SOUTHLAKE
REGIONAL HEALTH CENTRE

June 2024

Southlake Regional Health Centre 2024-2029 Energy Conservation and Demand Management Plan

Management sign-off

I confirm that Southlake Regional Health Centre's senior management has reviewed and approved this 2024-2029 Energy Conservation and Demand Management Plan.

Signature: 

Name: John Marshman Date: June 30, 2024

Title: VP Capital Facilities and Business Development

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.

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Part 1: Introduction

1. About Southlake Regional Health Centre

Southlake Regional Health Centre (SRHC) is a full-service hospital with a regional, clinically advanced focus. As a regionally designated site, SRHC is responsible for developing and providing advanced levels of care to people who reside in York Region, Simcoe County, and beyond. Combined with our commitment to provide the best possible care, our goal is to make SRHC synonymous with healthcare excellence.

We are committed to a sustainable future and have made significant efforts towards reducing the impact of our hospital on the environment, while ensuring occupant comfort and efficiently delivering high quality healthcare services to our community. Southlake RHC has undertaken projects aimed at lowering energy use and improving facility operations. Hospital facility staff work diligently to operate and maintain building systems as efficiently as possible with available resources.

Table 1 Southlake RHC site

Site	Address	Building Area (ft²)	Description
Southlake Regional Health Centre	596 Davis Drive Newmarket, ON L3Y 2P9	736,881	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 which are manageable within this period.

3. Leadership in energy and emissions efficiency

As outlined in the 2019 – 2023 Southlake Strategic Plan, the hospital is dedicated to providing the best sustainable infrastructure to support community health as follows:

> *Through new partnerships, a relentless focus on quality and sustainability, and a dedication to the best patient and provider experience, Southlake will improve the health of our communities and shape the future of healthcare.*

To support this strategy, Southlake has outlined an energy conservation demand management plan to reduce energy and emissions, improve building conditions for occupants and make the best use of current infrastructure.

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

1. Energy and water performance progress

In the previous ECDM plan posted July 1, 2019, Southlake RHC defined a multi-year energy, management, financial and operational plan aimed at improving efficiencies and optimizing energy use. The 2019 plan focused on implementing smart improvements to meet the energy needs and obligations of SRHC and develop the pillars of energy management to guide good energy management practices. Table 2 presents the results showing actual, weather-normalized performance results from the 2023 calendar year as compared to the 2019 baseline, which resulted in net utility cost increase of $319,922. The increases in utility consumption are attributed to the infrastructure and capital projects completed in the last 5-years.

Table 2 Energy and water savings vs 2019 baseline

	2019 Plan Target savings				**Actual savings (2023 vs 2019 baseline)[1]**			
	Units	**%**	**$**	**GHG (tonnes eCO_2)**	**Units**	**%**	**$**	**GHG (tonnes eCO_2)**
Electricity (kWh)	50,554	0.2%	$6,571	874	-2,587,556	-12.6%	-$414,009	-78
Natural Gas (m^3)	171,384	4.1%	$49,702	324,020	116,609	3.2%	$38,481	223
Total Energy (ekWh)	**1,824,378**	**-**	**$56,273**	**324,894**	-1,380,651	-2.4%	-$375,528	**146**
Water (m^3)	-	-	-	-	12,932	15.9%	$55,606	2
Total			**$56,273**	**324,894**			**-$319,922**	**148**

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

2. Measures implemented in 2019-2023

Southlake Regional Health Centre was successfully able to implement the following projects outlined in the 2019 ECDM plan:

- Boiler controls
    - Upgraded controls on the new boiler in 2022.
- Automatic frequency drive upgrade
    - Addition of automatic frequence drives to 3 hospital chillers is ongoing and expected to be implemented Fall 2024.
- Interior lighting replacement
    - The lighting retrofit by switching to LED bulbs continues with some areas having been completed and some implementation completed by the maintenance team.
- Exterior lighting replacement
    - West Parking Garage lights were converted to LED in Spring 2024.

3. Project successes and lessons learned

There have been a number of successes over this period, along with lessons learned. Some of these include:

1. Early engagement of staff and stakeholders helps drive success.
2. Good headway is being made on thermal use with the installation of linkageless controls and steam pressure reduction projects, but more can be done.
3. With increased need for system resilience and adaptability, there is greater need to focus on air flows and pressurization when looking at proposed ventilation system alterations.

