

London Health Sciences Centre

ENERGY CONSERVATION AND DEMAND MANAGEMENT (CDM) PLAN Made for Ontario Regulation 507/18 – The Electricity Act



**Prepared by Facilities Management
2019-2024**

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Introduction

London Health Sciences Centre (LHSC) has created this conservation demand management (CDM) plan to promote environmental stewardship and to fulfill its obligations to O. Reg. 507/18 Electricity Act, 1998. LHSC posted its former CDM plan in 2014 under the Green Energy Act, O.Reg 397/11, which was repealed with Bill 34, Green Energy Repeal Act, 2018. Provisions regarding energy and greenhouse gas emission reporting and the conservation demand management plan were re-enacted in the Electricity Act and the requirements prescribed by the new regulation must include the following information:

1. A summary of annual energy consumption for each of the public agency's prescribed operations.
2. A description and a forecast of the expected results of current and proposed activities and measures to conserve the energy consumed by the public agency's prescribed operations and to otherwise reduce the amount of energy consumed by the public agency, including employing such energy conservation and demand management methods as may be prescribed.
3. A summary of the progress and achievements in energy conservation and other reductions described in paragraph 2 since the previous plan.

London Health Sciences Centre's energy conservation and demand management program will reduce overall energy consumption, operating costs, and greenhouse gas emissions. It will be posted on both the internal and external LHSC websites and available to anyone in hard copy upon request at head office.

Past CDM Results Summary (2014 - 2019)

From the energy projects completed since the posting of the previous CDM plan in 2014, LHSC has achieved the following results:

- **6% reduction in energy consumption**
- **\$713,072 in annual energy cost reduction**
- **4,140,822 kWh decrease in electricity consumption**
- **1,102,043 m3 decrease in gas consumption**
- **3,166,142 lb decrease in steam consumption**
- **2,508 tonnes reduction in annual carbon dioxide equivalent (tCO₂e) emissions**

Annual utility costs are a significant part of overall operating costs. London Health Sciences Centre's annual energy consumption and related costs/emissions for 2017 were:

- **Utility costs were approximately \$15,000,000 for the year.**
- **Energy related emissions for 2017 equaled 45,216 tCO₂e for the five sites.**
- **Total energy project investment over the 5 years was \$16,973,232**

Benchmark - the Hospital's Energy Use Index (EUI) for 2017 was as follows:

Hospital Energy Use Index (ekWh/ft²)	
Byron Family Medical Centre	15
Kidney Care Centre	43
Victoria Family Medical Centre	20
University Hospital	54
Victoria Hospital	106

Future CDM Forecast Summary (2019 - 2024)

With energy management an integral part of the strategic direction, London Health Sciences Centre can expect to achieve the following targets by 2024:

- **6% reduction in energy consumption**
- **\$575,488 in annual energy cost reduction**
- **1,913,497 kWh decrease in electricity consumption**
- **1,384,587 m3 decrease in gas consumption**
- **5,138,884 lb decrease in steam consumption**
- **3,640 tonnes reduction in annual carbon dioxide equivalent (tCO₂e) emissions**

To further strengthen and obtain full value from energy management activities, a strategic approach will be taken: the organization will fully integrate energy management into its business decision-making, policies, and operating procedures.

Active management of energy related costs and risks in this manner will provide a significant economic return to the organization and will support other key organizational objectives.

Past Measures from 2014 CDM Plan

In July 2014, London Health Sciences Centre developed goals and objectives for decreasing the facilities annual energy consumption and resulting greenhouse gas emissions. The following activities, completed between 2014 and present day are associated with managing overall energy consumption, lowering annual operating costs, and reducing greenhouse gas emissions.

Victoria Hospital (VH) – large project work

- **Power plant upgrades** – Past work completed at the Victoria Hospital power plant includes the control fuel/ratio system of the high pressure boiler, flue gas economizer installation, blow down heat recovery, process improvements on the gas turbine, a new roof, and a steam pipe insulation study. This project work received **\$97,070** in Union Gas incentive money and is reducing natural gas consumption by **1,000,000 m3** per year.
- **Chiller replacement** - Six new absorption chillers were installed in place of old and failed equipment to make use of the waste steam being produced at the Victoria Hospital power

plant while providing cooling to the hospital. The additional steam demand is expected to allow LHSC to run its four megawatt KB5 gas turbine during the summer months and create additional cost savings through the electricity generated. This was an **\$8,000,000** investment that awarded almost **\$400,000** in incentive money and is reducing the hospital's electricity consumption by over **2,000,000 kWh** per year.

