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2019

Niagara Health

**Energy Conservation & Demand
Management Plan**

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1 Energy Conservation & Demand Management Plan – Overview

Originally created under Ontario's Green Energy Act, the Energy Conservation & Demand Management Plans (ECDMP) now fall under the Electricity Act and Ontario Regulation 507/18 – Broader Public Sector: Energy Reporting, Conservation, and Demand Management Plans. This CDM plan ensures that targets are met and offers a comprehensive understanding of how Niagara Health has progressed over the past 5 years, and includes the vision Niagara Health has for the future.

Promoting Energy Conservation

Not only does energy conservation decrease costs associated with energy usage, it also decreases the demand on the electrical systems. This is particularly important, as Ontario has seen an increase in prolonged heat warnings, leading to intense strain on the province's electrical system. With each energy conservation measure, the potential for blackouts associated with these strains during hot weather also decreases. This decrease in electrical demand, coupled with a decrease in natural gas demand will lead to a decrease in greenhouse gas emissions and overall costs to the organization.

Since the previously named Conservation & Demand Management Plan was first introduced, Ontario has made strides in decreasing the environmental footprint of the province. This has been done by a combination of measures, including:

- Switching to more sustainable electricity generation (primarily hydroelectricity).
- Improving the standard of efficiency in new appliances and buildings.
- Creating the "Save ON Energy" program under the IESO, which promotes energy efficient upgrades through the offering of monetary incentives.

2 Introduction

Niagara Health (NH) is a regional health system consisting of five hospitals serving over 450,000 residents across the Niagara Region. With a wide range of services across these sites, Niagara Health is able to deliver extraordinary care to every patient that enters our facilities.

The purpose of this plan is to promote and maintain environmental stewardship in the local communities, and better identify and allocate resources in order to achieve ambitious results. In keeping with our CORE values of *Compassion in Action*, *Driven by Optimism*, *Achieving Ambitious Results*, and being *Extraordinary*, Niagara Health will aim to reduce our energy consumption while promoting social responsibility to over 4,800 staff members and the community.

To obtain full value from this plan and all energy management activities, a strategic approach will be taken. This will include the consultation of Facilities Management, a review of simple return on investments, the projected lifespans of projects, and the future construction of a new Niagara South Hospital. This is all intended to provide the most efficient use of resources to better suit Niagara Health.

3 Building Survey

3.1 St. Catharines Hospital Site

The St. Catharines Hospital Site is the newest Niagara Health facility and the headquarters for all administrative operatives. This site is home to Niagara's leading cancer clinic, the Walker Family Cancer Centre, the Women's and Children's unit, mental health services, and much more.

St. Catharines Hospital Site	
Address	1200 Fourth Avenue, St. Catharines, ON
Acronym	SCS
Size (ft ²)	983,000.00
Year Build	2013
Beds	419
Emergency Service Type	Emergency Department



3.2 Welland Hospital Site

The Welland Hospital Site is Niagara Health's second largest facility, located in the heart of the Niagara Region with services ranging from the Niagara Diabetes Centre, to the Region's primary Extended Care Unit. Welland services a large population.

Welland Hospital Site	
Address	63 Third Street, Welland, ON
Acronym	WHS
Size (ft ²)	405,000.00
Year Build	1958
Beds	316
Emergency Service Type	Emergency Department



3.3 Greater Niagara General Hospital Site

The Greater Niagara General Site is located in the tourism driven municipality of Niagara Falls. As such, this hospital caters to individuals from around the world and is able to provide services ranging from day surgery, diagnostic imagining, to regional stroke services.

Greater Niagara General Hospital Site	
Address	5546 Portage Road, Niagara Falls, ON
Acronym	GNG
Size (ft ²)	333,773.00
Year Build	1958
Beds	215
Emergency Service Type	Emergency Department



3.4 Douglas Memorial Hospital Site

Located in the border community of Fort Erie, the Douglas Memorial Site often serves patients who are visiting from outside of the community. It is one of Niagara Health's small community hospitals along the shores of Lake Erie, but is still able to provide Urgent Care, and a Complex Care Unit.