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

Southlake RHC has the potential to make significant savings and is working towards top-quartile positioning in the Greening Health Care energy efficiency benchmark charts. The targeted energy use reduction is 21.5% by 2029 compared with the 2023 baseline. The projects and organizational measures described below are together designed to achieve this goal along with utility cost savings worth approximately $945,516/year at 2024 rates and GHG emissions reduction of 1,872 tonnes eCO_2/year.

1. 2023 energy and water use

Table 3 below presents the 2023 baseline energy and water use, costs, and emissions for Southlake RHC.

Table 3 Southlake RHC 2023 energy and water use

Energy Type	2023 Use	2023 Costs ($)	Greenhouse Gas Emissions (tonnes eCO_2)
Electricity	23,114,475 kWh	$3,467,171	1,512
Natural Gas	3,531,142 m^3	$1,166,403	6,783
Total Energy	**59,661,798 ekWh**	**-**	**-**
Water	127,180 l/ft^2	$572,311	2
Total	**-**	**$5,205,885**	**8,296**

2. Benchmark positioning and targets

Greening Health Care sets good practice energy and water 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. Figure 4 shows the positioning of Southlake RHC in 2019, 2023 and at the 2029 performance level which is the goal for the Plan.

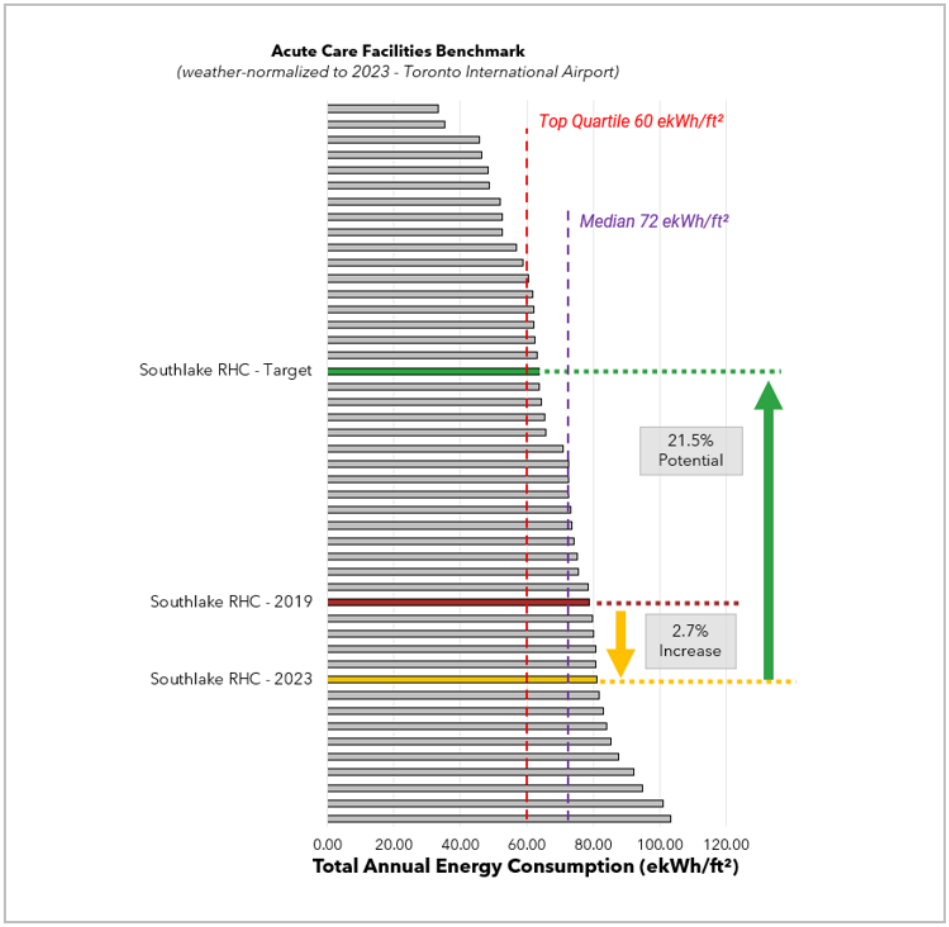

Figure 1 Southlake RHC energy benchmark for 2019, 2023, and 2029 target

Table 4 below presents Southlake RHC's actual and target energy intensities once the measures included in this Plan are implemented. Targeted savings are broken down by energy components, which help direct efforts to the building systems with the biggest opportunities:

- Base electricity systems are fans, pumps, equipment, and lighting that operate consistently throughout the year. The savings potential lies mostly in fans and pumps.
- Electric cooling systems that are weather dependent include air conditioning plant and equipment. These have significant further savings potential.

