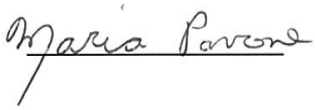
June 2024

Oak Valley Health

2024-2029 Energy Reporting and Conservation and Demand Management Plan

Management sign-off

I confirm that Oak Valley Health's senior management has reviewed and approved this 2024-2029 Energy Reporting and Conservation and Demand Management Plan. Senior management understands further refinement and improvement of the plan may occur subsequently following discussion with stakeholders and more detailed technical and financial review.

Signature: 

Name: Maria Pavone Date: April 8, 2025

Title: Senior Director, Facilities and Corporate Services

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

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Part 1: Introduction

1. About Oak Valley Health

Oak Valley Health is a leading community health care organization in Ontario and serves residents of Markham, Whitchurch-Stouffville, Uxbridge, and the surrounding areas. Oak Valley Health is comprised of two hospitals, Markham Stouffville Hospital and Uxbridge Cottage Hospital, as well as a Reactivation Care Centre. The three sites offer patients a high-quality level of care in several areas including childbirth and children's services as well as addictions and mental health. Oak Valley Health aims to create an *honoured to care* culture among staff, through which it delivers an extraordinary experience to patients.

Table 1 Oak Valley Health

Site	Address	Building Area (ft^2)	Description
Markham Stouffville Hospital	381 Church Street Markham, ON L3P 7P3	710,000	Acute care facility
Uxbridge Cottage Hospital	4 Campbell Drive Uxbridge, ON L9P 1S4	25,391	Medical building

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

Oak Valley Health is consistently striving to make the organization more environmentally friendly. These efforts include joining other organizations who are participating in challenges and initiatives, such as Earth Hour and The Great Global Cleanup, aimed at promoting energy savings and community cohesion. Oak Valley Health's continuing leadership in energy and environmental action has been recognized through numerous awards including:

- 2024: Lifetime certificate for offsetting 39,602 lbs of paper consumption by reforesting 476 standard trees since joining the PrintReleaf Exchange
- 2022: Green Hospital Scorecard (bronze), Green Hospital Scorecard – Pollution Prevention Award – Canada-wide category (top score) and Green Hospital Scorecard – Leadership Award (honourable mention)
- 2021: Green Hospital Scorecard (silver), Green Hospital Scorecard – Water – Canada-wide category (top score), Green Hospital Scorecard – Pollution Prevention – Canada-wide

category (top score), and Green Hospital Scorecard – Energy – Ontario category (top score)

- 2020: Greening Health Care 5 per cent Club for lowering facility energy use by more than 5 per cent, Ontario Water Works Association – Water Conservation and Efficiency Award, and Canadian Coalition for Green Health Care Award for Pollution Prevention

Through the ongoing implementation of energy saving projects and other green initiatives, Oak Valley Health is committed to helping deliver a more sustainable future.

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

1. Energy performance progress

The measures proposed in the previous ECDM plan, intended to reduce electricity and gas consumption at both the Markham Stouffville Hospital and Uxbridge Cottage Hospital. Overall, the plan from 2019 focused on planning for the long-term and ensuring sufficient organizational capacity. In addition to implementing energy efficiency measures, Oak Valley Health aimed to accomplish its goal through training, information and engagement.

1.1 Markham Stouffville Hospital

Table 2 presents both the planned energy savings and the results showing actual, weather-normalized performance results from the 2023 calendar year as compared to the 2018 baseline, which resulted in net utility cost savings of $468,700.

Table 2 Markham Stouffville Hospital: Energy savings vs 2018 baseline

	2019 Plan Target savings				Actual savings (2023 vs 2018 baseline)[1]			
	Units	**%**	**$**	**GHG (tonnes eCO_2)**	**Units**	**%**	**$**	**GHG (tonnes eCO_2)**
Electricity (kWh)	2,729,724	13.7%	$409,074	55	1,481,654	11.3%	$237,065	67
Natural Gas (m^3)	1,266,674	32.8%	$285,400	2,427	701,925	10.6%	$231,635	750
Total Energy (ekWh)	**15,839,804**	**26.4%**	**$694,474**	**2,481**	**51,617,006**	**10.8%**	**$468,700**	**817**

Monthly savings graphs help identify the periods of recorded savings or increases. On the graphs in Figure 1 through Figure 4**Error! Reference source not found.**, the blue points are actual monthly energy use, and the red points are the comparative, weather-normalized 2018 baseline. Blue dots below red represent real savings.

