Mount Sinai Main Hospital Energy Conservation and Demand Management Plan

Leadership in Energy Efficiency

Already at the top quartile of energy performance, Mount Sinai is working towards becoming one of the most energy efficient acute care hospitals in Ontario. This ECDM plan combines operational excellence and prudent investment in existing system retrofits with high performance design standards for ongoing renovations to achieve this goal.

JULY 1, 2014

The Government of Ontario enacted the Green Energy Act Regulation 397/11 on January 1, 2012. This legislation requires broader public sector organizations to develop and publish a five-year Energy Conservation and Demand Management (ECDM) plan by July 1, 2014.

This document was prepared in accordance with Ontario Regulation 397/11 for Mount Sinai Hospital by Enerlife Consulting.

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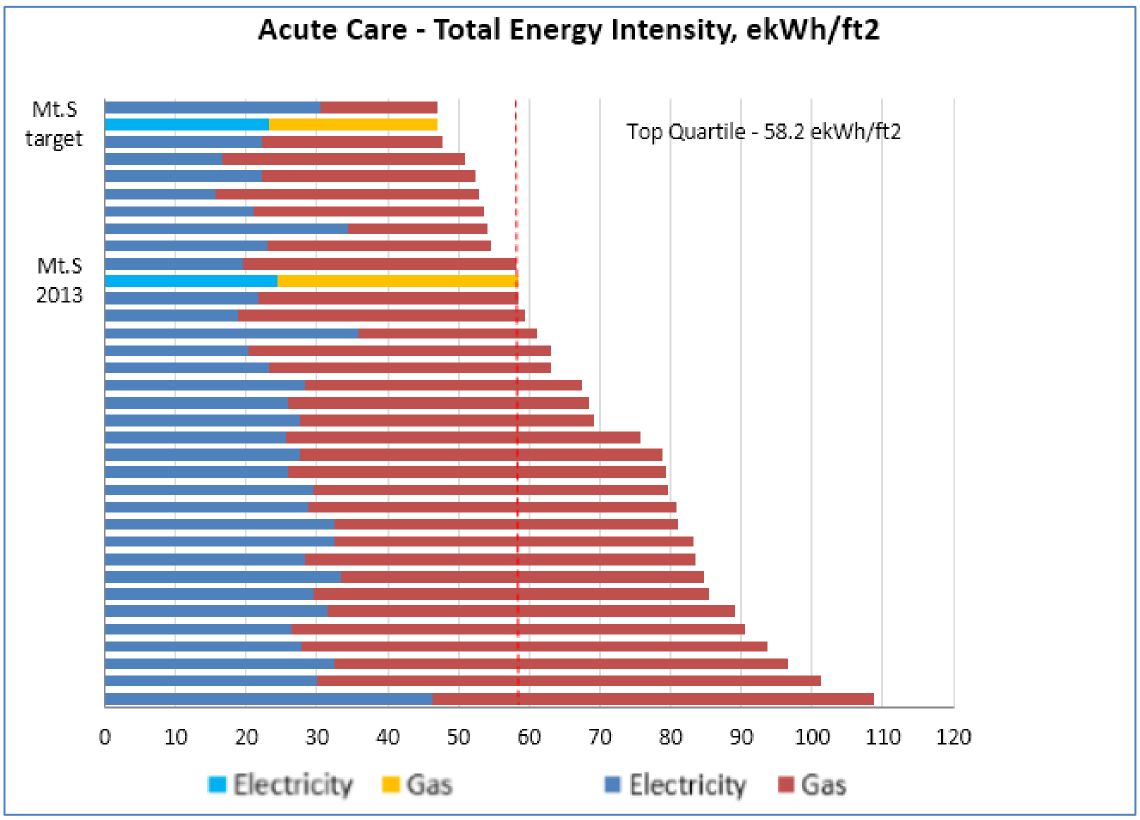
Summary

Mount Sinai Hospital (Mount Sinai) is already among the most energy efficient facilities of its type in the Enerlife database[1]. This Energy Conservation and Demand Management (ECDM) plan, prepared in accordance with Ontario's Green Energy Act Regulation 397/11, focuses on Mount Sinai's main hospital site at 600 University Avenue. The plan presents the main hospital's energy target – the performance level which Mount Sinai is aiming for, and identifies the key areas of attention and initiatives as the hospital works towards that goal.

