West Park HEALTHCARE CENTRE get your life back

West Park Healthcare Centre 2019-2023 Energy Conservation and Demand Management Plan

FINAL • June 21, 2019

Under Ontario Regulation 507/18, Ontario's broader public sector organizations are required to develop and publish an Energy Conservation and Demand Management (ECDM) Plan by July 1, 2019. Technical advice and analysis for this ECDM Plan were provided by Enerlife Consulting Inc.

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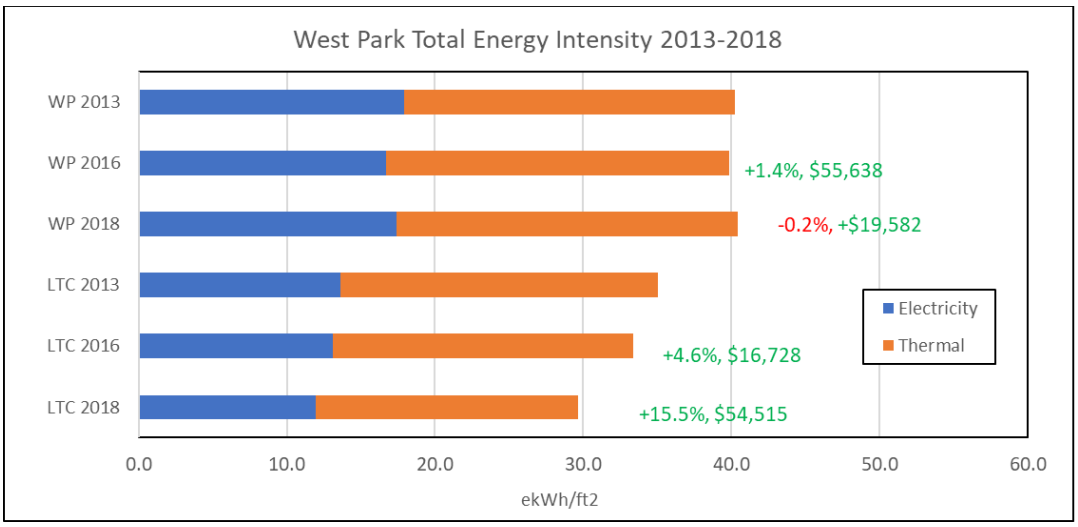
Table of Contents

Executive summary

West Park Healthcare Centre's 2019-2023 Energy Conservation and Demand Management (ECDM) plan (the Plan) will maintain its tradition of exceptional energy and environmental performance. This will be a transformational period, as our new hospital goes through its design and construction, ready for opening in 2023. The overall development of our 27-acre site into a world-class integrated campus of care will be moving forward, creating exceptional opportunities for environmental design and sustainability. West Park has also embarked upon a non-hospital development of 5 acres of its 27-acre property with a private developer to support its vision of an integrated campus of care by providing a continuum of services for seniors and persons with disabilities. The Plan is fully aligned with West Park's Strategic Plan and its embedded Vision, Mission and Values, and reflects the hospital's long-standing board and executive commitment to environmental sustainability and healthy communities.

The Plan presents the actual energy and water performance of the existing hospital and its adjoining long-term care (LTC) facility since the previous plan was posted in 2014, discussing actions taken, savings achieved, and lessons learned. Notwithstanding West Park's long-standing positioning at the top of the Greening Health Care[1] energy efficiency charts, the 2014 plan had targeted further energy savings of 11% at the main hospital and 14% at the LTC building, along with a 21% water use reduction for the hospital. West Park proceeded with implementation of the identified improvements and achieved significant savings over the following 2 years. As shown in Figure 1, savings in 2018 slipped for the hospital, primarily due to operational problems with the aging boiler plant, and water use increased sharply at the LTC facility. These factors cut into the savings. Nonetheless, the $250,000 investment in 2015-16 was offset by $51,000 in utility company incentives and has generated more than $350,000 in utility cost savings over the 5-year period while lowering greenhouse gas emissions by 67 tonnes CO2e.

Figure 1 Main hospital (WP) and long-term care facility (LTC) savings in 2016 and 2018 compared to 2013



[1] Founded in 2004, Greening Health Care is the largest and longest serving program of its kind in North America, helping hospitals work together to lower their energy costs, raise their environmental performance and contribute to the health and well-being of their communities.

Lessons learned from this experience inform the strategy and management practice recommendations in this Plan, with particular reference to ongoing monitoring of energy and water use and continuous commissioning. As summarized in Table 1, low-cost measures are presented to maximize efficiencies over the final few years of the existing hospital's life. We are aiming to lower energy use at the main hospital by 6%, regaining losses seen since 2016, and by 5% at the LTC building. Efficiency measures to improve the performance of both buildings are described in Part 3.

