Muskoka Algonquin Healthcare 2024-2029 Energy Conservation and Demand Management Plan

May 2024

Management sign-off

I confirm that Muskoka Algonquin Healthcare's senior management has reviewed and approved this 2024-2029 Energy Conservation and Demand Management Plan.

Signature:

Name: Cheryl Harrison Date: 26 July 2024

Title: President and CEO

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:

Tim Miller, P.Eng.
Manager, Plant and Facilities
Muskoka Algonquin Healthcare
100 Frank Miller Drive
Huntsville, ON P1H 1H7
705.789.0022 x 2234
tim.miller@mahc.ca
www.mahc.ca

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Part 1: Introduction

1. About Muskoka Algonquin Healthcare

This Energy Conservation and Demand Management (ECDM) plan addresses Huntsville District Memorial Hospital (HDMH) and South Muskoka Memorial Hospital (SMMH), which together form Muskoka Algonquin Healthcare (MAHC).

MAHC is committed to a sustainable future and has made significant efforts towards reducing the impact of its hospitals on the environment while ensuring occupant comfort and efficiently delivering high-quality health care services to our community. MAHC has undertaken projects aimed at lowering energy use and improving facility operations. Hospital staff work diligently to operate and maintain building systems as efficiently as possible with the available resources.

Table 1 MAHC sites

Site	Address	Building Area (ft^2)	Description
Huntsville District Memorial Hospital	100 Frank Miller Drive, Huntsville, ON, P1H 1H7	121,400	Acute care facility
South Muskoka Memorial Hospital	75 Ann Street, Bracebridge, ON, PIL 2E4	127,800	Acute 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 that are manageable within this period.

3. Leadership in sustainability

In 2010, MAHC joined Greening Health Care, a program that helps hospitals work together to lower energy costs, raise their environmental performance and contribute to the health and well-being of communities.

MAHC received a Silver Seal Award through the Ontario Hospital Association's Green Hospital Scorecard for environmental performance in 2015, 2016 and 2017. It also received a 2013 Bronze Seal Award through the Ontario Hospital Association's inaugural Green Hospital Scorecard for performance in 2012. The Green Hospital Scorecard is a benchmarking and recognition program that evaluates environmental performance in five areas: energy, waste, water, pollution prevention, and corporate leadership, planning and management.

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

1. Energy and water progress compared to targets

In the previous ECDM plan posted on July 1, 2019, MAHC 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 to provide immediate savings and to develop a longer-term vision and strategy for rationalizing and renewing the facilities. Both hospitals show increases in energy usage rather than savings, as COVID and other priorities meant few of the planned projects could be implemented. Additionally, COVID required modifications to the HVAC systems to prioritize high airflow and to create temporary air isolation rooms, which were not energy efficient.

1.1 Huntsville District Memorial Hospital

Table 2 presents the planned energy targets from the 2019 ECDM plan and actual, weather-normalized performance results from the 2023 calendar year compared to the 2018 baseline.

Table 2 HDMH: Energy and water savings vs 2018 baseline

		2019 Plan Target savings			Actual savings (2023 vs 2018 baseline)	
	Units	**%**	**GHG (tonnes eCO_2)**	**Units**	**%**	**GHG (tonnes eCO_2)**
Electricity (kWh)	55,073	2%	2	-264,358	-10.6%	-8
Natural Gas (m^3)	101,558	21%	194	-181,846	-36.9%	-348
Total Energy (ekWh)	-	14%	197	-	-28.3%	- 356
Water (m^3)	3,163	14%	0	7,103	32.5%	1
Total	-	-	199	-	-	-355

HDMH's electricity consumption has increased over the past five years. In 2023 MAHC consumed 10.6% more electricity than in 2018. This corresponds to an ever-increasing summer season with added cooling load.

Natural gas consumption also increased over the past five years. There were significant construction projects during this period where sections of the building were enclosed with temporary, inefficient construction hoarding.

Significant water savings were achieved across all five years. In 2023 we consumed 32.5% less water compared to 2018. This has led to a five-year cumulative savings of 30,446 m^3 of water over the five years.

1.2 South Muskoka Memorial Hospital

Table 3 presents the planned energy targets from the 2019 ECDM plan and actual, weather-normalized performance results from the 2023 calendar year compared to the 2018 baseline.

