Baycrest Hospital
2024-2029 Energy Conservation and Demand Management Plan

July 2024

Under Ontario Regulation 25/23, Ontario's broader public sector organizations are required to develop and publish an Energy Conservation and Demand Management (ECDM) Plan by July 1, 2024. Technical advice and analysis for this ECDM Plan were provided by Enerlife Consulting Inc.

For additional information regarding this document, please contact:

Tracey Clatworthy
Project Manager, Redevelopment
Baycrest Corporate Centre for Geriatric Care
3560 Bathurst Street,
Toronto, ON M6A 2E1
TClatworthy@baycrest.org
www.baycrest.org

Table of Contents

Part 1: Introduction

1. About Baycrest Hospital

Baycrest Hospital is an academic health sciences centre providing a continuum of care for older adults, including independent living, assisted living, long-term care and a post-acute hospital specializing in the care of older adults all within one campus. Baycrest is a leader in geriatric residential living, healthcare, research, innovation and education, with a special focus on brain health and aging.

Baycrest is committed to a sustainable future and has made significant efforts towards reducing the impact of its hospital on the environment, while ensuring occupant comfort and efficiently delivering high quality healthcare services to the community. The hospital has undertaken significant projects aimed at lowering energy use and improving facility operations. Hospital staff work diligently to operate and maintain building systems as efficiently as possible.

This Energy Conservation and Demand Management (ECDM) plan addresses Baycrest Hospital.

Table 1 Baycrest sites

Site	Address	Building Area (ft^2)	Description
Baycrest Hospital	3560 Bathurst Street Toronto, ON M6A 2E1	1,034,336	Continuing care facility

2. Planning horizon and scope

The horizon for this plan is the 5-year period from 2024 to 2029, prioritizing projects and organizational improvements which are manageable within this period.

3. Leadership in sustainability

In keeping with Baycrest's core values of efficiency, concern for the environment and financial responsibility, the hospital is an active leader in greening hospitals.

Baycrest is a member of Greening Health Care, a program that helps hospitals work together to lower energy costs, raise their environmental performance and contribute to health and well-being of communities. The hospital is also a member of the Canadian Coalition for Green Health Care, an organization that aims to build capabilities and capacity in individuals and organizations to enable an environmentally sustainable, net-zero and climate-resilient health system.

In 2022, Baycrest was awarded Green Hospital Scorecard Award for Green Hospital of the Year – Non-Acute peer group category from the Canadian Coalition for Green Health Care. The award honours Baycrest's commitment to reducing health care's ecological footprint, improving climate

change preparedness, and enhancing resiliency to better deliver the compassionate care the community deserves.

Part 2: Results from the past 5 years (2019-2023)

1. Energy and water progress compared to targets

In the previous ECDM plan posted July 1, 2019, Baycrest aimed to implement an integrated multi-year energy, management, financial and operational plan with achievable energy reduction targets. The 2019 plan objectives were to implement smart improvements which will provide immediate savings and to develop the longer-term vision and strategy for rationalizing and renewing the facilities.

1.1 Baycrest Hospital

Table 2 presents actual, weather-normalized performance results from the 2023 calendar year compared to the 2018 baseline, which resulted in net utility cost savings of $346,619.

Table 2 Baycrest Hospital: Energy and water savings vs 2018 baseline

	2019 Plan Target savings				Actual savings (2023 vs 2018 baseline)[1]			
Utility	**Units**	**%**	**$**	**GHG (tonnes eCO_2)**	**Units**	**%**	**$**	**GHG (tonnes eCO_2)**
Electricity (kWh)	4,442,087	23.0%	-	182	497,128	3.2%	$79,540	15
Natural Gas (m^3)	541,036	25.0%	-	1,022	23,941	1.2%	$7,901	46
Total Energy (ekWh)	**10,041,810**	**24.1%**	**-**	**1,204**	**744,917**	**2.1%**	**$87,441**	**61**
Water (m^3)	-	-	-	-	60,274	35.0%	$259,178	8
Total			**-**	**1,204**			**$346,619**	**69**

Monthly savings graphs help identify the periods of recorded savings or increases. On the graphs in Figure 1 through Figure 6, the blue points are actual monthly energy use, and the red points are the comparative, weather-normalized 2018 baselines. Blue dots below red represent real savings.

The electricity consumption trend over the last 5 years in Figure 1 demonstrates savings in each of the 5 years. The 5-year cumulative savings were 2,545,219 kWh valued at $407,235.

[1] Using 2024 utility rates: Electricity $0.16/kWh, gas $0.33/$m^3$, water $4.30/$m^3$.