Table 1 Summary of energy and water efficiency measures

Building	Measure	Budget Cost	Annual Savings	Estimated Payback
Existing Hospital	HVAC Re-Commissioning	$8,500	$45,400	0.2
Existing Hospital	Water meter investigation	$5,000	$0	0.0
LTC Centre	Rooftop unit recommissioning and testing	$25,000	$6,400	3.9
LTC Centre	Identification and correction of water losses	$20,000	$23,000	0.9
TOTALS		$58,500	$74,800	0.8

While we are committed to minimizing the environmental footprint of the old hospital over its final few years of operation, the thrust of the Plan is towards working with EllisDon, our redevelopment partner, to deliver world-class standards of energy and environmental performance in the new building. Considerable thought, best practices and innovation have gone into the design development to date. The Plan lays out West Park's intentions to continue this effort over the next 5 years to achieve the full potential of the new hospital design, location and operations in terms of patient experience and health outcomes as well as energy and environmental performance.

As discussed in Part 3, West Park is actively participating in the Greening Health Care research into the energy and water performance of new hospitals opened in the past 10 years under the public-private partnership (P3) model which is being used for the West Park redevelopment. Our goal is to work with EllisDon to learn from best practices used by top-performing non-acute care hospitals in order to achieve the best possible energy and water use intensity levels. Key strategies include design and operational excellence, full departmental, staff and patient engagement in sustainable practices and best-in-class management systems. We are convinced that the combined experience and knowledge of EllisDon and West Park can deliver the world-class energy and environmental performance that all parties are striving for and will be proud of.

Part 1: Introduction

1 About West Park Healthcare Centre

West Park was founded in 1904 as a sanitarium for tuberculosis patients. Its major buildings were opened in 1980 (main hospital), 1984 (Gage), and 2001 (long-term care facility).

Our new hospital is currently under construction with opening planned for 2023. The existing buildings will be demolished, with the exception of the Long-Term Care (LTC) Centre which will remain connected to and serviced from the new building.

Table 2 West Park sites

Site	Building Area (ft2)	Description	Status in ECDM Plan
New Main Hospital	730,000	Primary Hospital Services	Primary Focus
Existing Main Hospital	235,000	Primary Hospital Services	Short-term consideration
Ruddy Building	53,000	Administrative Offices	Not considered
Gage Building	20,000	Administrative Offices	Not considered
Power Plant	9,200	Building Systems	Not considered
Quonset Garage	3,200	Equipment Storage	Not considered
Long-Term Care Centre	135,000	Seniors' Centre	Secondary Focus

West Park has also embarked upon a non-hospital development of 5 acres of its 27-acre property with a private developer to support its vision of an integrated campus of care by providing a continuum of services for seniors and persons with disabilities. This time of transformational renewal provides the backdrop to the Plan, presenting new opportunities for innovation leading to exceptional energy and environmental performance and sustainability.

West Park's long-standing success with energy efficiency is grounded in its culture and values, which are reflected throughout the hospital's governance, management and operations. Performance is reported annually to the board of directors. The board has always demonstrated a high level of commitment to energy efficiency as an integral part of the hospital's strategy.

West Park's Environmental Committee meets monthly, and actively supports events such as Earth Day and Earth Week. West Park was a founding member of Greening Health Care in 2004 and has continued its active participation ever since. The hospital's management knows how its energy and water performance compares to similar facilities, is committed to always being at the top of the benchmark charts and is proactive in sharing with and learning from others. Proposed investments in energy efficiency are evaluated by management and given equal consideration among other capital expenditures.

Part 2: Results from the past 5 years (2014-2018)

1 Energy and water progress compared to targets

In the previously approved ECDM plan, posted July 1, 2014, West Park set a goal to reduce energy use by 11.0% and water use by 21.0% at the main site and total energy use by 14.0% at the LTC Centre.

That plan budgeted an investment of $254,860 for energy conservation and demand management measures. The full campus combined to achieve 4.8% electricity and 2.9% natural gas savings in 2018 along with 11.4% water savings compared to the 2013 baseline, reducing utility costs by $113,687. Cumulative savings in the five years from 2014 to 2018 total $383,466 with an associated reduction of 67 tonnes CO2e of greenhouse gas emissions (mostly due to lower steam consumption at the LTC Centre).

Total 2018 savings and cumulative savings over the last 5 years are summarized in the tables below for each site, and visually displayed in monthly savings graphs.

1.1 Main hospital

Table 3 lists the energy savings in the 2018 calendar year compared to the 2013 baseline, which resulted in net utility cost savings of $88,345.

Table 3 Main hospital: Energy and water savings in 2018 vs 2013 weather-normalized baseline

Energy Type	Savings in 2018 vs 2013	Units	%	Cost savings
Electricity	177,426	kWh	3.0%	$26,614
Natural Gas	-20,024	m3	-2.7%	-$6,007
Water	17,640	m3	24.3%	$67,738
Total				**$88,345**

Table 4 presents the total cumulative savings over the full 2014 to 2018 period compared to the 2013 baseline year. The overall reduction in energy and water use yielded $297,801 in net utility cost savings.

