Kingston Health Sciences Centre

Centre des sciences de la santé de Kingston

Kingston Health Sciences Centre

Energy Conservation & Demand Management Plan (2019-2024)

In accordance with O. Reg. 507/18

July 2019

Hôpital Hotel Dieu Hospital

KGH Hôpital Général de Kingston General Hospital

Forward from the Chief Executive Officer and Director, Facilities Management

Kingston Health Sciences Centre is pleased to publish its Energy Conservation and Demand Management Plan for 2019-2024. This report is published to communicate our energy conservation plans for the next number of years and to meet the requirements of Ontario Regulation 507/18.

Our hospital recognizes the importance of utility conservation and environmental stewardship in our efforts to operate a cost-efficient healthcare facility.

We have reviewed and support Kingston Health Sciences Centre's Energy Conservation and Demand Management Plan. We look forward to the progress that our Facilities Management team will make in this next stage of our energy conservation journey.

Dr. David Pichora

Chief Executive Officer
Kingston Health Sciences Centre

Ted Splinter

Director, Facilities Management
Kingston Health Sciences Centre

Table of Contents

Introduction

Kingston Health Sciences Centre (KHSC) is southeastern Ontario's complex, acute and specialty care, research and teaching hospital. Consisting of our Hotel Dieu Hospital (HDH) and Kingston General Hospital (KGH) sites, as well as the Cancer Centre of Southeastern Ontario and our research institutes, we care for more than 500,000 patients and their families from across our region. As one of the region's largest employers, we are home to nearly 5,000 staff, more than 2,000 health-care learners and 1,000 volunteers who are committed to partnering with patients and families to ensure that we continually provide high quality, compassionate care. Fully affiliated with Queen's University, we are ranked as one of Canada's top research hospitals.

For many years, our KGH and HDH sites have embraced a commitment to energy conservation and environmental stewardship as evidenced by the numerous energy efficiency projects and energy services contracts completed across the sites over the last decade. By being a strong steward of our resources, KHSC remains in an excellent position to operate lean and cost-effective facilities, ensuring that healthcare dollars can be re-directed to patient care whenever possible.

This Conservation and Demand Management Plan outlines KHSC's energy conservation and demand management strategy for the period of 2019-2024. This plan is also published to satisfy the regulatory requirements of Ontario Regulation 507/18, Broader Public Sector: Energy Reporting and Conservation and Demand Management Plans.

Where We are Today

Southeastern Ontario is home to a rapidly aging population with growing rates of chronic diseases such as diabetes, cardiovascular and heart diseases. Unlike in more urban regions of Ontario, the 500,000 members of our community are spread out over a large geographic and mostly rural area, which can make access to care challenging.

However, these challenges can also be opportunities. We know that many of our patients do not travel outside of the Southeast region for care. As a top research facility brimming with inquisitive minds, we have the capacity to take a close look at our unique health demographics and to identify long-term solutions to address the health issues we see here in our communities. Our large rural population also forces us to think creatively about partnering with other providers to make care more available in the community and about how to make it easier to access that care.

As stewards of public dollars, we are constantly looking for new ways to ensure that our care remains affordable and sustainable within the funding provided to us as an academic hospital. At the same time, we must invest in our spaces and keep pace with technology in order to maintain our high standards of care and facilitate better flow of information for enhanced safety, convenience and coordination. This requires us to use our dollars wisely and to maintain trust with donors who support our hospital through the University Hospitals Kingston Foundation.

Organizational Changes since 2014 CDM Plan

The Creation of Kingston Health Sciences Centre

On June 28, 2016, the Boards of Directors of KGH and HDH announced that they had agreed to create a new academic health sciences centre to bring together the operations of the two hospitals. This integration became official on April 1, 2017.

The new entity, Kingston Health Sciences Centre, now operates as one hospital with one budget on two separate sites, and is overseen by one Board, President & Chief Executive Officer and Executive Team. The two existing boards chose this direction as a way to provide better, more integrated care for patients and families. As a result, KHSC will publish one CDM Plan which captures the results and goals for our two hospital sites.

Consolidation of Facilities Management Leadership

With the creation of KHSC, the KGH and HDH Facilities Management groups consolidated under the leadership of a single Director of Facilities. This role oversees facilities matters at both the KGH and HDH sites. Under this model, KHSC expects to be able to share lessons learned and energy management best practices between our two sites.

Our Mission

Our mission

We care for our patients, families and each other through everyday actions, significant moments and exciting breakthroughs.

Our Vision

Our vision

Partnering in care, discovery and learning to achieve better health for our communities while transforming our health care system.