- Base thermal energy systems are primarily reheat in ventilation systems, along with domestic hot water and kitchens and heating distribution losses. The big savings potential is mostly in limiting simultaneous heating and cooling.
- Heating thermal systems (weather dependent) are space and ventilation heating and humidification, with some further targeted savings potential.

Table 4 Southlake RHC's energy and water targets

Energy Component	Energy Usage Intensity (ekWh/ft^2)		Annual Savings Potential	
	Actual	**Target**	**%**	**$**
Base Electricity	27.2	22.7	16.4%	$525,765
Electric Cooling	4.2	2.9	29.6%	$145,215
Base Thermal	35.3	25.0	29.0%	$240,406
Heating Thermal	14.4	12.9	10.1%	$34,130
Total Energy	**81.0**	**63.6**	**21.5%**	**-**
Water (liters/ft^2)	172.6	172.6	0.0%	$0
Total	**-**	**-**	**-**	**$945,516**

3. Energy efficiency measure

Table 5 summarize the proposed energy and water efficiency measures for each site together with their estimated costs, savings, and payback. The measures are described in more detail in the following section.

Table 5 Energy and water efficiency projects summary

Measures	Estimated Costs		Potential Savings			Incentives	Payback (with incentives)	GHG emissions reductions (tonnes eCO_2/year)
Ventilation								
Install variable frequency drives and associated controls on select systems	$270,000	$790,750	946,746 kWh	141,172 m³	$198,066	$129,968	3.3	333
Schedule air handling units	$137,500							
Canadian Standards Association's air change rates validation	$78,750							
Testing and re-balancing	$175,000							
Percentage of outdoor air control and optimization	$52,500							
Enthalpy wheel optimization	$24,500							
Optimize control sequence of operations	$52,500							
Cancer Centre - Schedule air handling units	$27,500	$67,500	315,582 kWh	64,202 m³	$71,680	$47,609	0.3	144
Cancer Centre - Enthalpy wheel optimization	$20,000							
Cancer Centre - Optimize control sequence of operations	$20,000							
Capital Measure - Replace steam coils	$1,415,483		245,226 kWh	83,355 m³	$66,743	$45,361	20.5	176
Building Automation and Lighting Controls								
System Upgrade/Expansion	$250,000	$250,000	189,349 kWh	38,521 m³	$43,008	$28,565	5.1	86
Heating plant								

Steam and boiler plant optimization	$29,000	$547,500	392,362 kWh	244,039 m³	$143,311	$100,246	3.1	494
Add new variable frequency drive on heating pumps	$240,000							
Pump testing and upgrades	$50,000							
Manually close isolation valves on air handling unit heating coils	$37,500							
Reset water temp in summer and winter based on outside air temperature	$80,000							
Isolate perimeter heating loops in summer months	$111,000							
Cancer Centre - Isolate perimeter heating loops in summer months	$111,000	$276,000	147,136 kWh	128,404 m³	$65,915	$46,815	3.5	256
Cancer Centre - Add new variable frequency drive on heating pumps	$90,000							
Cancer Centre - Manually close isolation valves on air handling unit heating coils	$37,500							
Cancer Centre (CC) - Connect CC and main hospital heating lines	$37,500							
Heat recovery chiller	$450,000	$600,000	189,349 kWh	38,521 m³	$43,008	$28,565	13.3	86
Connect 24/7 loads on Main Hospital and Cancer Centre	$150,000							
Cooling Plant								
Testing and balancing	$20,000	$168,000	492,492 kWh	0 m³	$78,799	$49,249	1.5	32
Cooling plant upgrades and optimization	$148,000							
Building Envelope								
Thermographic analysis	$35,000	$110,000	21,107 kWh	3,831 m³	$4,641	$3,068	23.0	9
Air sealing, re-insulation	$75,000							
Lighting								
Upgrade to LED	$2,200,000		1,373,266 kWh	0 m³	$219,723	$622,176	7.2	90
Total	**$6,425,233**		**4,312,615 kWh**	**742,045 m³**	**$934,893**	**$1,101,622**	**5.7**	**1,707**
Total ECDM not including Capital and lighting	**$2,809,750**		**2,694,123 kWh**	**658,690 m³**	**$648,427**	**$434,085**	**3.7**	**1,441**