- **Cooling tower replacement** – Zone C & D cooling towers servicing the new absorption chillers were replaced. They were installed with Variable Frequency Drives on the fans that modulate with the cooling load. The project cost **\$3,200,000** and is saving approximately **200,000 kWh** per year.
- **Parking garage lighting** - Victoria Hospital parking garage was updated with LED lighting. This project cost **\$300,000**, received approximately **\$70,000** in incentive money and is saving the hospital **170,000 kWh** of electricity per year.
- **Boiler upgrades** - In 2017, LHSC received **\$1,523,864** through the Hospital Energy Efficiency Program (HEEP) to upgrade the burner control assembly on two boiler units at the Victoria Hospital power plant. The project was estimated to save **102,043 m3** of natural gas and **\$18,367** in operational savings per year.
- **Power plant lighting** - In the same year, another **\$125,829** of HEEP money was awarded to LHSC to complete a lighting overhaul at the power plant. All of the fluorescent lighting was replaced with new LED technology reducing electricity consumption by **238,859 kWh** and costs by **\$40,000** per year.

Victoria Hospital (VH) – small project work

Date	Project	Cost	Savings (kWh)	Incentive
Jul-15	VH fire alarm upgrade	\$470,080	20,726	\$1,365
May-16	VH HVAC unit - building D	\$21,000	5,120	\$7,360
Oct-16	VH Variable frequency drive on 15 HP motor	\$3,068	8,056	\$805
Nov-16	VH Building 24 HVAC unit	\$9,683	324	\$1,600
Dec-16	VH LED Lighting - patient washroom lights	\$8,350	36,682	\$4,020
Jan-17	VH Gift Shop LED reflector lamp	\$8,675	3,316	\$320
Feb-17	VH LED lighting - hospital sign	\$11,960	23,888	\$1,194
May-18	VH LED lighting - E zone	\$3,830	4,538	\$240
Jul-18	VH custom LED lighting project	\$8,855	4,748	\$237
Oct-18	VH LED lighting - D zone bridge	\$1,120	1,751	\$150
Oct-18	VH LED lighting - canopy light	\$1,680	2,335	\$200
Mar-19	VH LED lighting - 75 linear ambient fixtures	\$25,000	10,750	\$3,500
Total		\$573,301	122,234	\$20,991

Victoria hospital invested approximately **\$13,884,386** in the energy projects listed above, received **\$1,600,000** in provincial grant money and **\$556,281** in energy efficiency incentive money. The projects are saving **3,002,093 kWh** of electricity, **1,102,043 m3** of natural gas and reducing greenhouse gas emissions by **2,247,610 kg CO2e** each year.

Victoria Hospital (VH) – operational changes

- **Cooling loop upgrade** - New BACnet control boards were added to the Victoria Hospital chillers in 2018 and connected to the building automation system to provide real time cooling loads associated with each chiller. The data is now visible on the building automation control screen as a percentage of total capacity for each chiller. In addition, the cooling system was modified to run in an open loop format so that the eleven chillers could work in unison. Without this information chillers would often be running at minimum capacity and the cooling system would be running more chillers than necessary to meet the cooling load. With the cooling load information on the front end, building engineers can quickly ensure that chillers are running at optimum capacity and that that the cooling is being provided with the least number of chillers running.
- **Global Adjustment** - In 2014, Victoria Hospital began targeting provincial peak electricity demand hours in an attempt to switch from a Class B customer to a Class A customer. The hospital became a Class A customer for the first time in July 2015. Managing global adjustment by way of peak demand allows the hospital to buy electricity from the grid for the Hourly Ontario Electricity Price (HOEP), which greatly reduces the cost of having electricity generation equipment down for maintenance and overhauls.

This measure reduces the hospitals greenhouse gas emissions by approximately **5,000,000 kg CO₂e** each year and the annual electricity cost by approximately **\$500,000** each year. *As an operational change these savings have not been included as part of the CDM results summary.*

University Hospital (UH) – large project work

- **Air handling unit replacement** - Two 1970's constant air volume air handling units servicing the operating rooms were replaced with Mafna, variable air volume units at University Hospital. The project cost was **\$1,700,000** and is saving approximately **40,000 kWh** and **9,263 m³** of natural gas each year.
- **Parking garage lighting** - In 2015, the University Hospital parking garage was updated to LED lighting. The project cost was **\$289,500**, received **\$67,936** of incentive money, and is saving the hospital **180,000 kWh** of electricity per year.
- **Dishwasher replacement** - In 2017, the large dishwashers were replaced at both University Hospital and Victoria Hospital. The project cost was **\$402,190**, received **\$17,174** of incentive money, and is saving the hospital **87,600 kWh** of electricity and **108,044 m³** of natural gas per year.

