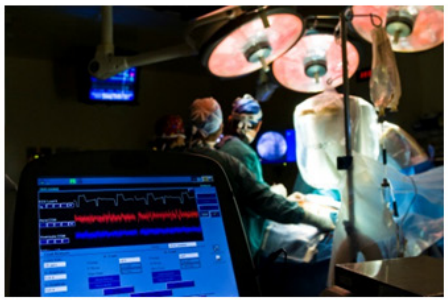
2014-2019

Energy Management Plan






Sunnybrook
EARTH MATTERS

Laura Hough
Sunnybrook Health Sciences Centre
2014-2019

Earth Matters

Sunnybrook Health Sciences Centre is committed to not only responding to health problems, but preventing future health risks. We will make a significant impact on the health and well-being of those who work at our hospitals, the patients we serve, the community in which we operate and the environment that allows us to live and breathe.

Sunnybrook's Earth Matters Program aims to foster environmental awareness and help build a more sustainable environment through creating and developing leadership in energy efficiency, pollution prevention and waste management. We believe that hospitals are in the unique position to lead in this area as they have the mandate to protect patient safety, as well as a deep knowledge and understanding of the requirements for improved human health.

Through improved energy efficiency, the hospital can save money, help prevent greenhouse gas emissions, improve the air quality of our community, and support commitment to public health. Sunnybrook's 2014 Five Year Energy Management Plan outlines how the hospital will reduce energy consumption and our related environmental impact. Senior leadership approves and supports the 2014 Energy Management Plan.

Supporting energy efficiency and sustainability is a long term journey. We have seen rewards for our efforts so far and look forward to doing more — to realizing our vision of inventing the future of health care.

Yours Truly,

Michael S. Young
Executive Vice President
Chief Administrative Officer

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1 Introduction

1.1 REASONS TO REDUCE ENERGY CONSUMPTION

Healthcare organizations spend millions of dollars on energy each year, and that amount is rising to meet patients' needs. By being more energy efficient, hospitals can save money, help prevent greenhouse gas emissions, improve the air quality of their communities, and support their commitment to public health.

Ontario Regulation 397/11 of the Green Energy Act now requires public agencies to report on energy and green house gas emissions annually. Additionally, the regulation calls for demand management plans outlining energy conservation and demand management measures to be prepared every five years.

2 Hospital Profile

2.1 HOSPITAL END USES

Sunnybrook provides expert and compassionate care for patients in their time of greatest need: from premature newborns, to those requiring critical care, specialized trauma, oncology, mental health, dementia, cardiac or stroke care, to elderly war veterans living at Sunnybrook.

Sunnybrook Health Sciences Centre Programs:

- Brain Sciences Program
- Odette Cancer Centre
- Schulich Heart Centre
- Trauma, Emergency and Critical Care
- Veterans and Community
- Women and Babies
- *Musculoskeletal Program (provided at Holland Campus-outside the scope of this plan)*
- *Rehabilitation (provided at St. John's Campus-outside the scope of this plan)*

When considering energy performance the hospital end uses can be broken down into five main space use types: acute care spaces, chronic care spaces, medical and administrative office spaces and research spaces.

Acute Care Spaces: provide inpatient medical care and other related services for surgery, acute medical conditions or injuries (usually for a short term illness or condition). Acute care is usually given in a hospital by specialized personnel using complex and sophisticated technical equipment and materials, and it may involve intensive or emergency care.

Chronic Care Spaces: provide long-term medical care lasting usually more than 90 days especially for individuals with chronic physical or mental impairment. Chronic care spaces are typically 24 hour residential operations.

Medical and Administrative Office Spaces: provide diagnosis and treatment for medical, dental, or psychiatric outpatient care and administrative support for other hospital services.

Research Spaces: provide investigation and research to find advances in medical science. Research spaces usually involve cutting-edge equipment and energy intensive laboratory facilities.

Support Spaces: provide technical support and/or storage for hospital operations. Support spaces include: central utility plant, electrical and mechanical rooms, IT communication rooms and data centres, waste management, stores/logistics, maintenance shops and food services.

2.2 BUILDINGS

Sunnybrook Health Sciences Centre consists of the 3 sites: Bayview Campus, Holland Campus and St. John's Campus. Though all three campuses will be summarized here for reference, the energy management plan will focus on the main Bayview Campus which makes up 88% of the total square footage.

Bayview Campus: Sunnybrook's Bayview Campus is Canada's largest single-site hospital. It began as a veteran's hospital in the 1940s and has since evolved into one of Canada's premier academic health sciences centres. The campus consists of 19 buildings of varying ages, many of which are the original buildings from the 1940s. The total square footage of the Bayview campus is 2,803,160 sq ft.

Holland Campus: Is home to the Holland Orthopedic and Arthritic Centre. The total square footage of the Holland campus is 159,049 sq ft.

St. John's Campus: is home to the St. John's Rehabilitation Centre. The total square footage of the St. John's Campus is 223,151 sq ft.