Mount Sinai main hospital's 2013 energy performance (Mt.S 2013) is shown in Figure 1 along with its projected benchmark positioning following attainment of the energy target presented in Section 2.3 of this plan (Mt.S target).

Figure 1: Mount Sinai Main Hospital Total Energy Intensity



[1] Enerlife Consulting has developed and manages a large, dynamic national database of hospital energy use. Many hospitals use the database for benchmarking their buildings' energy use, setting targets, and tracking energy performance over time.

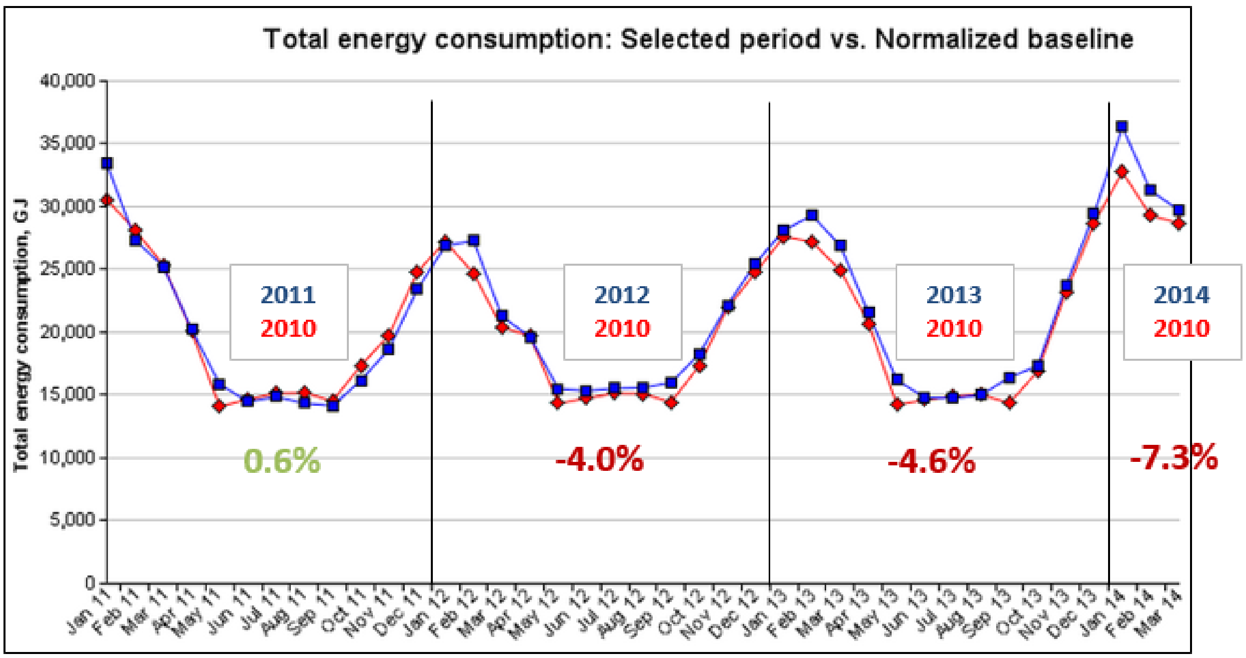
1 Commitment to Energy Efficiency

1.1 Previous Energy Initiatives

Mount Sinai's focus for the past five years has been on the major, ongoing redevelopment of large areas of the existing hospital. Conversion in 2008 from the original chilled water plant to the highly energy efficient Deep Lake Water Cooling chilled water system provides more efficient air conditioning for the existing hospital as well as the renovated areas. Good current energy performance is primarily attributable to effective operation of building systems.