University Hospital (UH) – small project work

Date	Project	Cost	Savings (kWh)	Incentive
Jun-14	UH booster pump replacement	\$123,518	151,949	\$15,195
Jun-15	UH LED lighting - parking garage	\$289,500	450,848	\$67,936
Dec-15	UH LED lighting - exterior lighting	\$39,478	73,446	\$6,268
May-16	UH LED lighting - exterior lighting	\$23,150	57,232	\$8,624
Oct-16	UH LED lighting - auditorium	\$185,049	7,184	\$1,475

Jan-17	UH and VH dishwasher	\$402,190	87,600	\$16,000
Jan-17	UH LED lighting - operating rooms	\$207,571	2,870	\$400
Total		\$1,270,457	831,129	\$115,898

University Hospital invested approximately **\$3,662,147** in the energy projects listed above and received **\$201,008** in energy efficiency incentive money. The projects are saving **1,138,729 kWh** of electricity, **3,166,142 lbs** of steam and reducing greenhouse gas emissions by **260,154 kg CO2e** each year.

Energy Management Vision

London Health Sciences Centre has a long history of energy conservation that supports both its financial and environmental responsibilities to the community. The CDM plan backs one of four areas of LHSC’s Energy Management Plan alongside supply side management, monitoring and tracking, and regulatory compliance. LHSC is now creating parallels between facility infrastructure, emergency preparedness & energy redundancy, asset management & reliability, and our energy management goals and objectives. These pieces are being brought together to form an integrated approach to facility management that supports the organization’s strategic plan while addressing energy costs and environmental concerns. It is LHSC’s vision to become a model for sustainability in this regard that will support future growth and expansion as we move toward a new design for healthcare in the province.

Conservation Demand Management Goals

The following goals will help to guide London Health Sciences Centre toward meeting its objectives for the conservation demand management of energy resources and greenhouse gas emissions over the next five years.

1. Energy Conservation and Demand Management Plan Approval

The goals and objectives for energy management over the next five years have been put together by the Facilities Management team and been approved by executive leadership in the organization. The CDM plan will be used as a road map to identify the potential projects, business cases, timelines, and funding mechanisms that may be scheduled over the next five years. LHSC will use this plan and the organization’s commitment to financial and environmental responsibility to comply with energy and greenhouse gas emission legislation and be an environmental steward for the London community.

2. Implement Financial Practices and Decision-Making Processes

London Health Sciences Centre will continue to make use of programs such as the Hospital Infrastructure Renewal Fund (HIRF) and others such as the former Hospital Energy Efficiency Program (HEEP) to help finance projects. This funding is connected to the Facility Condition Assessment Program (FCAP) and so energy reduction can be achieved in parallel with infrastructure renewal. Business cases with proper risk assessments and life cycle costing analyses will be presented to the organization where capital dollars or alternative ways of financing projects are needed. Projects providing a reduction in energy and greenhouse gas emission cost will be viewed as an investment for the organization and reductions in utility budget spending will be considered in relation to the internal rate of return on the project. Facilities staff will also liaison with local utility companies and government programs to receive incentive money for audits, engineering studies, and energy saving projects.

3. Implement Strategic Energy Management Practices

London Health Sciences Centre will continue to include energy efficient technology such as variable frequency drives and LED lighting in the retrofit of existing buildings and space and make use of new emerging technology as it advances. LHSC will continue to improve building automation and control in order to match the use of equipment with the use of the space. The organization will consider energy efficiency standards when making large purchases and incorporate energy efficiency language in future requests for proposals. LHSC will continue to work with energy suppliers and procurement agents to ensure the best procurement strategies are being applied. Employees will continue to help by turning off unused electrical equipment at the end of the day and reporting energy wastes to the facilities department where found. LHSC will continue to track and monitor the success of the energy management initiatives and greenhouse gas emission reduction through utility management software and facilities management systems.

Conservation Demand Management Objectives

LHSC's demand management objectives have been outlined below and have been quantified in terms of time, energy, cost savings, and greenhouse gas emission reduction. Facilities Management has put together a list of energy project work to support these objectives over the next five years. This work is derived from the five year infrastructure renewal plan and corresponds to the recommendations summarized in the Facility Condition Assessment Program (FCAP) list. Without knowing what level of funding will be available from year to year the objectives have been quantified by proposing that seventy percent of the project work may be completed in the next five years.