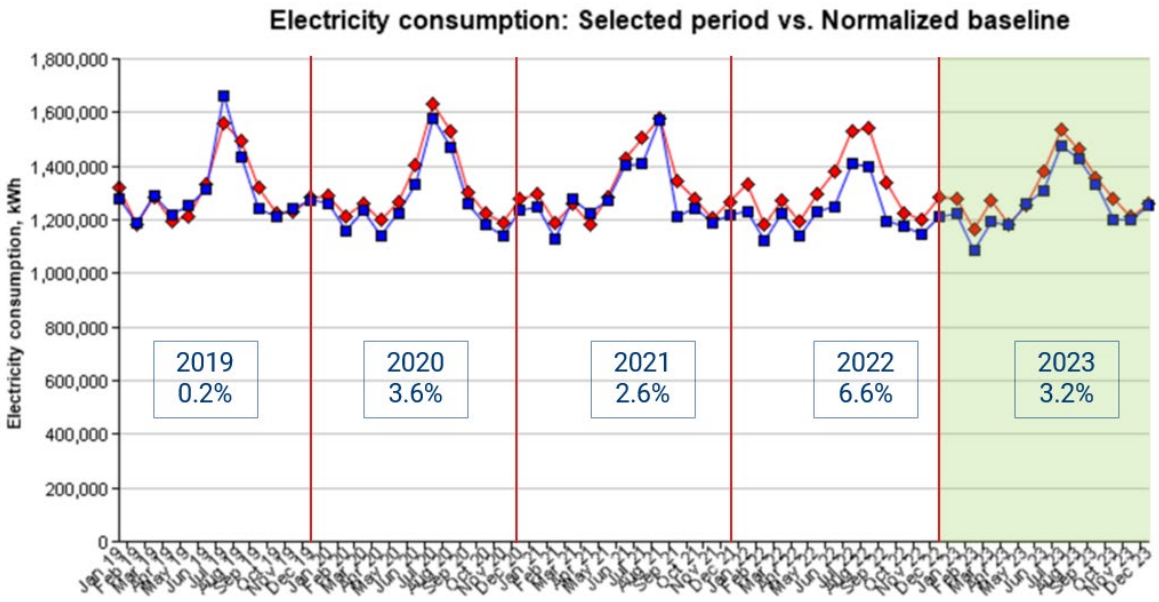

Figure 1 Baycrest Hospital: Electricity consumption (kWh) in 2019-2023 vs 2018 baseline

The natural gas trend in Figure 2 also indicates savings through each of the five previous years The 5-year cumulative savings were 390,109 m³ valued at $128,736.

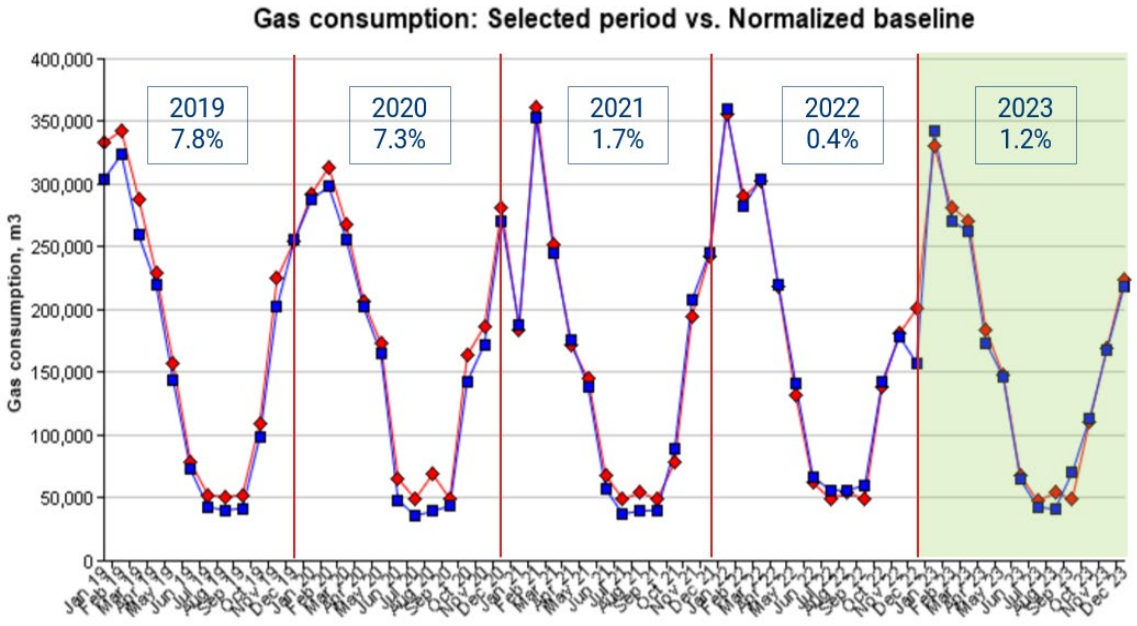

Figure 2 Baycrest Hospital: Natural gas consumption (m^3) in 2019-2023 vs 2018 baseline