Douglas Memorial Hospital Site	
Address	230 Bertie Street, Fort Erie, ON
Acronym	DMH
Size (ft ²)	94,149.00
Year Build	1931
Beds	50
Emergency Service Type	Urgent Care Clinic



3.5 Port Colborne General Hospital Site

This hospital site is located in southern Niagara along the shores of Lake Erie. As Niagara Health's smallest site, it still provides Urgent Care, a Complex Care Unit, and Niagara Health's addiction clinic, the New Port Centre.

Port Colborne General Hospital Site	
Address	260 Sugarloaf Street, Port Colborne, ON
Acronym	PCG
Size (ft ²)	37,774.00
Year Build	1951
Beds	61
Emergency Service Type	Urgent Care Clinic



4 Energy and Utility Overview

4.1 Energy Consumption

Hospitals are among the highest energy consumers in the public sector due to the nature of their facilities and being in use 24 hours a day. Knowing and understand energy consumption can help the organization make informed decisions and identify conservation opportunities (excluding water).

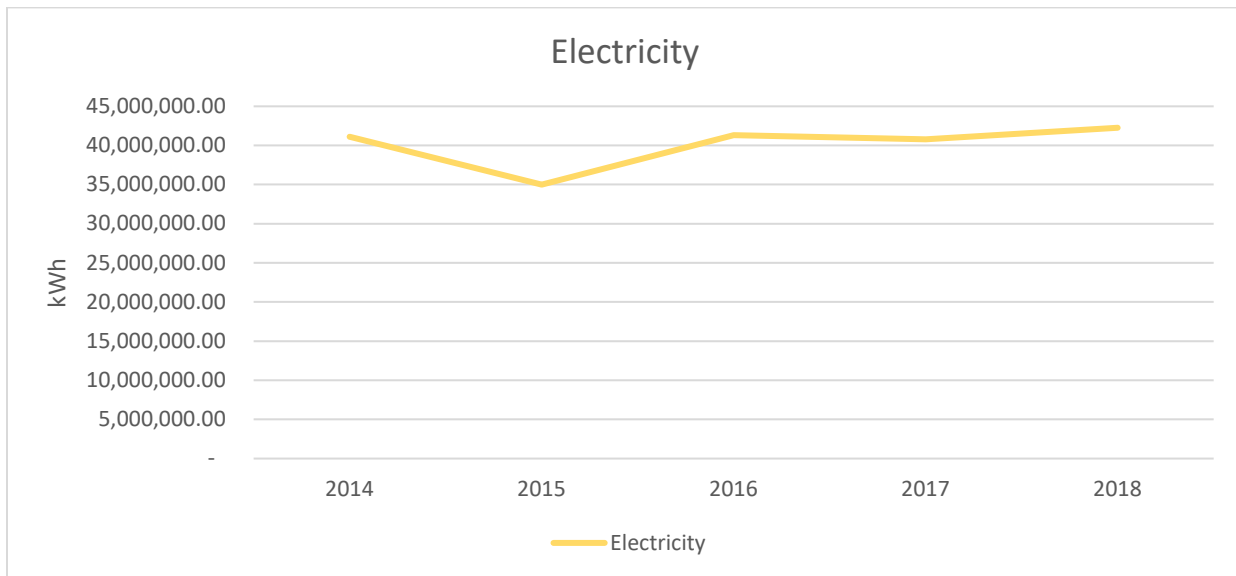


Figure 1: Electricity consumption at Niagara Health between 2014 and 2018

Between 2014 and 2018, Niagara Health saw an increase of approximately 1,145,000 kWh. Although the intention was to have a total decrease in electricity consumption, there were still significant improvements to the energy efficiency of Niagara Health's buildings through various retrofit projects. Since 2014, Niagara Health has seen a marked increase in in-patient and visitor numbers, medical interventions, and staff hiring. It can be surmised that despite the increase that is seen here, it had the potential to be a much larger difference if not for those retrofits.