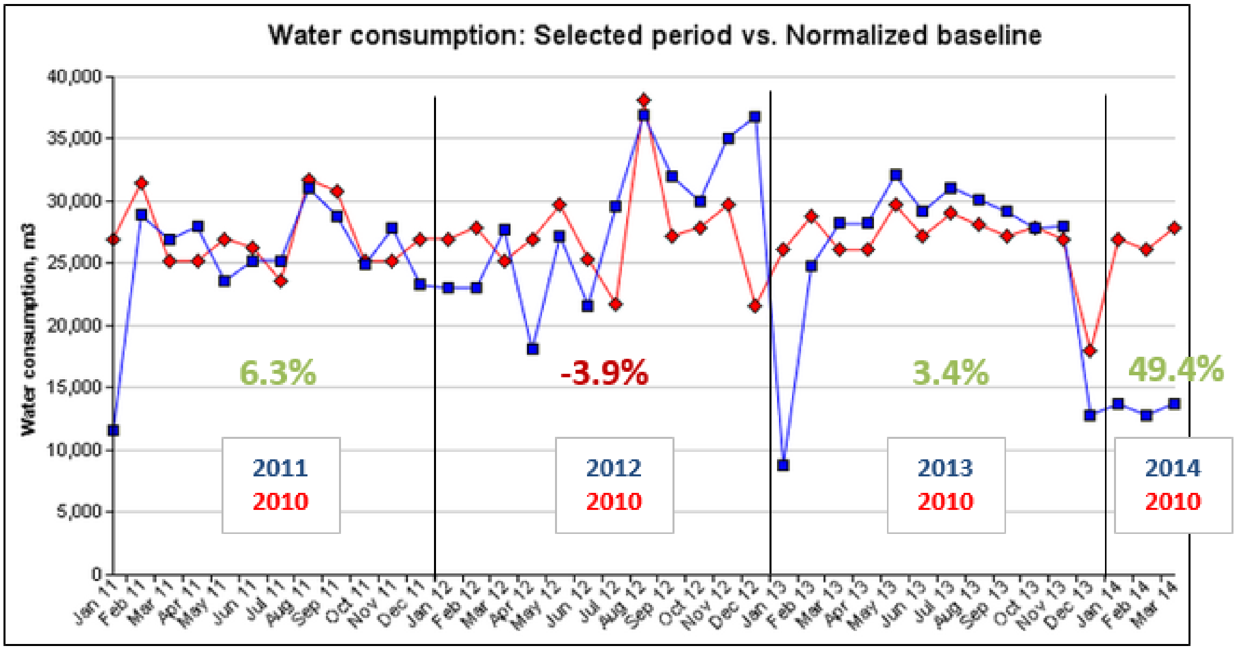
The monthly performance chart in Figure 2 shows the weather-normalized changes in energy use since 2010. Increases in 2012 and 2013 are due to opening of new floors.

Figure 2: Mount Sinai Main Hospital 2011--2014 Total Energy Savings



Water performance is relatively good, and monthly use since 2010 is presented in Figure 3. Increases in 2012 and 2013 are also attributable to opening of new floors. In 2013, conversion of equipment which was previously city water cooled to cooling by the chilled water system is believed to have substantially reduced consumption. Metering issues in 2013-2014 are responsible for erratic readings and are masking these savings. They are being investigated.

Figure 3: Mount Sinai Main Hospital 2011-2014 Water Savings



1.2 Current Initiatives

The hospital's focus is on the redevelopment, with no current energy conservation initiatives underway.

2 Building on Success – The 5-Year Plan (2014-2019)

2.1 Goals and Objectives

Mount Sinai's commitment to excellence in patient care and leadership in research is central to the hospital's strategic plan. In support of these priorities, improved cost performance is a core business strategy, including superior performance compared with peer organizations. Mount Sinai's energy and water benchmark positioning are already strong and will be further improved through this ECDM plan.

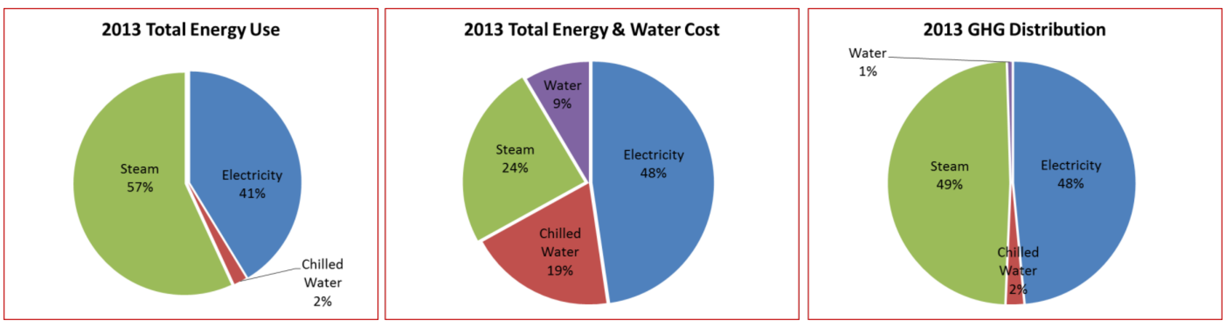
Mount Sinai's goal with respect to energy conservation is to optimize utility expenditures consistent with excellence in patient care. The objectives for the duration of this plan are to ensure that hospital redevelopment incorporates high standards of energy efficiency, while operating existing plant and systems as efficiently as possible and making judicious investments in equipment and technology upgrades.