The water use trend in Figure 3 shows significant savings across all five years. The 5-year cumulative improvement was 214,789 m³ valued at $923,593.

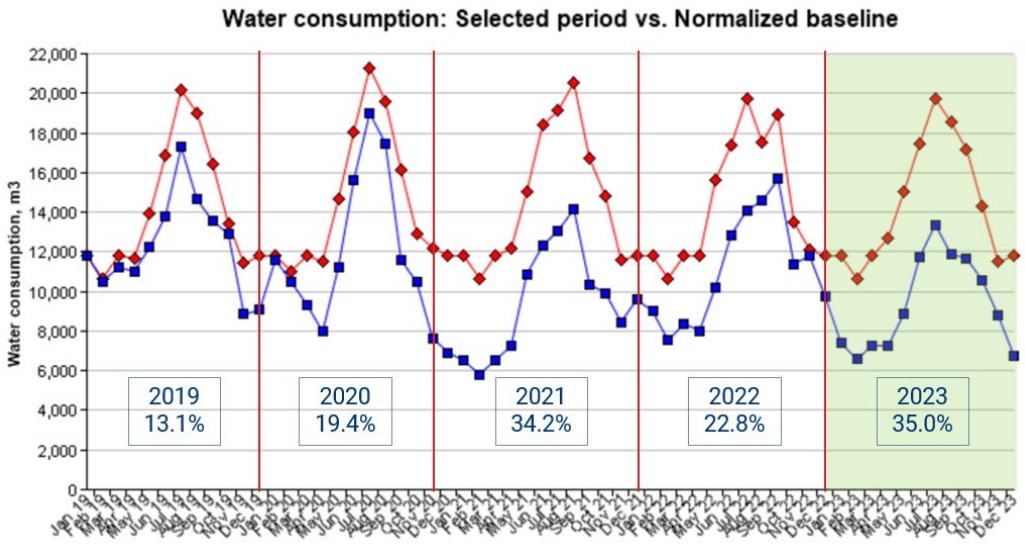

Figure 3 Baycrest Hospital: Water consumption (m^3) in 2019-2023 vs 2018 baseline

2. Measures implemented in 2019-2023

Measures proposed in 2019 ECDM plan:

Baycrest Hospital:

- Energy Awareness
- Air Handling Unit Scheduling
- Building Recommissioning
- Building Automation Upgrade (DDC upgrade)
- LED Lighting Retrofit

3. Project successes and lessons learned

Over the past five years, there have been major renovations and some significant impacts from COVID that had a major impact on operations.

The hospital is focused on improving monitoring of energy performance and reducing peak demand. Would like to make more use of interval gas data to reduce use and emissions. Will be monitoring water use closely as staff saw a big drop in water use when the cafeteria closed in 2020 with COVID restrictions. Preparing for future heat recovery is another area of interest.

Part 3: The plan for the next 5 years (2024-2029)

Baycrest has the potential to significantly improve the energy efficiency of its hospital and is working towards top-quartile positioning in the Greening Health Care energy efficiency benchmark charts. The targeted energy use reduction is 25% and 33%, by 2029 compared with the 2023 baseline. The projects and organizational measures described below are designed to achieve this goal along with utility cost savings worth approximately $974,474/year at 2024 rates and GHG emissions reduction of 1,690 tonnes eCO_2/year.

1. 2023 energy and water use

Table 4 below presents the 2023 baseline energy and water use, costs, and emissions for both Baycrest facilities.

Table 3 Baycrest 2023 energy and water use

Site	Energy Type	2023 Use	2023 Costs ($)	Greenhouse Gas Emissions (tonnes eCO_2)
Baycrest Hospital	Electricity	15,049,024 kWh	$2,257,354	984
	Natural Gas	1,899,558 m³	$627,460	3,649
	Water	113,323 m³	$509,953	1

2. Energy and water intensity benchmarks and targets

Greening Health Care sets energy and water intensity targets for its 69 member hospitals based on the average of top-quartile performance of comparable buildings in the Greening Health Care database and adjusted for weather and material site specific variables. Top-quartile is considered good practice, requiring no special technology, just consistent application of good design and operational practices which are already in wide use. Figure 7 shows the relative energy intensity of the Baycrest Hospital site in 2018, 2023 and at the target 2029 performance level which is the goal for the Plan.