Our Values

Our values

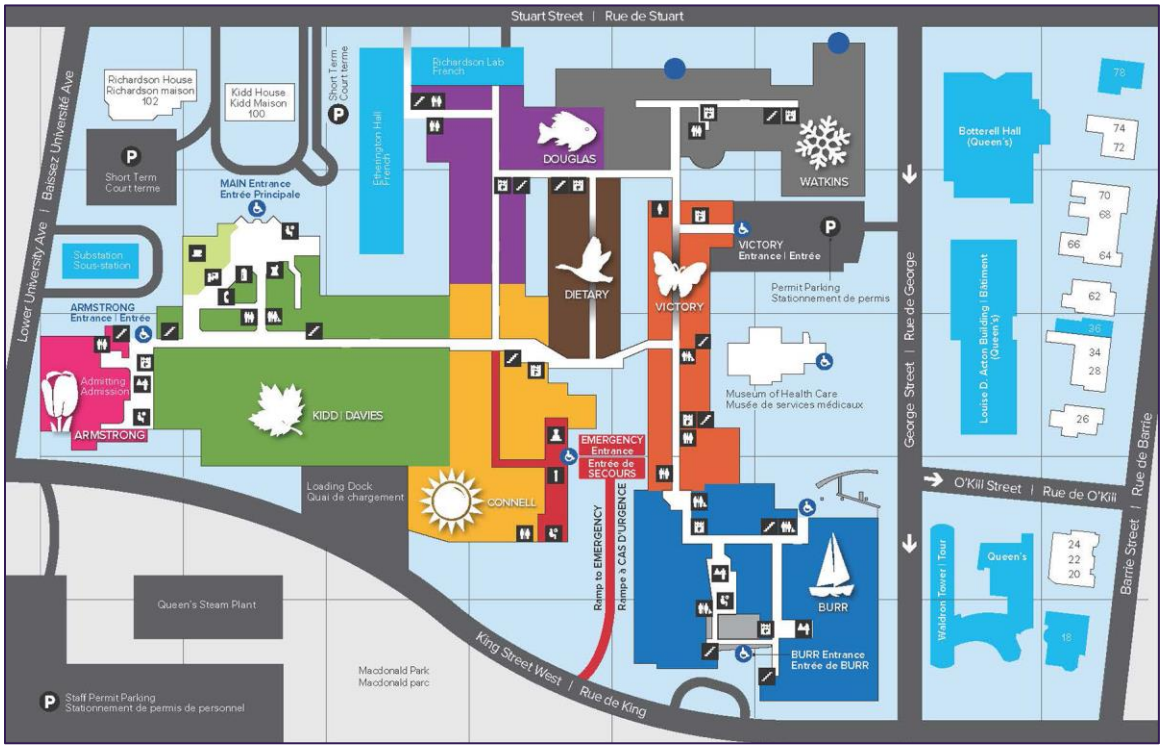
Compassion Respect Partnership
Excellence Innovation

About the Kingston General Hospital Site

Our KGH site serves as the regional referral centre for cardiac, stroke, renal, trauma, neurosurgery, pediatrics, neo-natal, high-risk obstetrics, acute inpatient mental health, and cancer care.

The KGH campus consists of nine buildings that house various medical and administrative services, as well as a series of smaller out-buildings that primarily house certain administrative services for the hospital. **Figure 1** provides a KGH site map.

