Analytics of LHSC Utilities

Facilities Management

November 20, 2015

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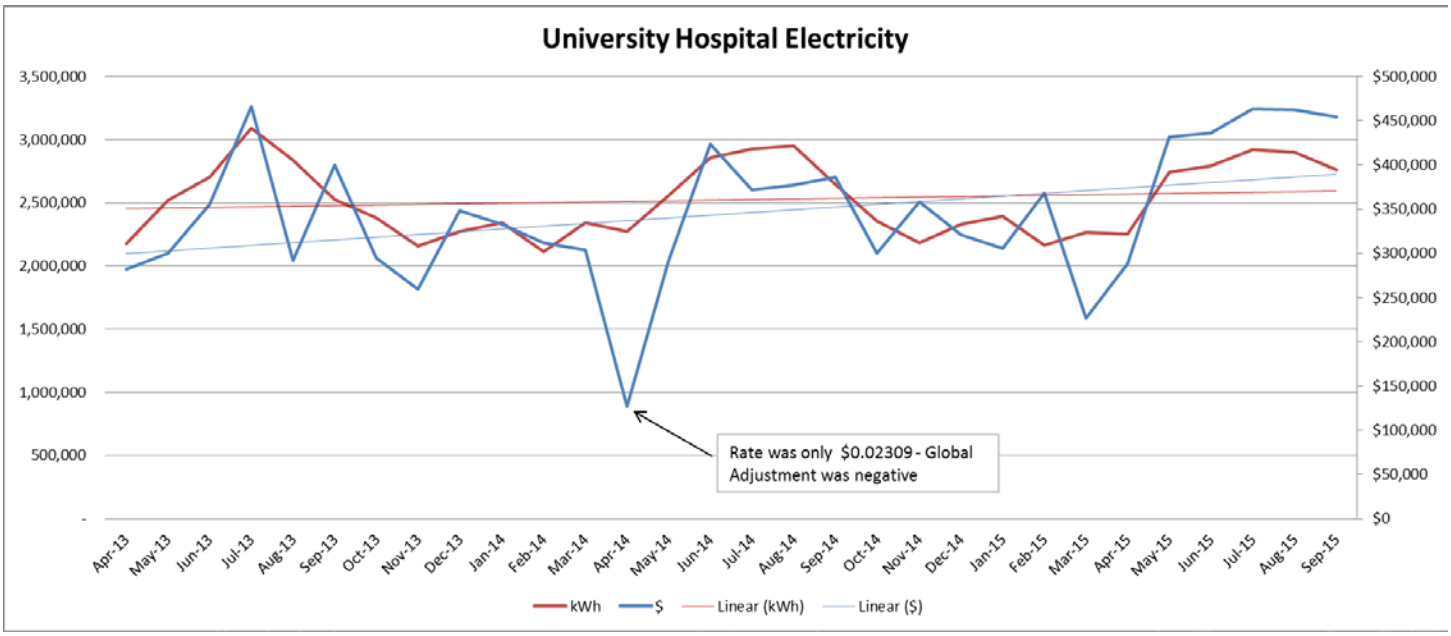
University Hospital Electricity

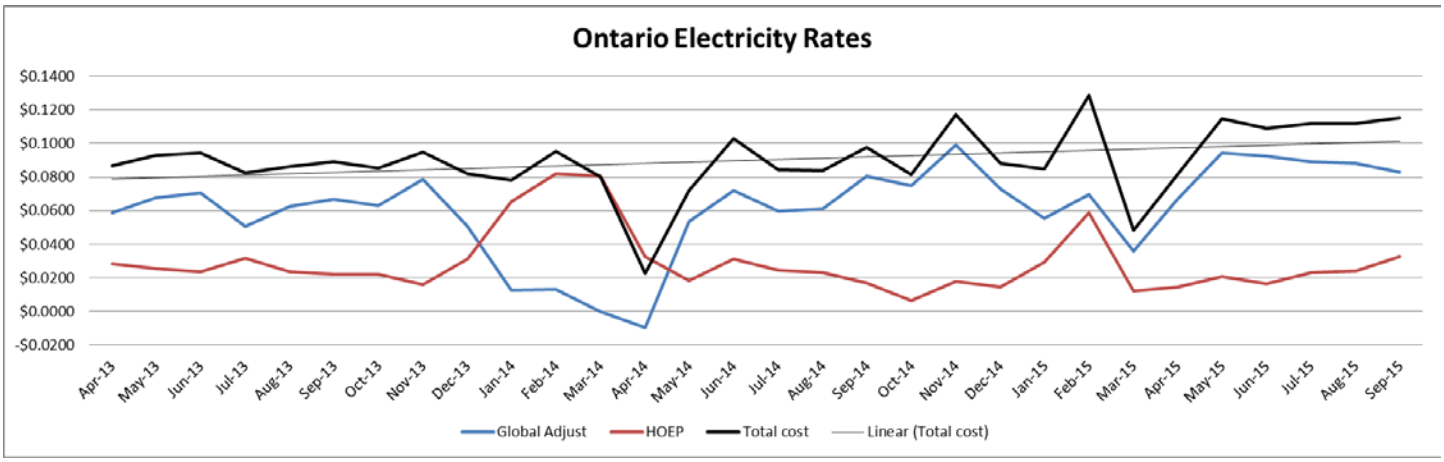
University Hospital – Cost and Consumption