The electricity consumption trend over the last 5 years in Figure 1 reveals savings in each of the 5 years. The 5-year cumulative savings were 10,736,096 kWh valued at $1,717,775.

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

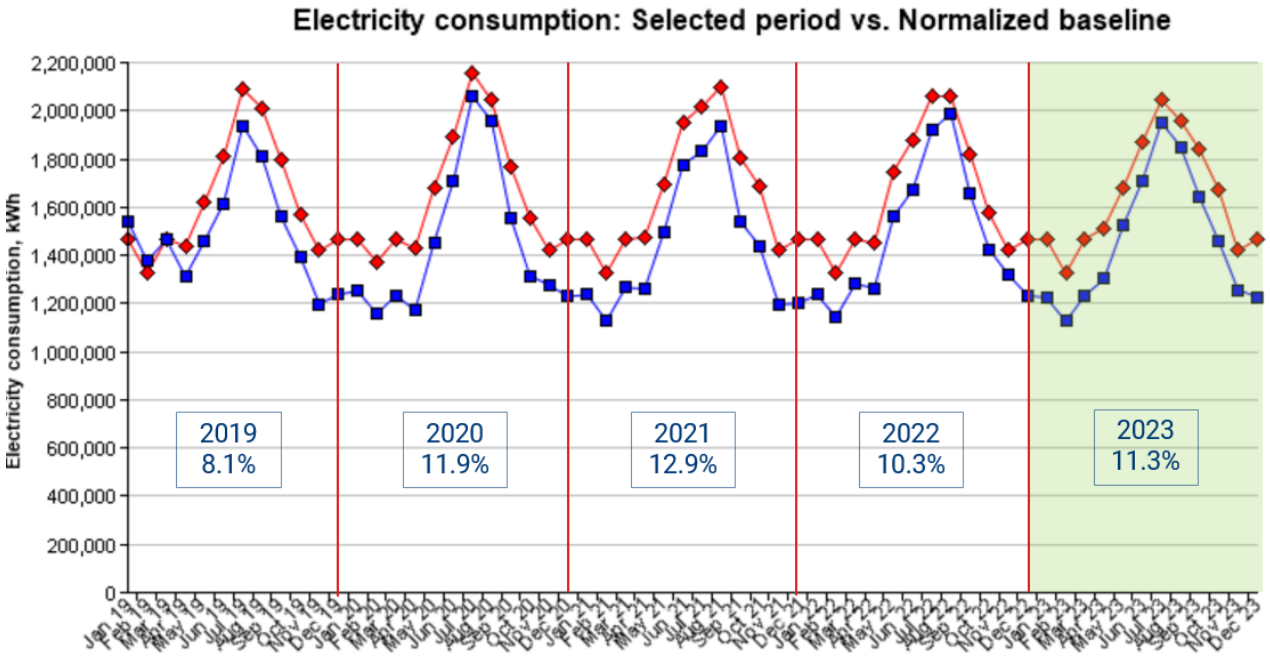

Figure 1 Markham Stouffville Hospital: Electricity consumption (kWh) in 2019-2023 vs 2018 baseline

Figure 2 shows the natural gas consumption trend between 2019-2023 and indicates savings in each year. The 5-year cumulative savings were 1,962,333 m³ valued at $647,570.