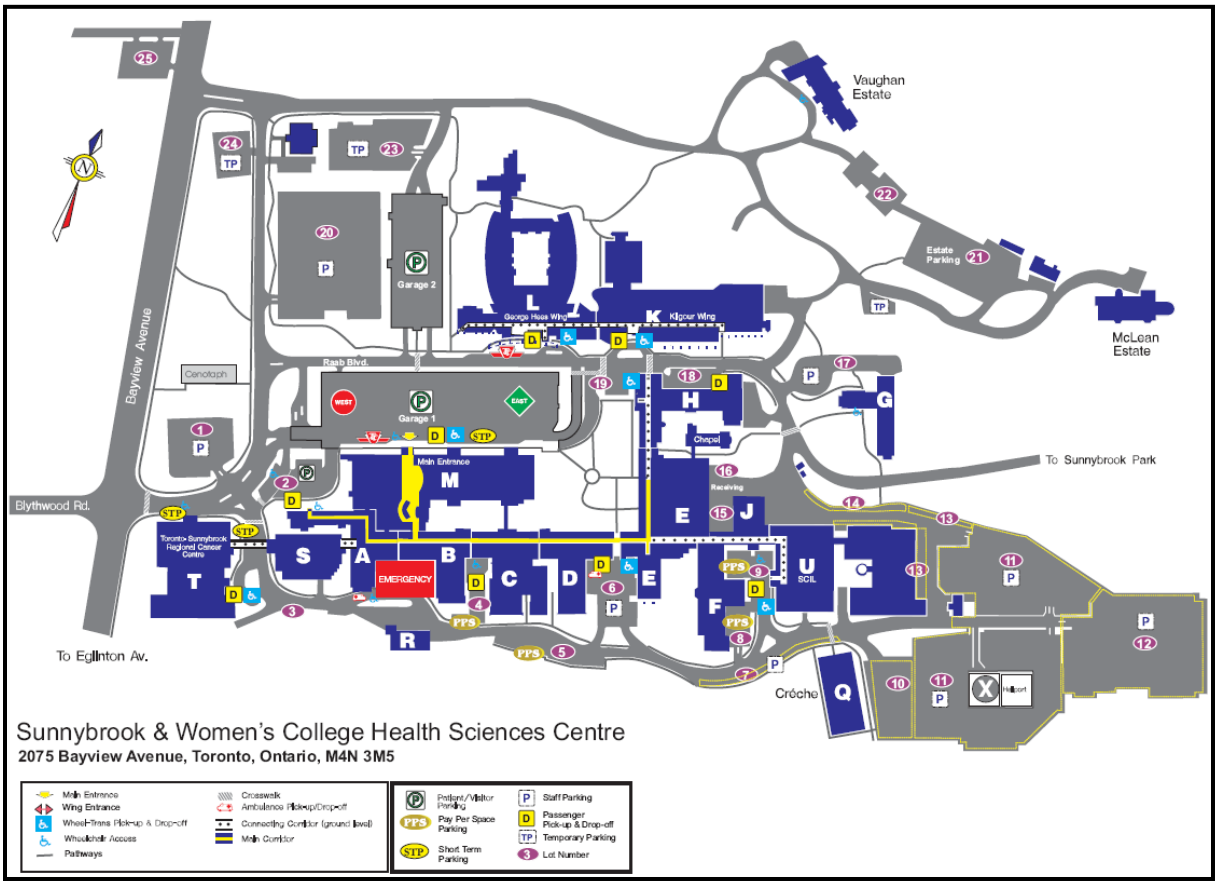

Figure 1: Map of Sunnybrook Bayview Campus

The following table summarizes the Bayview Campus building details including age and sq footage:

Table 1: Bayview Campus Building Summary

Building Name	Year Built	# of Floors	Square Footage	Main Hospital Uses
A – Wing	1944	8*	172,499	Mixed acute care and office
B – Wing	1944	9*	99,975	Mixed acute care and office
C – Wing	1978	11*	197,756	Mixed acute care and office
D – Wing	1976	13*	168,819	Mixed acute care and office
E – Wing	1948	8*	193,955	Mixed acute care, office and support
F – Wing	1944	5*	59,719	Mental Health – chronic and acute care
G – Wing	1946	7	71,315	Office
H – Wing		6*	127,754	Office, support
J – Wing	1944	2*	22,108	Office, support
K – Wing	1974	5*	243,918	Veterans Care - Chronic
L – Wing	1987	5*	275,217	Veterans Care - Chronic
M – Wing	1996	10*	681,857	Mixed acute care and office
Q – Wing		1	7,617	Office
R – Wing	1965	2*	10,740	Office
S – Wing	1992	9*	155,377	Research
T – Wing	1995	5*	197,118	Cancer Centre
U – Wing	1944	2*	92,511	Office and support (Central Utilities Plant)
Dorothy Macham	2000	2*	13,388	Veterans Care
Wellspring Centre	2000	1	11,516	Office
Estates	1920	2	51,703	Non-hospital use
ALL BAYVIEW CAMPUS		***TOTAL***	***2,803,160***	

* Includes basement level

2.3 BAYVIEW HVAC SYSTEMS

Sunnybrook Health Sciences Centre has a Central Utilities Plant located in U-Wing which provides central heating and cooling to most of the buildings at the Bayview campus. Ventilation and air handling systems are specific to each area and are located in mechanical rooms throughout the buildings.

Steam Plant: The Central Utilities Plant has four (4) natural gas fired boilers having a capacity of 50,000 lb/hr to 60,000 lb/hr each. Boilers 1, 2, and 3 are Foster Wheeler and were installed in 1972, while Boiler #4 is an English Boiler and was installed in 2007. The total steam generation capacity is about 210,000 lbs/hr and the current peak winter steam load is around 100,000 lbs/hr. High pressure steam is generated at 125 psig (saturated) by the four steam boilers which is then supplied from the central plant to all wings via 12” + 6” mains in the service tunnel. Steam pressure is maintained at a constant 125 psi with distribution at each building via pressure reducing valves. Each boiler is equipped with an economizer and according to a recent study by Enbridge (Sunnybrook Steam Plant Baseline Performance Testing and Assessment, November 2011), the average efficiency of the boilers is 81.6% (LHV). The steam boilers provide heating for space heating as well as for domestic hot water.

Chilled Water System: There are currently five (5) centrifugal chillers and two (2) absorption chillers installed at the Central Utilities Plant. The five York centrifugal chillers are each rated for 1,400 Tons. Four were installed in

2006/2007 and the fifth one was installed in 2013. The two Carrier double-effect absorption chillers are rated at 1,500 Tons each and were installed in 1995. The total chilling capacity is about 10,000 Tons. Each chiller is served by a cooling tower for a total of 7 cooling towers. Two of the cooling towers are currently equipped with heat exchangers to provide free cooling during the winter months. The chilled water system was designed for a chilled water main supply temperature of 44F and a return temperature of 60 F. The unit electricity use of the centrifugal chillers at full load is about 0.56 kWe/Ton. However, at part load, their performance can improve to 0.45 kWe/Ton. The absorption chillers require 9.9 lb/hr-Ton, or 13,900 lb/hr each, at full load.

Air Handling Systems: Ventilation and air handling systems are specific to each area and are located in mechanical rooms throughout the buildings. Some systems operate 24/7 while others are only running during typical office hours. Systems serving multiple use types are controlled to operate based on the worst case space requirements.