The Last Three Years Summary

	Cost ($)	Consumption (kWh)
2013/2014	$3,946,581	29,467,260
2014/2015	$3,858,989	29,906,773
Last 12 months	$4,418,182	30,068,264

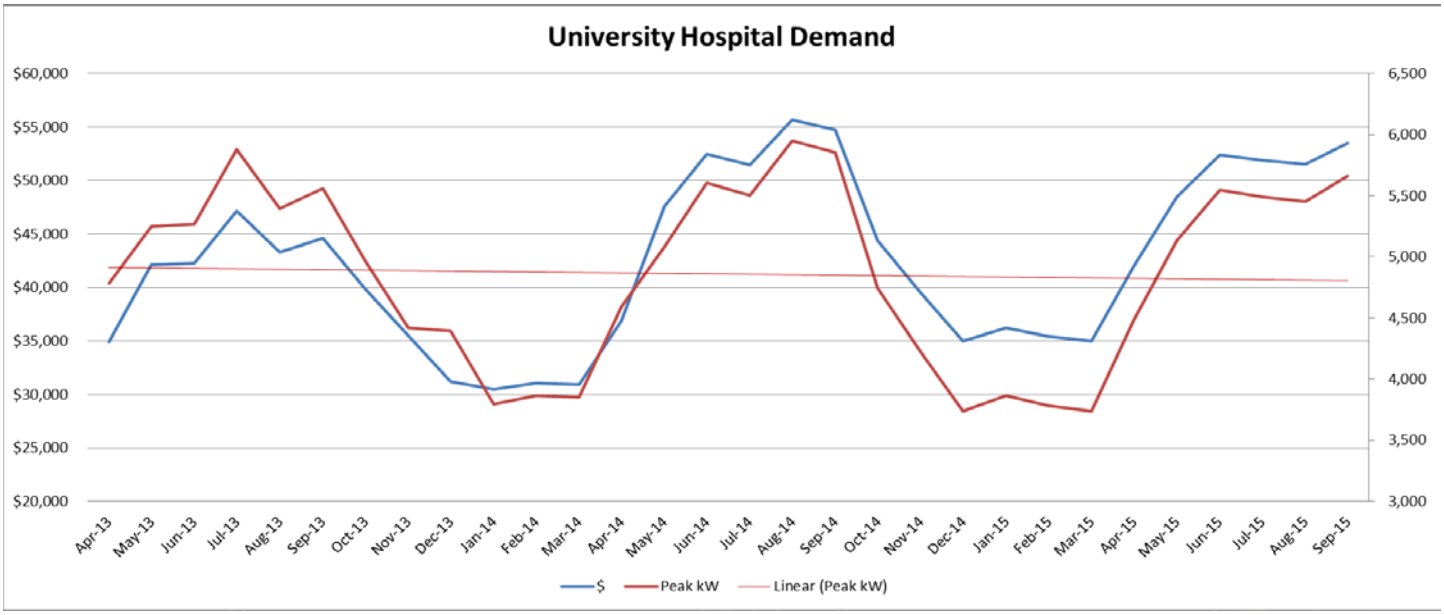
Both cost and consumption have trended upward over the last three years however the cost has increased at a greater rate than consumption. This is due to the increasing rate of electricity in Ontario over the last three years as seen below.