Figure 1: Site Map – Kingston General Hospital

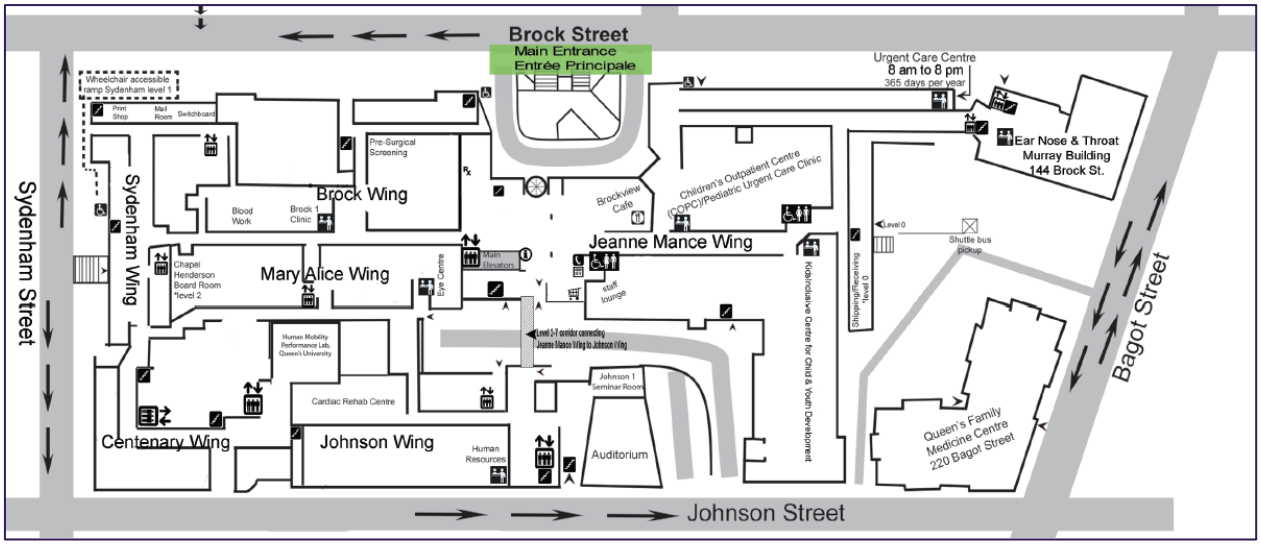


About the Hotel Dieu Hospital Site

Our HDH site offers specialized outpatient programs such as pediatrics, medicine, ophthalmology, cardiology, urology, dermatology, gastroenterology, surgery, mental health, oncology and urgent care.

The HDH campus consists of six buildings that house various clinical and administrative functions. The site also consists of multiple out-buildings, including the Queen's University Family Medicine Building, the Murray Building, and the Detoxification Centre. **Figure 2** provides an HDH site map.

Figure 2: Site Map – Hotel Dieu Hospital



Results since 2014 CDM Plan

Kingston General Hospital Site

Since 2009, KGH completed its $196 million Phase 1 redevelopment project, which added two stories to its Kidd wing and included the redevelopment of the Burr wing. In total, the project added approximately 170,000 square feet of new space and renovated 143,000 square feet of existing space within our Burr wing. Phase 1 redevelopment was completed in 2013.

Since 2014, the KGH site has continued its LED re-lamping program upon the burnout of existing T8 fluorescent lamps. Since 2014, the KGH site has retrofitted approximately 2,800 lamps, which reflects approximately 20% of the site's lighting fixtures. It has also replaced a number of air handling units and motors with high efficiency units equipped with variable frequency drives (VFDs).

However, due to increased patient demands and numerous pieces of new equipment being installed at the hospital, the KGH site's energy use on an absolute basis has increased. In 2014, the site completed its Energy Services Performance Contract with Honeywell, which has returned six-figure energy savings to the site each year since project completion.

Table 1 outlines the KGH site's energy usage between 2009 and 2017.

Table 1: KGH Site Energy Use Data

Year	Electricity Use (kWh)	Natural Gas Use (m3)	District Heating Use (GJ)	Greenhouse Gas Emissions (tCO_2e)[1]	Greenhouse Gas Emissions / Sqft (kg CO_2e/sqft)
2009	23,888,539	22,074	142,097	9,152	8.65
2014	26,019,904	234,812	156,478	9,414	7.66
2017	25,636,241	156,285	157,403	8,784	7.15

Despite an absolute increase in energy usage as a result of significant amounts of new equipment and increased floor area, the KGH site successfully reduced its natural gas and electricity use between 2014 and 2017. A slight increase in steam usage over the same period is attributed to a minor increase in heating degree days in 2017 relative to 2014.

The KGH site's greenhouse gas emissions decreased by 630 tonnes of carbon dioxide equivalent (tCO_2e) between 2014 and 2017 (6.7%). The emissions reduction was primarily driven by a decrease in natural gas usage and due to Ontario phasing out coal from its electricity grid.

Hotel Dieu Hospital Site

HDH has made a number of facilities management operational changes since it first began reporting its energy data to the province. The most notable operational change over the last number of years was the site's boiler project which, upon completion, discontinued the purchase of steam from the Queen's University central heating plant. HDH stopped purchasing steam from Queen's University in August 2014.

The decision to shift away from Queen's University steam was made after giving consideration to the deferred maintenance requirements associated with the aged steam distribution line, as well as the benefits associated with having multiple boilers on site to provide heat as opposed to a single central source. This project was completed as part of an Energy Services Contract that focused on steam-to-hot water conversion.

The site also completed a $20 million redevelopment project in 2013, which commenced in 2010. The redevelopment project added 36,000 square feet of newly developed clinical space to the Jeanne Mance wing.

Table 2 outlines HDH's energy usage between 2009 and 2017.