Table 4 Main hospital: Cumulative energy and water savings from 2014-2018 vs 2013 weather-normalized baseline

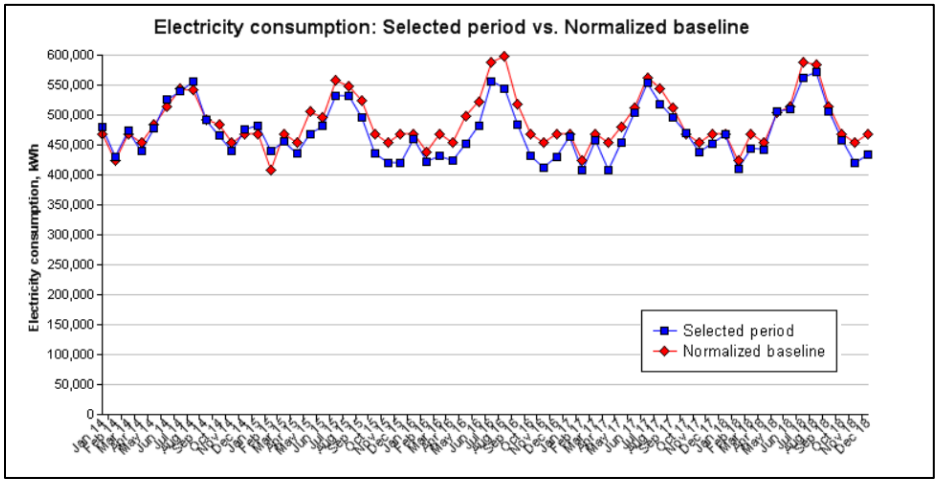
Energy Type	Savings over 2014-2018 vs 2013	Units	%	Cost savings
Electricity	1,008,385	kWh	3.4%	$151,258
Natural Gas	-142,215	m3	-3.9%	-$42,665
Water	49,273	m3	13.6%	$189,208
Total				**$297,801**

Monthly savings graphs help identify the periods of recorded savings or increases. The blue dots represent monthly consumption from the actual bills, and the red dots represent the 2013 consumption weather

normalized to the weather conditions during the period in the actual bill. Blue dots below red represent real savings.

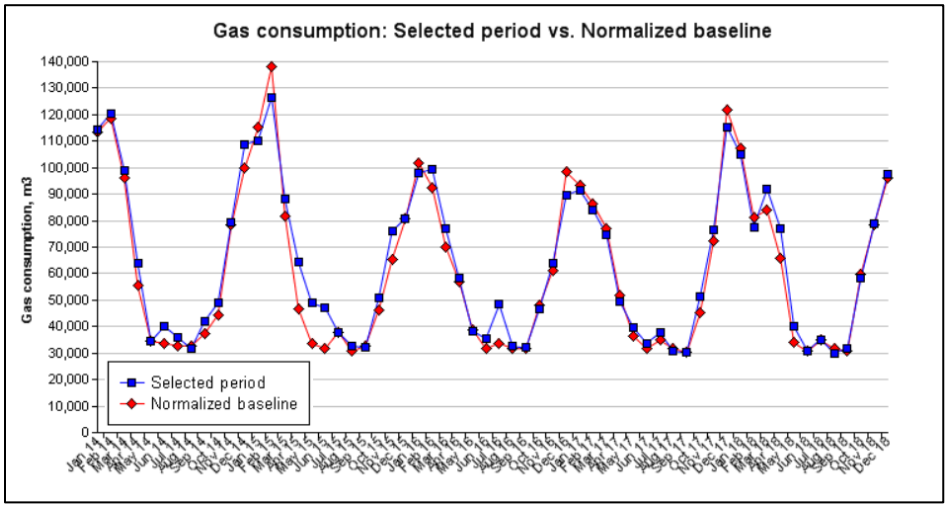
The electricity consumption trend over the last 5 years in Figure 2 shows significant improvement in 2015 and 2016 resulting from measures arising from the 2014 ECDM Plan. A return back to the 2013 baseline is seen for the most recent two years.

Figure 2 Main hospital: Electricity consumption in 2014-2018 vs 2013 weather-normalized baseline



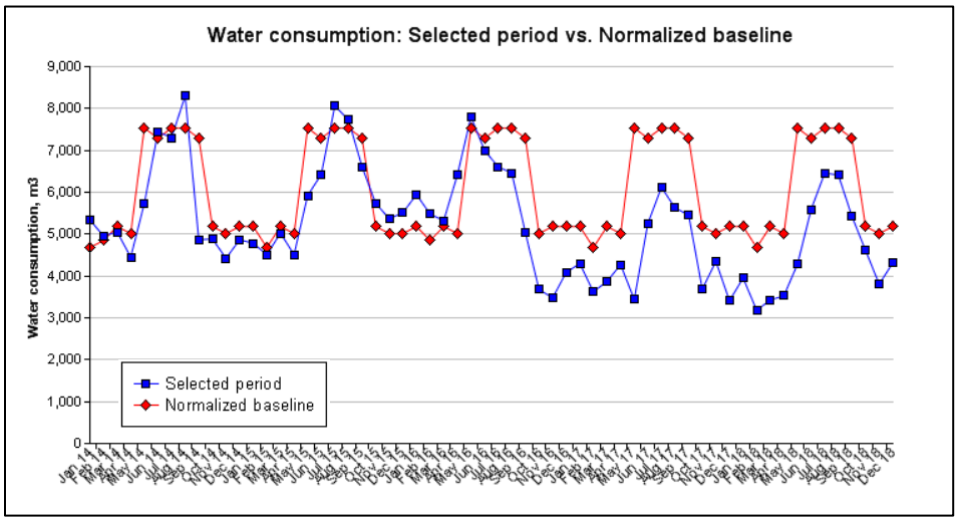
The natural gas trend in Figure 3 indicates small improvements in winter months, but setbacks in summer use between 2014 and 2016. These increases were primarily due to operational issues with the aging boiler plant.