Last 12 Months Point of Use Cost of Electricity for University Hospital - $0.1469/kWh

Note: point of use cost includes all consumption, demand, transportation costs etc. and should not be confused with rate

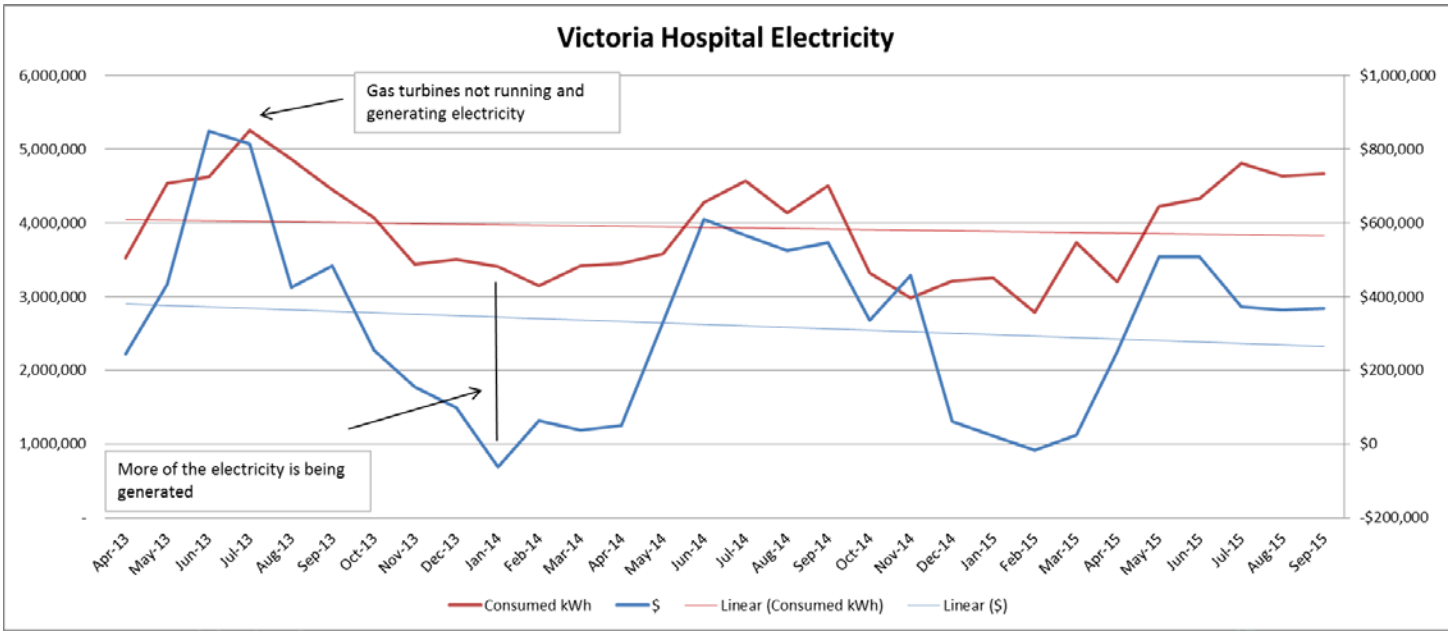
University Hospital – Electricity Demand



Electricity demand at University Hospital hovers just below the 5,000 kW mark, dropping in the winter months and lifting in the summer months. Class A customers must meet the requirement of having 5,000 kW of demand on average each month. It would be wise to evaluate the potential for University Hospital to decrease its summer peak demand in the event that it reaches the qualifying criteria for Class A in the future.

