energy Consumption Trends & Projections

Halton Healthcare takes great pride in providing quality, compassionate healthcare services to our rapidly growing communities. As a progressive and vibrant healthcare organization, we are committed to being an innovative center of excellence. We embrace inclusion, high performance and flexibility with ‘exemplary patient experiences, always’ at the heart of everything we do.

Our Vision

Transforming the community hospital experience through ‘Exemplary patient experiences, always’.

Our Mission

For the communities we serve, Halton Healthcare provides compassionate, quality, community hospital care as part of an integrated system.

Our Values

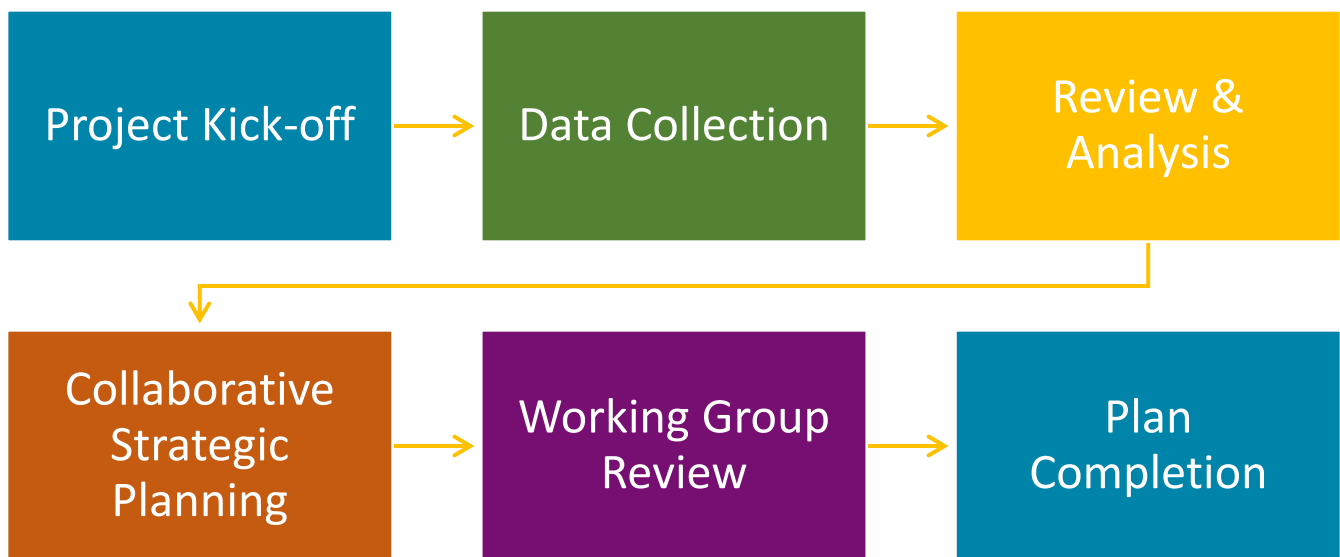
Compassion, Accountability, and Respect.



Picture 1. Halton Healthcare – Oakville Trafalgar Memorial Hospital

1.1. Methodology

In order to meet the regulatory requirements, annual utility consumption data for each facility was collected from 2014 – 2018. To forecast future facility performance, 2018 consumption was used as the baseline for each facility. For the purposes of the ECDM plan, the impact of weather or changes in facility operations were not taken into consideration although these variables can have a significant impact on facility performance. A working group was created to guide the plan creation that consisted of Halton Healthcare utilities management group, the Oakville Trafalgar Memorial Hospital facility manager (Ellis Don), the Milton District Hospital South/Central Block facility manager (Johnson controls) and Blackstone Energy Services. Audit data and working group feedback were used to develop energy conservation measure opportunities listed for each site. Several collaborative strategic planning sessions was held to guide the draft documentation and obtain group feedback. The process below provides a high-level process overview which resulted in the final ECDM plan.



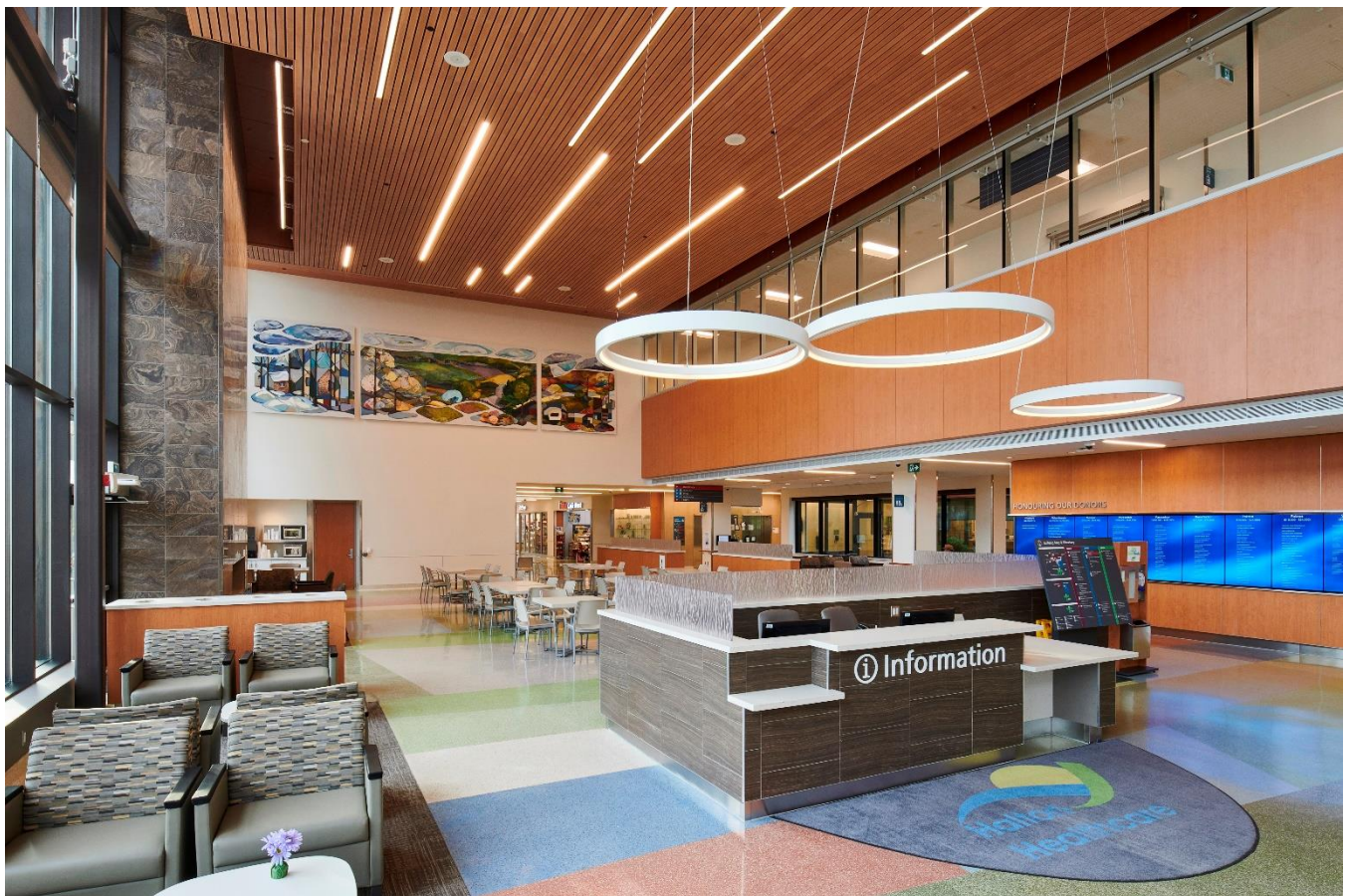
2. Regulatory Update

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.



Picture 2. Halton Healthcare – Milton District Hospital

3. About Halton Healthcare

Halton Healthcare is an award-winning healthcare organization comprised of three community hospitals. We serve the growing urban and rural communities of Halton Hills, Milton and Oakville. We take pride in offering the finest technology and healthcare expertise and strive to provide exemplary patient experiences always. We are a part of Halton’s rich history, and together with our three hospitals and community-based services we serve a population of almost 400,000 residents.

3.1. Halton Healthcare Historical Energy Intensity

Energy Utilization Index is a measure of how much energy a facility uses per metre squared. By breaking down a facility’s energy consumption on a per-metre-squared-basis, we can compare facilities of different sizes with ease. In this case, we are comparing our facilities 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 **2.45 GJ/m²**.