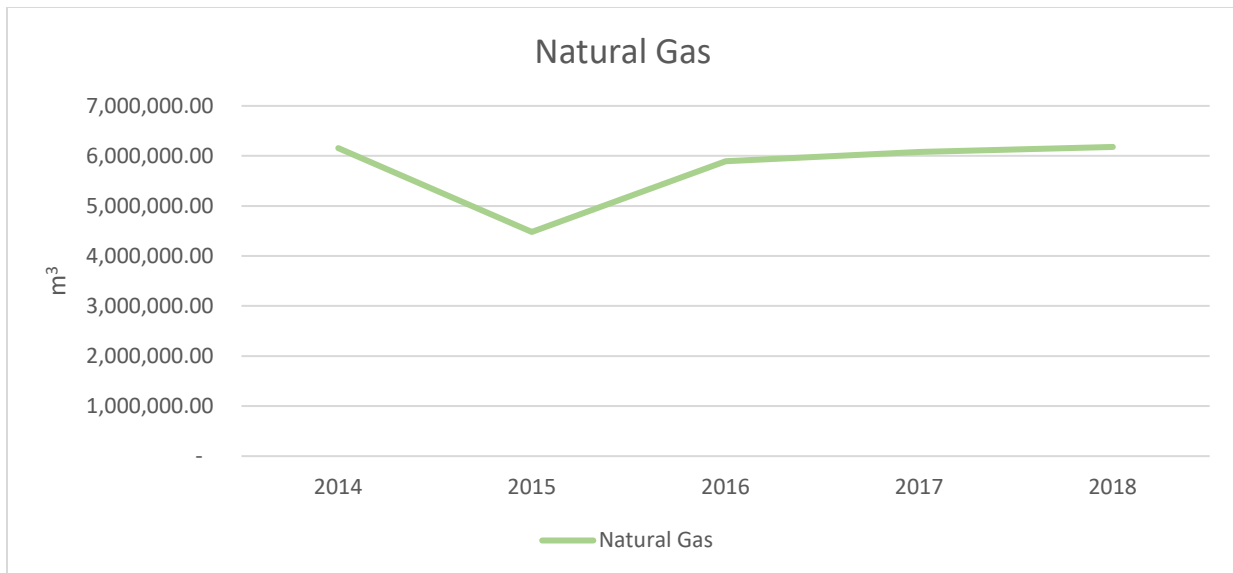


Figure 2: Natural Gas costs at all Niagara Health sites between 2014 and 2018

Between 2014 and 2018, Niagara Health saw a decrease in natural gas consumption of approximately 25,000 m³. This can be attributed to improvements in building and equipment efficiencies.

4.2 Energy Cost

In addition to having an inherent social responsibility to the community to decrease energy consumption, there is also a monetary component as well. As Niagara Health decreases energy consumption, the organization will incur lower utility costs. This, in turn, can then be spent in patient areas or on patient care. For this plan, the utilities and their costs under review are electricity and natural gas. All values shown will be the cost of delivery and total consumption prior to provincial and federal tax.