Figure 3 Main hospital: Natural gas consumption in 2014-2018 vs 2013 weather-normalized baseline



The water use trend in Figure 4 shows ups and downs through the first 2 years of the period followed by a substantial reduction starting in June 2016. The reduction coincided with the change-out of the old water meter, putting the reliability of the original meter in question.

Figure 4 Main hospital: Water consumption in 2014-2018 vs 2013 weather-normalized baseline



1.2 Long-Term Care Centre

Table 5 lists the LTC Centre's energy savings in the 2018 calendar year compared to the 2013 baseline.

Table 5 LTC Centre: Energy and water savings in 2018 vs 2013 weather-normalized baseline

Energy Type	Savings in 2018 vs 2013	Units	%	Cost savings
Electricity	229,246	kWh	12.4%	$34,387
Natural Gas	-10,067	m3	-11.0%	$3,020
Steam	1,777	klbs	30.5%	$18,133
Water	-7,864	m3	-49.0%	-$30,198
Total				**$25,342**

Table 6 presents total cumulative savings over the five-year period, yielding net utility cost savings totalling $85,665.

Table 6 LTC Centre: Cumulative energy and water savings from 2014-2018 vs 2013 weather-normalized baseline

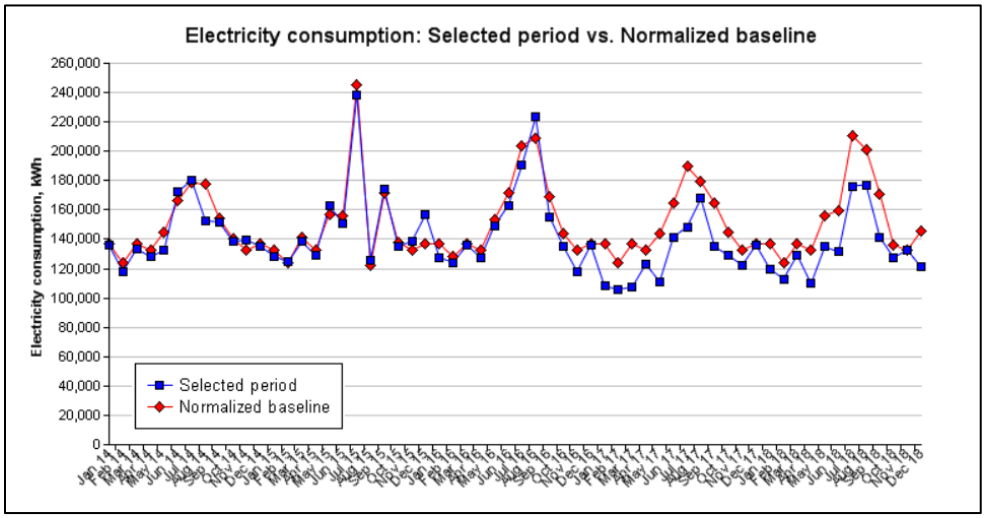
Energy Type	Savings over 2014-2018 vs 2013	Units	%	Cost savings
Electricity	578,642	kWh	6.4%	$86,796
Natural Gas	-57,835	m3	-12.5%	$17,350
Steam	5,766	klbs	20.1%	$58,774

Water	-20,121	m3	-25.2%	-$77,265
Total				**$85,665**

Electricity and water use for the LTC Centre are supplied from the hospital and sub-metered and recorded monthly. The natural gas supply has a separate Enbridge meter and supplies the gas-fired heating coils in the air handling units. The steam supply sub-metering is based on condensate return and serves the domestic hot water and hot water heating systems.

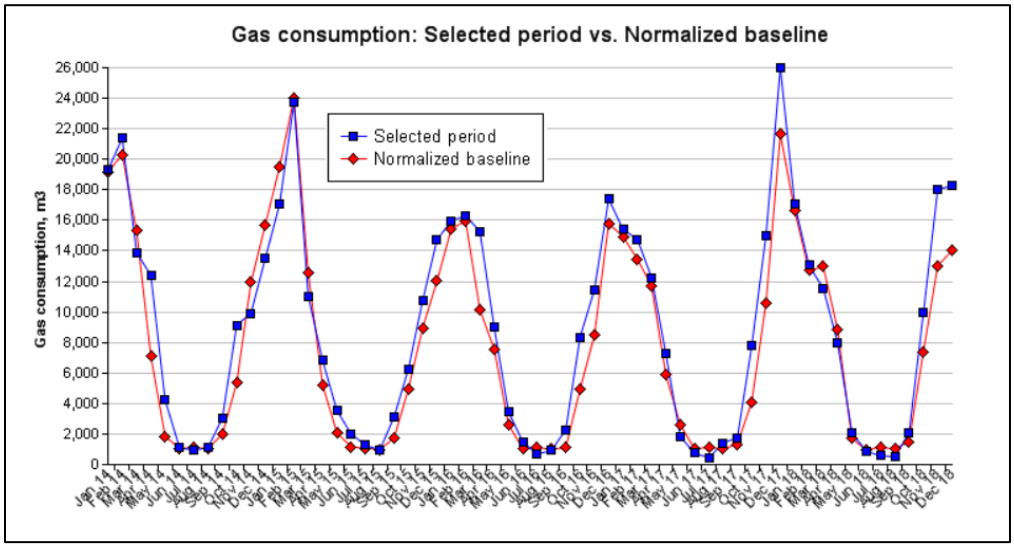
Electricity consumption showed significant savings since the end of 2016 as shown in Figure 5.