Victoria Hospital Future Projects

Victoria Hospital Infrastructure Renewal Plan - Energy Projects						
Project	2019	2020	2021	2022	2023	2024
Heating System Refurbishment			\$1,300,000			
Zone C Cooling Tower 5/6		\$1,000,000				
Water Heater Replacement			\$150,000	\$250,000		
Chiller 7/8 & Cooling Tower Replacement			\$1,000,000	\$2,500,000		
Air Handling Unit Refurbishment			\$500,000	\$1,000,000	\$2,900,000	\$2,500,000
Heat Pump Replacement		\$1,000,000	\$200,000		\$100,000	\$100,000
Exhaust Fan Replacement		\$250,000	\$600,000	\$600,000	\$650,000	\$350,000
Building Automation Updates & Controls					\$750,000	
Total Proposed Expenditure	\$0	\$2,250,000	\$3,750,000	\$4,350,000	\$4,400,000	\$2,950,000

- **Heating system refurbishment** - this includes the replacement of heat exchangers, circulation pumps, and hot water heaters. Replacement of eight heat exchangers and eight circulating pumps for Zone A along with eight heat exchangers and six pumps for Zone C/D has been proposed for this time period.
- **Zone C cooling towers** – towers 5/6 are a 2-cell, variable speed, induced draft fan with 2 – 40 HP motors and a 3-cell, two speed, forced draft fan with 3 – 50 HP motors.
- **Water heater replacement** - two hot water heaters serving Zone A and two for Zone E
- **Chiller 7/8 & cooling tower replacement** – tower 510 A/B/C is a 3-cell, two speed, forced draft tower with 3 – 50 HP motors.
- **Air handling unit replacement** - many areas have 30 year old units that require refurbishment or replacement of coils, control valves, humidifiers, fan motors and sheet metal and 14 are proposed to be replaced in the next five years.
- **Heat pump replacement** - replace two 20 HP vertical inline water source heat pumps for Zones C & D.
- **Exhaust fan replacement** - begin to replace 30 year old fans with electrical and controls upgrade over the next seven years. One cafeteria fan in Zone D is proposed for 2020 and then nine fans in Zone C and 33 fans in Zone D isolation rooms are proposed for the next five years.
- **Building automation updates and controls** - replace pneumatic systems and obsolete direct digital controls (DDC) with new DDC controllers in Zone A.

If funding can be acquired for 70% of the proposed projects, Victoria Hospital will invest **\$12,390,000**, save **847,223 kWh** of electricity, **488,251 m³** of natural gas, and reduce greenhouse gas emissions by **982,322 kg** over the next five years.

University Hospital Future Projects

University Hospital Infrastructure Renewal Plan - Energy Projects						
Project	2019	2020	2021	2022	2023	2024
Hot Water Heating		100000	\$1,400,000	\$100,000	\$700,000	\$100,000
Steam and Condensate						\$200,000
Air Handling Units		\$1,500,000	\$1,500,000	\$1,500,000	\$1,500,000	\$3,600,000
Heat pump replacement			\$200,000	\$200,000	\$100,000	\$200,000
Exhaust Systems		\$300,000	\$600,000	\$500,000	\$650,000	

- **Hot water heating** – four original 1970’s systems for Podium and Tower locations with single steam to hot water heat exchangers, three systems with two circulating pumps and one spare.
- **Steam and condensate** – replace approximately 45 of 182 traps beginning in 2024.
- **Air handling units** – replace seven main building 1970’s air handling units each year plus six rooftop units in 2024.
- **Exhaust systems** – replace 50 original exhaust fans in main building and 4 in MRI building over the next 5 years. Begin upgrading 11 isolation room systems.

If funding can be acquired for 70% of the proposed projects, University Hospital will invest **\$10,465,000**, save **894,263 kWh** of electricity, **5,138,884 lbs** of steam, and reduce greenhouse gas emissions by **399,160 kg** over the next five years.

Power Plant Future Projects

Power Plant Infrastructure Renewal Plan - Energy Projects						
Project	2019	2020	2021	2022	2023	2024
Feedwater Pumps		\$180,000	\$600,000			
Pneumatic Control Upgrade		\$250,000				
Blowdown Heat Recovery Controls			\$120,000			
High Pressure Condensate Cooling & Heat Recovery				\$125,000		

- **Feed water pumps** - replace high pressure and low pressure feed water pumps in WPP2
- **Pneumatic control upgrade** - replace pneumatic system with direct digital control
- **Blow down heat recovery controls** - optimization of heat recovery from boiler blow down to be used in glycol space heating system
- **High pressure condensate cooling and heat recovery** – upgrade heat recovery system for high pressure condensate returning from VH

If funding can be acquired for 70% of the proposed projects, the Power Plant will invest **\$892,500**, save **156,072 kWh** of electricity, **896,336 m3** of natural gas, and reduce greenhouse gas emissions by **1,762,130 kg** over the next five years.

For more information on LHSC's Energy Management Plan please visit the Facilities Management website at <https://intra.lhsc.on.ca/facilities-management/environmental-stewardship/energy-management> or contact the Facilities Management Department at Victoria Hospital.

This CDM Plan has been approved by

Derek Lall, Director, Facilities Management

Signatures omitted for public posting

Dipesh Patel, Vice President, Facilities Management and Environmental and Support Services

Signatures omitted for public posting