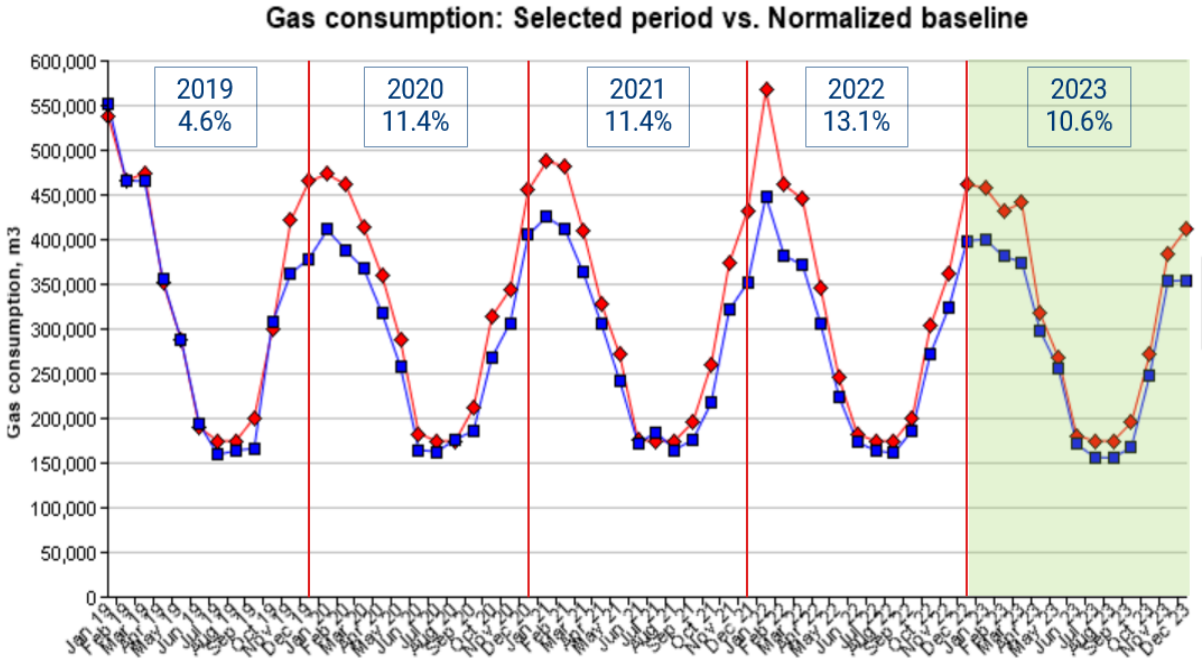

Figure 2 Markham Stouffville Hospital: Natural gas consumption (m^3) in 2019-2023 vs 2018 baseline

1.2 Uxbridge Cottage Hospital

Table 3 presents both the planned energy savings and the results showing actual, weather-normalized performance results from the 2023 calendar year as compared to the 2018 baseline, which resulted in net utility cost savings of $11,876.

Table 3 Uxbridge Cottage Hospital: Energy savings vs 2018 baseline

	2019 Plan Target savings				Actual savings (2023 vs 2018 baseline)[2]			
	Units	**%**	**$**	**GHG (tonnes eCO_2)**	**Units**	**%**	**$**	**GHG (tonnes eCO_2)**
Electricity (kWh)	315,260	40%	$47,001	6	35,696	4%	$5,711	1
Natural Gas (m^3)	10,218	14%	$3,361	196	18,680	27%	$6,164	36
Total Energy (ekWh)	**421,021**	**27%**	**$50,362**	**202**	**229,032**	**15%**	**$11,876**	**37**

The electricity consumption trend over the last 5 years in Figure 3 reveals savings in each of the 5 years. The 5-year cumulative savings were 400,902 kWh valued at $64,144.

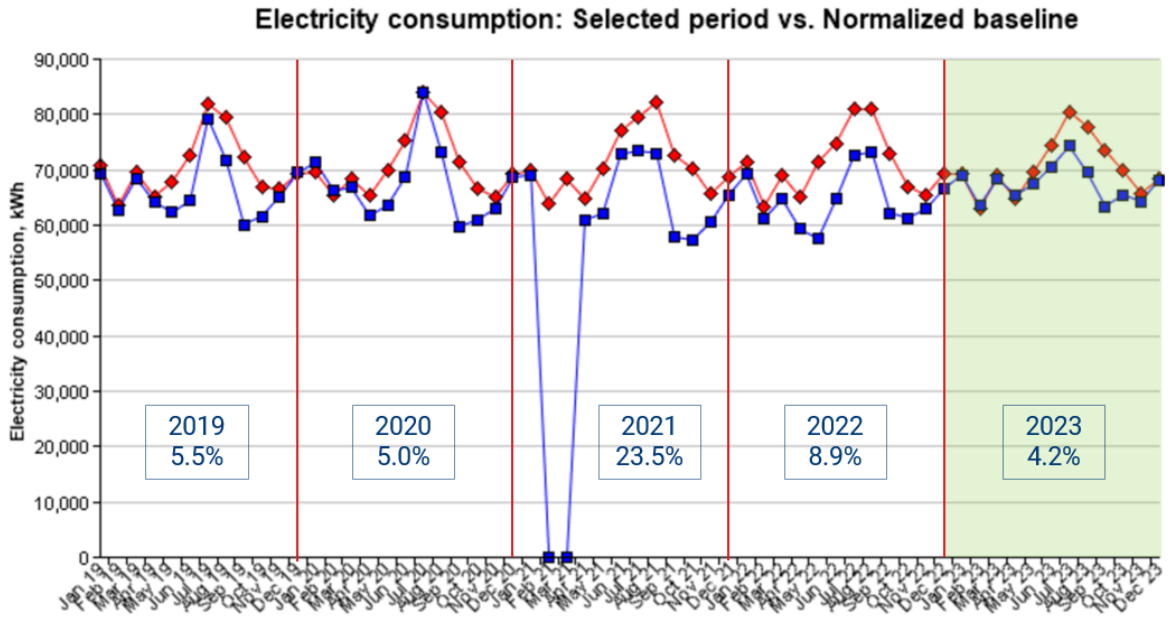

Figure 3 Uxbridge Cottage Hospital: Electricity consumption (kWh) in 2019-2023 vs 2018 baseline