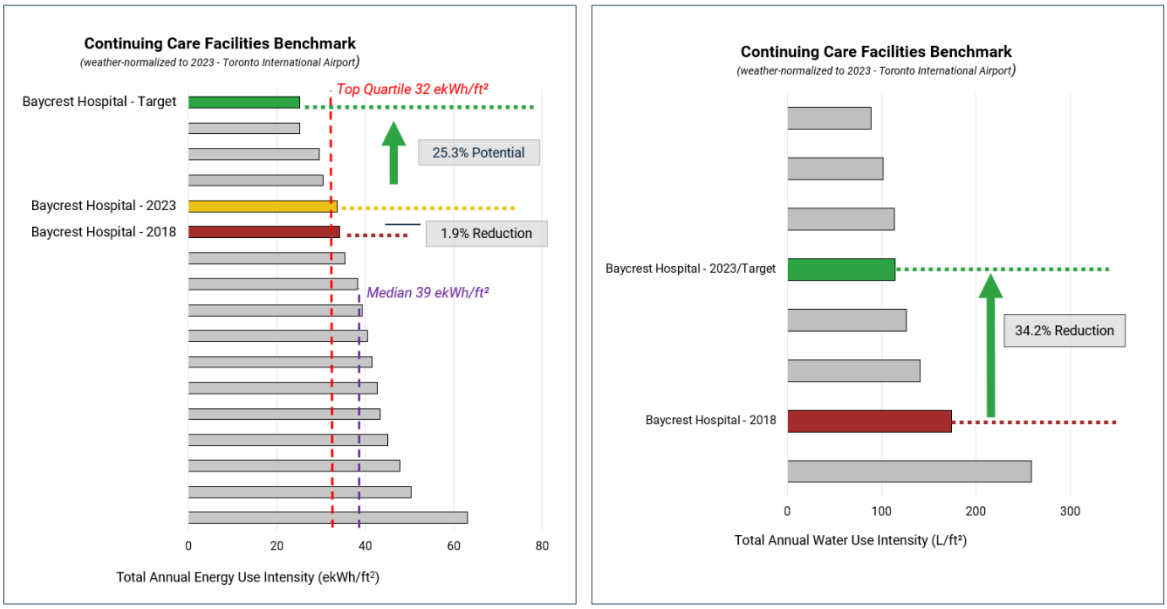

Figure 4 Annual energy intensity benchmarks for 2018, 2023, and 2029 target for Baycrest Hospital

Table 5 below presents Baycrest's current and target energy intensities once the measures included in this Plan are implemented. The energy intensities are broken down by energy components, which indicates where the greatest savings are to be found and helps direct efforts to the building systems with the biggest opportunities. The energy components and associated potential opportunities for savings are as follows:

- Base electricity systems consist of fans, pumps, equipment, and lighting. The savings potential lies mostly in fans and pumps.
- Electric cooling is air conditioning plant and equipment, with significant further savings potential in how the equipment is controlled.
- Base thermal energy is primarily used for reheat in ventilation systems, along with domestic hot water and kitchens and heating distribution losses. Isolating the radiation loop and other optimization measures will help reduce base thermal energy use.
- Heating thermal systems are space and ventilation heating and humidification, with further targeted savings potential through improved control of ventilation and scheduling optimization.

Table 4 Energy and water targets for Baycrest Hospital

Site	Energy Component	Energy Usage Intensity (ekWh/ft^2)		Annual Savings Potential	
		Actual	Target	%	$
Baycrest Hospital	Base Electricity	13.7	9.4	31.6%	$681,506
	Electric Cooling	0.85	0.78	7.5%	$10,452
	Base Thermal	6.0	6.0	0.0%	$0
	Heating Thermal	13.1	9.0	31.4%	$135,183
	Total Energy	**33.6**	**25.1**	**25.3%**	**$827,141**
	Water (liters/ft^2)	115	115	0.0%	$0
Total					**$827,141**

3. Energy efficiency measures

Table 6 and Table 7 summarize the proposed energy efficiency measures for each site together with their estimated costs, savings, and payback. No water efficiency measures are recommended at this time, as both sites have seen water savings and are meeting the water target. The energy efficiency measures are described in more detail in the following section.