Table 3 SMMH: Energy and water savings vs 2018 baseline

	2019 Plan Target savings			Actual savings (2023 vs 2018 baseline)		
	Units	**%**	**GHG (tonnes eCO_2)**	**Units**	**%**	**GHG (tonnes eCO_2)**
Electricity (kWh)	667,886	19.1%	27	-164,574	-5.0%	-5
Natural Gas (m^3)	306,184	43.0%	586	-35,367	-5.0%	-68
Total Energy (ekWh)	-	26.5%	613	-	-5.0%	-73
Water (m^3)	3,011	13.0%	0	3,293	14.9%	0
Total	-	-	613	-	-	-73

Electricity consumption in SMMH between 2019 and 2022 remained relatively constant. In 2023, however, there was a 5% increase in consumption, corresponding to the Facilities department responding to excessive temperature issues on the north wing.

Natural gas consumption showed savings in 2019 and 2020. However, consumption increased between 2021 and 2023 which was expected due to the temporary installation of an exterior steam plant providing redundancy during an emergency repair.

SMMH also had consistent water savings from 2020 onward. In 2023 we consumed 14.9% less water than in 2018. This has led to a five-year cumulative savings of 8,876 m^3.

2. Measures implemented in 2019-2023

Muskoka Algonquin Healthcare successfully completed several of the proposed projects as outlined in the 2019 ECDM plan. Detailed project analysis determined some projects were infeasible as implementation required an unacceptable interruption to patient care, which was consistently over capacity. There were also funding constraints and other infrastructure priorities. Starting early in 2020 and continuing into late 2022, COVID-19 impacted the implementation of most projects. MAHC implemented only straightforward projects with short paybacks. This included lighting retrofits to LED across both sites, some upgrades to the Bracebridge chiller, and some equipment scheduling adjustments.

3. Project successes and lessons learned

Over the past five years, there have been successes and lessons learned, which will help make future progress and have informed the Plan.

Some of the lessons learned included:

- Prioritization changed with COVID-19, as it impacted the implementation of some projects.

- Prioritization also changed with MAHC's focus on development of new hospitals, which are expected to be ready by 2032. Proposed projects do not include replacement of long-life equipment, are low-intensive implementations with minimal interruption to patient care and have paybacks of 3 years or less.
- Facility and operations staff are already fully employed with facility maintenance, upkeep, infrastructure and equipment renovations, upgrades, and planning for the new facilities. Dedicated and focused resources would be an asset to ensuring that projects are fully executed.
- Update to CSA Z317.2:19 Special Requirements of heating, ventilation, and air-conditioning (HVAC) systems in healthcare facilities, has presented an opportunity for reduction of conditioning outside air.
- Any proposed ventilation system alteration needs to be proven to comply with the latest Canadian Standards Association regulations regarding air flows and pressurization before implementing them.

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

MAHC has the potential to improve the energy efficiency of its hospitals. The targeted energy use reduction is 30% and 22%, for HDMH and SMMH, respectively, 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 $299,870/year at 2024 rates and GHG emissions reduction of 893 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 MAHC hospitals.

Table 4 MAHC 2023 energy and water use

Site	Energy Type	2023 Use	2023 Costs ($)	Greenhouse Gas Emissions (tonnes eCO_2)
Huntsville District				
	Electricity	2,772,372 kWh	$415,856	181
	Natural Gas	680,211 m^3	$224,686	1,307
	Water	14,733 l/ft^2	$66,299	0
South Muskoka				
	Electricity	3,478,501 kWh	$521,775	227
	Natural Gas	746,745 m^3	$246,664	1,434
	Water	17,403 l/ft^2	$78,315	0
Total				
	Electricity	6,250,873 kWh	$937,631	408
	Natural Gas	1,426,956 m^3	$471,350	2,741
	Water	32,136 l/ft^2	$144,614	0

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 the top-quartile performance of comparable buildings in the Greening Health Care database, adjusted for weather and material site-specific variables. Figure 1 shows the relative energy intensity of the two MAHC sites in 2023 and at the target 2029 performance level which is the goal for the Plan.