Building Automation System: Majority of the building systems are controlled through the Johnson Controls "Metasys" system, which is monitored from the central utilities plant. This is a comprehensive controls system that is capable of monitoring various inputs such as system and space temperatures, and equipment status. Energy saving controls strategies include:

- a summer economizer control for mixed air dampers
- temperature resets for constant reheat systems
- time schedules for each fan to allow equipment operation to align with occupancy
- unoccupied night setbacks outside air temperature lockout strategies to avoid simultaneous heating and cooling

2.4 BAYVIEW ELECTRICAL SYSTEMS

Hydro power is supplied to the site from Toronto Hydro at 27,600V with two feeders which terminate in the hospital's main 27.6kV Switchgear. The incoming hydro service is reduced to a hospital high voltage distribution system at 4,160V via four 5,000kVA outdoor transformers (T1, T2, T3 & T4). Each transformer serves some hospital load. From the 4,160V switchboard, power is stepped down and distributed to low voltage switchboards around the site.

Emergency Power Generation: There are seven emergency power diesel generators at the Hospital, with two 600V units (400kw & 600kw) being dedicated to the Central Plant and five 4,160V units (2 @ 800kW and 3@900kW) serving hospital loads. In emergency conditions, up to 3.6 MW of power is supplied from diesel generators, which is approximately 40% of the hospitals base load demand. A project is currently underway to replace the existing generators with new, larger generators for increased capacity and facility renewal.

3 Energy Management Framework , Goals and Targets

3.1 FRAMEWORK – WHO IS RESPONSIBLE FOR WHAT

As Sunnybrook, the responsibility of energy management falls within the Operations and Maintenance Department. The Manger of Energy and Sustainability is responsible for overseeing the energy management process. The Manger of Energy and Sustainability involves various energy champions to help with energy tracking, efficiency improvements, and planning of new capital projects. Energy management decisions are approved by the Director of Plant Operations & Maintenance and the Executive Vice President Chief Administrative Officer. The following chart represents the decision making hierarchy for decisions related to energy /environment policies and projects.

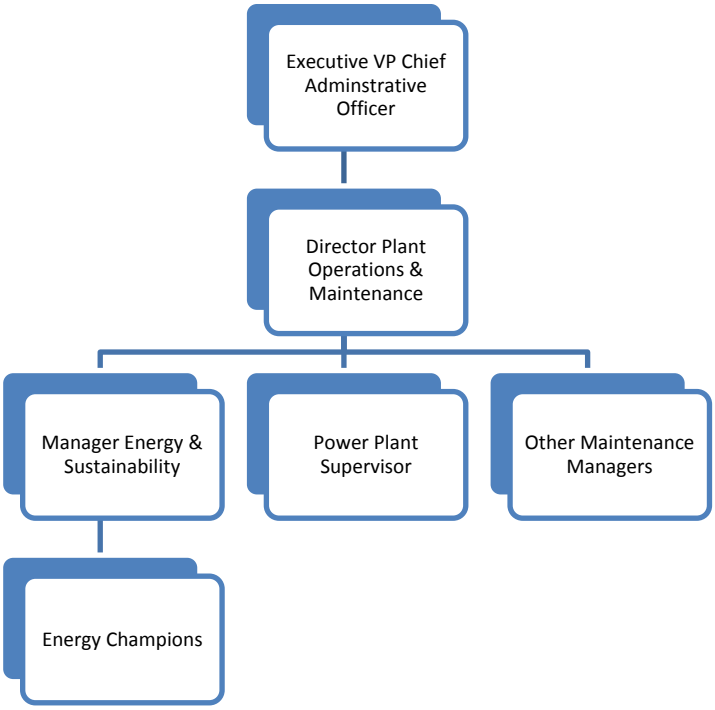

Figure 2: Sunnybrook Energy Management Responsibility Chart

The following table summarizes the members of the "Energy Team" and their extent of involvement based on their percentage of time spent on "Energy Team" related work.

Table 2: Sunnybrook Energy Team

Name	Position	% of time on Team
Laura Berndt	Manager: Energy & Sustainability	70%
Michael McRitchie	Director: Plant Ops & Maintenance	10%
Kelven Kwong	Project Coordinator	10%
Kyle Buxton	JCI Tech	10%
Kevin McQueen	Power Plant Supervisor	5%
Michael Young	Executive VP: Chief Administrative Officer	<5%

3.2 ENERGY MANAGEMENT PROCESS

Energy management is intended to be a process of continuous improvement. A closed loop feedback approach is most effective in demonstrating results that will justify further investment in efficiency. The energy management process at Sunnybrook has four key components: Investigation and planning, implementation, measurement and verification, and celebration and improvement.

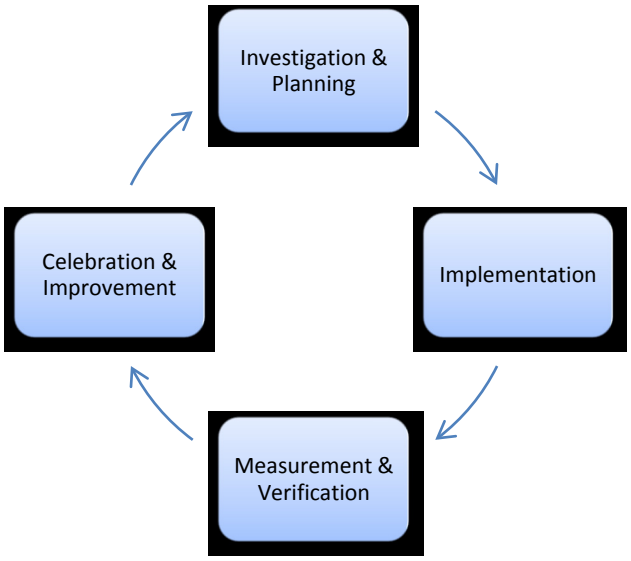

Figure 3: Sunnybrook Energy Management Process

Investigation & Planning: Is the on-going process of identifying energy efficiency opportunities. It includes establishing budgets, resources and timelines required to meet targets and objectives.

Implementation: Is the execution and management of various energy efficiency projects. It includes tracking progress and preparing status reports to keep projects moving forward.

Measurement & Verification: Is the regular monitoring and tracking of energy performance. It includes reporting and analyzing the trends in operation, energy consumption, and energy costs.

Celebration & Improvement: Is the regular communication of achievements and successes. It includes building on past success and recommending improvements, course corrections, and modifications to the plan.

3.3 GOALS AND TARGETS

Sunnybrook is committed to environmental stewardship and to reducing the hospital's dependence on non-renewable energy and waste sources. As such, Sunnybrook has developed 5 year energy reduction targets based on a consistent 2% per year reduction. These goals are based on the hospital's existing 2012 conditions including: energy rates, building footprints, and equipment specific to the hospital's end uses. Should these conditions change over the next five years; these targets will also be adjusted accordingly.