Figure 4 shows the natural gas consumption trend between 2019-2023 and indicates savings in each year. The 5-year cumulative savings were 42,742 m³ valued at $14,105.

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

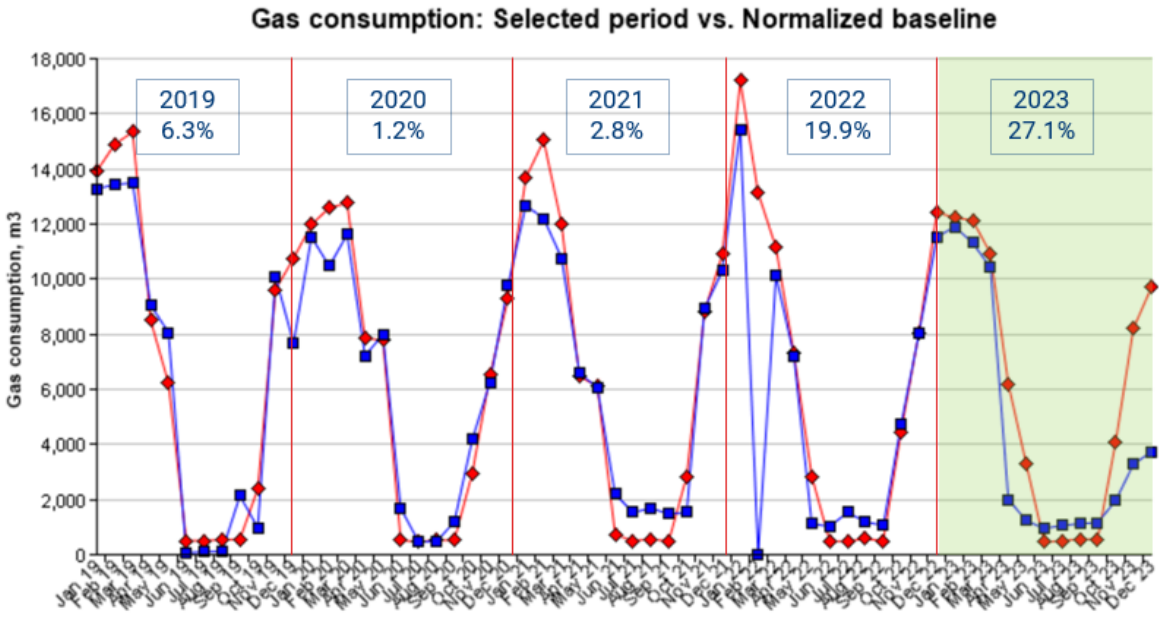

Figure 4 Uxbridge Cottage Hospital: Natural gas consumption (m^3) in 2019-2023 vs 2018 baseline

2. Measures implemented in 2019-2023

Markham Stouffville Hospital, comprised of Building A and Building B, has implemented several energy conservation projects since the previous ECDM plan, including the following:

- Conducted a study with the energy heat wheels in Building B to conserve gas consumption.
- Energy position hired to supplement organizational capacity.
- Automated supply temperature and SP reset, fan and pump speed controls.
- Analysis of air test reports, re-balance to CSA, retrofits to allow zone control and reduce static pressure losses, adjust schedules.
- Install white roofs, conduct thermographic scans, re-point brickwork, local draft proofing and re-insulation.
- Installed and connected air conditioners, fridge and freezer compressors, and biohazardous fridge compressor to the district cooling loop, reducing water usage by 20%.
- Upgraded recirculation controls on air handling units.
- Replacement of 20 air handling units (75% of the total) in Building A.
- Shut down of Building A steam lines in summer and replacement of steam traps identified as leaking in annual steam trap audit.
- Water audit and beginning of conversion from domestic water to chilled water-cooled equipment.
- Comprehensive LED lighting retrofit.