Victoria Hospital Electricity

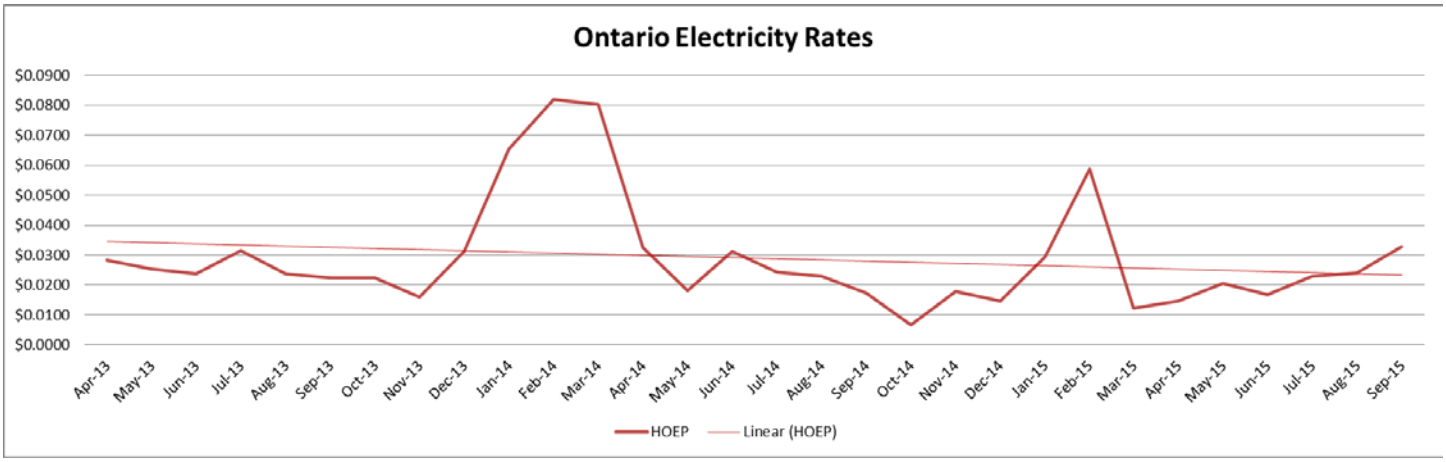
Victoria Hospital – Electricity Cost and Consumption



The Last Three Years Summary

	Cost ($)	Consumption (kWh)
2013/2014	$3,793,878	48,237,987
2014/2015	$3,509,682	43,821,317
Last 12 months	$3,206,821	45,175,358

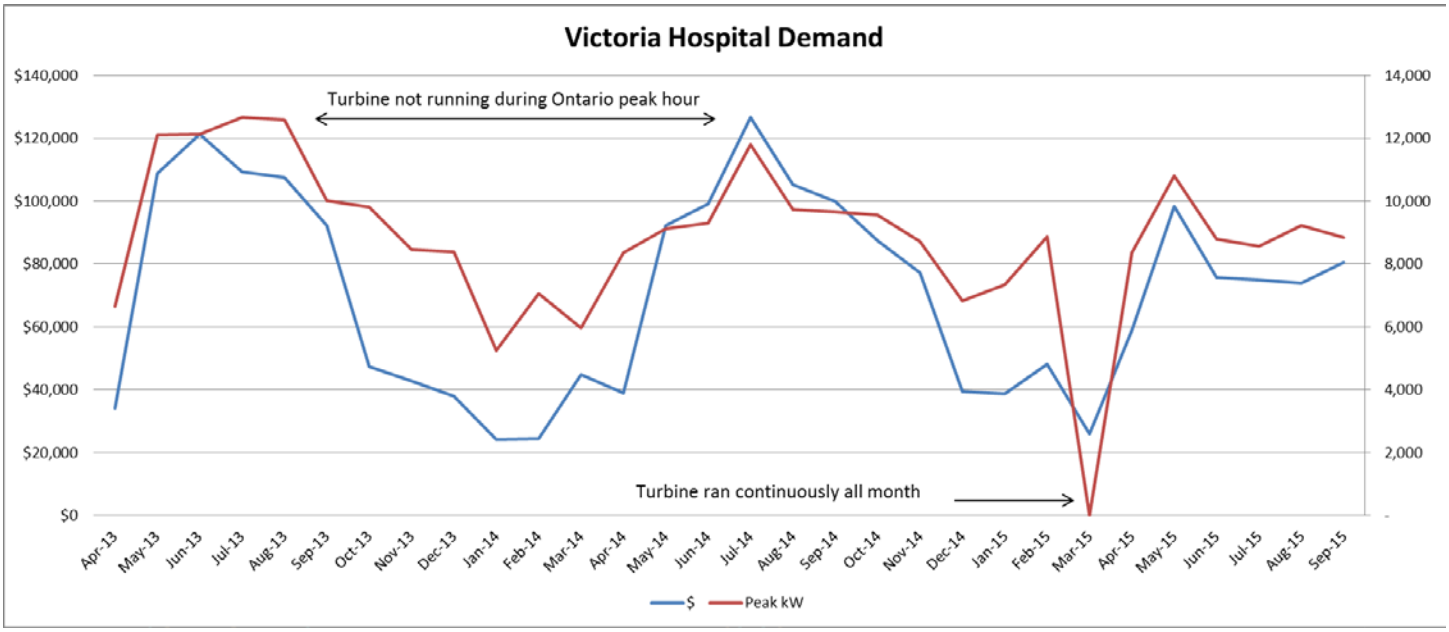
Both cost and consumption at Victoria Hospital have been decreasing over the last three years however the cost has been decreasing at a greater rate than consumption. The decreasing consumption is attributed to the summer reliability of the turbines and the intended use of absorption chilling during the summer to increase generation. The decreasing cost is both a function of decreasing consumption and global adjustment savings as of July 2015. IE; the point of use cost per kWh is decreasing for Victoria Hospital. This is the opposite case of University Hospital. As a Class A customer, Victoria Hospital pays only the HOEP price for electricity consumption (below) as of July 2015.



