



ROSS MEMORIAL
HOSPITAL
Kawartha Lakes



Ross Memorial Hospital 2019-2023 Energy Conservation and Demand Management Plan

JUNE 26, 2019

Under Ontario Regulation 507/18, Ontario's broader public sector organizations are required to develop and publish an Energy Conservation and Demand Management (ECDM) Plan by July 1, 2019. Technical advice and analysis for this ECDM Plan were provided by [Enerlife Consulting Inc.](#)

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Executive Summary

Ross Memorial Hospital (RMH) has prepared this Energy Conservation and Demand Management (ECDM) plan (the Plan) that will reduce energy consumption and greenhouse gas (GHG) emissions, lower utility costs, upgrade building systems and provide a positive economic return on investment. The Plan presents energy savings achieved and lessons learned since the previous plan was posted in 2014, and lays out the goals, strategy and business case for the Hospital's energy efficiency investments over the next five years. We are committed to improving our energy efficiency, while maintaining occupant comfort and meeting the expectation of the general public and the Ministry of Health to efficiently deliver the highest quality healthcare services to our community.

The Plan is aligned with RMH's strategic direction of operational excellence and provides indicators and targets in line with our key priority of continuous quality improvement. It supports our commitment to community leadership in environmental awareness while the economic return on investment contributes to our corporate goals of safeguarding financial health. The Plan is posted on the Hospital's website and forms an integral part of the Hospital's public reporting.

In the previously approved Energy Act Plan posted July 1, 2014, RMH set a goal of reducing energy use by 10% over the plan's 5-year term. As discussed in Part 2, for a number of reasons, including additional service provisions to community partners and expansion of patient beds, actual energy use in 2018 was higher than the 2013 baseline. Replacement of the electricity meter in 2017 revealed that the previous meter was underreporting electricity use making the 2013 baseline incorrect, but enabling accurate measurement of electricity use going forward.

Lessons learned over the past 5 years have been incorporated into the Plan and can help us make real progress over the coming 5 years. Key among these are optimizing all heating, ventilation and air conditioning (HVAC) systems, making full use of our investment in building automation and following a fiscally prudent financial plan which will deliver an internal rate of return which is acceptable to our Board and Executive.

Benchmarking our 2018 energy and water use against other acute care hospitals of varying sizes and ages indicates the potential to lower energy use by as much as 30.8% and water use by 16.2%. These improvements would be expected to move RMH into the top quartile of the Greening Health Care¹ benchmark charts of top-performing acute care hospitals. The resulting savings could lower utility costs by more than \$500,000/year and greenhouse gas emissions by almost 1,000 tonnes/year, equivalent to the carbon sequestered by 16,300 trees grown over 10 years.

With sufficient funding and resources, we are confident that RMH could meet these targets. However, without clarity on funding sources, our initial goals for the next five years (2019 to 2023) are more modest

¹ Founded in 2004, Greening Health Care is the largest and longest serving program of its kind in North America, helping hospitals work together to lower their energy costs, raise their environmental performance and contribute to the health and well-being of their communities.

– to reduce energy use by 12.9%, and to cut water consumption by 16.2%, all measured against the new 2018 baselines. Work can be accelerated as and when funding commitments are received.

The overall strategy prioritizes working systematically to test and optimize HVAC systems’ operation and controls and to get the best efficiency out of the existing heating and cooling plants. The work will be implemented to provide consistent indoor environmental conditions as well as energy savings. We will be further upgrading the building automation system and user interface to optimize its functionality and fully integrate it into hospital operations and maintenance. We will tackle water conservation, in particular getting kitchen refrigeration equipment off domestic water cooling.

Table 1 below summarizes the energy and water efficiency improvements included in the scope of this initial plan. Implementation of these projects is projected to reduce energy use by 12.9% and to cut water consumption by 16.2% against 2018 baselines. Manageable work packages will be prioritized and scheduled over the 5-year period based on capital availability to meet our energy and water reduction goals.