Figure 5 LTC Centre: Electricity consumption in 2014- 2018 vs 2013 weather-normalized baseline



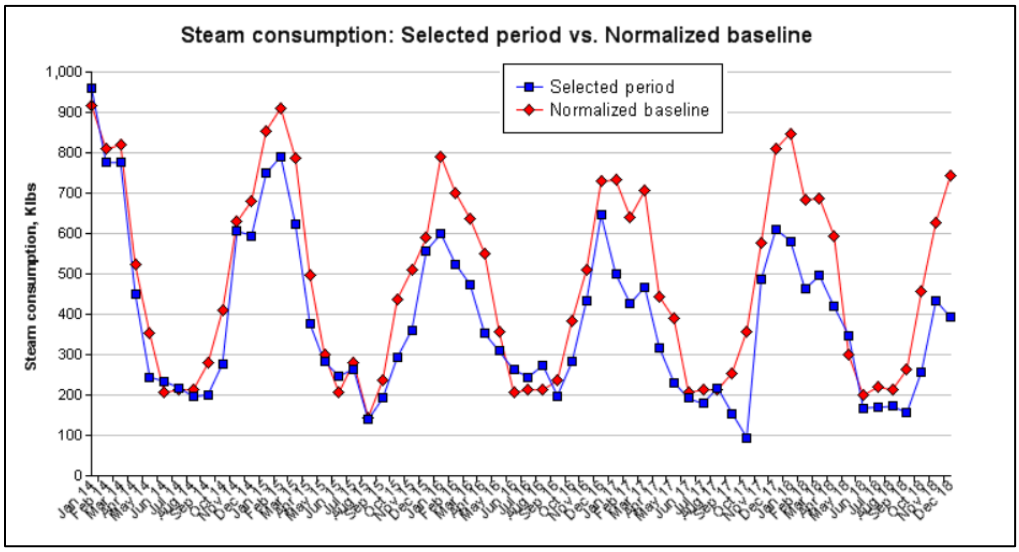
Gas consumption presented in Figure 6 has increased significantly over the past 3 winters, attributed to efficiency deterioration in the air handling units.

Figure 6 LTC Centre: Gas consumption in 2014-2018 vs 2013 weather-normalized baseline



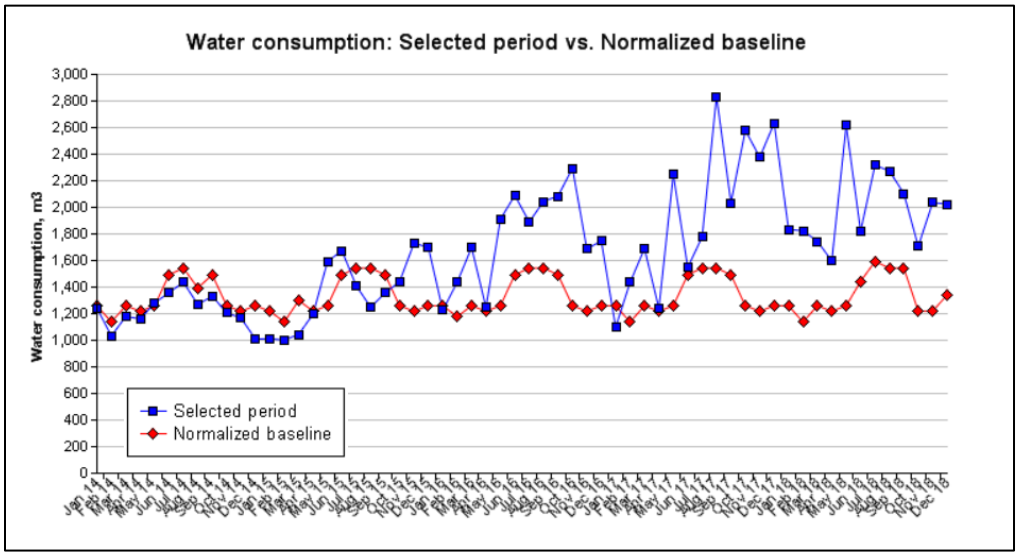
Steam consumption (Figure 7) has shown significant savings in winter months through the period, and more recently has also recorded savings in the summer months.

Figure 7 LTC Centre: Steam consumption in 2014-2018 vs 2013 weather-normalized baseline



Water use (Figure 8) jumped dramatically at the end of 2015. Considerable effort has gone into identifying the cause of the increase, so far without success.