2.2 2013 Energy and Water Performance

Mount Sinai's 2013 energy use placed it at the top quartile mark of Enerlife's database of acute care facilities, as previously shown in Figure 1. The facility used 29,151,521 kWh of electricity, 4,524,384 TH of chilled water, 113.56Mlbs of steam, and 4,881 m3 of gas, spending a total of approximately $7,078,000 (including water).

2013 energy use and cost breakdowns are presented below. Steam consumption accounts for the largest share of energy use and greenhouse gas (GHG) emissions. The relatively high electricity price is responsible for electricity's larger share of utility costs. Electricity, steam and water prices are forecast to rise faster than the rate of inflation for the foreseeable future, further improving economic returns on investment in energy efficiency.

Figure 4: Mount Sinai Main Hospital 2013 Energy Use and Cost Breakdown



2.3 Energy Targets

"Top-down" energy targets shown in Table 1 below are based on good performance standards for individual energy use components from other comparable facilities. This analysis serves to quantify the overall savings potential to be expected from systematically tackling all building systems, operations and occupant behaviour, and also points to the areas of current inefficiency which this ECDM plan addresses in order to work towards the targeted performance.

Table 1: Mount Sinai Main Hospital Component Energy Target Savings

Component	Target Savings		Primary Areas for Attention
	Percent	$/year	
Hospital Electric Base	10%	$376,733	Fan power, operation of lights and equipment
Hospital Thermal Base	14%	$81,768	Heating system controls
Hospital Cooling Chilled Water	26%	$140,903	Cooling system and ventilation system controls
Hospital Thermal Heating	35%	$304,015	Ventilation system operation and controls
Hospital Water	19%	$146,699	Metering, plumbing fixtures, water-cooled equipment and losses
TOTAL		**$1,050,118**	

2.4 Energy Efficiency Improvements

Specific initiatives identified for this ECDM plan are shown in Table 2, along with preliminary budgets and savings estimates. These measures, described in more detail below, are projected to deliver a substantial part, but not all of the targeted top-down savings potential shown in Table 1. Further testing and monitoring of individual systems, which is the next stage of plan implementation, can be expected to verify the magnitude of the savings for these measures and/or identify additional measures for consideration. As scopes of work are further developed, budget costs and available incentives will be firmed up.

Table 2: Proposed Energy Efficiency Measures

#	Description	Budget Cost $	Annual Savings $/year	Estimated Incentives $	Simple Payback years
1	Ventilation Refurbishment and Rebalancing	$1,500,000	$299,637	$326,756	3.92
2	Ventilation System Controls	$700,000	$286,744	$107,834	2.07
3	Steam and Heating System Controls	$235,000	$85,333	$32,788	2.37
4	Lighting Retrofits	$1,060,000	$134,788	$51,842	7.48
5	Water Conservation	$14,625	TBD	$-	TBD
6	Department/Staff Engagement	$38,000	$7,932	$6,102	4.02
7	Energy Adviser/coordination (36 months)	$300,000	$-	$-	
	TOTALS	**$3,847,625**	**$814,436**	**$525,322**	**4.08**

2.4.1 Ventilation Refurbishment and Re-Balancing

Ventilation systems account for the largest part of the hospital's energy use and conservation potential. Testing of some systems over the past 15 years indicates some with relatively high static pressures and overall high fan power per square foot. More in-depth testing of the main systems will isolate issues and identify corrective actions, while also informing an evaluation of actual airflow rates against current standards, and the airflow balance of the hospital as a whole to avoid excessive air movement between areas due to imbalances. Variable frequency drives and other retrofits will be installed where appropriate to help maintain proper airflows and reduce energy consumption over time. This initiative also includes identification and repair or replacement of leaking, oversized and undersized airflow control dampers. Design standards and operational practices will be integrated with the new redevelopments.