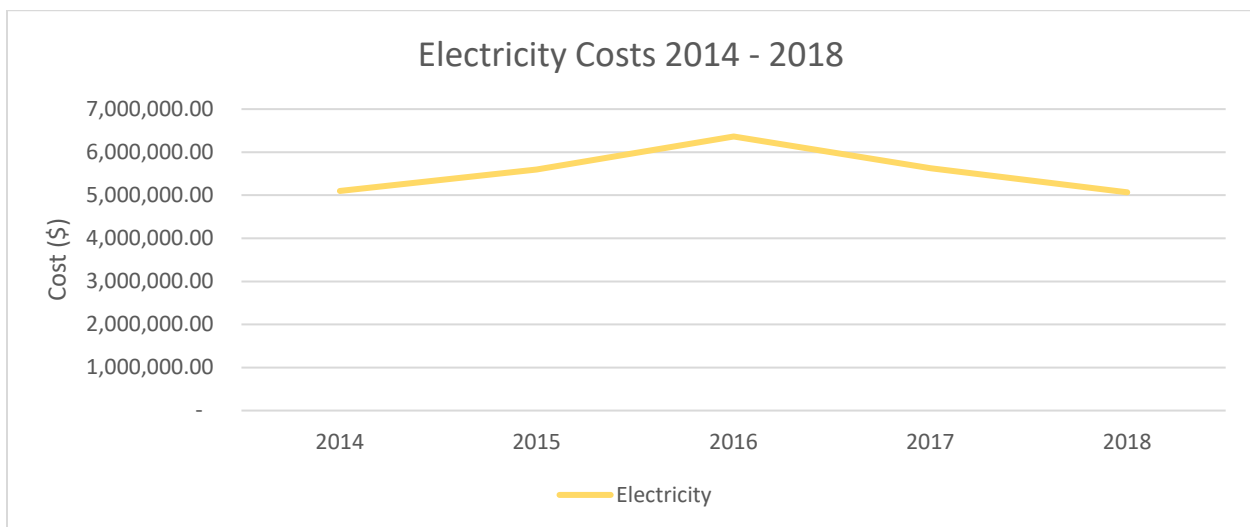


Figure 3: Electricity costs for Niagara Health between 2014 and 2018

The cost of Niagara Health's electricity in 2014 and 2018 were incredibly similar, \$5,100,630.12 and \$5,068,182.08 respectively. There is a notable increase in electricity cost in 2016 to \$6,364,065.97. This can be attributed to a warmer than average summer, requiring air conditioning units and chillers to run at higher than normal capacities.

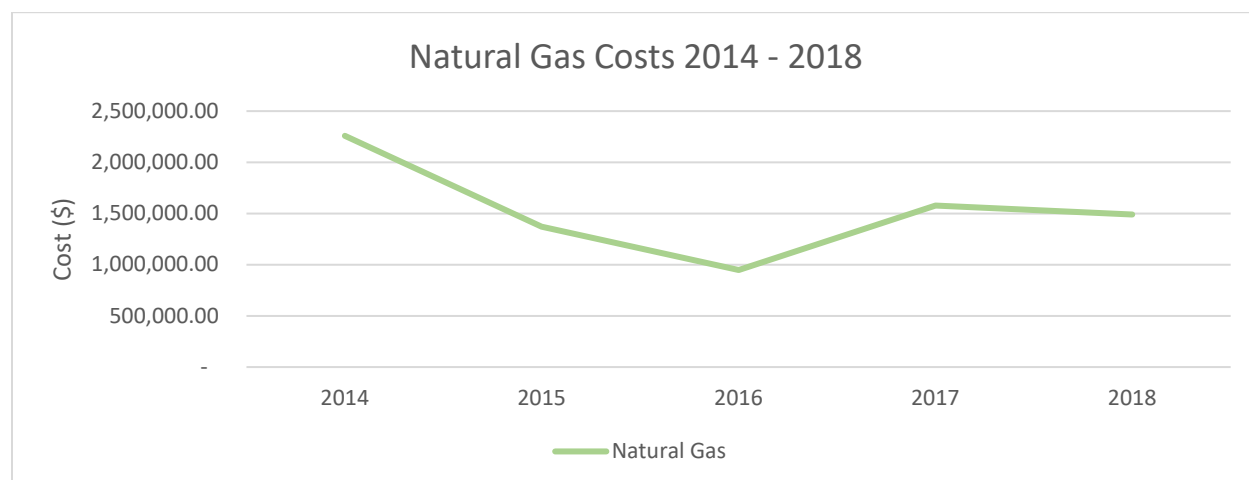


Figure 4: Natural gas costs for Niagara Health between 2014 and 2018

Between 2014 and 2018, Niagara Health has decreased the amount spent on natural gas from \$2,258,693.08 to \$1,490,150.08. This is an overall decrease of approximately 34%. This decrease in cost can be attributed to improved energy efficiency measures as outlined in *Table 2*, as well as a warmer than average year in 2016, resulting in lower natural gas consumption.

4.3 Past Project Summary

Niagara Health understands that there is the potential for documented energy savings with many of the projects that occur on a regular basis, as well as those that may not appear to have an energy related component. When possible, projects are tracked and details of project cost, assumed savings and return on investments are recorded. Not only is this vital to ensure transparency, it also allows a direct comparison to annual electricity and natural gas consumption to determine if there are noticeable decreases.

It has been found that not all projects will have a noticeable impact, as the volume of service Niagara Health provides has increased dramatically since the 2014 Plan. In these cases, it is assumed that the reduction in energy usage has offset the increases that resulted from increased services. This still indicates that the energy savings are effective and will continue to be in place going forward.