Figure 8 LTC Centre: Water consumption in 2014-2018 vs 2013 weather-normalized baseline



2 Measures implemented in 2014-2018

Most of the work was completed early in the 2014-2018 period. Projects were undertaken only at the main hospital and were organized into two phases of work. Phase 1 occurred between the end of 2014 and mid-way through 2015, followed by Phase 2 which ended in May 2016.

Phase 1 started with testing of ventilation systems to gain actual data on their performance compared to good performance metrics as well as negative pressure conditions being experienced at the main entrance doors in winter. Opportunities for immediate control improvements were uncovered and implemented. The ventilation systems were retrofitted to rebalance supply and return air volumes, enable running fans at low speed in unoccupied periods, lower system pressures and seal openings that were causing significant air losses.

The work also included new controls for the main heating/cooling circulation systems, linkage-less controls on the boilers and rain sensors for the irrigation system. Investigation into modifications to boiler feedwater pump controls ultimately proved to not be cost-effective.

Phase 2 also included further work to improve boiler efficiencies including modified steam pressure reset to enable greater use of the more efficient summer boiler and partial cleaning of the flue gas economizers on two of the original boilers.

Table 7 Measures implemented at the main hospital in 2014-2018

Phase 1	**Cost to date**	**Date**
Systems Testing	$7,060	Nov, 2014
Automation System Upgrades	$3,790	Nov, 2014
Pumps connect to BAS	$2,980	Nov, 2014
Irrigation Controls	$5,500	Apr, 2015
East Mech. Room Ventilation	$6,850	Jun, 2015
East Mech. Room Ventilation	$1,350	Jun, 2015
Boiler Controls	$22,951	Aug, 2015
Feedwater Pump Analysis	$2,100	Aug, 2015
Energy Advisor Services	$87,110	Aug, 2015
Subtotal:	**$139,691**	

Phase 2	**Cost to date**	**Date**
Service Port for Boilers	$1,682	Aug, 2015
Temp Controls Replacement	$2,268	Aug, 2015
West Mech. Room Ventilation	$9,500	Jan, 2016
West Mech. Room Ventilation	$5,855	Jan, 2016
Feedwater Temp. Sensors	$8,110	Apr, 2016
Service Calls	$952	May, 2016
Inspection/Analysis Reports	$3,262	May, 2016
Energy Advisor Services	$40,000	Aug, 2016
Subtotal:	**$71,629**	
Total Project Costs:	**$211,320**	

Utility cost savings in 2017 (the first full year after projects were complete) were $101,505 and we received $51,893 in Toronto Hydro and Enbridge incentives for a payback of less than two years.

3 Lessons learned

There were many successes over this period, along with lessons learned which will help us make further progress in future. They are summarized as follows:

1. Action and previous successes have been driven by our focus on setting and meeting targets. We will work with EllisDon to meet high-performance energy and environmental targets for the new building.
2. High performance can erode over time. We will take action to correct the energy and water slippage seen at the existing hospital and implement necessary metering, monitoring and organizational response in the new building to ensure targets are achieved, sustained and improved on over time.
3. Powerful building automation technology has been central to West Park's energy efficiency success over the years. We will work towards full integration of facility operations, maintenance and technology for the new building to support efficiency and performance.
4. Fully engaged and well-informed operations staff are vital for success. We will establish an integrated performance monitoring and reporting system so that operators and management are fully aware of actual energy and water performance at all times and able to build on identified improvements and take action to correct any slippage in future.
5. We'll make full use of our membership in Greening Health Care, exposing more staff to team learning, best practices and networking through workshops and webinars.
6. Achieving the full energy and environmental potential of the new building requires proactive, informed engagement of departments, staff and patients. We will reinforce West Park's established culture of conservation by putting in place a continuing, best-in-class communications and feedback program to provide specific advice to departments and occupants on sustainable actions and behaviours.

Part 3: The plan for the next 5 years (2019-2023)

West Park plans to take all reasonable actions to minimize the environmental footprint of its existing buildings over their remaining life, as well as maximizing the efficiency of the new hospital and the long-term care facility including the interface between the two buildings.

Table 8 below presents the 2018 baseline energy and water use, costs, and emissions for the existing hospital and the LTC Centre.

Table 8 West Park Healthcare Centre energy and water use and expenditure

Site	Energy Type	2018 Use	Units	2018 Costs ($)	Greenhouse Gas Emissions (tonnes CO2e)
West Park Main Hospital					
	Electricity	5,734,677	kWh	$860,202	229.4
	Natural Gas	753,935	m3	$226,180	1,444.5
	Water	54,974	m3	$209,451	
Long-term Care Centre					
	Electricity	1,614,237	kWh	$242,135	64.6
	Natural Gas	101,944	m3	$30,583	58.6
	Steam	4,056	klbs	$41,344	264.0
	Water	23,899	m3	$90,972	
Total					
	Electricity	7,348,914	kWh	$1,102,337	294.0
	Natural Gas[2]	993,692	m3	$298,107	1,767.1
	Water	78,873	m3	$300,423	

1 Existing Hospital and Long-Term Care Centre

1.1 Target Savings

The energy targets presented in Table 9 and Table 10 will return the existing hospital to its best electricity and heating thermal performance levels as seen in 2016-17. Further water savings are expected, primarily associated with cooling tower use.