Annual Consumption (EUI GJ/m ²)						
Site	2013	2014	2015	2016	2017	2018
Georgetown Hospital	2.90	3.14	2.64	2.61	2.74	2.74
Milton District Hospital	3.29	2.68	2.71	2.47	2.17	2.91
Oakville Trafalgar Memorial Hospital	0.00	0.00	1.90	2.84	2.93	2.99

Table 2. Historic Energy Utilization Indices for Halton Healthcare

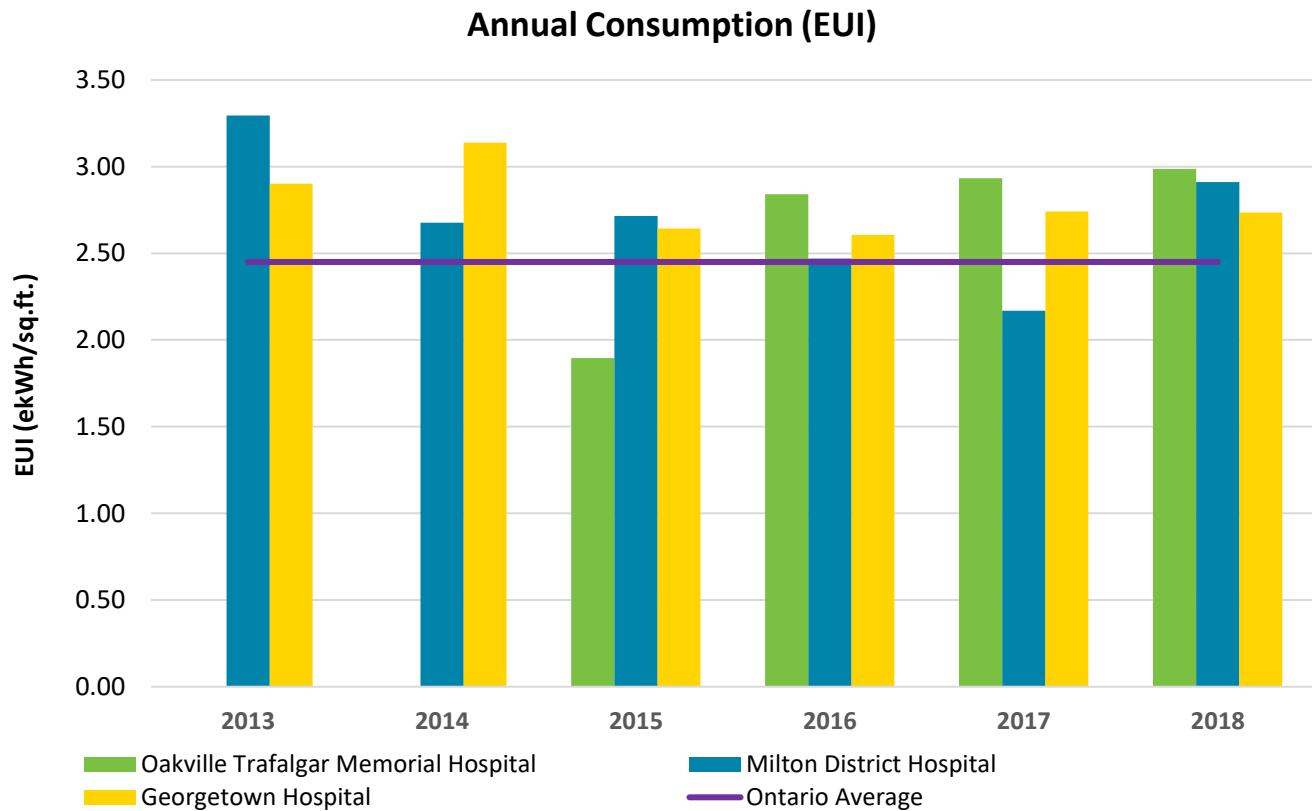


Figure 2. Historic Annual Energy Utilization Indices for Halton Healthcare

3.2. Halton Healthcare Historical GHG Emissions

O.Reg 507.18 requires that Halton Healthcare must report the greenhouse gas (GHG) emissions related to facilities utility consumption. GHG emissions are expressed in terms of equivalent tonnes of Carbon Dioxide (tCO₂e). 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 Halton Healthcare, 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 Halton Healthcare have been converted to their equivalent tonnes of greenhouse gas emissions in the table on the following page.

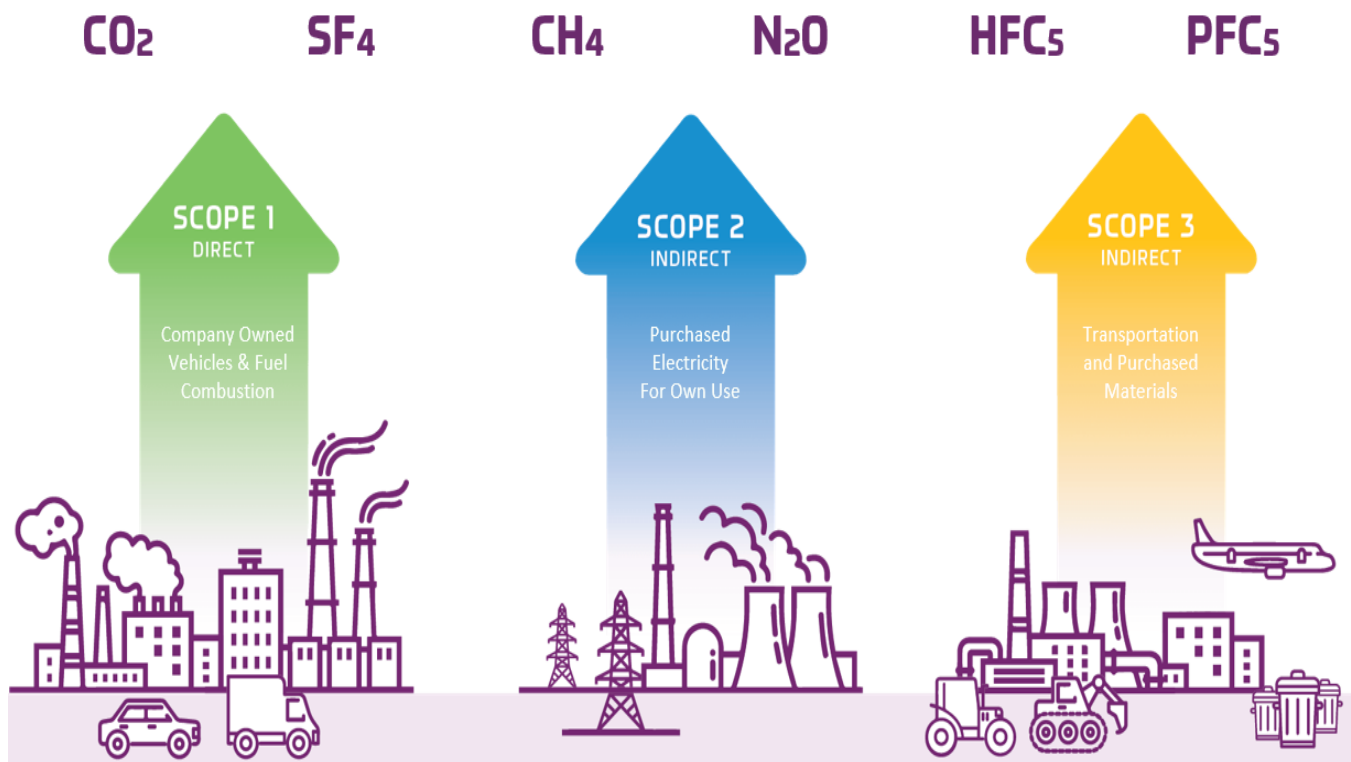


Figure 3. Examples of Scope 1,2 and 3 Emissions

The GHG emissions have increased commensurately with the growth of the total facility area of Halton Healthcare. Oakville Trafalgar Memorial Hospital is a 148,644 m² facility which opened its doors in 2015. GHG emissions for Halton Healthcare has increased as the facilities operations have expanded.

GHG Emissions	2013	2014	2015	2016	2017	2018
Electricity	320	342	813	1,849	2,170	2,358
Natural Gas	2,448	2,694	7,496	15,608	17,634	18,704
Total Scope 1 & 2 Emissions	2,768	3,036	8,309	17,458	19,803	21,062