Last 12 Months Point of Use Cost of Electricity for Victoria Hospital - $0.0832/kWh

Note: this price includes a mix of purchased electricity and generated electricity as do the consumption numbers in the graph above

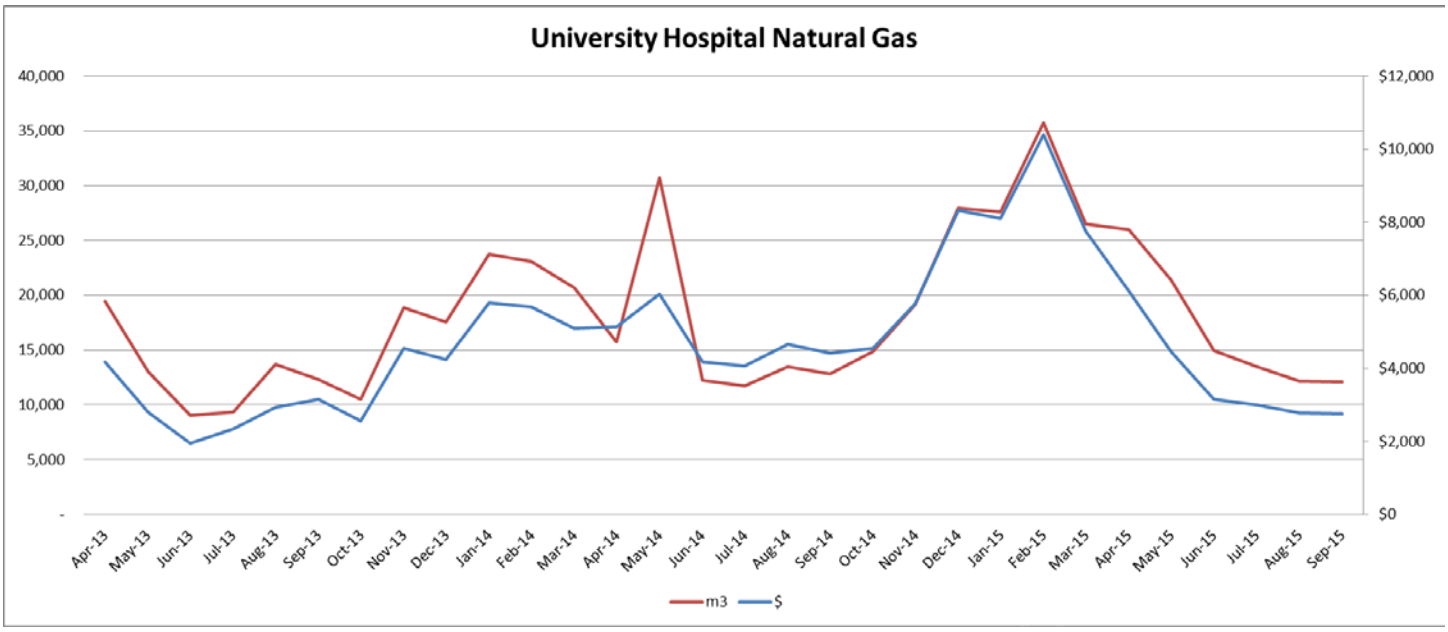
Victoria Hospital – Electricity Demand



Victoria Hospital's demand can range from 0-12,000 kW depending on the season and whether the turbines are running or not. Demand costs can exceed $100,000 per month when the Hospital is completely relying on the grid. Demand charges are greatly affected by the presence of the turbines generating electricity. For this reason, even as a Class A customer when HOEP is cheaper than our cost to generate, it may be worthwhile to run the turbines during the peak hours of 17:00-19:00 each day in effort to target these demand charges.