The targets for the LTC Centre reflect its current strong performance, with significant energy savings potential only found in heating thermal consumption (gas use in winter for heating) associated with the air handling units. Targeted water savings will result from isolating and correcting the losses which led to the big increase in 2015.

[2] Includes steam consumption of the LTC Centre.

Table 9 West Park's energy targets

Hospital Site	Base Electricity (kWh/ft2)		Cooling Electricity (kWh/ft2)		Base Thermal (ekWh/ft2)		Heating Thermal (ekWh/ft2)		Total Energy (ekWh/ft2)		Annual Savings Potential	
	Actual	Target	Actual	Target	Actual	Target	Actual	Target	Actual	Target	%	Cost
Main Hospital	16.0	15.6	1.4	1.2	11.9	11.9	11.0	9.2	40.4	38.1	6%	$45,463
LTC Centre	10.8	10.8	1.1	1.1	5.7	5.7	12.0	10.5	29.7	28.2	5%	$6,414

Table 10 West Park's water targets

Hospital Site	Base Water (litres/ft2)		Cooling Water (litres/ft2)		Total Water (litres/ft2)		Annual Savings Potential	
	Actual	Target	Actual	Target	Actual	Target	%	Cost
Main Hospital	139.7	139.7	27.9	15.7	167.6	155.4	7%	$16,064
LTC Centre	167.8	125.0	0.0	0.0	167.8	125.0	26%	$23,044

1.2 Energy and Water Efficiency Improvements

The planned improvements to the existing hospital and Long-Term Care Centre are summarized in Table 11.

Table 11 Summary of energy and water efficiency measures

Building	Measure	Budget Cost	Annual Savings	Estimated Payback
Existing Hospital	HVAC Re-Commissioning	$8,500	$45,400	0.2
Existing Hospital	Water meter investigation	$5,000	$0	0.0
LTC Centre	Rooftop unit recommissioning and testing	$25,000	$6,400	3.9
LTC Centre	Identification and correction of water losses	$20,000	$23,000	0.9
TOTALS		$58,500	$74,800	0.8

The description of measures and budgeted costs are as follows:

1.2.1 Main Hospital HVAC Re-Commissioning (estimated measure life 5 years)

An in-depth review of current operation of the ventilation and pumping systems, the boilers and cooling towers compared to how they were running in 2016-17 will be undertaken together with the testing and building automation contractors to identify where slippage has taken place and optimize operations and controls.

The budget cost for this work is $8,500 with estimated annual energy savings of $45,400/year. The work is not expected to be eligible for utility company incentives.

1.2.2 Main Hospital Water Meter investigation

We will work with Toronto Water to consider possible contributing factors to the big drop in water use in June 2016 and any action arising.

1.2.3 Long-Term Care Centre Rooftop Unit Recommissioning and Testing (estimated measure life 10 years)

Changes in energy use over the past 5 years, in particular gas consumption, indicates that performance changes have taken place in the air handling units and associated heat recovery equipment. System testing by a qualified contractor will verify airflows, static pressures and efficiencies so that any required remedial action can be taken. The budget cost for this work is $25,000 including installation of variable frequency drives to enhance system controllability. The work may be eligible for utility company incentives.

1.2.4 Long-Term Care Centre Water Losses Identification and Correction (estimated measure life 5 years)

Work will continue using temporary metering to isolate and correct the big water use increase, with an estimated budget cost of approximately $20,000 for metering, valve repairs and analysis.

2 The New West Park Hospital

The contractual energy target agreed for the new hospital is contained in the Project Agreement and will govern the business relationship between the parties. All parties are also interested and motivated to potentially go beyond the contractual target and deliver the most energy efficient building possible which will maintain West Park's long history of being at the top of hospital energy efficiency charts. West Park and its redevelopment partner EllisDon will work together to achieve this.