Table 3. Historic Greenhouse Gas Emissions for Halton Healthcare

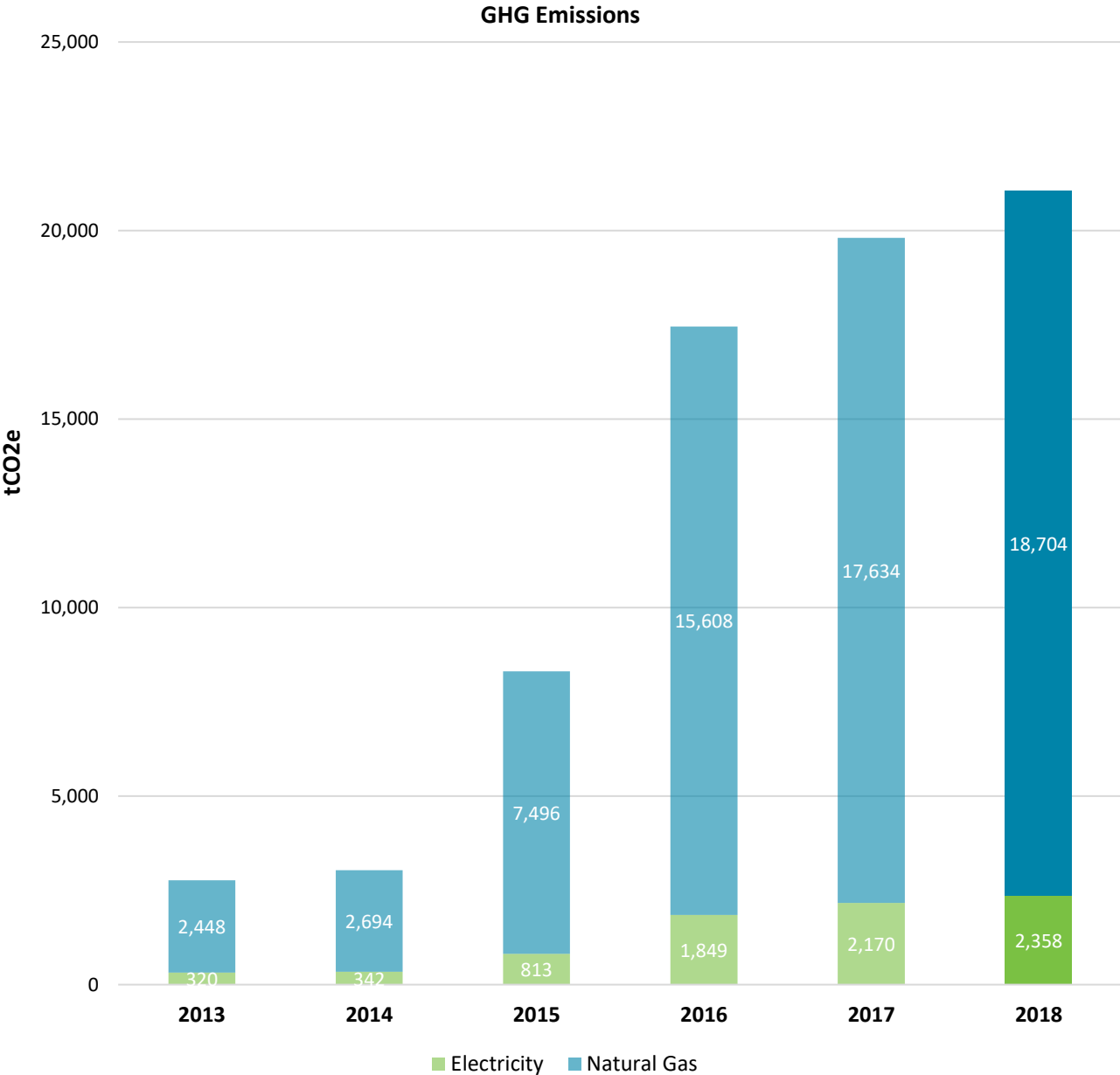


Figure 4. Historic Greenhouse Gas Emissions for Halton Healthcare

3.3. Previously Completed Measures

The measures listed below have been completed by the Halton Healthcare Team and their strategic partners in the past 5 years. The impacted utility and the estimated payback of each measure is also provided. Oakville Trafalgar Memorial Hospital is a new construction facility that came online in 2015. Since the facility was newly constructed, no previously completed energy conservation measures are listed for the historical period.

Measure Name	Site	Impacted Utility	
		Electricity	Natural Gas
Retrofit Fluorescent Fixtures	Georgetown	X	
Retrofit Potlights with LED Kits	Georgetown	X	
Group Relamp with Screw-in LED Lamps	Georgetown	X	
Install Occupancy and Daylighting Controls	Georgetown	X	
Controls Re-Commissioning	Georgetown	X	X
Expand BAS	Georgetown	X	X
Scheduling of HVAC equipment	Georgetown	X	X
Zone Dampers and Fan Speed Reduction	Georgetown	X	
Kitchen Demand Ventilation	Georgetown	X	
Air Handling Unit Replacement	Georgetown	X	
Piping Insulation	Georgetown	X	X
Replace Chiller	Georgetown	X	
Building Envelope Upgrades	Georgetown		X
Retrofit Potlights with LED Kits	Milton	X	
Relamp with Screw-in LED Lamps	Milton	X	
Upgrade with New Fixtures	Milton	X	
Scheduling of HVAC Equipment	Milton	X	X
Zone Dampers and Speed Fan Reduction	Milton	X	
Install VFD in HW and CHW Pumps	Milton		
Piping Insulation	Milton		X
Building Envelope Upgrades	Milton		X

Table 4. Previously Completed Measures for Halton Healthcare

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. Georgetown Hospital



Picture 3. Georgetown Hospital

The Georgetown Hospital is a community hospital located in the Georgetown area of Halton Hills, Ontario. The original facility opened in 1961 and has had several additions.

Facility Information	
Facility Name	Georgetown Hospital
Address	1 Princess Anne Drive, Georgetown, ON
Type of Facility	Healthcare Services
Gross Area (m2)	14,486
Average Operational Hours in a Week	168
Number of Floors	1

Table 5. Georgetown Hospital 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. 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)	3,639,277	4,136,515	3,816,603	3,984,366	4,590,628	4,198,672
Natural Gas (m ³)	661,018	803,973	646,142	616,081	609,741	645,015

Table 6. Historic Annual Utility Consumption for the Georgetown Hospital

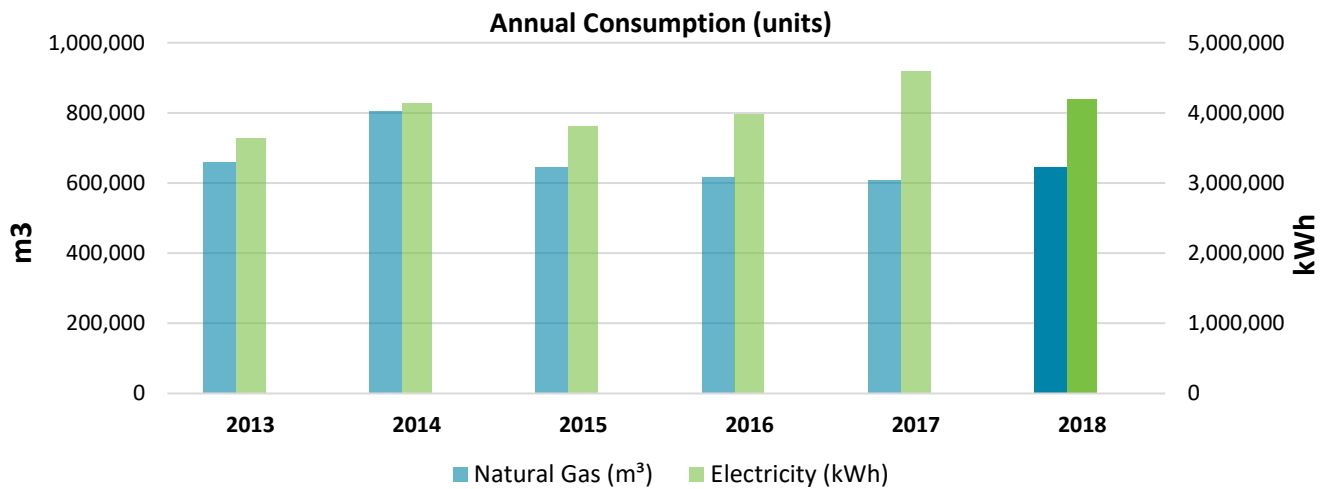


Figure 5. Historic Annual Utility Consumption for the Georgetown Hospital

4.1.2. GHG Emissions Analysis

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

GHG Emissions (tCO ₂ e)						
Utility Source	2013	2014	2015	2016	2017	2018
Electricity (scope 2)	149	170	156	163	188	172
Natural Gas (scope 1)	1,249	1,520	1,221	1,164	1,152	1,219
Totals	1,399	1,689	1,378	1,328	1,341	1,391

Table 7. Historic Annual Greenhouse Gas Emissions for the Georgetown Hospital

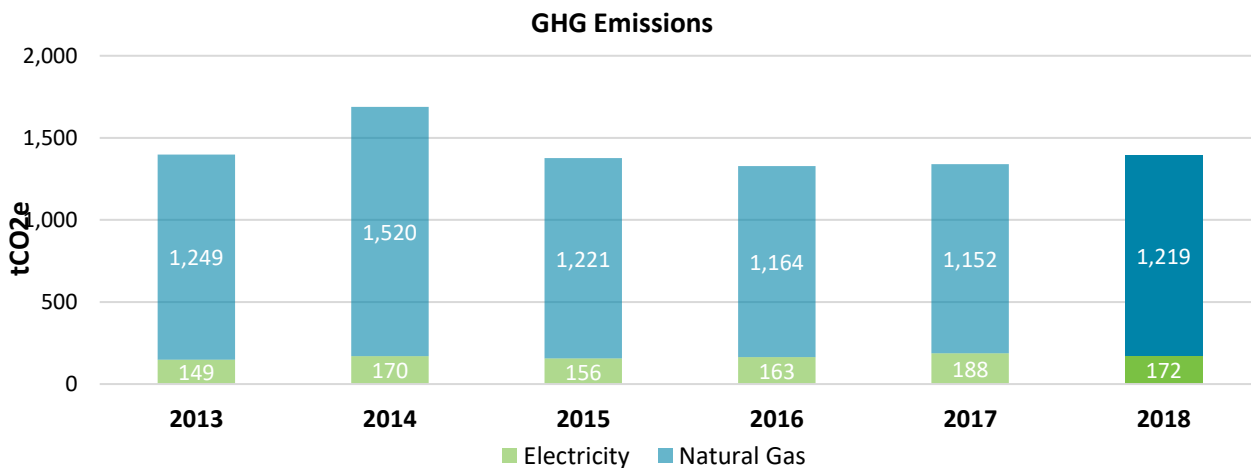


Figure 6. Historic Annual Greenhouse Gas Emissions for the Georgetown Hospital

4.1.3. Proposed Conservation Measures

Our ongoing energy analysis has revealed several conservation strategies for this facility. Georgetown Hospital’s proposed energy saving initiatives are summarized in the table below along with their high-level savings. The implementation of these measures is dependent on the availability of finances, operational decisions and government incentives. The Georgetown Hospital is being considered for replacement in the Halton Healthcare capital plan. Extensive system retrofits or system upgrades are not being considered at this time.