University Hospital Natural Gas

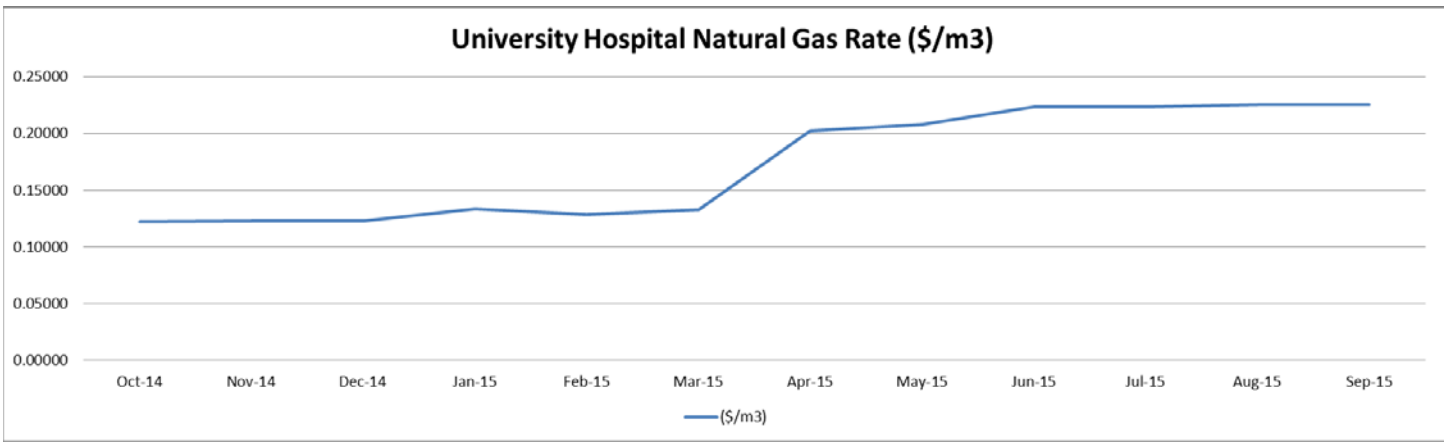
University Hospital – Natural Gas Cost and Consumption



The Last Three Years Summary

	Cost ($)	Consumption (m3)
2013/2014	$45,338	191,396
2014/2015	$73,427	248,699
Last 12 months	$66,631	255,319