Figure 1 Annual energy intensity benchmarks for 2023, and 2029 target for MAHC Huntsville District and MAHC South Muskoka

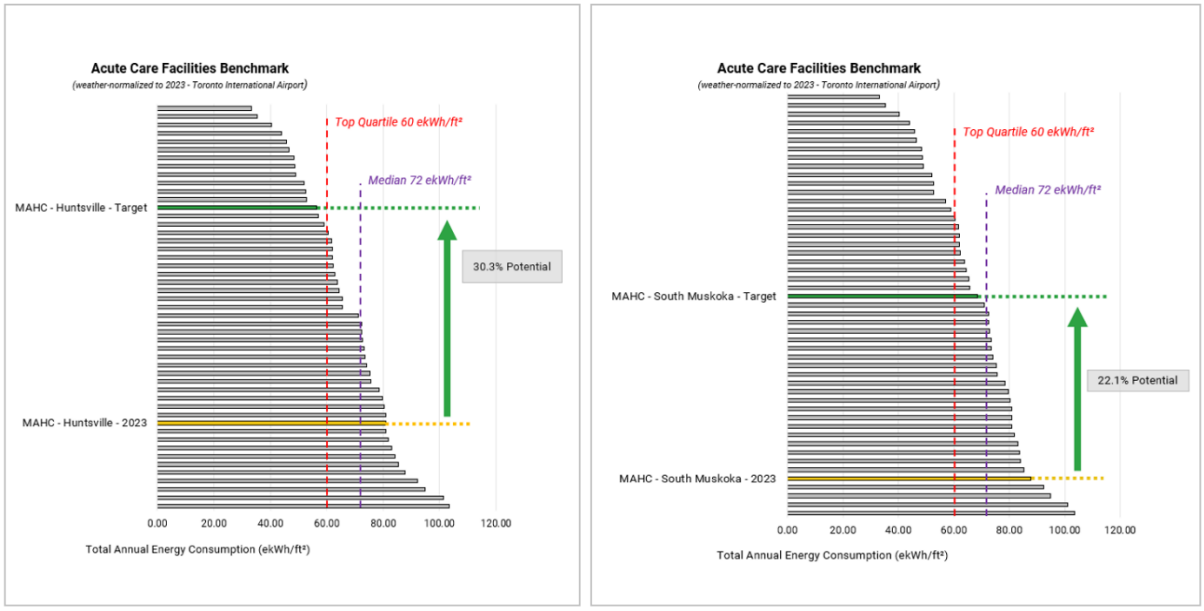

Table 5 below presents MAHC's current and target energy intensities once the measures included in this Plan are implemented. The energy intensities are broken down by energy components, which indicate where the greatest savings are to be found and help direct efforts to the building systems with the 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 5 MAHC sites energy and water targets

Site Potential	Energy Component	Energy Usage Intensity (ekWh/ft^2)		Annual Savings	
		Actual	**Target**	**%**	**$**
Huntsville District	Base Electricity	20.1	18.7	6.9%	$27,019
	Electric Cooling	2.7	1.4	49.9%	$26,479
	Base Thermal	30.8	19.0	38.2%	$45,456
	Heating Thermal	27.3	17.3	36.7%	$38,705
	Total Energy	**80.9**	**56.4**	**30.3%**	-
	Water (liters/ft^2)	121.4	121.4	0.0%	$0
	Total	-	**-**	**-**	**$137,658**
South Muskoka	Base Electricity	21.4	19.6	8.0%	$35,005
	Electric Cooling	5.9	2.5	57.5%	$69,045
	Base Thermal	40.6	27.6	31.9%	$52,814
	Heating Thermal	19.9	18.6	6.6%	$5,348
	Total Energy	**87.8**	**68.4**	**22.1%**	-
	Water (liters/ft^2)	136.2	136.2	0.0%	$0
	Total	-	**-**	**-**	**$162,212**

3. Energy efficiency measures

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

Table 6 Energy efficiency projects summary – HDMH

Measures - HDMH	New Funding Required	Savings			Incentives	Payback (with incentives)	GHG emissions reductions (tonnes CO2e/year)
Ventilation							
Install variable frequency drives and associated controls	$167,250	151,137 kWh	95,876 m³	$55,821	$39,083	2.3	194
Schedule air handling units							
Canadian Standards Association's air change rates validation							
Testing and re-balancing							
Outdoor air % control and optimization							
Optimize control sequence of operations							
Heating plant							
Investigate radiation loop, add valves, isolate loop and shut down pumps in summer	$204,000	16,718 kWh	159,156 m³	$55,196	$41,461	2.9	307
Isolate heating/steam lines in summer, add valves as required							
Boiler plant sequence optimization and controls							
Cooling Plant							
Testing & Balancing							
Add variable frequency drives to chilled water pumps							
New plant sequence optimization and controls							
Lighting							
Upgrade to LED	$25,000	50,660 kWh	0 m³	$8,106	$5,066	2.5	3
Total	**$470,750**	**334,359 kWh**	**255,033 m³**	**$137,658**	**$97,194**		**512**