Measure	Estimated Annual Savings		Simple Payback (years)	Year of Implementation
	Electricity (kWh)	Natural Gas (m3)		
Air Handling Unit (AHU) Scheduling	291,325	60,287	4.57	2019
Heating, Ventilation & Air Conditioning (HVAC) System Recommissioning	1,127	15,416	3.99	2020
Energy Awareness	101,034	15,604	0.91	2019
LED Lighting Retrofit	253,581	0	6.32	2020
Total	647,067	91,307		

Table 8. Proposed Conservation Measures for the Georgetown 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	Units	% Change	Units	% Change	Units	% Change	Units	% Change	Units	% Change
Electricity (kWh)	4,198,672	0%	3,806,313	9%	3,551,605	15%	3,551,605	15%	3,551,605	15%	3,551,605	15%
Natural Gas (m ³)	645,015	0%	569,123	12%	553,706	14%	553,706	14%	553,706	14%	553,706	14%

Table 9. Forecast of Annual Utility Consumption for the Georgetown Hospital

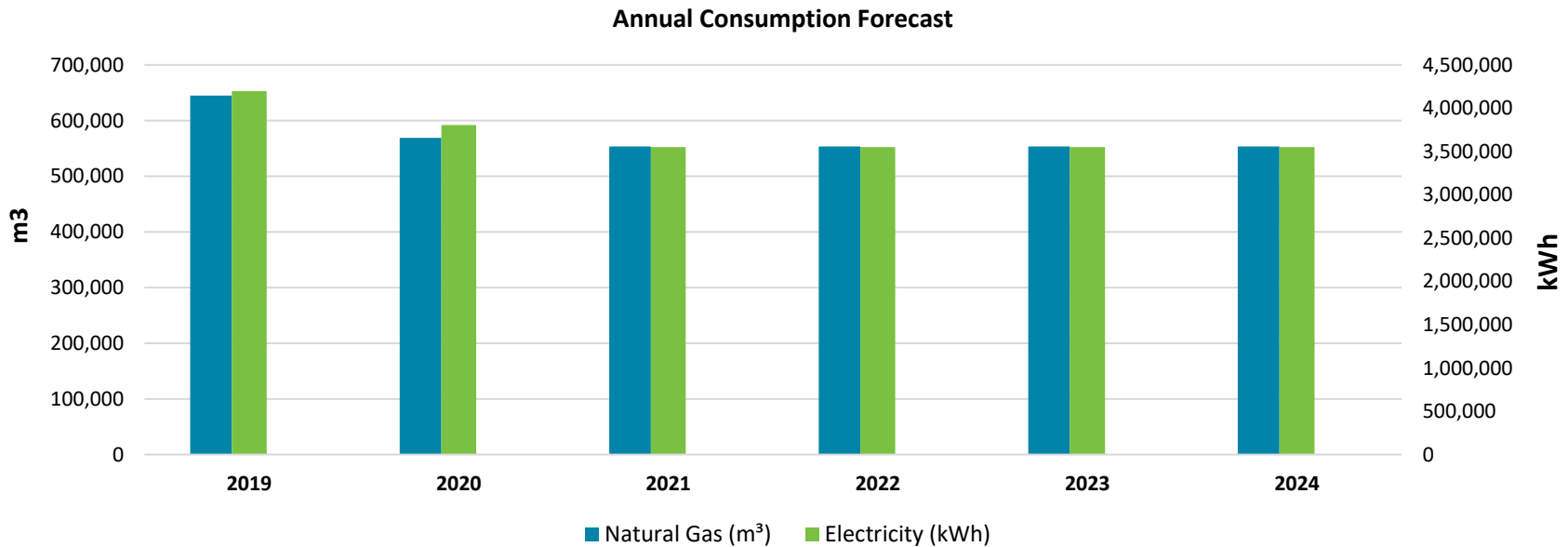


Figure 7. Forecast of Annual Utility Consumption for the Georgetown Hospital

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 2018.

GHG Emissions (tCO ₂ e)						
Utility Source	2019	2020	2021	2022	2023	2024
Electricity (scope 2)	172	156	146	146	146	146
Natural Gas (scope 1)	1,219	1,076	1,047	1,047	1,047	1,047
Totals	1,391	1,232	1,192	1,192	1,192	1,192
Reduction from Baseline Year	0.00%	11.47%	14.31%	14.31%	14.31%	14.31%

Table 10. Forecast of Annual Greenhouse Gas Emissions for the Georgetown Hospital

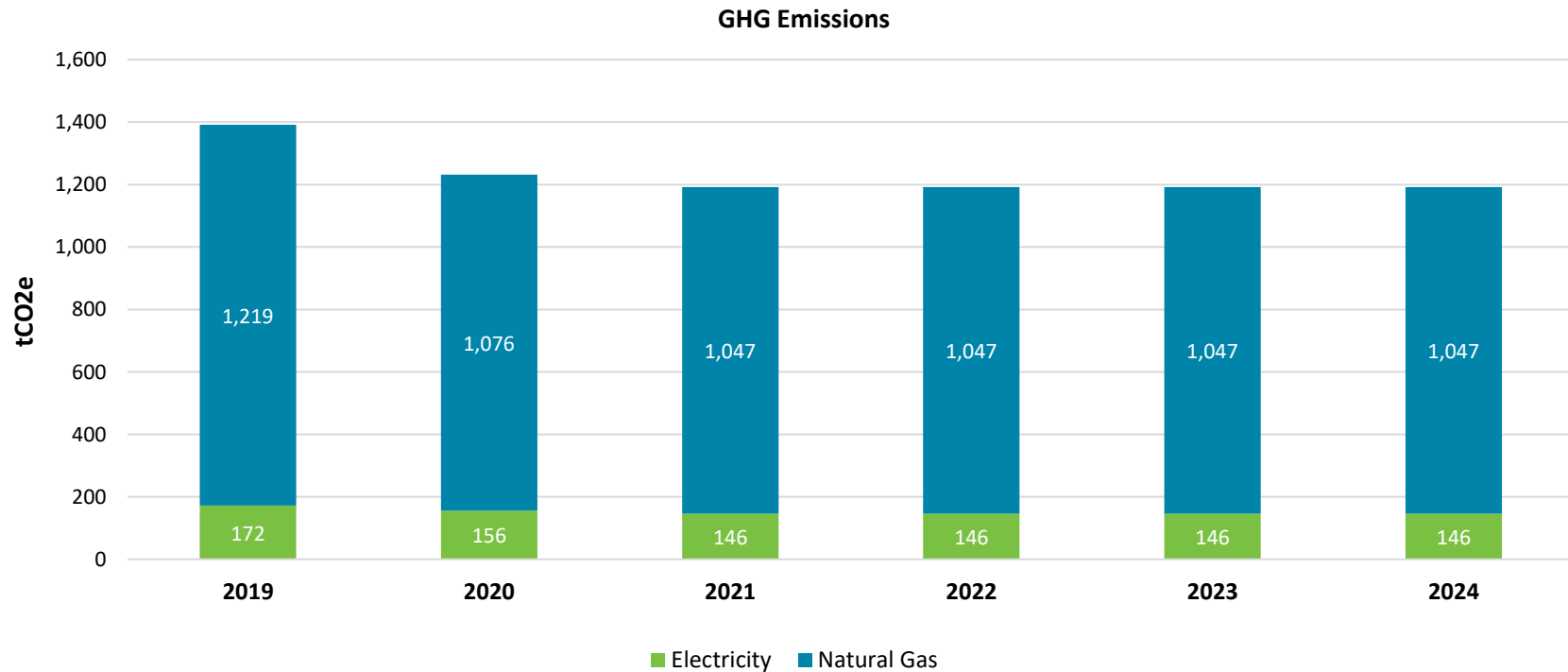


Figure 8. Forecast of Annual Greenhouse Gas Emissions for the Georgetown Hospital

4.2. Milton District Hospital



Picture 4. Milton District Hospital

Milton District Hospital is a community hospital located in Milton, Ontario, Canada. The original facility opened in 1959 and has had several major additions to the original structure. In April 2017, Milton District Hospital added an additional 26,405 m² of facility gross area. This caused an increase in utility consumption seen in the following pages. The original facility is referred to as the “North Block” and the new area is referred to as the “Center/South Block” in the proposed measure section.