Table 1: Financial Overview of Recent Electricity Based Projects

Site	Project Type	Project Cost (\$)	Assumed Energy Savings (kWh)	Annual Savings (\$)
DMH	Lighting	42,200.69	409,944.33	49,289.29
GNG	Lighting	143,246.00	212,189.20	23,977.38
GNG	Kitchen Ventilation	19,775.00	21,551.00	2,435.26
GNG	Chiller	145,713.50	166,724.00	18,839.81
PCG	Lighting	26,897.76	50,168.18	5,669.00
SCS	Fan Optimization	10,880.00	71,755.00	8,108.32
WHS	Lighting	103,351.32	274,363.03	31,003.02
WHS	Chiller	5,650.00	100,000.00	11,300.00
WHS	Elevator Modernization	520,335.00	130,173.00	14,709.55
WHS	Kitchen Ventilation	25,044.00	25,438.38	2,874.54
Total		1,043,093.27	1,462,306.11	168,206.18

Table 2: Financial Overview of Recent Natural Gas Based Projects

Site	Project Type	Project Cost (\$)	Assumed NG Savings (m ³)	Annual Savings (\$)
WHS	Steam Trap	20,805.78	67,878.00	5,433.56
WHS	Kitchen Ventilation	25,044.00	43,606.00	15,056.00
GNG	Kitchen Ventilation	19,775.00	20,120.00	5,030.00
GNG	DHW Heater	20,573.00	55,202.00	13,800.50
Total		86,197.78	186,806.00	39,320.06

4.3.1 Douglas Memorial Hospital Site

Douglas Memorial Hospital has had extensive lighting retrofits over the past several years. This includes replacing the majority of the fluorescent lights inside with LED, and upgrading all of the exterior lighting to LED.

4.3.2 Greater Niagara General Hospital Site

The Greater Niagara General Hospital has completed several projects over the past several years in order to decrease the building's energy consumption. Of all of the projects, that with the largest scope was the replacement of fluorescent bulbs with LED bulbs, both throughout the interior and the exterior.

In 2016, the chiller servicing the hospital was inspected by a third party contractor and was found to no longer be functioning at top efficiency. Over the course of 2017 and 2018, recommendations made by the third party to improve efficiency were implemented via a chiller optimization project. These measures included the installation of a VFD and AFD, implementing a chilled water set point reset strategy, decreasing water return temperatures, and installing sensors to control the flow pump.

Electricity consumption was also decreased through the installation of a Demand Control Kitchen Ventilation system. The kitchen vent hoods were running at full capacity 24 hours a day, despite the kitchen only being in use for a small portion of the day. A variable frequency drive linked with a laser sensor was installed and was able to increase and decrease fan speeds based on ventilation needs. This led to savings both in electricity and in natural gas as the fresh air replaced through the supply fan no longer needed to be cooled in the summer or heated in the winter.

In 2018 a new domestic hot water heater was purchased and installed to replace a non-functional heater. Not only did this increase the resiliency of the system, it was also a much more efficient model compared to the alternative. Prior to the installation of the new DHW heater, a heat exchanger had been in use to fulfill heating needs.

4.3.3 Port Colborne General Hospital Site

Over the past several years, Port Colborne has had an extensive lighting retrofitting across the site. This included the majority of interior lights, as well as through on the exterior of the building and in the parking lots. The two original elevators were also retrofitted in 2017 with a new solid state system that uses less energy to operate.

4.3.4 St. Catharines Site

St. Catharines was constructed with energy efficiency in mind. It was among the first hospitals in Ontario to be a LEED certified and thus has always maintained below-average energy consumption. This was done through a variety of initiatives including passive solar light throughout patient rooms, a Building Automation System (BAS), and the installation of efficient building equipment.

More recently, in 2018 two fans in air handler units were upgraded to optimize speeds and operational times for supply, return, and exhaust fans.

4.3.5 Welland Hospital Site

As with all of the legacy sites, Welland has retrofitted the majority of all interior and exterior light bulbs with LED. Any that have not yet been replaced are currently in progress to be replaced as rooms become available.