Table 7 Energy efficiency projects summary – SMMH

Measures - SMMH	New Funding Required	Savings			Incentives	Payback (with incentives)	GHG emissions reductions (tonnes eCO2/year)
Ventilation							
Install variable frequency drives and associated controls	$185,750	204,111 kWh	59,831 m³	$52,402	$35,369	2.9	128
Schedule air handling units							
Canadian Standards Association's air change rates validation							
Testing and re-balancing							
Outdoor air % control and optimization							
Optimize control sequence of operations							
Building Automation and Lighting Controls							
System Upgrade/Expansion	$110,000	74,367 kWh	29,915 m³	$21,771	$14,915	4.4	62
Re-programming							
Heating plant							
Steam and boiler plant optimization	$198,000	131,904 kWh	86,504 m³	$49,651	$34,817	3.3	175
Pump testing and recommend upgrades							
Add new variable frequency drive on heating pumps							
Manually close isolation valves on air handling unit heating coils							
Isolate perimeter heating loops in summer months							
Cooling Plant							
Testing chilled water pumps flow requirements	$85,500	172,613 kWh	0 m³	$27,618	$17,261	2.5	11
Add new variable frequency drives on chilled water distribution pumps							
Optimize chiller plant sequence of operations							
Lighting							
Upgrade to LED	$50,000	67,317 kWh	0 m³	$10,771	$6,732	4.0	4
Total	**$629,250**	**650,312 kWh**	**176,250 m³**	**$162,212**	**$109,094**		**381**

Further details about the energy efficiency measures are described in more detail below:

3.1 Ventilation system (both sites)

- Install new variable frequency drives (VFDs) complete with static pressure sensor and connect to the building automation 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 VFD speed aligns with expected unoccupied turn-down levels during off-hours.
- Test the operating room air change rates to ensure they meet Canadian Standards Association guidelines.
- Test and rebalance airflows throughout the two hospitals. 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 hospital spaces.

3.2 Building Automation System and Lighting Controls (SMMH only)

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

3.3 Heating Plant

- HDMH:
    - As the heating and chiller plants compete in the summer, investigate the radiation loop to see if valves can be added. Isolate the loop and shut down pumps in summer.
    - Isolate heating/steam lines in summer, add valves as required.
    - New BAS control of the boiler plant that will be worked out with Reliable to ensure an automatic shut-off.
- SMMH:
    - Ensure proper controls are established so the steam and boiler plant run efficiently when needed.
    - 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 sensor setpoints to avoid excessive pipe pressure losses resulting from over-pumping. Reset differential pressure sensor setpoint to match with findings from the field test.

- Add new VFD on heating pumps.
- Manually close isolation valves on air handling unit heating coils.
- Isolate perimeter heating loops in summer months to ensure they don't affect or compete with the cooling system.

3.4 Cooling Plant

- HDMH:
  - Testing and balancing – test and optimize sequences of operations, including chiller staging, pump flows, and cooling tower operations, to maximize energy savings.
  - Add VFD to central heating pumps and control using a differential pressure sensor.
  - New plant sequence optimization and controls.
- SMMH:
  - Testing chilled water pumps flow requirements and adjusting to match the facility's actual operating condition.
  - Add new VFDs on chilled water distribution pumps, optimize flow and control using differential pressure sensors.
  - Optimize the chiller plant sequence of operations.

3.5 Lighting

- Continue to upgrade lighting to LED. The cost is primarily for labour, as the lamps are already stocked by MAHC.

3.6 Building Operator Staff Training

- Training will be provided as required to ensure the building operators are knowledgeable about the new equipment and operational changes resulting from the implementation of the measures.

3.7 Ongoing Monitoring, Reporting and Corrective Action

- Regular ongoing review of savings results and flagging by email of anomalies for corrective action.

4. Organization role and impact

This ECDM plan focuses on facility energy consumption reduction measures. The plan focuses on straightforward, small-scale operational improvements that current staff and service contractors can implement. Measures were designed to minimize disruption of hospital operations. This approach provides the most likely path to successful implementation and improved facility performance.

MAHC is committed to minimizing our impact on our environment and support overall sustainability initiatives. The revitalization of the Green and Sustainability Team, with the support and oversight of leadership, will develop sustainability initiatives to conserve resources, reduce waste, encourage local biodiversity, and green spaces, increase resilience, and minimize air pollution. This team will also develop insight and awareness that will be applied to the future design and redevelopment of the hospitals.