Additionally, the following projects have been implemented by Oak Valley Health since 2015:

- Installation of variable speed drives to HVAC units in Building A.
- Installation of extensive sub-metering and system monitoring capability.
- Increased operator involvement through Plant Services Committee.
- Installation of low-flow fixtures to achieve water use reduction of 40%.
- Building envelope designed to increase thermal resistance.
- Exterior lighting designed to minimize light pollution onto neighboring properties and reduce impact on the night sky.

3. Project successes and lessons learned

Oak Valley Health has seen many successful outcomes from the projects it has implemented. These successes influence future projects and help the organization continue its aim to be good green citizens. The completion of so many projects, has been accompanied by lessons learned including:

1. Numerous successful measures have been implemented however there is opportunity for fine tuning and continuing operational improvements.
2. Success is driven with help from early engagement of staff and stakeholders.
3. Climate related disasters demonstrate a greater need for system resilience. Proposed alterations to ventilation systems will focus on better air flow control and pressurization in line with the latest Canadian Standards Association's regulations.

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

Oak Valley Health has potential to achieve further energy and emissions savings. From the projects outlined below, the targeted energy use reduction is 13.6% and 16.8% for Markham Stouffville Hospital and Uxbridge Cottage Hospital respectively, by 2029 compared with the 2023 baseline. The total utility cost savings will be worth approximately $433,234/year at 2024 rates and reduce GHG emissions by 1,106 tonnes eCO_2/year.

1. 2023 energy use

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

Table 4 Oak Valley Health's 2023 energy use

Site	Energy Type	2023 Use	2023 Costs ($)	Greenhouse Gas Emissions (tonnes eCO_2)
Markham Stouffville Hospital	Electricity	17,535,150 kWh	$2,630,272	631
	Natural Gas	3,292,933 m³	$659,223	6,325
Uxbridge Cottage Hospital	Electricity	815,051 kWh	$130,408	29
	Natural Gas	172,316 m³	$56,864	331
Total	**Electricity**	**18,350,201 kWh**	**$2,760,681**	**660**
	Natural Gas	**3,465,249 m³**	**$716,087**	**6,656**

2. Benchmark positioning and targets

Greening Health Care sets good practice energy 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 5 shows the positioning of Markham Stouffville Hospital in 2018, 2023 and at the 2029 performance level which is the goal for the Plan.

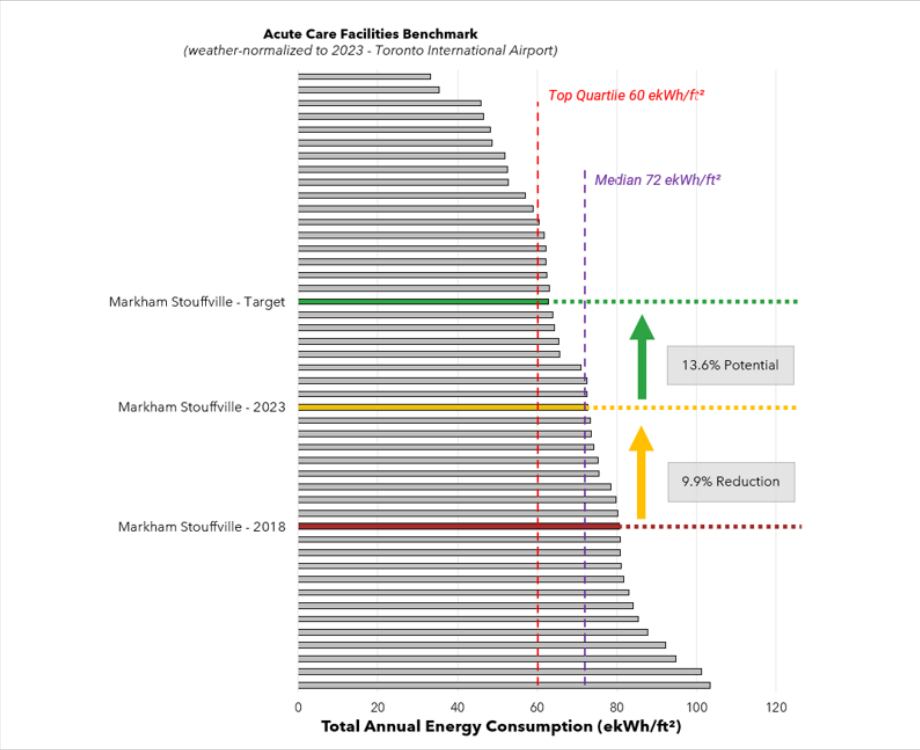

Figure 5 Annual energy benchmark for 2018, 2023, and 2029 target for Markham Stouffville Hospital