Measure Life: This measure should remain effective for 5 years, at which time systems should be retested to see if adjustments are required.

2.4.2 Ventilation System Controls

The main ventilation systems supplying the different areas of the hospital comprise many elements, including heating and cooling coils and control valves, air control dampers and actuators, and fans and drives. Proper operation and control of these elements through the building automation system delivers good indoor environmental quality with optimal energy use and cost. Targeted savings of base electricity, chilled water and base and heating steam indicate potential for savings through better control of ventilation systems.

Operating schedules will be revisited based on current use and occupancy of different areas of the hospital. Trend logs of ventilation systems have been set up to reveal specific inconsistencies in temperature controls which lead to higher than necessary heating and cooling energy use. This initiative includes identification and repair or replacement/right-sizing of leaking control valves as well as re-programming of the building automation system with smart operating sequences such as demand-based temperature resets. A tune-up of sensors, controllers, operating sequences and control devices will lower energy consumption and provide more consistent environmental controls. Design standards and operational practices will be integrated with the new redevelopments.

Measure Life: This measure should remain effective for 2 years, at which time the trend log diagnostic exercise should be repeated. Close monitoring of electricity and gas use in the interim will identify any significant efficiency losses.

2.4.3 Steam and Heating System Controls

Resetting the pressure of the steam system, and supply water temperatures of heating systems, based on actual requirements at different times of day and weather conditions, will lower steam consumption, particularly during the summer, spring and fall. Trend logs of heating systems and monitoring the hospital's interval steam meter will help define the improvements and verify the results. Design standards and operational practices will be integrated with the new redevelopments.

Measure Life: This measure will remain effective indefinitely, subject to periodic monitoring.

2.4.4 Lighting

While localized lighting improvements have been made in the past, a comprehensive audit of all areas against current light level and power density requirements will identify remaining cost effective retrofit opportunities. The hospital has a wide range of lighting fixtures and technologies of different vintages. This initiative will replace obsolete technology and standardize fixtures, lamps and ballasts to simplify ongoing operation and maintenance, as well as enhancing visual appearance and lowering energy use. Design standards and operational practices will be integrated with the new redevelopments.

Measure Life: This measure will last for ten years or more, subject to future changes in standards or available technology.

2.4.5 Water Conservation

Overall water use is relatively efficient compared to other comparable facilities. The sharp reduction in monthly billing seen in 2014 is being investigated in order to verify current performance and help identify any remaining conservation potential.

Measure Life: To be determined based on resolution of metering issues.

2.4.6 Departmental/Staff Engagement

Use of lighting, along with IT, medical, kitchen and other equipment used by hospital staff, accounts for a significant portion of the hospital's electricity use and costs. Engaging the IT Department in network control strategies can significantly lower electricity use. Broader departmental engagement in switching off lights and equipment when not in use can also contribute material energy and cost savings. Such a campaign will help reinforce the hospital's conservation culture, and make everyone part of energy efficiency success.

Measure Life: This measure will set the stage for continuing, active departmental involvement in raising the energy performance of the hospital.

2.5 Renewable and Geothermal Energy

There is no renewable or geothermal installation at Mount Sinai, and none is planned for the term of this ECDM Plan.

3 Implementation

Most of the measures described in Section 2 are planned for implementation in priority sequence over the life of this plan in order to realize the economic and operational benefits as early as possible. The next stage of the work involves targeted, in-depth measurement and testing of existing systems to fully define the individual measures and firm up budgets and savings estimates. Individual projects will then be designed and tendered, and the work supervised and results monitored to ensure the efficiency gains are realized. A multi-disciplinary implementation team will bring together the best available knowledge and experience with mechanical and electrical system design, testing and balancing and building automation, along with facility management and operators. The team is charged with reviewing performance data, identifying the best measures, verifying savings and driving continuous improvement. The implementation budget includes costs for project direction and coordination, measurement and verification of savings, and reporting on results.

Where practical, electricity conservation measures for implementation in 2015 will be identified by the end of 2014 so that applications can be submitted for Toronto Hydro incentives.