In 2016 a third party contractor undertook an inspection of the chiller servicing the hospital. Several measures to improve the efficiency and retrofit the chillers was noted and undertaken between 2016 and 2018. This include the scoping of both chillers used for the site, installing a ClimaChek system, and implementing several of their recommendations.

The main elevator banks located at the entrance of the building were retrofitted in 2017 with a new system that uses less electricity to function, while also improving patient and visitor experience.

Electricity consumption further decreased through the installation of a Demand Control Kitchen Ventilation system. The kitchen vent hoods were running at full capacity 24 hours a day, despite the kitchen being used for only a small portion of the day. A variable frequency drive linked with a laser sensor was installed and was able to increase and decrease fan speeds based on ventilation needs. This led to savings both in electricity and in natural gas as the fresh air replaced through the supply fan no longer needed to be cooled in the summer or heated in the winter.

In addition to the decrease in natural gas consumption through the kitchen ventilation, Welland had all steam traps audited and fitted for protective steam trap jackets. This has improved staff safety and decreased thermal loss.

5 2014 Energy Conservation & Demand Management Plan Goals and Results

5.1 Conservation & Demand Management Plan Approval, Resources to Implement

In 2014, the CDM Plan had a primary goal of being approved by the appropriate levels of management at Niagara Health, which occurred. Since then there have been resources put in place and staff trained in order to continue the implementation of various goals and objects previously identified.

5.2 Implement Financial Practices and Decision Making Processes

Since the implementation of the 2014 plan, an emphasis was been placed on investing in energy efficient infrastructure, as well as identifying when and where savings occur and capturing their assumed value. Using project costs and assumed savings through energy reduction, staff are able to calculate a basic return on investment (ROI), and from there can determine if a project fits into Niagara Health's current strategic plan.

5.3 Establish Purchasing Specifications for Energy Efficient Equipment and Services

Although identified as a previous goal, there has been no specific implementation of a plan to prioritize the purchasing of energy efficient equipment and services. Despite there being no formal plan in place, the Energystar ratings do factor in to the overall decision to purchase or not purchase an item or service. For all infrastructure improvements, emphasis is placed on purchasing energy efficient items (I.e. LED lighting, HVAC systems with variable frequency drives and occupancy sensors, etc.). There is opportunity for continuous growth within this goal.

5.4 Implement Enhanced Design and Construction (D&C) Practices

No formal plan has been implemented in order to achieve this goal. Staff will continue to work with design and construction firms and place an emphasis on energy efficient improvements.

As of the writing of this report, the design process of the new South Niagara hospital is underway, and there is currently a focus on energy performance targets for the building pre and post-construction.

5.5 Improve Building Operating Performance

Niagara Health set a goal of having measured changes in our operating performance:

- Goal of reducing utility operating costs by an average of 5% between 2014 and 2018
 - Between 2014 and 2018 the operating costs accrued through the purchasing of electricity and natural gas decreased from \$7,359,323.20 to \$6,558,332.16. This is a decrease of \$800,991.04 or approximately 11%, meeting the goal set by Niagara Health in the previous plan.
- Reduce the system-wide EI from 325.59 ekWh/ft² in to 275 ekWh/ft².
 - The previous system wide EI was last calculated in 2012 and included aged and energy intense buildings that are no longer part of Niagara Health, and a LEED Certified replacement building. Due to the removal of aged buildings and the inclusion of a LEED certified building, the most recent system-wide EI is 46.24 ekWh/ft².
- Reduce energy consumption by 500,000 kWh/ year (2,500,000 kWh total)
 - Between 2014 and 2018, Niagara Health increased kWh consumption from 41,115,011.90 kWh to 42,261,142.70 kWh. This is an increase of 1,146,130.8 kWh, resulting in this goal not being met.
- Improve Energystar rating
 - Niagara Health does not currently use an Energystar rating system.

5.6 Implement Cost – Effective Facility Upgrades

Niagara Health had the goal of using life-cycle analysis to justify equipment and system upgrades and improvements. Currently, an approximate ROI is calculated in order to determine if a large equipment or system upgrade can be rationalized in order to fit with Niagara Health's strategic plan and 5-year goals. Although this is not a full life-cycle analysis, it does aid in the decision making process.