Sunnybrook's 5 Year (2014-2019) Energy Targets are as follows:

- A 10% reduction in electricity and natural gas use
- A 5% reduction in peak electrical demand
- A 10% energy cost reduction
- A corresponding reduction in greenhouse gas emissions of 10%

3.4 KEY CHALLENGES AND CONSTRAINTS

Hospitals have many urgent and pressing needs, such as maintaining a safe environment for patients, budget constraints, inspections, or staff retention issues. It is often challenging to plan for energy management when there are many competing priorities.

Sunnybrook also has the challenge of how to meet infrastructure renewal needs when there is such strong competition for the funding required for facility renewal. Many of Sunnybrook's buildings and systems are aging (over 40 years) and at a stage where significant facility renewal is required. For example, the most recent VFA assessment scores show that Sunnybrook has a FCI score over 30%. Ideally $20-$40 Million would be invested in an infrastructure renewal program per year (that's 2-4% of our building's capital replacement value). Unfortunately this is not the reality and the hospital does what it can with the limited resources available.

In addition to aging infrastructure, there are also sensitive occupants who require stringent air quality and comfort conditions which can constrain energy saving measure opportunities. Conservation measures must not effect patient comfort, infection control or impede the operation of medical equipment.

Lastly, Sunnybrook's demand profile is not very flexible and the peak electrical load is heavily dependent on weather conditions which align with the rest of the province, making it an expensive time to require energy.

4 Energy Benchmarking

4.1 SUNNYBROOK'S LOAD PROFILES (BAYVIEW)

Hospital buildings are known to be one of the most energy intensive building types in Canada and the United States. The following graph from the Commercial Building Energy Consumption Survey (CBECS) in the United States shows that the healthcare industry uses significantly more energy than other non-industrial building types.

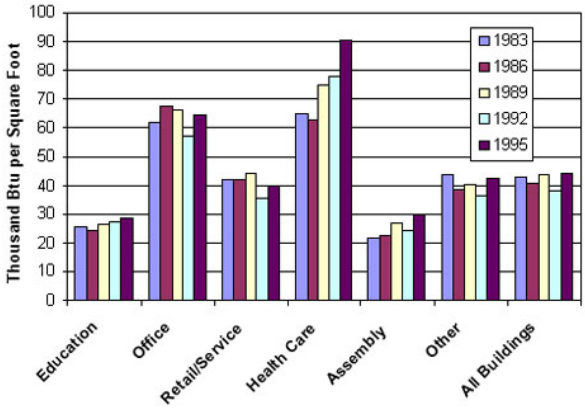

Figure 4: Building Energy Use - CBECS

Sunnybrook currently spends over $14 million annually in utility costs (natural gas, electricity and water), and has an average energy intensity of 67.56 ekWh/ft² of floor space. Sunnybrook's main energy uses include electricity (for lighting, space cooling, HVAC pumps & fans and other medical equipment) and natural gas (space heating and domestic hot water).

Electricity Consumption Profile: Sunnybrook Bayview uses 70 million kwh of electricity per year. Electricity consumption is highest in the summer months when the electrical demand is greatest due to increased cooling loads. The weather normalized electricity consumption data from 2010 – 2012 shows the increase in electrical consumption due to new spaces that were first occupied in 2012.

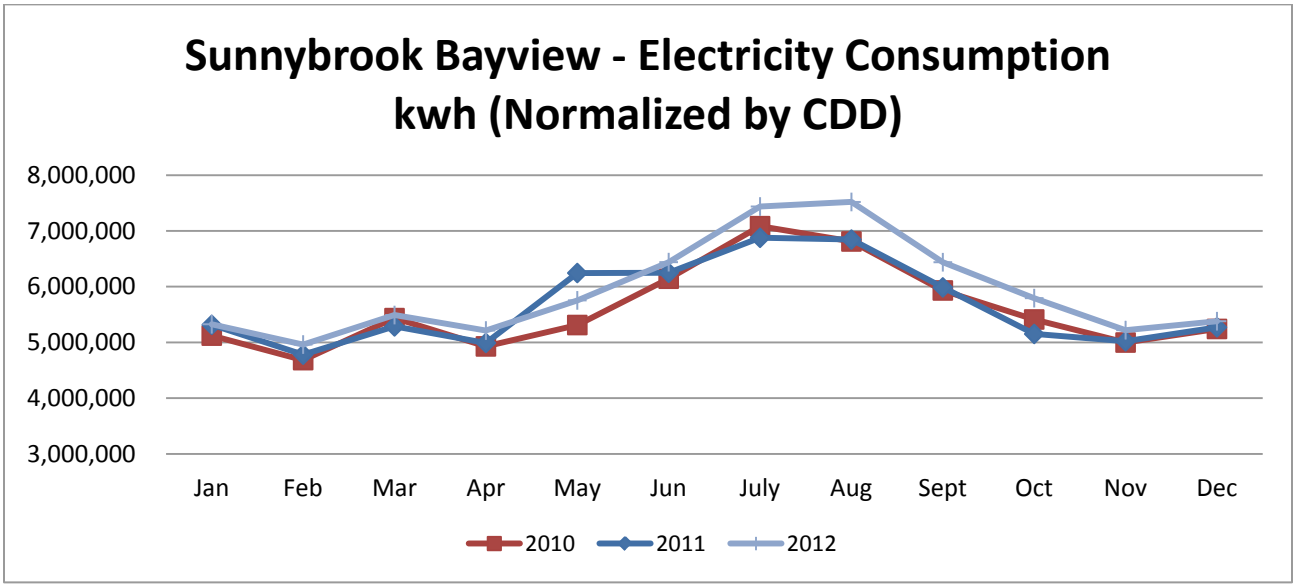

Figure 5: Sunnybrook Electricity Consumption

Electricity Demand Profile: The summer peak electrical demand at Sunnybrook Bayview is 14MW compared to the winter peak demand of 8.5MW and a night load of 6.5MW. Sunnybrook's high electricity demand qualifies as a Class-A electricity customer and global adjustment electricity costs are determined by the peak loads experienced on the 5 worst (province's highest loads) days of the year. As a result Sunnybrook has potential to significantly reduce electricity costs by reducing peak electrical loads on the worst days of the year.