Facility Information	
Facility Name	Milton District Hospital
Address	725 Bronte Street S, Milton, ON
Type of Facility	Healthcare Services
Gross Area (m2)	41,204
Average Operational Hours in a Week	168
Number of Patient Floors	3

Table 11. Milton District Hospital 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)	4,163,192	4,194,575	4,225,155	4,106,871	9,110,257	12,412,715
Natural Gas (m ³)	634,140	621,462	633,126	550,717	1,487,923	1,980,885

Table 12. Historic Annual Utility Consumption for the Milton District Hospital

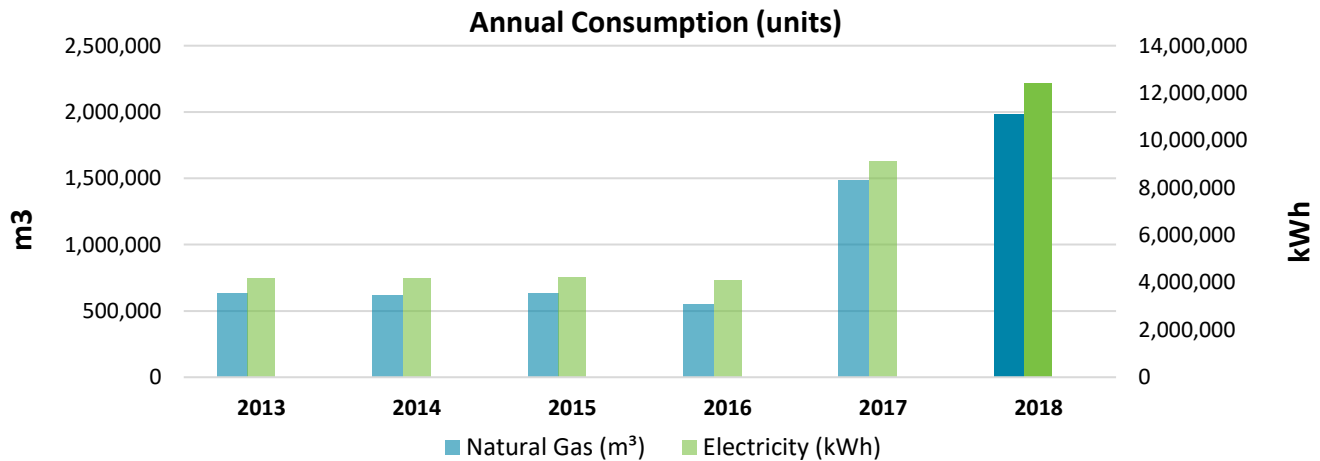


Figure 9. Historic Annual Utility Consumption for the Milton District Hospital

4.2.2. GHG Emissions Analysis

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

GHG Emissions (tCO ₂ e)						
Utility Source	2013	2014	2015	2016	2017	2018
Electricity (scope 2)	171	172	173	168	374	509
Natural Gas (scope 1)	1,199	1,175	1,197	1,041	2,812	3,744
Totals	1,369	1,347	1,370	1,209	3,186	4,253

Table 13. Historic Annual Greenhouse Gas Emissions for the Milton District Hospital

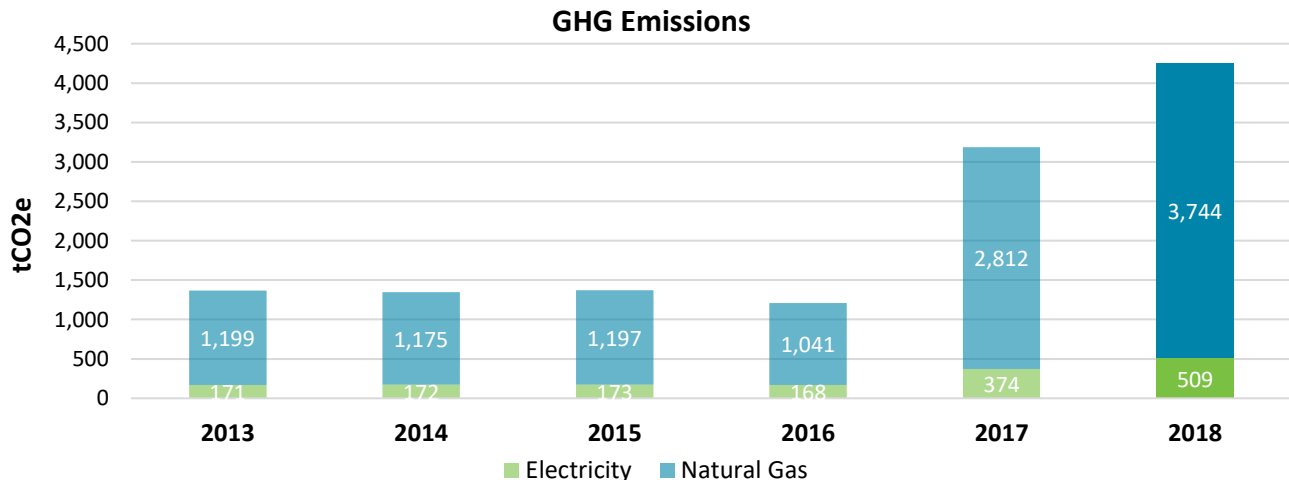


Figure 10. Historic Annual Greenhouse Gas Emissions for the Milton District Hospital

4.2.3. Proposed Conservation Measures

Our ongoing energy analysis has revealed several conservation strategies for this facility. Milton District Hospital’s proposed energy saving initiatives are summarized in the table below along with their high-level savings. The implementation of these measures is dependent on the availability of finances, operational decisions and government incentives.

Measure	Estimated Annual Savings		Simple Payback (years)	Year of Implementation
	Electricity (kWh)	Natural Gas (m3)		
Whole Building - Energy Awareness	55,857	6,339	1.72	2019
North Block MDH – Air Handling Unit (AHU) Scheduling	3,458	30,957	2.61	2020
North Block MDH - Heating, Ventilation & Air Conditioning (HVAC) Recommissioning	275,301	56,971	0.33	2019
North Block MDH - Enthalpy Wheel Control	1,836	36,992	4.80	2019
North Block MDH – Direct Digital Controls (DDC) Upgrade	410,687	55,072	10.47	2020
North Block MDH - LED Lighting Retrofit	325,162	0	6.14	2020
North/Center/South MDH - Install Solar PV system (253 kW)	289,400	0	19.46	2023
Center/South MDH – Air handling Unit (AHU) Scheduling Work	250,000	0	0.23	2019
Center/South MDH - OR Air Handling Unit (AHU) Scheduling	85,000	0	2.18	2020
Center/South MDH - Air Handling Unit (AHU) Steam Jackets Control and Humidification Control	0	150,000	1.58	2019
Center/South MDH - Hydronic Pump Optimization	90,000	0	1.81	2019
Center/South MDH - Enhanced Heat Recovery Chiller Usage	-225,000	175,000	2.54	2019
Center/South MDH - Continuous Commissioning of Set-Points	120,000	40,000	0.97	2019
Total	1,681,701	551,331		

Table 14. Proposed Conservation Measures for the Milton District Hospital

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 2018.

Annual Consumption												
	2019		2020		2021		2022		2023		2024	
	Units	% Change	Units	% Change	Units	% Change	Units	% Change	Units	% Change	Units	% Change
Electricity (kWh)	12,412,715	0%	11,844,721	5%	11,020,414	11%	11,020,414	11%	11,020,414	11%	10,731,014	14%
Natural Gas (m ³)	1,980,885	0%	1,515,583	23%	1,429,554	28%	1,429,554	28%	1,429,554	28%	1,429,554	28%

Table 15. Forecast of Annual Utility Consumption for the Milton District Hospital

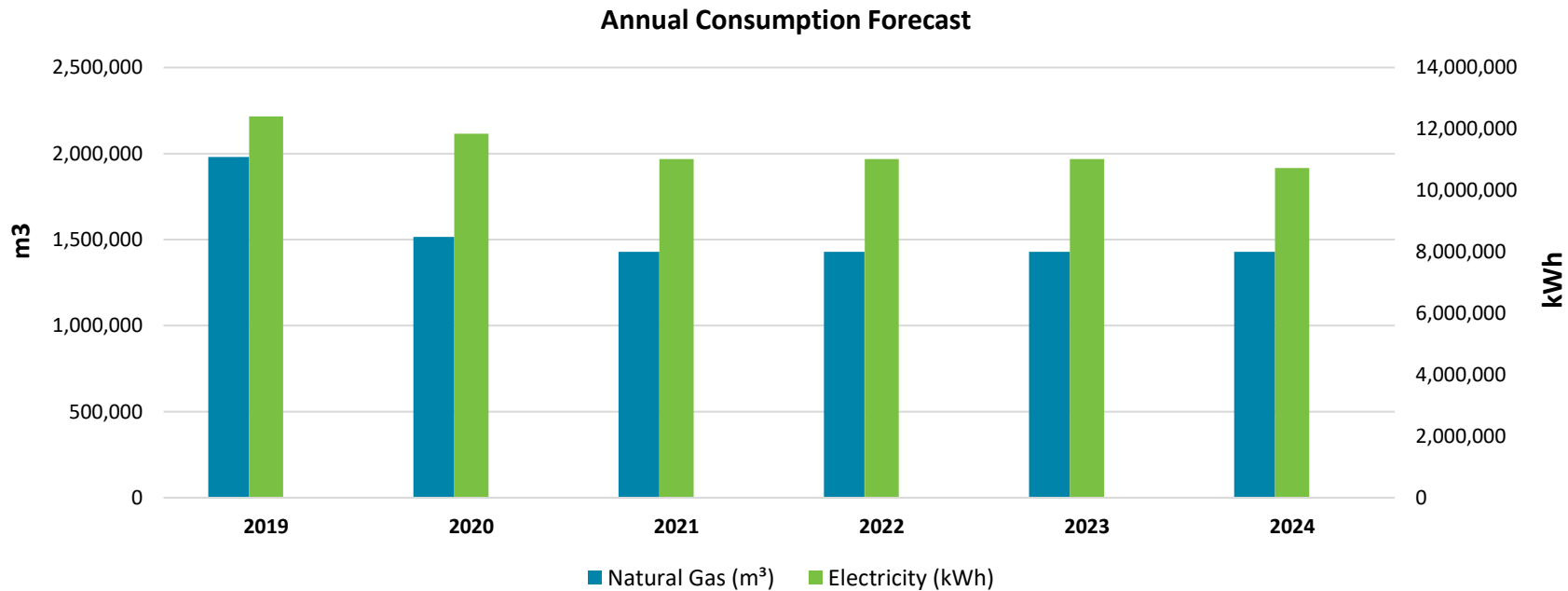


Figure 11. Forecast of Annual Utility Consumption for the Milton District Hospital

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 2018.