Table 1 Energy and water efficiency projects summary

#	Measures (Note 1)	Budget Costs	Savings \$/year	Incentives	Payback (with incentives)	GHG Emissions Reduction (tonnes CO2e)	Estimated Measure Life (years)
1	Lighting & Controls						
	LED retrofit and controls	\$146,401	\$17,371	\$11,580	7.8	2.3	15
2	Ventilation						
	Scheduling, testing and air balancing; refurbishing ductwork/dampers; VFD installation	\$306,450	\$121,579	\$73,768	1.9	234.1	10
3	Building Automation						
	System upgrade and reprogramming	\$60,600	\$64,287	\$41,524	0.3	133.4	15
4	Cooling Plant						
	Testing, reconfiguration and optimization	\$115,000	\$22,533	\$15,022	4.4	3.0	15
5	Water Conservation						
		\$95,000	\$40,806	\$0	2.3		15
	Total	\$723,451	\$266,576	\$141,894	2.2	372.8	

Note 1: Some measures are interrelated and cannot be implemented independently

Part 1: Introduction

1 About Ross Memorial Hospital

Table 2 Sites in Ross Memorial Hospital

Site	Address	Building Area (ft2)	Description	Status in ECDM Plan
Main hospital	10 Angeline Street N, Lindsay, ON	310,003	Acute care hospital	Primary focus

Energy and Environmental Stewardship has been an ongoing commitment for Ross Memorial Hospital for many years. Our senior management is fully supportive of energy conservation projects and has a focus on the total life cycle costs of equipment retrofits and replacements. Funding is made available for energy and water conservation initiatives which provide an acceptable return on investment.

2 Planning horizon and scope

The planning horizon is the 5-year period from 2019 to 2023, prioritizing projects and organizational improvements which improve occupant comfort and are manageable within this timeframe.

3 Other goals

RMH aims to be a leader in energy efficiency and corporate sustainability among our peers. We will continue our collaboration with other hospitals through Greening Health Care, working to raise the level of environmental sustainability across the healthcare sector as a whole. Our vision will be exemplified through our Go Green Team and by engagement with our surrounding communities, including events such as Earth Day which serve to reinforce a strong community sense of sustainability champions.

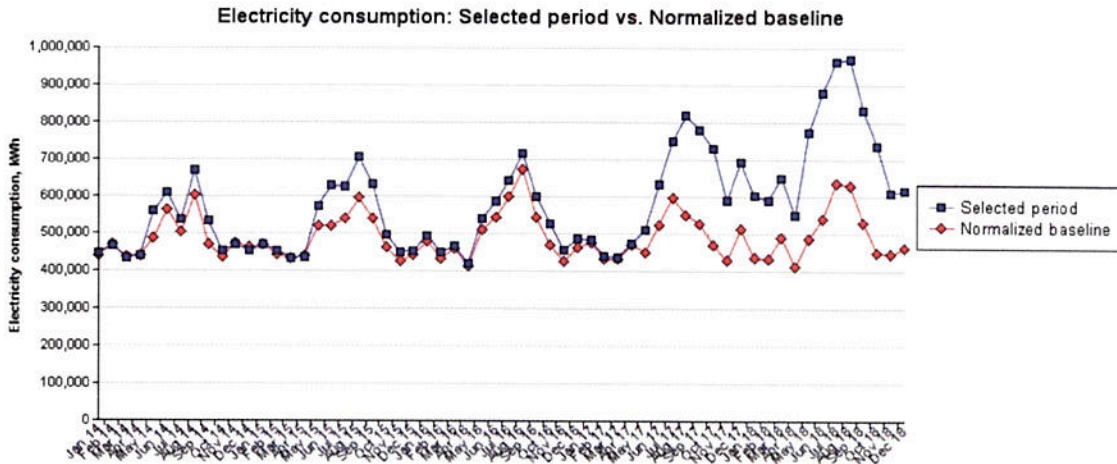
Part 2: Results from the past 5 years (2014-2018)

1 Energy and water utilization

In the previously approved Energy Action Plan posted on July 1, 2014, RMH set a goal to reduce energy use by 10% over the plan's 5-year term. Actual gas consumption in 2018 increased by 14% from the 2013 baseline. Water use went up by 9% over that time period. The hospital's electricity meter was found to be faulty and was replaced in 2017. Readings prior to that time are not correct, so no baseline has been established. The new meter will enable accurate measurement of electricity use and savings going forward.