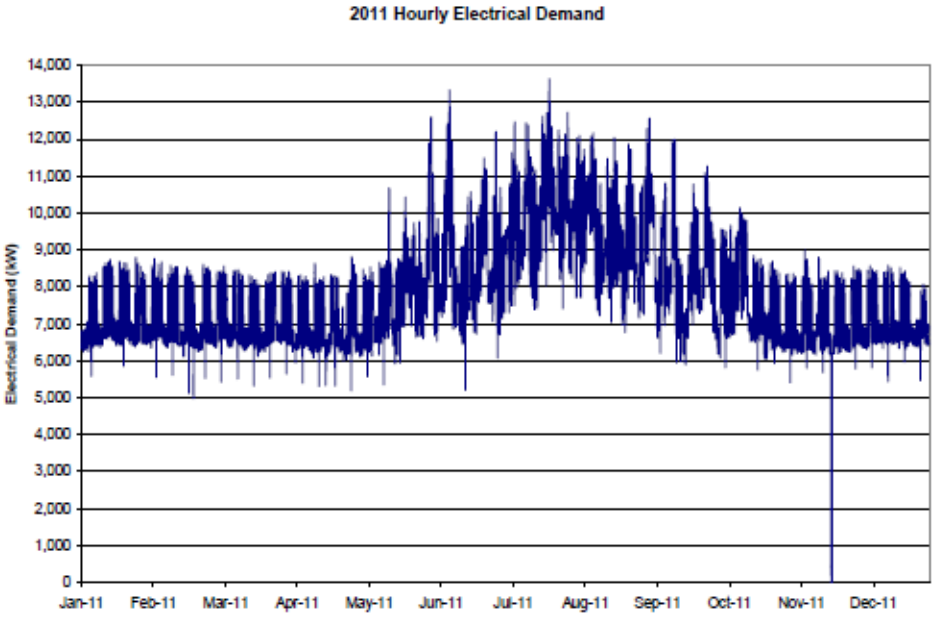

Figure 6: Sunnybrook Bayview Electricity Profile

Natural Gas Consumption Profile: Sunnybrook Bayview uses 10,500,000 m^3 of natural gas per year. Natural Gas consumption is highest in the winter months when the heating demand is greatest due to cold temperatures. The weather normalized electricity consumption data from 2010 – 2012 shows that the NG consumption has also increased due to new spaces occupied in 2012 and appears to show some inconsistencies which may indicate there is room for improvement.

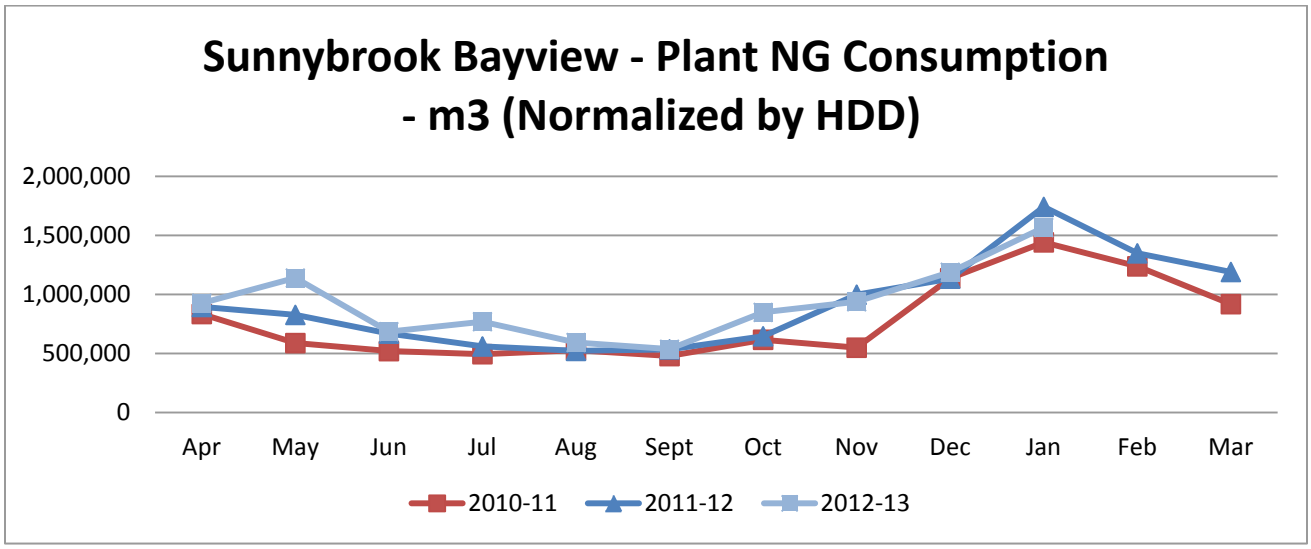

Figure 7: Sunnybrook Natural Gas Consumption

Natural Gas Demand Profile: The winter peak natural gas demand at Sunnybrook Bayview is 2,500 m^3/hr compared to the summer base demand of 700m^3/hr. During summer natural gas is sometimes required to produce steam for the absorptions chillers which can increase the summer load as high as 1,500 m^3/hr.