GHG Emissions (tCO ₂ e)						
Utility Source	2019	2020	2021	2022	2023	2024
Electricity (scope 2)	509	486	452	452	452	440
Natural Gas (scope 1)	3,744	2,864	2,702	2,702	2,702	2,702
Totals	4,253	3,350	3,154	3,154	3,154	3,142
Reduction from Baseline Year	0.00%	21.23%	25.84%	25.84%	25.84%	26.12%

Table 16. Forecast of Annual Greenhouse Gas Emissions for the Milton District Hospital

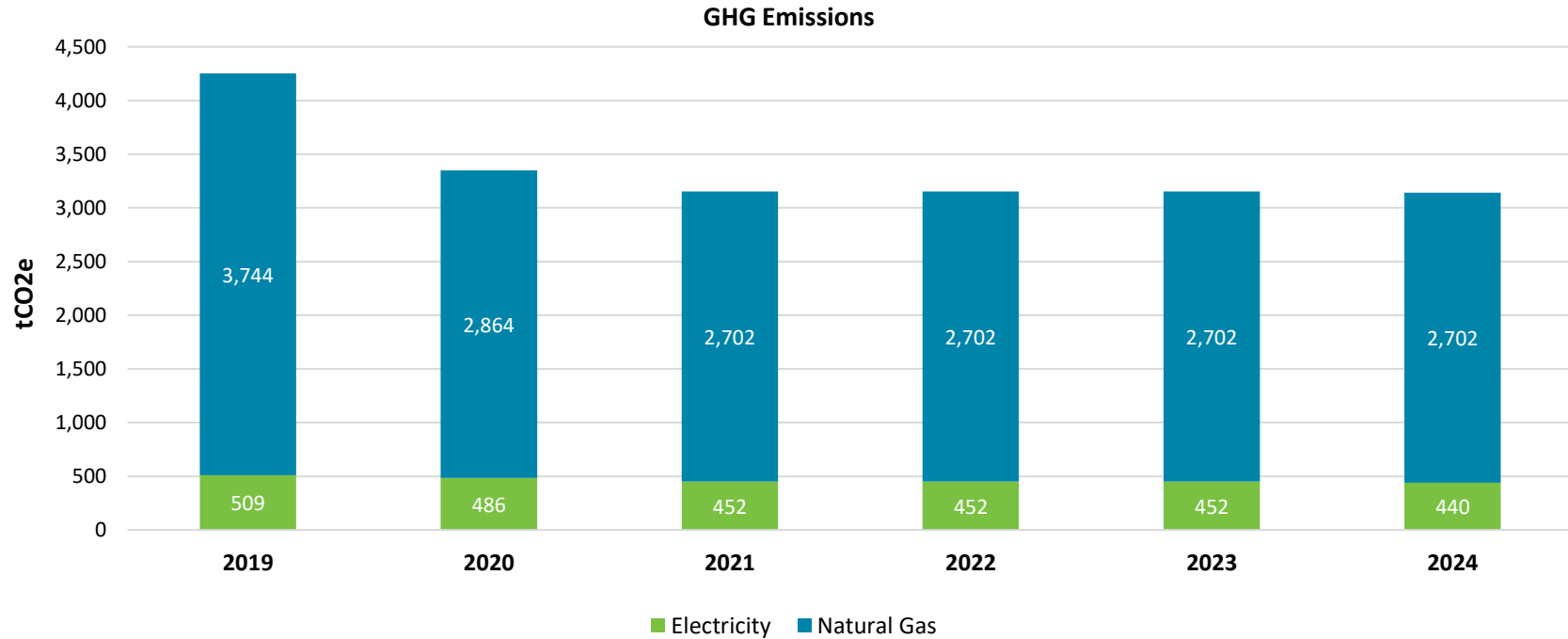


Figure 12. Forecast of Annual Greenhouse Gas Emissions for the Milton District Hospital

4.3. Oakville Trafalgar Memorial Hospital



Picture 5. Oakville Trafalgar Memorial Hospital

The Oakville Trafalgar Memorial Hospital is located at 3001 Hospital Gate in Oakville, Ontario. The hospital opened its doors in 2015.

Facility Information	
Facility Name	Oakville Trafalgar Memorial Hospital
Address	3001 Hospital Gate, Oakville, ON
Type of Facility	Healthcare Services
Gross Area (m2)	148,644
Average Operational Hours in a Week	168
Number of Patient Floors	7

Table 17. Oakville Trafalgar Memorial Hospital Facility Information

4.3.1. 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)	0	0	11,779,398	37,017,527	39,217,339	40,905,189
Natural Gas (m ³)	0	0	2,686,954	7,091,620	7,232,292	7,270,412

Table 18. Historic Annual Utility Consumption for the Oakville Trafalgar Memorial Hospital

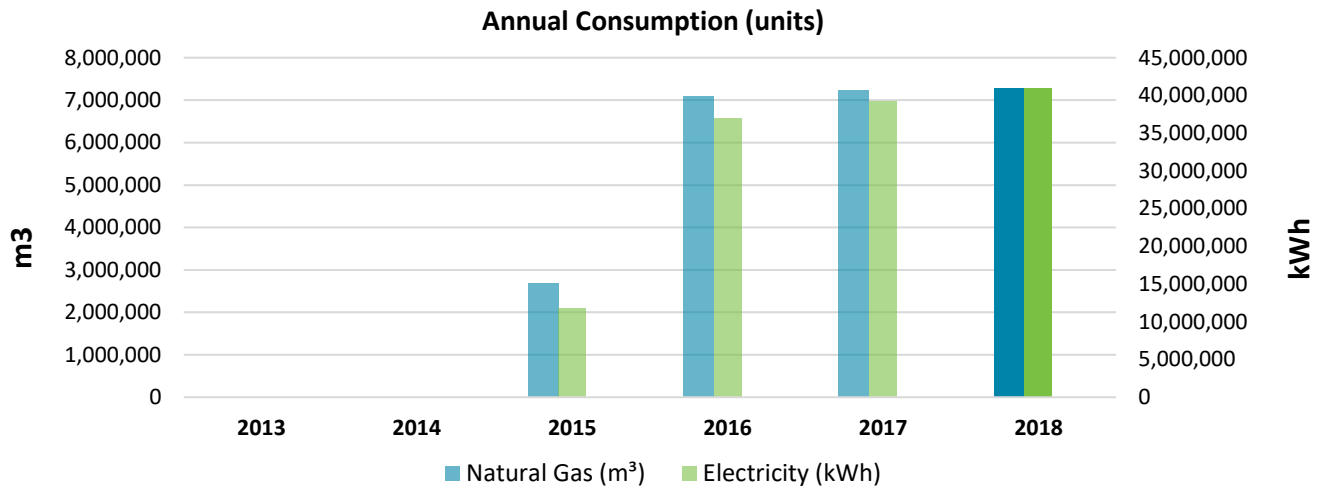


Figure 13. Historic Annual Utility Consumption for the Oakville Trafalgar Memorial Hospital

4.3.2. GHG Emissions Analysis

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

GHG Emissions (tCO ₂ e)						
Utility Source	2013	2014	2015	2016	2017	2018
Electricity (scope 2)	0	0	483	1,518	1,608	1,677
Natural Gas (scope 1)	0	0	5,078	13,403	13,669	13,741
Totals	0	0	5,561	14,921	15,277	15,418

Table 19. Historic Annual Greenhouse Gas Emissions for the Oakville Trafalgar Memorial Hospital

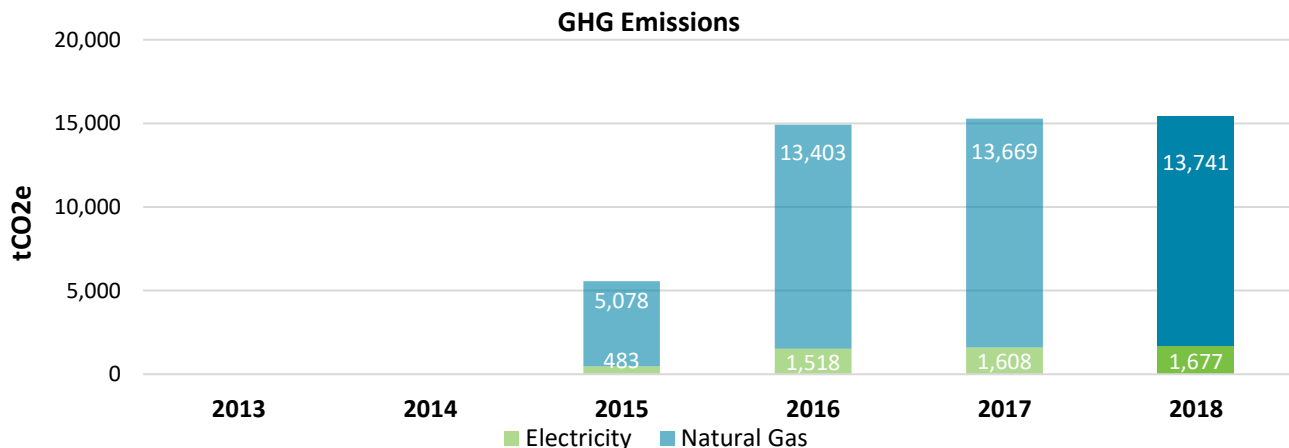


Figure 14. Historic Annual Greenhouse Gas Emissions for the Oakville Trafalgar Memorial Hospital

4.3.3. Proposed Conservation Measures

Our energy analysis has revealed several conservation strategies for the facility. Oakville Trafalgar Memorial Hospital’s proposed energy saving initiatives are summarized in the table below outlining the targeted utilities. The implementation of these measures is dependent on the availability of finances, operational decisions and government incentives.