Table 5 Energy efficiency projects summary – Baycrest Hospital

Measures	Implementation Year	Costs		Savings			Incentives	Payback (with incentives)	GHG emissions reductions (tonnes eCO_2/year)
Ventilation									
Install variable frequency drives and associated controls	24/25	$630,000	$1,230,000	600,587 kWh	208,024 m³	$164,742	$112,065	4.2	439
Schedule air handling units	25/26	$180,000							
Canadian Standards Association's air change rates validation	26/27	$60,000		46,199 kWh	16,002 m³	$12,672	$8,620	4.1	34
Testing and Re-balancing	26/27	$120,000		92,398 kWh	32,004 m³	$25,345	$17,241	4.1	68
Outside air % Control and Optimization	26/27	$180,000		138,597 kWh	48,005 m³	$38,017	$25,861	4.1	101
Optimize control sequence of operations	26/27	$60,000		46,199 kWh	16,002 m³	$12,672	$8,620	4.1	34
Building Automation and Lighting Controls									
System Upgrade/Expansion	27/28	$55,000	$90,000	65,999 kWh	0 m³	$10,560	$6,600	7.9	4.3
Re-programming	25/26	$35,000							
Heating plant									
Add new variable frequency drives on pumps and differential pressure sensors	24/26	$70,000	$150,000	32,999 kWh	89,610 m³	$34,851	$25,702	3.6	174
Pump Testing and Upgrades	24/25	$25,000							
Boiler plant sequence optimization and controls	27/28	$55,000							

Cooling Plant								
Cooling plant sequence optimization and controls	28/29	$65,000	98,323 kWh	0 m³	$15,732	$9,832	3.5	6.4
Lighting								
Upgrade to LED	25/26	$1,396,470	3,416,998 kWh	0 m³	$512,550	$734,680	1.3	420
Total		**$2,931,470**	**4,538,298 kWh**	**409,647 m³**	**$827,141**	**$949,222**	**2.4**	**1,280**

3.1 Ventilation system

- Optimize air handling unit (AHU) scheduling to align operating hours with departmental hours. For AHUs serving 24/7 zones, schedule variable air volume boxes in unoccupied zones to match space occupancy and adjust the AHU fan based on static pressure sensor feedback. Ensure AHU variable frequency drive (VFD) speed aligns with expected unoccupied turn-down levels during off-hours.
- Test air change rates to ensure they meet Canadian Standards Association guidelines.
- Test and rebalance airflows throughout the two sites. Refurbish ductwork and dampers as necessary.
- Ensure the correct percentage of outside air is provided when needed.
- Optimize control sequence of operations so equipment comes on when required for the most efficient and effective heating, cooling and ventilation of hospitals spaces.
- Install new VFDs complete with static pressure sensor and connect to building automation system.

3.2 Building Automation System and Lighting Controls

- System upgrade/expansion – retrofit control devices including actuators, control valves and sensors as needed to achieve savings.
- Re-programming – update building automation system programming to implement new optimized sequences of operations.

3.3 Heating Plant

- Install new VFDs on pump complete with differential pressure sensor and implement new sequence of operations.
- Pump testing and upgrades – test pumps, open triple duty balancing valves completely and rebalance by modulating the variable frequency drive speed. Field test differential pressure sensors setpoints to avoid any excessive pipe pressure losses resulting from over pumping. Reset DP sensor setpoint to match with field investigation.
- Test boiler efficiencies and confirm that the boilers are not cycling during low load conditions in the summer. Implement new sequences of operations to improve overall efficiency and performance.

3.4 Cooling Plant

- Test the chillers, pumps, and cooling towers, then implement a new smart sequence of operations to optimize the cooling plant controls. This will enhance the efficiency and performance of the cooling system, ensuring optimal operation and energy savings.

3.5 Lighting

- Upgrade the existing fluorescent fixtures to energy-efficient LED fixtures and add lighting controls where possible. This includes installing occupancy sensors to automatically turn lights on or off based on room occupancy, implementing daylight sensors to adjust lighting levels based on the amount of natural light available, integrating dimming capabilities for adjustable lighting levels, and utilizing networked control systems for centralized management and automation of the lighting (where applicable).

4 Organization role and impact

Baycrest's building operations is supported by experienced, knowledgeable facility staff. Staff are experienced in managing large renovations and upgrades implemented by third parties. They are focused on ongoing improvement and future projects.

With this in mind, the plan focuses on straightforward, operational improvements that can be implemented by current staff and service contractors. Measures were designed to minimize disruption of hospital operations. This approach provides the most likely path to successful implementation and improved facility performance.