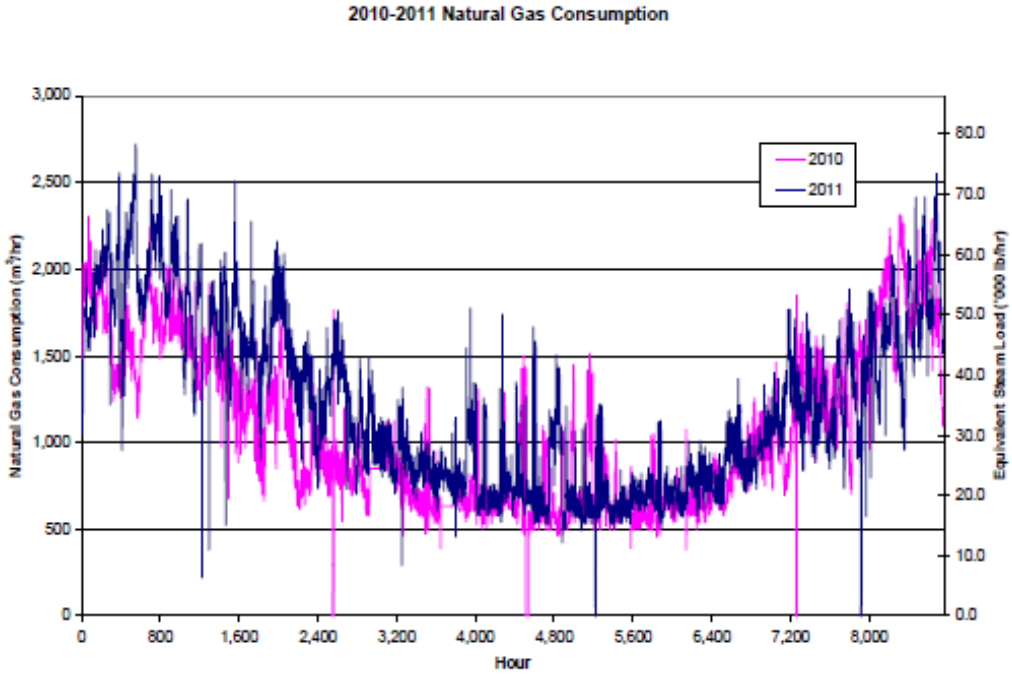

Figure 8: Sunnybrook Bayview Natural Gas Profile

4.2 SUNNYBROOK'S 2012 PERFORMANCE METRICS

Energy intensities are used to measure energy performance and compare that performance to other hospitals of different sizes and locations. This is calculated based on the total energy consumed and divided by the hospital's total gross square footage. The table below summarizes the hospitals 2012 performance data as reported to the Green Energy Act.

Table 3: 2012 Performance Data - as reported to Green Energy Act

	Bayview	Holland	St. John's	Total Sunnybrook
Electricity Used	70,286,368 [kwh]	5,186,222 [kwh]	3,191,158 [kwh]	78,663,748 [kwh]
Electricity Intensity	25.88 [kwh/ft^2]	34.99 [kwh/ft^2]	14.12 [kwh/ft^2]	25.46 [kwh/ft^2]
Natural Gas Used	10,653,782 [m^3]	500,848 [m^3]	593,728 [m^3]	11,748,358 [m^3]
Natural Gas Intensity	3.92 [m^3/f^2]	3.38 [m^3/ft^2]	2.63 [m^3/ft^2]	3.80 [m^3/ft^2]
Total Energy Used	183,494,489 [ekwh]	10,549,447 [ekwh]	9,276,109 [ekwh]	203,280,045 [ekwh]
Total Energy Intensity	67.56 [ekwh/ft^2]	70.9 [ekwh/ft^2]	41.05 [ekwh/ft^2]	67.78 [ekwh/ft^2]
GHG Emissions	26,892,632 kg	1,445,002 kg	1,395,387 kg	29,733,021 kg

4.3 HOW SUNNYBROOK COMPARES TO PEERS

Sunnybrook has used two main sources for comparison of energy performance to peers. The first is the "2011 Hospitals Total Energy Benchmark" produced from the published energy data reported by Ontario Hospitals for the 2011 Green Energy Act. The second is the "Benchmarking 2.0 for Health Care Facility Management Report" produced by IFMA, AEE and CHES that compares 184 hospitals across the United States and Canada.

The following table from the 2011 Hospitals Total Energy Benchmark shows how each of the Sunnybrook sites performs compared all Ontario hospitals with regards to overall energy intensity. On average, Sunnybrook performs near the median for total equivalent energy intensity compared to other hosptials in Ontario. It should also be noted that the hosptials in the top 30% percentile are typically continuing care hospitals whereas the lower scoring hospitals tend to be acute care hosptials like Sunnybrook.

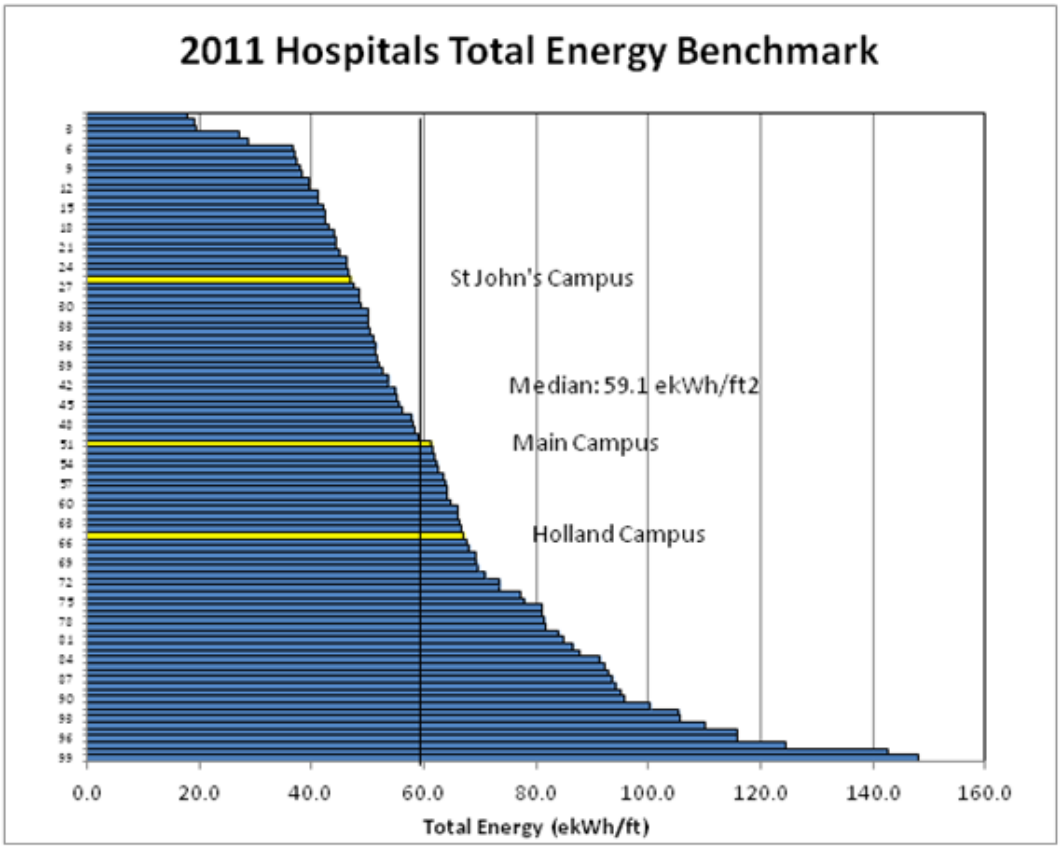

Figure 9: Energy Use Benchmarking for Hospitals – 2011 Green Energy Act Reporting

4.4 LIST OF PAST ENERGY EFFICIENCY MEASURES

In 2008 Sunnybrook began a partnership with Honeywell to improve Sunnybrook's energy efficiency and green initiatives through the Energy & Facilities Renewal Program. The Program has been a successful application of the ESCO (Energy Services Company) model for implementing energy efficiency upgrades and has enabled Sunnybrook to carry out infrastructure upgrades without financial risk or capital dollars and pay for the project from energy savings.