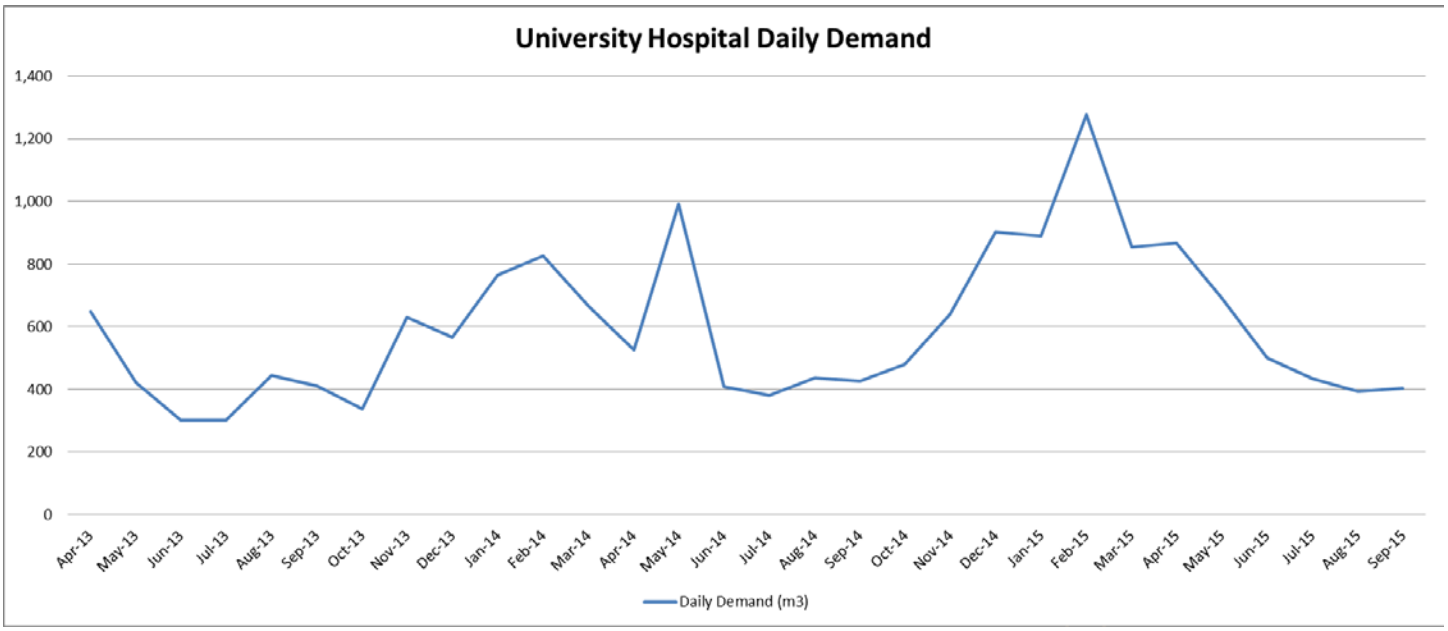
Since University Hospital purchases its steam directly from the University of Western Ontario, the hospital uses very little natural gas. Natural gas for University Hospital is purchased directly from the distributer, Union Gas.



The Union Gas rates fluctuate throughout the seasons as can be seen in the last 12 months of University Hospital bills. Rate adjustments are used to balance the difference between forecasted and actual rates. Rates will likely drop again for the winter.

Last 12 Months Point of Use Cost of Natural Gas for University Hospital - $0.2601/m3

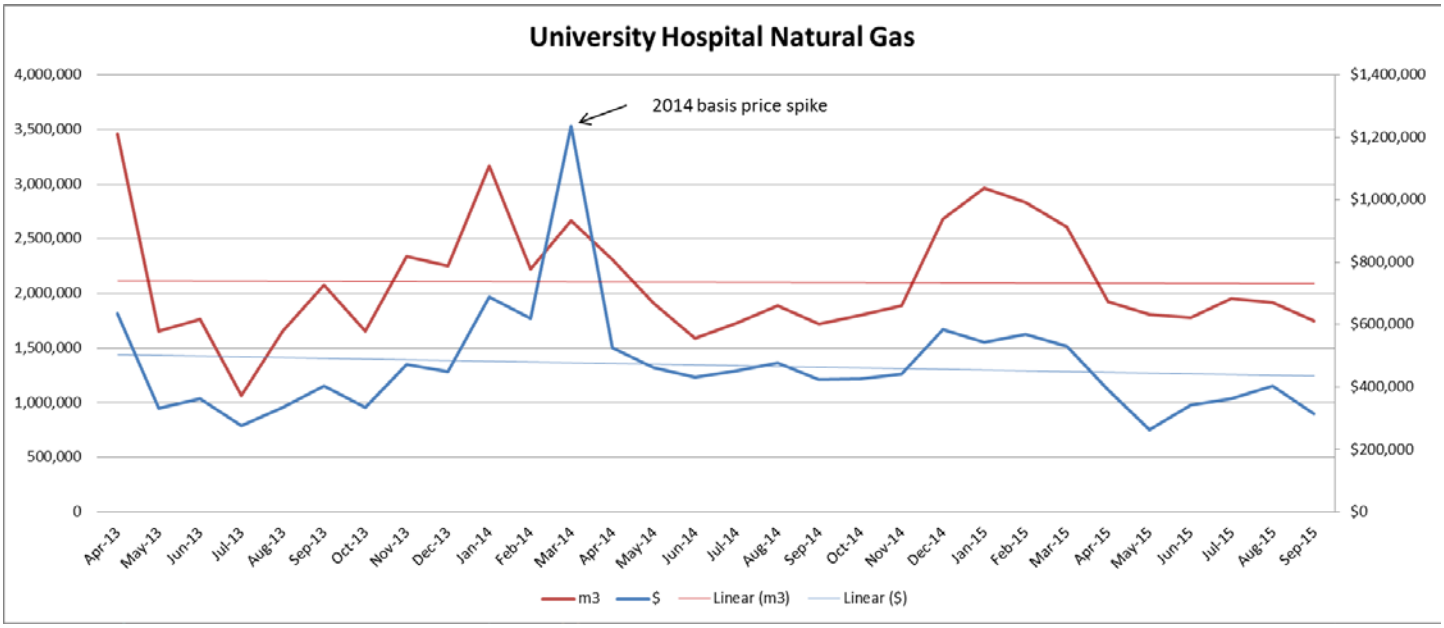
University Hospital – Natural Gas Demand