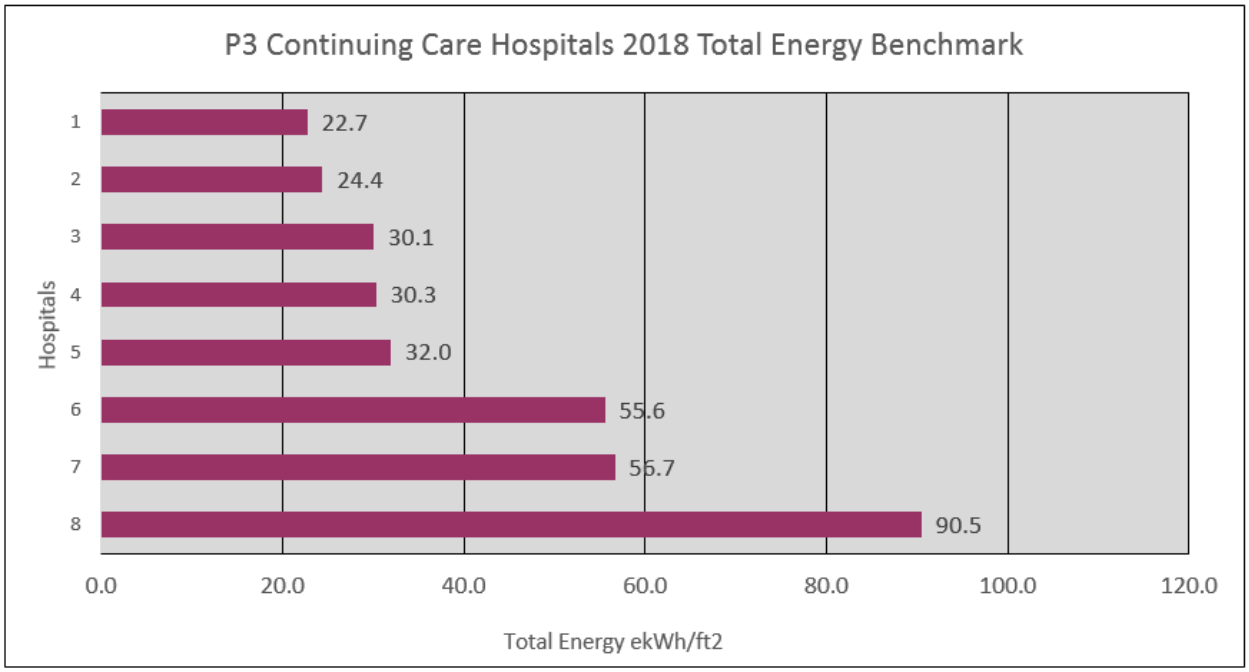
West Park is actively taking part in Greening Health Care's ongoing research into the actual energy performance of Ontario's fleet of new hospitals built under the Public-Private Partnership (P3) model which is being used for the new West Park. This research is identifying top-performing hospitals and determining lessons learned and best practices which make them efficient. West Park aims to build upon this knowledge to make the new hospital the most energy efficient it can be. For reference, Figure 9 presents the actual 2018 energy use intensity for new non-acute care P3 hospitals from the Greening Health Care database. The most efficient are the St Joseph's Parkwood mental health facility in London and the ambulatory care Peel Memorial Centre in Brampton. While the operations are different at these facilities, they do provide an indication of how efficient non-acute hospitals can be.

The following steps are being taken to work towards the best possible energy performance level:

- Incorporate heat recovery chillers, highly efficiency lighting and controls, oversized AHUs, operable windows, and automated roller shades in the building design
- Follow the ongoing performance of top-performing P3 hospitals and incorporate lessons learned where applicable
- Put in place continuous commissioning and operational best practices to help meet the high-performance goal from the outset and sustain and improve on it over time

- Work together on the management and organizational alignment factors presented in Section 7 which, along with design, commissioning and operational excellence, are essential for meeting and sustaining high-performance goals.

Figure 9 New continuing care hospitals total energy benchmark



3 Renewable energy

There are no existing renewable energy sources, and none are planned at this time for the new hospital or existing LTC Centre.

4 Management, organizational and community alignment

Key to West Park's long history of leadership in energy and environmental performance has been commitment from the top down, together with bottom-up engagement and active involvement from the facility operations team and other departments. Building on this successful model with the new hospital and our partner EllisDon, further development of our management systems, organizational integration and outreach form an essential part of the Plan to enable and support continuous efficiency improvement, to sustain savings over time and to maximize the benefits for all stakeholders.

4.1 Strategic alignment

In order to make clear to internal and external stakeholders the importance of efficiency and sustainability to the hospital, specific reference to energy and environmental performance has always been incorporated in West Park's strategic plan, the embedded mission, vision and values and our quality improvement and other strategic reporting. This ECDM Plan will be formally presented to key groups within the hospital to ensure their input to and alignment with our broader goals.

4.2 Energy management, reporting and team building

An integrated energy performance reporting system will be put in place to provide transparency and motivation through regular communication to all stakeholders of actual savings results. The reporting to facility operations staff will be built upon the existing Greening Health Care online system and will be designed to improve knowledge and team building through regular review and analysis of actual savings achieved. Monthly meetings will support formal feedback on corrective action and continuous improvement. Regular communication with management, operators and external service providers will review results, identify solutions, brainstorm new ideas, document action items and follow up on implementation, providing the overall ongoing direction to implementation of the Plan.

Quarterly reporting will be provided to senior management along with annual reporting to the board to keep them informed of progress towards the established targets.

4.3 Staff training and support

Staff training to enhance individual and team capability, particularly in energy management and building automation, will be developed through the quarterly meetings by defining expectations and working with service providers to provide necessary training and support. We will make greater use of our membership in Greening Health Care by engaging more of our staff in the networking, best practices and recognition which the program offers through its workshops, webinars and technical support.

4.4 Occupant engagement and communications

Maintaining the culture of conservation throughout the organization requires regular feedback and reinforcement of West Park's commitment to achieving and sustaining high performance. The new hospital enables patients to participate in environmental controls and connect with the natural environment. The beautiful West Park site and ongoing campus development provide new opportunities for engagement and leadership with the surrounding community. We will develop a comprehensive communications and outreach program to fully leverage these opportunities, engage and assist all occupants in becoming active players in the performance of the hospital and maximize our amazing energy and environmental potential.