Energy efficiency and facility renewal projects included:

- Installation of 100 KW Solar PV Array
- Replacement of Holland campus chillers and cooling towers to more energy-efficient models that use environmentally friendly refrigerants
- Installation of a new efficient electric chiller to meet growing capacity demands of the hospital
- Installation of high-efficiency lighting systems and control strategies that provide better illumination while using less energy
- Upgrading and optimization of ventilation, heating and cooling equipment including:
    - Installation of heat reflectors on cabinet type heaters to reduce heat loss through exterior walls
    - Dynamic Ventilation Reset of laboratory exhaust hoods
    - Installation of variable speed motors allowing regulation of airflow

- Improvement of aging mechanical systems that serve critical areas with more energy efficient products including:
    - Insulating valves and pumps with removable thermal jackets to reduce thermal heat loss while allowing for future maintenance on equipment
    - Replacement of old heat exchangers with new shell and tube heat exchangers
    - Replacement of old hot water heaters with new efficient DHW heaters
- Improvement of aging electrical systems including:
    - Improvements to power factor and power quality
    - Replacing older transformers with high efficiency models
- Upgrading building automation systems to optimize energy management. Added control strategies including:
    - a summer economizer control for mixed air dampers
    - temperature resets for constant reheat systems
    - time schedules for each fan to allow equipment operation to align with occupancy
    - unoccupied night setbacks
    - outside air temperature lockout strategies to avoid simultaneous heating and cooling
- Improvements to building envelope including weather-stripping, sealing the cracks, and sealing penetrations
- Launch of Environmental Sustainability Website and many environmental awareness programs
- Implementation of a Hydroclave waste system for disposal of biomedical wastes

The two phase program launched in 2008, has been very successful saving over $2,000,000 in utility costs annually. Phase 1 measures were completed in summer of 2010 and have been confirmed through measurement and verification to be achieving the predicted annual utility savings.

Annual Savings of Phase 1 Measures:

- over 7,000,000 kwh of electricity consumption
- over 4,700 KW of electricity demand
- over 2,900,000 m3 of natural gas
- over 185,000 m3 of water

5 Utilities Monitoring & Tracking Plan

5.1 DESCRIPTION OF CURRENT MONITORING SYSTEM

Sunnybrook is implementing a digital monitoring system to monitor electricity use at each building. Currently 85 % of the building level loads are being digitally sub-metered and 60% of those are currently connected and communicating to the metering system. Sunnybrook is currently developing a plan to have the remaining building's metered and connected to the system so that a complete breakdown of the campus energy use by building will be possible. The following table summarizes the sub meters currently installed at Sunnybrook:

Table 4: Sunnybrook Bayview Campus Sub-metering Summary

Building				
Whole Campus	Main Sub	PowerLogic ION 7650 PowerLogic ION 7650 PowerLogic ION 7650 PowerLogic ION 7650	T1 T2 T3 T4	Measures main transformers
A – Wing	Sub-9	Cyberhawk 300 Cyberhawk 300	9N 9E	
A – Wing	Sub-10	Cyberhawk 300 Cyberhawk 300 Analog	10A-E 10B-E 10C-N/E	Serves- X-Ray Serves- X-Ray Serves- CT Scanner
A – Wing	Sub-11	Analog	11X	Serves A Wing Extension
B – Wing	Sub-8	Cyberhawk 300 Cyberhawk 300	8N 8E	
C – Wing	Sub-6	PowerLogic ION 7350 PowerLogic ION 7350	6N 6E	*Does not capture power to the Cath. Lab
C – Wing	Sub-7	PowerLogic CM 4000 PowerLogic CM 4000 PowerLogic CM 4000	7N1 7E1-1 7E1-2	Serves – Emergency and Satellite Imaging.
D – Wing	Sub-5	Cyberhawk 300 Cyberhawk 300	5N 5E	*Does not capture power to the Cath. Lab
	Sub-4	Power Logic ION 7350	4N	Serves - Nutrition??
E – Wing	Sub-3	Cyberhawk 300 Cyberhawk 300	3N 3E	
F – Wing	Sub-2	Analog	2E	
G – Wing	Sub-14	PowerLogic CM 3000	14X	
H – Wing	Sub-13	PowerLogic ION 7350 PowerLogic ION 7350	13N 13X	
K – Wing	Sub-16	PowerLogic ION 3750 Cyberhawk 300 PowerLogic ION 3750	16N 16E MH	MH = McLean House
L – Wing	Sub-19	PowerLogic ION 7350 Analog Analog	19N-1 19N-2 19E	
M – Wing	Sub-18	PowerLogic ION 3750 PowerLogic ION 3750 PowerLogic ION 3750 PowerLogic ION 3750	18N3 18N4 18E3 18E4	
M-Wing	Sub 18X			Serves M Wing Extension
S – Wing	Sub-15	PowerLogic ION 3750 PowerLogic ION 3750 PowerLogic ION 3750 PowerLogic ION 3750	15N1 15N2 15E1 15E2	Serves Research
T – Wing	Sub-12	PowerLogic ION 7350 PowerLogic ION 7350	12N 12E	
U – Wing	Sub-1	Cyberhawk 300 Power Logic 10N 7350	1N 1N	Serves – Laundry, SCIL, Maintenance

5.2 WHAT DATA/INFORMATION IS BEING MONITORED/TRACKED

Electricity and natural gas utility bills are monitored and tracked monthly and a normalized energy comparison is produced each year to identify trends in consumption and cost. Once the new digital metering system is successfully and accurately reading data, a quarterly report will be produced identifying demand trends, consumption trends and energy use irregularities for each building.