Measure	Estimated Annual Savings		Simple Payback (years)	Year of Implementation
	Electricity (kWh)	Natural Gas (m3)		
Operating Room Fresh Air Reduction (100% to 30%)	0	65,000	0.52	2021
Heat Recovery from Blowdown and Deaerator Bleed to Atmosphere Incorporating a Boiler Blowdown Study and a Condensate Return/Water Makeup Study	0	65,000	1.21	2019
Hot Glycol/Hot Water Heating Systems (Snow Melt System)	0	51,100	0.15	2019
Reduce Hot Water Boiler Temperature from 90 to 81 C and Operate with $\Delta T = 10$ C	0	187,701	0.21	2019
Combustion Efficiency Testing & Tuning	0	255,915	0.08	2019
Produce Hot Water from Heat Exchangers in Summer	0	172,181	0.00	2019
Flushing of Reheat Coils at Variable Air Volume boxes	75,000	150,000	8.27	2019
Sequence Hot Water Boilers & Hot Water Heat Exchangers to Maximize Efficiency, Improve Honeywell Building Automation System Logic	0	60,000	0.26	2019
Isolate Steam Injection at AHUs in Summer, i.e., Prevent Summer Humidification	0	222,445	0.18	2019
Heat Recovery Chiller Optimization	0	600,000	0.65	2019
Tenant Hood Exhaust Makeup	0	39,958	0.10	2019
Install Chiller to Serve Cooling Loads in MRI and CT Operations.	42,000	0	3.53	2019
Demand Response (DR) Programming for Building Automation System (BAS) (savings are on rates charged)	300	0	TBD	2019
Hospital Education Engagement	164,121	14,977	0.19	2019
Submetering Maintenance	32,824	2,995	9.62	2019
Camfil Dura Filter Retrofit Central & West Air Handling Units	1,000,000	0	0.59	2019
Cloud Based Control System for Air Handling Units (Shift Energy)	800,000	2,500,000	0.13	2019
Improved Occupancy Sensor in Meeting Rooms and Offices	29,200	0	1.01	2019
Hot Water & Glycol Unit Heaters	0	20,000	0.98	2019
Solar PV (611 kW)	704,000	0	12.86	2023
Total	2,847,445	4,407,272		

Table 20. Proposed Conservation Measures for the Oakville Trafalgar Memorial Hospital

4.3.4. Lighting Case Study

Approach to LED Retrofit

The hospital facilities management Team continuously review opportunities to improve the facility systems and site operations. The existing facility lighting system is currently predominantly T8 fluorescent tubes, approx. 20,000 across the site with only minimal use of LED's, within the facility.

The site utilizes a highly efficient lighting control system using daylight harvesting, occupancy sensors and an illumination intensity schedule. This controls the connected power input of 1240kW reducing the actual consumption of the units to approximately 600kW. Since there is significant savings from the lighting control system, the payback of an LED lighting retrofit is not within a reasonable period.

The Team has identified an LED fitting solution that could further improve the existing system. The compatibility and savings potential will be used to develop an operational strategy for project implementation.



4.3.5. 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	Units	% Change	Units	% Change	Units	% Change	Units	% Change	Units	% Change
Electricity (kWh)	40,905,189	0%	38,761,744	5%	38,761,744	5%	38,761,744	5%	38,761,744	5%	38,057,744	7%
Natural Gas (m ³)	7,270,412	0%	2,928,141	60%	2,928,141	60%	2,863,141	61%	2,863,141	61%	2,863,141	61%

Table 21. Forecast of Annual Utility Consumption for the Oakville Trafalgar Memorial Hospital

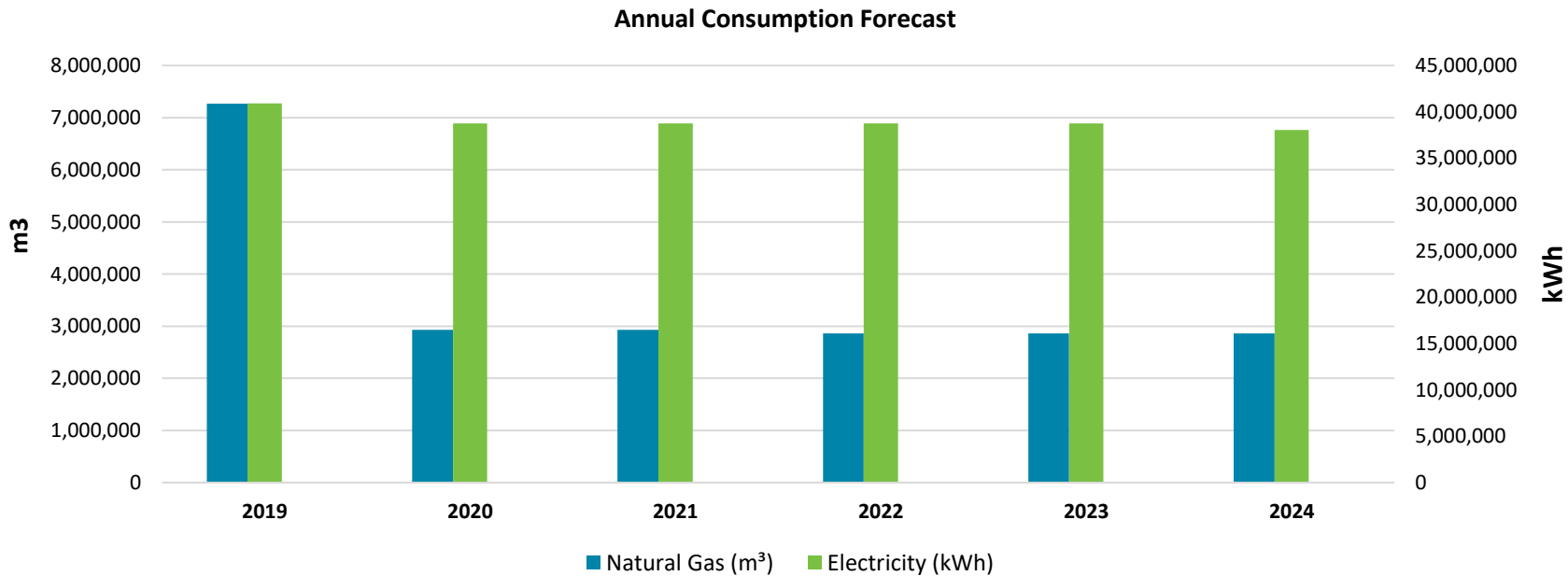


Figure 15. Forecast of Annual Utility Consumption for the Oakville Trafalgar Memorial Hospital

4.3.6. 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 2018.

GHG Emissions (tCO ₂ e)						
Utility Source	2019	2020	2021	2022	2023	2024
Electricity (scope 2)	1,677	1,589	1,589	1,589	1,589	1,560
Natural Gas (scope 1)	13,741	5,534	5,534	5,411	5,411	5,411
Totals	15,418	7,123	7,123	7,001	7,001	6,972
Reduction from Baseline Year	0.00%	53.80%	53.80%	54.60%	54.60%	54.78%

Table 22. Forecast of Annual Greenhouse Gas Emissions for the Oakville Trafalgar Memorial Hospital