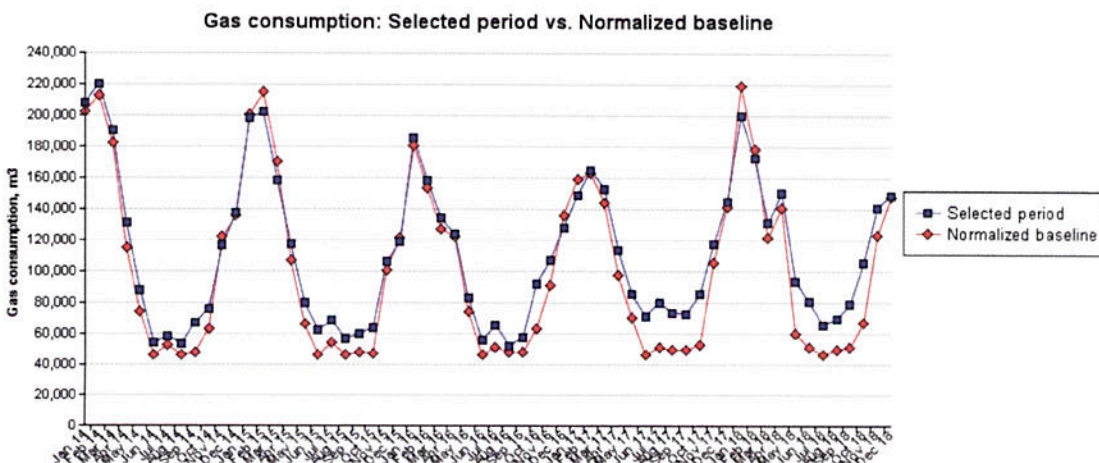
The weather-normalized energy and water consumption trends shown in the figures below serve to illustrate changes over this period. The blue points are actual monthly energy use and the red points are the comparative, weather-normalized 2013 baselines. Blue points below the red points signify real savings.

Figure 1 Electricity consumption in 2014-2018 vs 2013 weather-normalized baseline



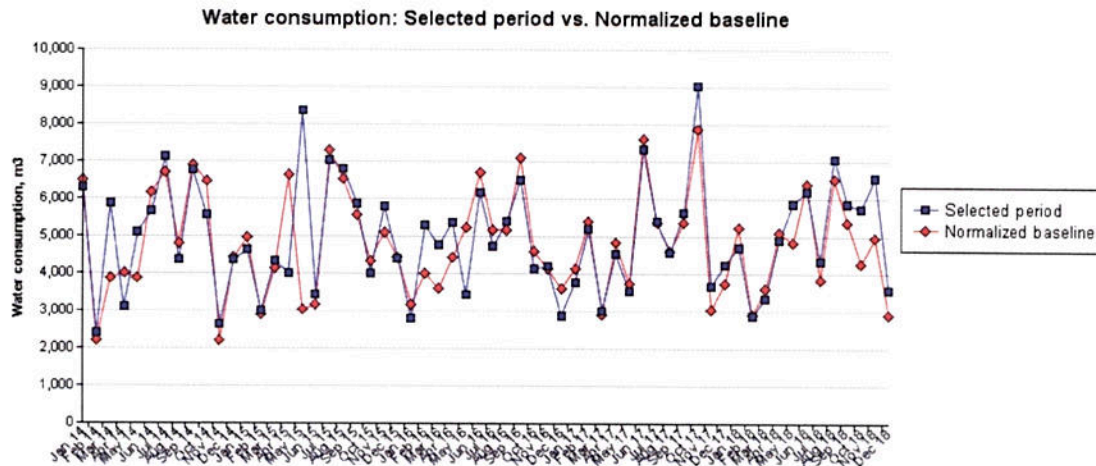
The effect of the meter replacement in September 2017 is apparent with a ~ 50% increase in reported consumption. It was discovered that one of the hospital’s meters was providing inaccurate readings due to a burnt wire and blown fuse. This resulted in one phase missing from the meter causing the consumption readings prior to replacement to be about 33% less than the total actual consumption. With the new meter in place, the 2018 baseline is reliable.

Figure 2 Natural gas consumption 2014-2018 vs 2013 weather-normalized baseline



Winter gas use has remained consistent throughout this period, but consumption during summer months has increased significantly. This is attributed in part to the additional services provided to the community by the hospital particularly in the medical device reprocessing department, and also to the requirement to apply reheat to manage humidity levels throughout the building.