5.7 Actively Manage Energy Commodities

As outlined in the 2014 plan, Niagara Health had a goal of managing and monitoring energy consumption across the health system. This is done through a variety of methods outlined below:

- Monthly data input of all utility bills (consumption and cost)
- Annually reporting energy usage through the Broader Public Sector reporting portal
- Annually reporting energy consumption to Greening Healthcare in the form of the Ontario Hospital Scorecard

6 Energy Intensity and Emissions

6.1 Energy Intensity

In order to accurately determine the efficiency of Niagara Health's building, the Energy Intensity (EI) was calculated based on the equivalent kilowatt-hours (ekWh) consumed by square footage. This provides a value that can be directly compared to similar organizations, and already takes into account the total geographic footprint of the building.

The EI is determined by combining electricity consumption (kWh) and converting natural gas consumption (m³) into ekWh. The combined total ekWh is then dividing by the facility's floor space.

Table 3: Niagara Health's Energy Intensity between 2014 and 2016

Year	ekWh/ft ²
2014	48.61
2015	42.12
2016	46.24

The values for Niagara Health EI is available for 2014, 2015, and 2016 due to the timing of the Broader Public Sector reporting. There has been a substantial decrease in the system-wide EI since the last CDM plan. This can be attributed to fewer hospitals and buildings within Niagara Health, the St. Catharines Hospital being a LEED certified building, and the energy retrofits that have occurred across all sites.

6.2 Green House Gas Emissions

Greenhouse Gas emissions are a measure of the equivalent tons of carbon dioxide (T CO₂e) emissions generated by the consumption of various energy sources used to run the hospitals. These emissions directly contribute to climate change. Typically Greenhouse Gas emissions are created using scope 1 (natural gas), scope 2 (electricity), and scope 3 (water) usage. As this report focuses on energy used by Niagara Health, the emissions are created using scope 1 and scope 2.

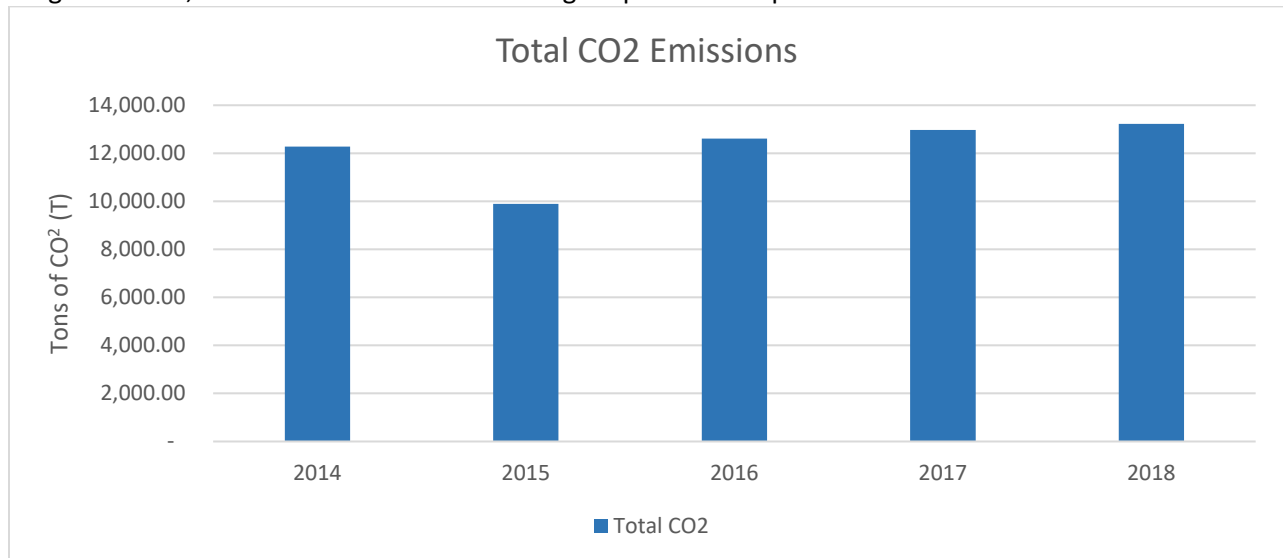


Figure 5: Tons of CO₂e Produces by Niagara Health between 2014 and 2018.