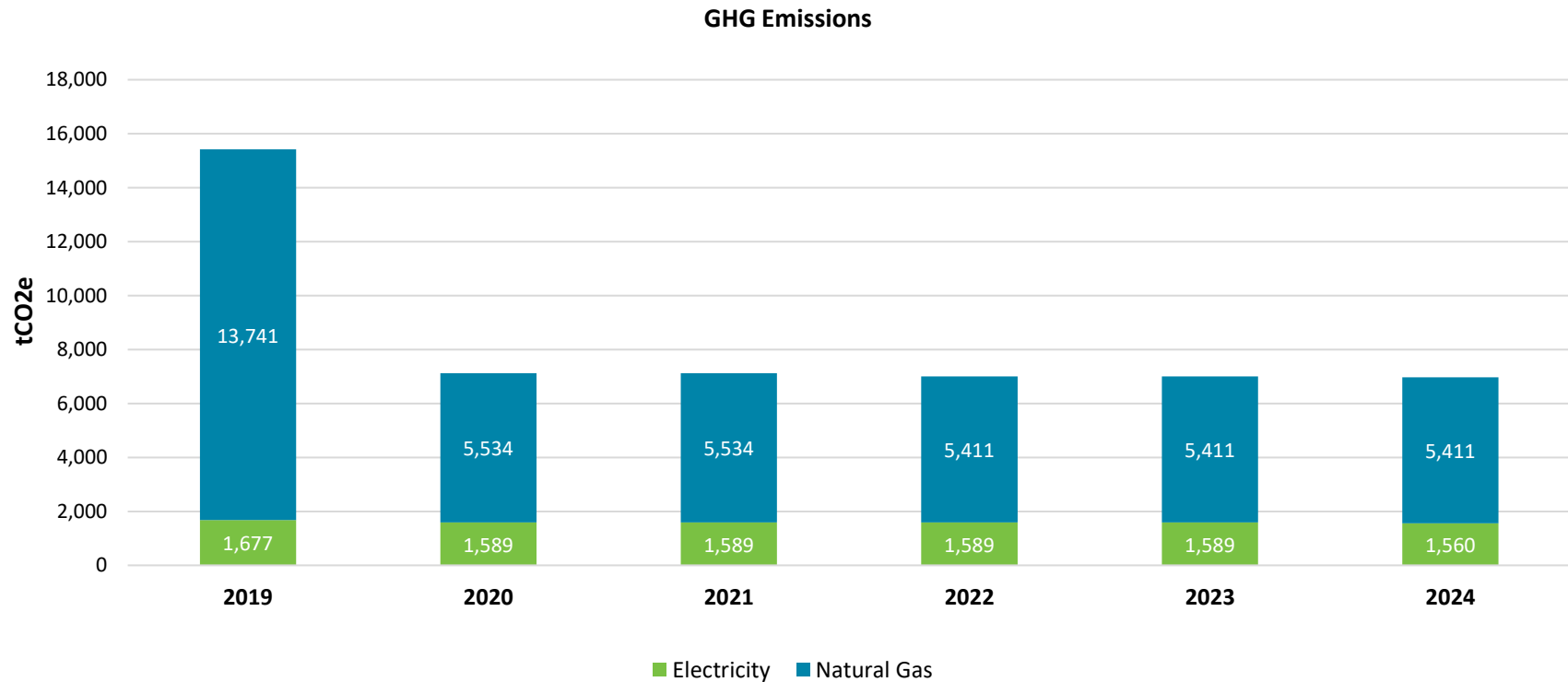


Figure 16. Forecast of Annual Greenhouse Gas Emissions for the Oakville Trafalgar Memorial Hospital

5. Halton Healthcare Outlook

5.1. Halton Healthcare Utility Consumption Forecast

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

	Annual Consumption											
	2019		2020		2021		2022		2023		2024	
	Units	% Change	Units	% Change	Units	% Change	Units	% Change	Units	% Change	Units	% Change
Electricity (kWh)	57,516,576	0%	54,412,778	5%	53,333,763	7%	53,333,763	7%	53,333,763	7%	52,340,363	9%
Natural Gas (m ³)	9,896,312	0%	5,012,846	49%	4,911,401	50%	4,846,401	51%	4,846,401	51%	4,846,401	51%

Table 23. Forecast of Annual Utility Consumption for Halton Healthcare

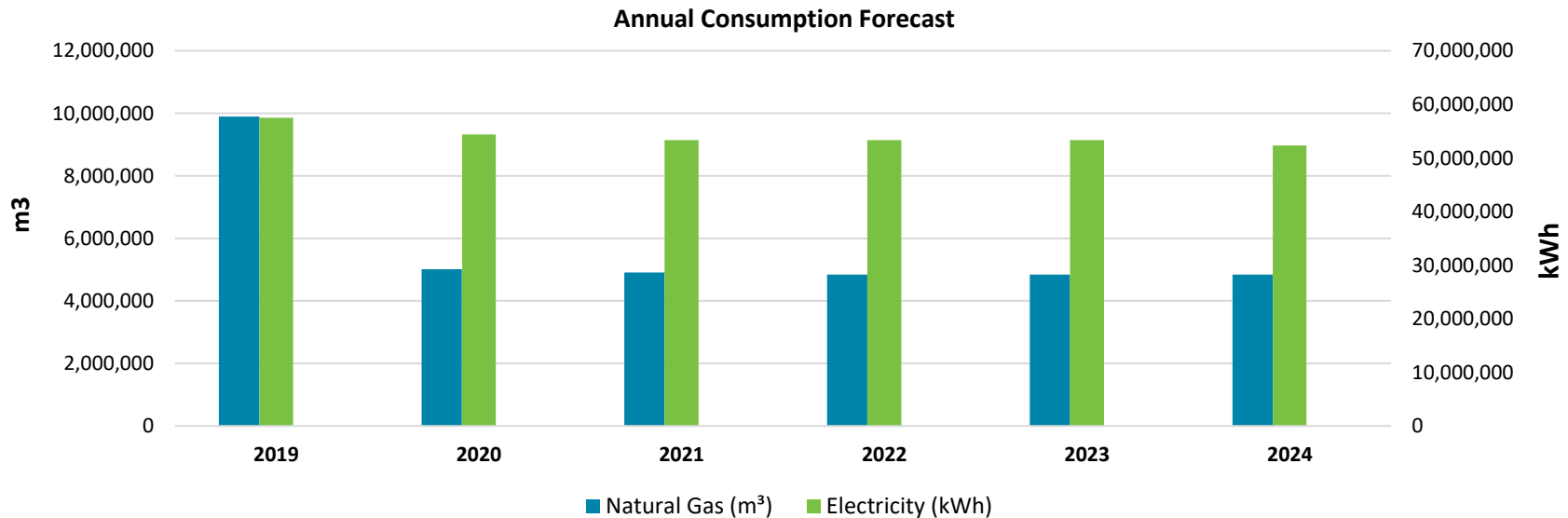


Figure 17. Forecast of Annual Utility Consumption for Halton Healthcare

5.2. Halton Healthcare GHG Emissions Forecast

The greenhouse gas emissions for Halton Healthcare are calculated based on the forecasted organization-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 2018.

GHG Emissions (tCO ₂ e)						
Utility Source	2019	2020	2021	2022	2023	2024
Electricity (scope 2)	2,358	2,231	2,187	2,187	2,187	2,146
Natural Gas (scope 1)	18,704	9,474	9,283	9,160	9,160	9,160
Totals	21,062	11,705	11,469	11,346	11,346	11,306
Reduction from Baseline Year	0.00%	44.43%	45.55%	46.13%	46.13%	46.32%

Figure 18. Forecast of Annual Greenhouse Gas Emissions for Halton Healthcare

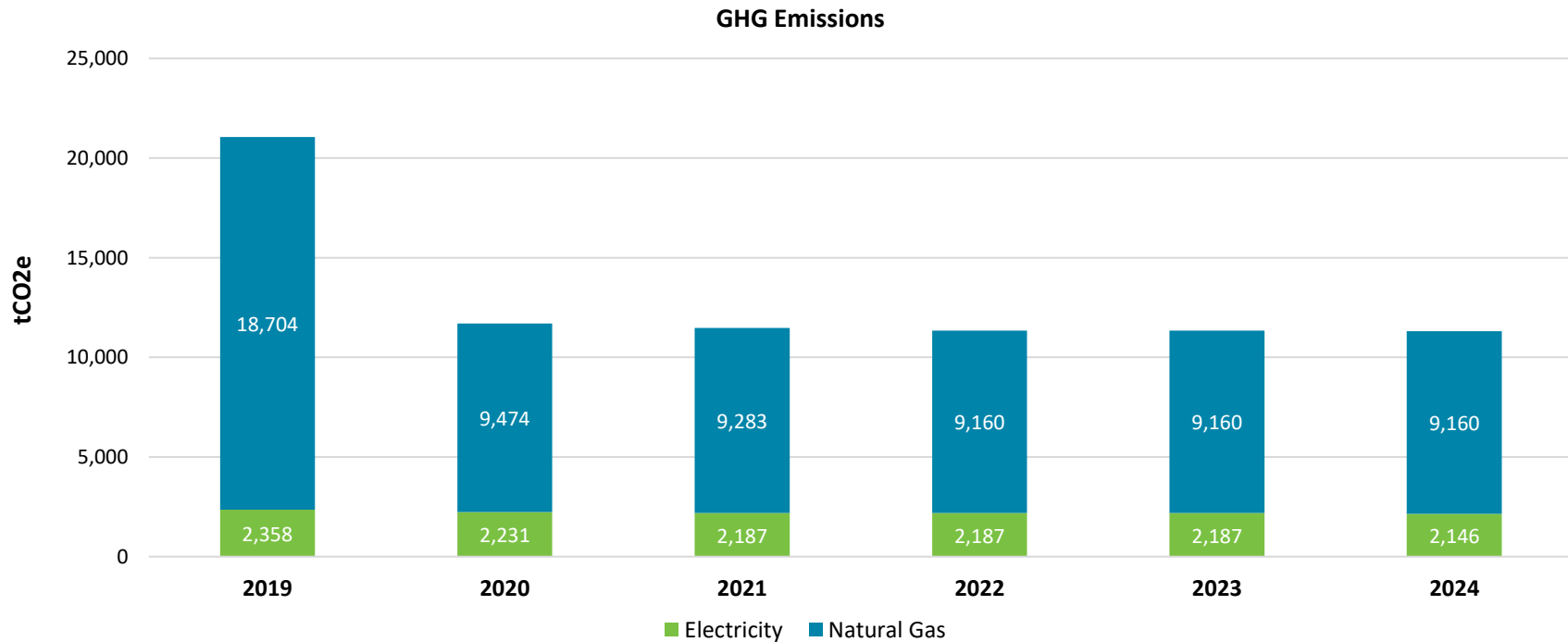


Table 24. Forecast of Annual Greenhouse Gas Emissions for Halton Healthcare

6. Closing Comments

We consider our facilities a primary source of care, and an integral part of the local communities. 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.

This Energy conservation and Demand Management plan addresses all the requirements of O.Reg. 507/18: Broader Public Sector: Energy Conservation and Demand Management Plans and has been approved by Halton Healthcare's Senior Management Team.

This ECDM plan was created through a collaborative effort between Halton Healthcare, Ellis Don, Johnson Controls and Blackstone Energy Services.

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 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.

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