Figure 3 Water use 2014-2018 vs 2013 weather-normalized baseline



Water consumption has been inconsistent and generally creeping up due to maintenance issues with aging equipment causing leaks and losses.

2 Measures implemented in 2014-2018

Energy conservation action over this period was directed primarily towards managing issues with aging infrastructure, along with commissioning and optimization of new air handling units and the building automation system replacement completed in 2014. The cooling tower was rebuilt in 2017 and recurring flow and control problems with the chillers are being addressed. With staff turnover at our service provider, there have been significant delays in building automation improvements and verification resulting in difficulties maintaining comfort conditions throughout the hospital.

RMH also spent considerable resources applying for funding to the Hospital Energy Efficiency Program (HEEP) and to the Exceptional Circumstance Program (ECP). Funding was received for several projects including in 2016/17 the chiller replacement and in 2017/18 the domestic hot water tank replacement and chiller optimization project. These initiatives all contributed to energy savings.

3 Lessons learned

The experience over the past 5 years provides the foundation for the Plan. We need a strategic, systematic approach to getting building systems working properly, supporting our facility operations team and building confidence with hospital staff. Upgrading our building automation system is central to this overall strategy for delivering energy savings, meeting required environmental standards for equipment and supplies and achieving consistent occupant comfort.

Part 3: The plan for the next 5 years (2019-2023)

RMH has the potential to reach the top quartile among acute care hospitals in Ontario, which would deliver annual utility cost avoidance in excess of \$500,000 and GHG emissions reductions of almost 1,000 tonnes of carbon dioxide equivalent per year (CO₂e/year). Without commitment of government funding to support the necessary investments, our 5-year plan is scaled back as described in Section 3 below.

1 2018 baseline

Table 3 presents 2018 energy and water use, costs and emissions for RMH.

Table 3 Ross Memorial Hospital 2018 energy use

Energy Type	2018 Use	Units	2018 Costs (\$)	Greenhouse Gas Emissions (tonnes CO ₂ e)
Electricity	8,829,792	kWh	\$1,324,469	176.6
Natural Gas	1,395,616	m ³	\$460,553	2,672.6
Water	62,979	m ³	\$251,284	0.8

2 Energy and water targets

Greening Health Care sets good practice energy and water targets for its member hospitals based on top-quartile performance of the other acute care hospitals of varying age and size in the Greening Health Care database and adjusted for weather and material site-specific variables.

Table 4 below presents RMH's actual and target energy intensities with all identified measures implemented. Achievement of these targets would result in \$515,000 in annual utility cost avoidance.

Table 4 Hospital energy and water targets

	Energy Usage Intensity (ekWh/ft ²)		Annual Savings Potential	
	Actual	Target	%	\$
Base Electricity	23.8	19.1	19.6%	\$217,133
Electric Cooling	4.7	2.6	43.6%	\$94,876
Base Thermal	28.9	16.5	43.1%	\$123,273
Heating Thermal	17.6	13.7	22.4%	\$39,093
Water (liters/ft ²)	203.2	170.2	16.2%	\$40,806
Total	75.1	51.9	30.8%	\$515,180

Separating targeted savings potential by energy components directs our efforts to the building systems with the biggest opportunities:

- Base electricity systems are fans, pumps, equipment and lighting. The significant savings potential lies mostly in fans and pumps;
- Electric cooling is used by the chiller plant, with the substantial savings potential associated with chiller efficiency improvements and with load reductions in the air handling systems through reduction of overcooling and reheat;
- Base thermal systems are year-round reheat in ventilation systems, domestic hot water, sterilizers and kitchens, with the big savings potential to be found in reheat;
- Heating thermal systems are space and ventilation heating and humidification in winter, with significant savings potential identified in excessive use of outside air in the air handling systems.

3 Initial energy efficiency measures

Recognizing that there is no committed government funding for the necessary work at this time, our goal over the next 5 years is more modest – to reduce energy use by 12.9% while cutting water consumption by 16.2%, all measured against the 2018 baselines.

Table 5 summarizes the costs and savings, paybacks and associated GHG emissions reductions for the initial retrofit projects and other measures. The full scope of these measures is described in more detail below.