[1] Annual electricity and natural gas emissions factors sourced from 2019 National Inventory Report (Canada). District heating emission factors sourced from Canadian Coalition for Green Healthcare Guidance document.

Table 2: HDH Site Energy Use Data

Year	Electricity Use (kWh)	Natural Gas Use (m^3)	District Heating Use (GJ)	Greenhouse Gas Emissions (tCO_2e)[2]	Greenhouse Gas Emissions / Sqft (kg CO_2e/sqft)
2009	9,750,537	0	50,141	3,320	5.64
2014	10,388,001	427,244	36,951	3,099	4.96
2017	10,092,239	1,391,913	0	2,844	4.55

Similar to KGH, absolute energy usage has increased since 2009, but has been reduced between 2014 and 2017 for both electricity as well as heating fuels when converted to a GJ equivalent.

The HDH site's greenhouse gas emissions decreased by 255 tonnes of carbon dioxide equivalent (tCO_2e) between 2014 and 2017 (8.3%). The emissions reduction at the HDH site was primarily driven by Ontario phasing out its coal-fired power plants but was also supported by a reduction in heating fuel usage and a reduction in electricity usage.

Revised Baseline – 2019 CDM Plan

In order to better reflect the energy conservation measures and redevelopment projects that have taken place since the release of the KGH and HDH 2014 CDM Plans, KHSC will revise its baseline year for the purposes of measuring future energy conservation initiatives.

Moving forward, 2017 will be considered the KGH and HDH sites' baseline years for the purposes of the organization's Conservation and Demand Management Plan. The 2017 baseline year better reflects the conditions of the buildings in their near-current state, which allows for more accurate energy reduction measurements in the future.

Planned Energy Conservation Measures: 2019-2024

Energy Performance Contract

At present (July 2019), KHSC is in the middle stages of a procurement effort that will potentially retain the services and expertise of an Energy Services provider for the purpose of identifying and delivering energy conservation measures at the KGH and HDH sites. The vendor and scope of work is expected to be finalized by the end of 2019.

If approved, the project will identify energy conservation measures that provide guaranteed cost savings through energy conservation and demand management tactics. Upon completion, the project would represent the second large-scale Energy Performance Contract (EPC) that each site has entered into in the last 10 years, with the KGH site completing a $10.5 million EPC in 2014 and the HDH site completing its $4.9 million EPC contract in the same year.

[2] Annual electricity and natural gas emissions factors sourced from 2019 National Inventory Report (Canada). District heating emission factors sourced from Canadian Coalition for Green Healthcare Guidance document.

Identified Energy Conservation Measures

In addition to the EPC work, we have also identified our own energy conservation measures. At KHSC, energy conservation projects are generally considered viable when they achieve a simple payback of under three years or achieve slightly longer paybacks while simultaneously addressing deferred maintenance or other operational challenges.

The cost savings per kilowatt hour (kWh) reduced is variable between the sites, as the KGH site pays significantly less per kilowatt hour of electricity than the HDH site. This is a result of KGH's ability to peak shave in collaboration with Queen's University through the use of two 7.5 MW generators. **Tables 3 & 4** identify our planned CDM measures.

Table 3: Identified Energy Conservation Measures – KGH Site

Description of Project	Project Status	Est. Utility Savings	Est. Net Project Costs	Est. Annual Cost Savings
Hospital-wide Interior LED Re-lamping	Ready – Pending Funding	1,100,000 kWh	$160,000	$77,000
Exterior LED Retrofit	Ready – Pending Funding	40,000 kWh	$15,000	$2,800
Thermal Improvements Study – Re-balancing, new controls, and continued chiller optimization	Feasibility Assessment by Q2 2020	0 kWh	$15,000	n/a
Thermal Improvement Initiatives resulting from Study	Feasibility Assessment by Q2 2021	TBA	TBA	TBC

Table 4: Identified Energy Conservation Measures – HDH Site

Description of Project	Project Status	Est. Utility Savings	Est. Net Project Costs	Est. Annual Cost Savings
AC-16 Air Handling Unit Upgrade, Motor Replacement & VFD	Complete by Q2 2019	648,000 kWh	$45,000	$78,000
Exterior LED Retrofit	Complete by Q2 2019	56,000 kWh	$28,000	$7,500
Peak Shaving – Chiller Setback	Pilot Project Testing Q2 2019	300 kW (Demand)	$15,000	$135,000
Hospital-wide Interior LED Re-lamping	Ready – Pending Funding	780,000 kWh	$140,000	$93,000
AC-18 Air Handling Unit Setback & Scheduling	Feasibility Assessment by Q2 2020	200,000 kWh	$120,000	$25,000
Peak Shaving Installation (GenSet, BESS, or Ice Box)	Feasibility Assessment by Q1 2021	1.5 MW (Demand)	$3,200,000	$925,000
Air Handling Unit Occupancy Setbacks	Feasibility Assessment by Q2 2022	50,000 kWh	$20,000	$6,000

Renewable Energy Generation

KHSC does not currently generate energy from renewable sources. While the hospital is open to exploring cost effective options for renewable energy generation, it has no immediate plans to complete a renewable energy project.