Table 5 below presents Oak Valley Health's actual and target energy intensities once the measures included in this Plan are implemented for both facilities. 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 5 Energy targets for Oak Valley Health

Site	Energy Component	Energy Usage Intensity (ekWh/ft^2)		Annual Savings Potential	
		Actual	Target	%	$
Markham Stouffville Hospital	Base Electricity	20.4	18.8	7.8%	$180,817
	Electric Cooling	4.3	3.9	11.1%	$54,288
	Base Thermal	29.2	25.4	13.3%	$88,021
	Heating Thermal	18.8	14.9	2.0%	$88,540
	Total Energy	**72.7**	**62.9**	**13.6%**	**$411,666**
Uxbridge Cottage Hospital	Base Electricity	30.1	25.8	14.4%	$17,571
	Electric Cooling	1.1	1.0	8.4%	$374
	Electric Heating	0.9	0.9	0.0%	$0
	Base Thermal	5.3	3.8	28.4%	$1,217
	Heating Thermal	15.4	12.4	19.3%	$2,406
	Total Energy	**52.8**	**43.9**	**16.8%**	**$21,568**

3. Energy efficiency measures

Table 6 and Table 7 summarize the proposed energy efficiency measures for the sites together with their estimated costs, savings, and payback. The measures are described in more detail in the following section.

Table 6 Energy efficiency projects summary – Markham Stouffville Hospital

Measures	New Funding Required		Savings			Incentives	Payback (with incentives)	GHG emissions reductions (tonnes eCO_2/year)
Ventilation								
Schedule air handling units	$150,000	$797,500	1,137,296 kWh	499,938 m³	$346,947	$238,714	1.6	1,001
Canadian Standards Association's air change rates validation	$240,000							
Testing and re-balancing	$105,000							
Outside air % control and optimization	$137,500							
Enthalpy wheel optimization	$105,000							
Optimize control sequence of operations	$60,000							
Heating plant								
Turn off radiation pump in summer	$10,000	$100,000	167,423 kWh	35,096 m³	$38,369	$25,516	1.9	74
Pump testing and upgrades	$90,000							
Cooling Plant								
Pump testing and balancing	$80,000	$80,000	157,794 kWh	0 m³	$25,247	$15,779	2.5	6
Total	**$977,500**		**1,462,513 kWh**	**535,034 m³**	**$410,563**	**$280,010**	**1.7**	**1,081**

Table 7 Energy efficiency projects summary - Uxbridge Cottage Hospital

Measures	New Funding Required		Savings			Incentives	Payback (with incentives)	GHG emissions reductions (tonnes eCO_2/year)
Ventilation								
Schedule air handling units	$30,000	$49,000	112,152 kWh	10,980 m³	$21,568	$13,960	1.6	25
Outside air % control and optimization	$5,500							
Economizer control and optimization	$5,500							
Optimize control sequence of operations	$8,000							
Total	**$49,000**		**112,152 kWh**	**10,980 m³**	**$21,568**	**$13,960**	**1.6**	**25**

3.1 Ventilation system

- Markham Stouffville Hospital and Uxbridge Cottage Hospital:
    - 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 variable frequency drive speed aligns with expected unoccupied turn-down levels during off-hours.
    - 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.
    - Optimize control sequence of operations.
- Markham Stouffville Hospital only:
    - 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.
    - Enthalpy wheel investigation and optimization.
- Uxbridge Cottage Hospital only:
    - Economizer control and optimization.

3.2 Heating Plant

- Markham Stouffville Hospital:
    - Turn off exterior zones heating pump in summer: radiations pumps are operating in summer where radiation loop is required in winter to offset building envelop heat losses. Pump operation in summer leads to simultaneous heating and cooling and resulting in further energy waste.
    - Pump testing and upgrades: test and field investigate pump flows, triple duty valve position, differential pressure set points and optimize for enhanced performance.

3.3 Cooling Plant

- Markham Stouffville Hospital:
    - Pump testing and upgrades: test and field investigate pump flows, triple duty valve position, differential pressure set points and optimize for enhanced performance.

4 Organization role and impact

Senior management support and staff capacity are key success factors in the execution of this plan. The additional hire of an energy management resource underlines the importance of staff capacity in order to address emissions and energy efficiency. Oak Valley Health remains committed to maximizing organizational efficiency while minimizing resource use. This plan reflects that commitment and focuses on operational improvements and lower cost retrofits, making the most of current systems.