The overall carbon emissions produce by Niagara Health increased slightly from 2014 to 2018 with a difference of 937 tons. As mentioned previously, this is attributed to the increase in patient visits and services that have been offered at Niagara Health.

7 Energy Conservation & Demand Management Plan Goals

In order for this Energy Conservation & Demand Management Plan to be successful in the long-term, adequate plans and targets need to be made and set. Using data shown throughout this plan, areas of interest have been targeted and will be explored further.

7.1 Goal: Receive Support for Future Projects

As Niagara Health moves forwards in a society that places emphasis on improved social responsibility and environmental awareness, improvements will need to be made with the support of key staff. This will be a continuation of a goal identified in the previous plan.

7.2 Goal: Increase the Frequency of Environmental Initiative Programing

Create an annual schedule to in order to have environmental initiatives promoted throughout the year. This can be on a quarterly basis and can cover a range of topics. Various media types will highlight different environmental topics and aim to improve or change staff behaviors.

7.3 Goal: Improve Building Operating Performance

Niagara Health will continue to improve building performance through a variety of measures in order to achieve the following:

- Reduce energy operating costs by an average of 5% over 5 years
- Reduce Greenhouse Gas emissions by 5% over 5 years
- Reduce average energy consumption by 500,000 kWh per year
- Reduce the system-wide EUI from 46.24kWh/ft² to below 40 kWh/ft² by the 2024 plan

7.4 Goal: Monitor and Track Progress

- Track progress through monthly and annual data analysis
- Continue reporting and actively being a member of Greening Health Care and the Ontario Broader Public Sector Reporting

7.5 Goal: Implement Cost-Effective Facility Upgrades

As several of Niagara Health's sites are aging, it is important to implement cost effective projects with justifiable life-cycle analysis, and reasonable payback periods.

8 Future Energy Conservation Plans

Table 4: Priority list of current and future energy efficiency projects at Niagara Health

Site	Project Description	Type of Savings	Priority
GNG	Old Mental Health Window Replacement	Electricity Natural Gas	1
WHS	Walkway Window Replacement/Film	Electricity Natural Gas	1
GNG	Lighting Retrofit - Continuation	Electricity	1
WHS	Lighting Retrofit - Continuation	Electricity	1
SCS	Continuation of Fan Optimization	Electricity	1
WHS	Medical Gas – Waterless Vacuum Pump	Electrical	2
DMH	Window Film	Electricity Natural Gas	4
PCG	Window Film	Electricity Natural Gas	4

Definition of Priority Types

1	Currently In progress or will begin within 12 months.
2	Project has been discussed as high priority and intention is to begin within 24 months.
3	Project has been discussed as medium priority and intention is to begin within 36 months.
4	Project has been discussed as low priority and will be reviewed at a later date.

Funding:

The funding for these projects will be funded from the Hospital Infrastructure Renewal Fund (HIRF), and Niagara Health's operating and capital budgets.

Limitations:

At the time of writing, the Niagara South Hospital is in the initial planning stages after passing several legislative and budgetary milestones. The construction of the new hospital will have a direct impact on the implementing of various energy efficiency projects across Niagara Health's four legacy sites. It is understood that at a minimum, the new hospital will replace the Greater Niagara General Hospital, the cost and site lifespan must be taken into consideration during any project decisions. While projects that directly improve patient care will receive priority, additional projects will be discussed more in detail to determine if the ROI or lifespan of the project is worth the immediate investment.

9 Closing Comments

Prior to, and during the creation of this plan, plans are underway to construct a new Niagara South Hospital. Although concrete opening dates are yet to be set, the completion and opening of the new hospital will occur shortly after this plan is renewed in 2024. Due to the reinvestment and potential shuttering of undisclosed hospitals mentioned in this plan, priority and return on investments have been discussed prior to committing to targets.

On behalf of senior management at Niagara Health, this Energy Conservation and Demand Management Plan has been approved.

A handwritten signature in black ink, appearing to read 'A. Zangari', with a stylized, cursive script.

Angela Zangari

Interim President and
Executive Vice President, Finance, Operations and CFO