Energy Conservation Goals

In order to further drive KHSC's work towards improving the energy efficiency of its buildings, we have set electricity conservation targets for each of our hospital sites.

KHSC's energy conservation goals are focused on electricity, as our steam and natural gas usage at each site is primarily driven by weather conditions. The HDH site upgraded its natural gas boiler plant in the last five years, while the KGH site purchases steam from the Queen's University Central Heating Plant. As a result, KHSC has determined that electricity is the area that each site can have the most influence on as it relates to improved energy efficiency in the next number of years.

Table 5 outlines KHSC's electricity conservation goals.

Table 5: Energy Conservation Goals – Kingston Health Sciences Centre

Hospital Site	Revised Baseline Year	Baseline Year Electricity Use (kWh)	Energy Conservation Target Year	Target Year (2022) Electricity Use (kWh)	Percent Reduction (%)
Kingston General Hospital	2017	25,636,241 kWh	2022	24,355,000 kWh	5%
Hotel Dieu Hospital	2017	10,092,239 kWh	2022	9,080,000 kWh	10%

Lessons Learned from previous CDM Plan

Since the previous CDM Planning period, KHSC has taken away a number of lessons learned regarding its energy conservation strategies. The hospital's top five lessons are outlined below.

The Business Case for Peak Shaving

- After the KGH and HDH sites integrated to form KHSC, the organization quickly realized how cost-effective peak shaving was at the KGH site.
- We aim to transfer those learnings and apply them (where possible) to the HDH site demand management program.

Scheduling and Occupancy Setbacks for non-24 hour Applications

- As a result of HDH primarily operating from Monday to Friday, HVAC system scheduling has emerged as a priority for the site.
- There are many lessons learned at the KGH site that can be applied at HDH, such as the operating theatre HVAC setback schedule that has been used at KGH for many years.

Alternatives to Energy Performance Contracts:

- Energy Performance Contracts have been used successfully at both sites in the past number of years, and have worked to address energy efficiency while also taking care of deferred maintenance challenges.
- However, in future years, KHSC will increasingly explore industry-specific energy efficiency specialists (ex. lighting companies) to deliver on smaller projects that may not make financial sense to include in a large-scale EPC.
- In the past number of years, the organization has grown its capacity to independently identify and plan cost-effective energy conservation projects.

Pursue Opportunities to Re-invest Savings

- The business case for energy efficiency is well understood by KHSC leadership.
- However, there are still opportunities to prioritize energy efficiency projects within the Facilities Management portfolio. This would allow for the financial savings from energy efficiency projects to fund other projects identified by KHSC as opposed to only pursuing energy efficiency projects if funds allow.

Hospital Funding Dollars are as Competitive as Ever

- Facilities Management understands that it must identify and propose energy efficiency projects with particularly fast payback periods in order to be considered in our cost-constrained healthcare environment.

Benchmarking Initiatives

KHSC participates in industry benchmarking initiatives to annually assess its energy efficiency and environmental performance relative to its peers. Specifically, the KGH site participates in the Greening Healthcare Initiative, which tracks and benchmarks the facility's energy efficiency data against other participating Canadian hospitals. In 2017, the KGH site ranked 23rd of 53 hospitals with respect to its energy use per square foot.

Both the KGH and HDH sites submit their annual energy and environmental performance data to the Canadian Coalition for Green Health Care *Green Hospital Scorecard* (GHS) initiative. In their most recent submissions to the GHS (2016), both sites received bronze recognition status for their overall environmental performance.

Conclusion

Now that our two hospital sites have integrated to form Kingston Health Sciences Centre, we are looking forward to the next phase of our energy conservation journey as a unified healthcare organization. While we have made considerable progress to advance environmental sustainability and utility conservation over the last number of years, we recognize that there is more work to be done.

As we continue to review and implement our planned energy conservation projects, we can look back on the success of our previous work that allowed our hospital to re-direct funding back to our core business of providing quality patient care in an environment that best suits the needs of patients, families and staff alike. Energy conservation has and will continue to be an important component of our hospital's ongoing and strong commitment to *Transforming care, together*.