Table 5 Energy and water efficiency projects summary

#	Measures (Note 1)	Budget Costs	Savings \$/year	Incentives	Payback (with incentives)	GHG Emissions Reduction (tonnes CO2e)	Estimated Measure Life (years)
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Note 1: Some measures are interrelated and cannot be implemented independently

3.1 Lighting & controls

- Convert existing lighting to LED technology, with the initial phase of work addressing 24/7 spaces. Conduct a lighting audit first and consider test area installations to ensure proper post-retrofit light levels and power densities
- Install occupancy sensors in spaces with low and intermittent occupied periods

3.2 Ventilation

- Schedule air supplies based on occupancy wherever practical, beginning with administrative and other non-clinical areas
 - Determine schedules in consultation with departments
 - Re-program/retrofit airflow control boxes and dampers to allow zone control.
- Testing and Re-balancing
 - Conduct comprehensive system testing, verify airflows against CSA requirements and supply/return/exhaust balance
 - Analyze static pressures, specify retrofits including silencer removal, system refurbishment
 - Refurbish ductwork/dampers as required
- Install variable frequency drives on older systems
- Replace end-of-life systems as funding becomes available

3.3 Building Automation

- Replace remaining pneumatic controls
- Implement trend logs with memory added to avoid system slowdown
- Reprogram controls for energy efficiency and occupant comfort

3.4 Cooling plant

- Monitor effect of new control valves, implement any further required modifications to obtain consistent, reliable performance

3.5 Water

- Implement conversion from domestic water to chilled water cooling
- Replace old, inefficient fixtures
- Monitor consumption, identify and repair leaks and losses

3.6 Innovation

- There are no existing renewable or geothermal installations at RMH. The economics of solar photo-voltaic and solar thermal installations are not yet competitive with the ROI to be obtained by the energy and water efficiency improvements presented in the Plan

4 Management and organizational alignment

Management process and organizational development forms an essential part of the Plan to enable and support conservation project delivery and continuous efficiency improvement, and to sustain savings over time.

4.1 Strategic alignment

Explicit reference to sustainability in RMH's quality improvement and other strategic reporting will further reinforce with stakeholders its importance to the hospital. We will seek collaborations with local community partners.

4.2 Sustainable funding

Funding for the required energy and water efficiency projects and resources will be woven into the hospital's overall financial strategy. We will actively pursue climate-related funding from both levels of government with "shovel-ready" emissions reduction projects.

4.3 Energy management and reporting

We will enable energy management effectiveness by implementing an integrated performance reporting system. Enhanced transparency and motivation will be achieved through regular communication of actual savings results to all stakeholders, in particular facility operations staff, beginning with monthly savings and progressing over time towards weekly and real-time reporting. Regular team meetings will review results, identify solutions and brainstorm new ideas, with documentation of action items and follow up on implementation.

4.4 Integrated Building Performance Team

We will fully integrate our building automation system into facility operations and maintenance through a team-based approach to monitoring performance through trend logs, optimizing and verifying control strategies, fine-tuning operations and responding to comfort and operational issues through a closed-loop work order system.

4.5 Staff training and support

Further enhancement of staff capability in energy management and building automation will be achieved by defining job-specific expectations, providing on-the-job training opportunities and working with service providers to provide necessary training and support. Roles and responsibilities for future hires will be formalized.

We will make greater use of our membership in Greening Health Care by incorporating case studies into our in-house training, exposing more of our staff to the program's networking, workshops and webinars, earning recognition for our achievements and continuing to participate in the program's applied research into areas of opportunity for RMH.

4.6 Facility renovations and operating standards

We will put in place and reinforce design and operational standards to ensure renovations consistently deliver high-performance, and that HVAC service levels and user guidelines (such as space temperature set-points) are communicated and followed.

4.7 Occupant engagement and communication

We will build confidence in the broader hospital community by working towards high standards of occupant comfort and regularly communicating results achieved.

4.8 Project and program management and support

Generating energy and operating cost savings requires time, particularly in project management, system monitoring and verification and internalizing the results of system testing and BAS trend log capability.

Management sign-off

I confirm that senior management of Ross Memorial Hospital has reviewed and approved this 2019 - 2023 Energy Conservation and Demand Management Plan.

Signature: 

Name: Veronica Nelson

Date: September 26, 2019

Title: Interim President + CEO



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