3.1 Ventilation system

- Install variable frequency drives (VFDs) and associated controls on select systems. Install new VFDs complete with static pressure sensor and connect to building automation system.
- Fine tune scheduling of air handling units (AHUs). Optimize 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 space air change rates to ensure compliance with Canadian Standards Association's (CSA) recommended levels. Reduce air change rates in areas where over-ventilation is identified.
- Test and rebalance air handling unit airflows, refurbishing ductwork and dampers as necessary to enhance system performance and resiliency.
- Percent outside air control and optimization: Test AHU outside air percentages, comparing them against CSA Z317.2 requirements. Then, adjust damper positions and/or balance return and supply air to ensure airflow aligns with CSA Z317.2 recommendations.
- Enthalpy wheel optimization
- Optimize control sequence of operations.
- Cancer Centre:
    - Schedule air handling units: Optimize 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.
    - Enthalpy wheel optimization
    - Optimize control sequence of operations: Investigate economizer, supply air temperature, mixed air temperature control and implement new sequences to optimize operations.
- Capital Measure: Replace steam heating coils with low temperature glycol coils. Ventilation units pre-heating the steam coils limits thermal wheel operation resulting in under-utilized thermal wheels and increase facility gas consumption. Steam coils are reaching the end of their life, and they should be replaced with low temperature glycol coils, where practical. The glycol pre-heat coils setpoint can be lowered without the risk of freezing coils, unlike steam coils.

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.

3.3 Heating Plant

- Steam and boiler plant optimization. Review sequence of operations, test boilers and optimize sequence to reduce plant cycling.
- Add new VFD on heating pumps. Convert constant flow pumps variable flow, open triple duty throttling valves reducing overall system pressure drop and improving efficiency and reducing energy consumption.
- Pump testing and upgrades. Test pumps flow and head requirements, match with design and field test static pressure setpoints to reduce overall system pressure drops.
- Manually close isolation valves on AHU heating coils. Passing heating valves go unnoticed when the cooling plant is operational in summer which causes simultaneous heating and cooling, increasing both heating and cooling loads. Manually closing the AHU heating valve will ensure no heating is provided to the heating coils even in case the control valve passes.
- Reset water temperature in summer and winter based on outside air temperature.
- Isolate perimeter heating loops in summer months. Perimeter heating is required in the winter months to offset building envelope losses from walls, windows, and roof. Operating perimeter heating in summer months adds to the cooling load causing simultaneous heating and cooling of space. Isolating and turning off the perimeter heating loops in summer will avoid this situation and improve chiller plant capacity available as well reduce reheat load.
- Cancer Centre (refer to above section for measures description):
    - Isolate perimeter heating loops in summer months.
    - Add new VFD on heating pumps.
    - Manually close isolation valves on AHU heating coils.
    - Connect heating to main hospital and heat recovery chiller.
- Heat recovery chiller. Install new heat recovery chiller and connect the facility's 24/7 cooling loads to the reclaim waste heat which is currently rejected to outside. The heat recovery chiller will reclaim the waste heat and produce hot water to heat the facility and lower natural gas use.
- Connect 24/7 loads from Main Hospital and Cancer Centre to the heat recovery chiller.

3.4 Cooling Plant

- Testing and balancing

- Cooling plant upgrades and optimization

3.5 Cooling Plant

- Thermographic analysis. Technical review of the thermographic analysis of roof and exterior walls.
- Air sealing, re-insulation. Implement local air sealing and re-insulation, as needed.

3.6 Lighting

- Upgrade to LED. 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

SRHC has been enhancing energy management practices, tracking and reporting energy performance and improving energy monitoring and feedback. This plan primarily focuses on straightforward retrofits and operational improvements, making the most of current systems and avoiding overburdening staff.