5.3 FREQUENCY OF REPORTING

Sunnybrook will be required to report electricity and natural gas use annually as per Regulation 397/11 of the Green Energy Act. This will report energy use broken down by each building and by building use (hospital or administrative). The annual energy reports will be made public on the Sunnybrook website.

An Embedded Energy Manager Projects Report is also produced quarterly which tracks project status of ongoing energy conservation measures.

6 Energy Management Plan

6.1 AREAS WITH POTENTIAL FOR IMPROVEMENT

Potential areas for improvement include the following:

- Employee engagement, awareness and training
- Optimization of the building automation controls through re-commissioning
- Optimization of the chilled water plant and air conditioning systems
- Replacing equipment nearing end of life with new more efficient equipment such as air handling equipment.

6.2 DISCUSSION OF POTENTIAL ENERGY CONSERVATION PROJECTS

The table below summarizes the main energy saving measures that are being planned at Sunnybrook over the next five years. These projects are in the planning stage and as such are subject to funding. In addition, all potential energy conservation projects are tracked in greater detail in the Embedded Energy Manager projects log which is the basis for the Embedded Energy Manager quarterly report. Energy conservation projects are organized based on the project stage and are categorized as either: complete, underway, under investigation and feasibility, or as just an idea. The tracking report includes estimated energy and cost savings for each project as well as a forecasted completion of the project. The projects log is used to track the status of project including the application of any applicable incentives and is updated quarterly.

Table 5: List of Energy Saving Measures

Description of Measure	Cost Estimate	Potential Energy Savings	Duration
Energy Management Policy: develop and implement a hospital wide energy management policy. Includes expectations for how energy using equipment such as lights, AC, computers, windows etc, should be operated, purchased, and maintained.	-	-	5 yrs
Employee Engagement Program: develop and implement an employee engagement program to encourage energy saving ideas and behaviours from hospital staff.	$5,000 - $15,000	260,000 kWh/yr	5 yrs
Monitoring & Tracking: Implement a system to regularly monitor building performance, through metering, BAS trending and/or analytic programs such as Panoptics.	$20,000 - $100,000	200,000 kwh/yr	5 yrs
Cool Roofs: Continue to install cool roofing materials as roof sections that have reached end of life are replaced	-	5,000 kWh/yr	20 yrs
Upgrade Window AC Units: Replace older window AC units with new Energy Star efficient models. All new AC units to be Energy Star Efficient Models.	$75,000 - $100,000	60,000 kwh/yr	20 yrs
Upgrade Computer Hardware: Replace PCs that are used 24x7 with Zero Client Hardware to reduce processing power requirements.	$640,000 - $1,000,000	600,000 kwh/yr	5 yrs
Upgrade Street Lighting: Replace existing street lighting with efficient LED street lighting.	$300,000 - $1,000,000	125,000 kwh/yr	20 yrs
Chilled Water Optimization: Optimize the performance of the chilled water plant through commissioning, valve upgrades, and variable flow.	$100,000 - $300,000	400,000 kwh/yr	20 yrs
Peak Load Shedding: Utilize new generator equipment complete with Eco Cube Emissions Control to offset peak loads corresponding with the provincial peak loads.	$500,000	5000 kw	5 yrs

7 Renewable Energy & Cogeneration

7.1 CURRENT RENEWABLE ENERGY STRATEGIES

In 2008, a 100KW Solar System was installed at Sunnybrook. The system consists of two arrays. The first is a 30KW Solar Wall with more than 140 solar panels spanning two stories of a parking garage. The panels are mounted vertically on the wall of the structure, which is located at the main entrance of the campus so as to serve as a visual reminder of the hospital's conservation efforts, as well as produce clean, renewable energy. The second solar array totaling 70KW, is on the roof of the hospital's U-Wing. At the time of construction, the two arrays combined formed the largest solar power generation system at a healthcare facility in Canada.

In addition, a display near the parking garage educates visitors and staff on photovoltaic technology, and provides real-time information on power generation and carbon emissions reduction.

7.2 POTENTIAL FUTURE RENEWABLE ENERGY STRATEGIES

Potential renewable energy strategies include, additional solar installations, biomass technologies, geothermal applications and combined heat and power generation. At this time only preliminary investigation has occurred with the exception of the additional solar for which a detailed study has been conducted identifying the best plans for a future systems.

7.3 POTENTIAL FUTURE COGENERATION

Sunnybrook is currently investigating the potential to implement a cogeneration system to provide both electricity generation and steam heating at Sunnybrook. This improves efficiency as the waste heat from power generation can be utilized in the heating plant. A detailed engineering study has been completed to determine economic feasibility and potential payback. In addition to the financial benefits of this project, the added 8MW (8 megawatts) of generation capacity would add resiliency to our power distribution system and reduce the risk to our patients associated with power interruptions - such as those experienced during the December 2013 Ice Storm.

8 New Construction & Energy Efficiency

8.1 ADDRESSING ENERGY EFFICIENCY IN NEW CONSTRUCTION PROJECTS

Sunnybrook plans to develop a Energy Efficiency Review Process by which all new equipment and construction will need to be reviewed.

9 Train, Educate & Celebrate

9.1 AWARENESS CAMPAIGN

Sunnybrook's Environmental Sustainability program "Earth Matters" builds awareness of environmental sustainability, energy use and energy conservation. Through the program Sunnybrook communicates to staff and patients through various media including: newsletters, environmental sustainability website and intranet site, blog, and various events. This is all delivered using the recognizable "Earth Matters" Brand.

Sunnybrook's Manager of Energy and Sustainability is responsible for implementing, sustaining and expanding the Environmental Sustainability program designed to achieve savings and promote sustainable practices and behaviors. Having an employee dedicated to this purpose is very important and allows for the momentum of the program to continue long after implementation of specific measures.

One of the effective tools used in promoting the environmental program is the Earth Matters Showcase, an annual event held at Sunnybrook to bring awareness to environmental initiatives underway at the hospital while educating employees, physicians, students, volunteers and community members about what they can do to help the environment. Throughout the day-long symposium, attendees are encouraged to interact with exhibitors who explain the impact of their unique greening initiatives on the hospital and the community.

9.2 TRAINING PROGRAMS

Through the Environmental Sustainability program "Earth Matters" various training programs are being developed, such as general training through staff orientation, and specific energy training programs for the operations staff and the cleaning staff.