The daily demand of natural gas for University Hospital ranges from approximately 300 m3 to 1,200 m3. More volatility is seen on the graph due to the low volume of consumption.

Victoria Hospital Natural Gas

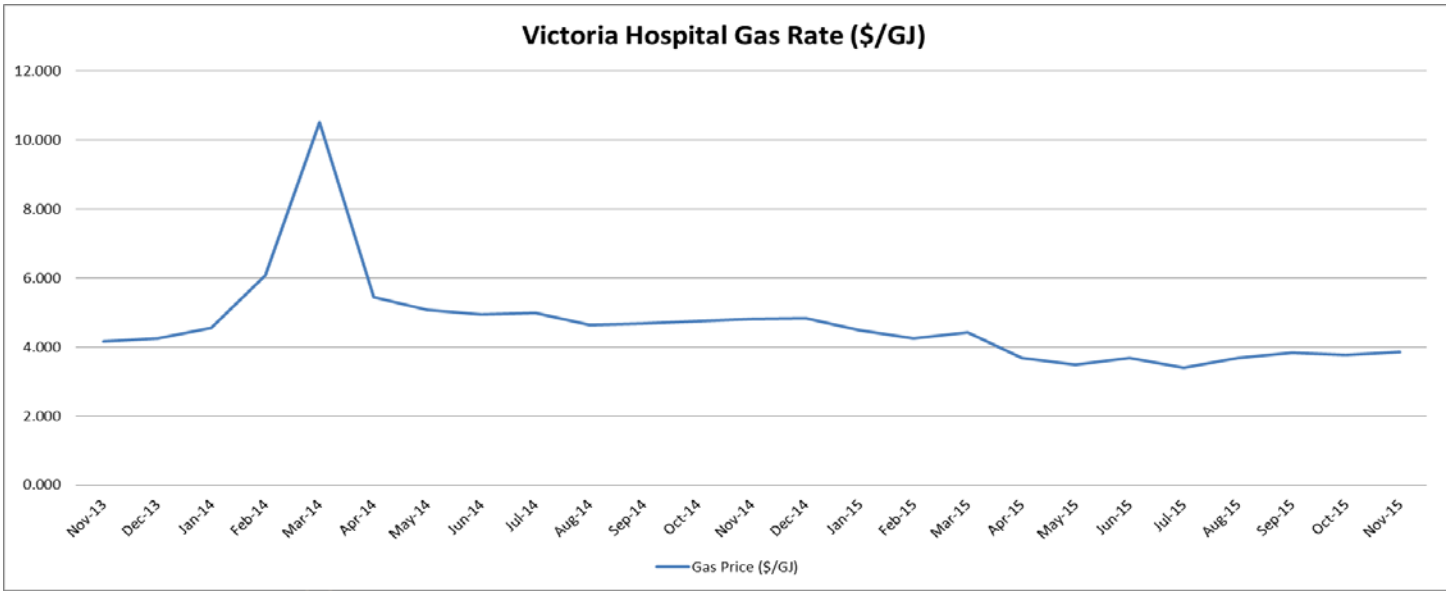
Victoria Hospital – Natural Gas Cost and Consumption



	Cost ($)	Consumption (m3)
2013/2014	$6,144,551	25,975,289
2014/2015	$5,867,794	25,927,991
Last 12 months	$5,114,424	25,769,683

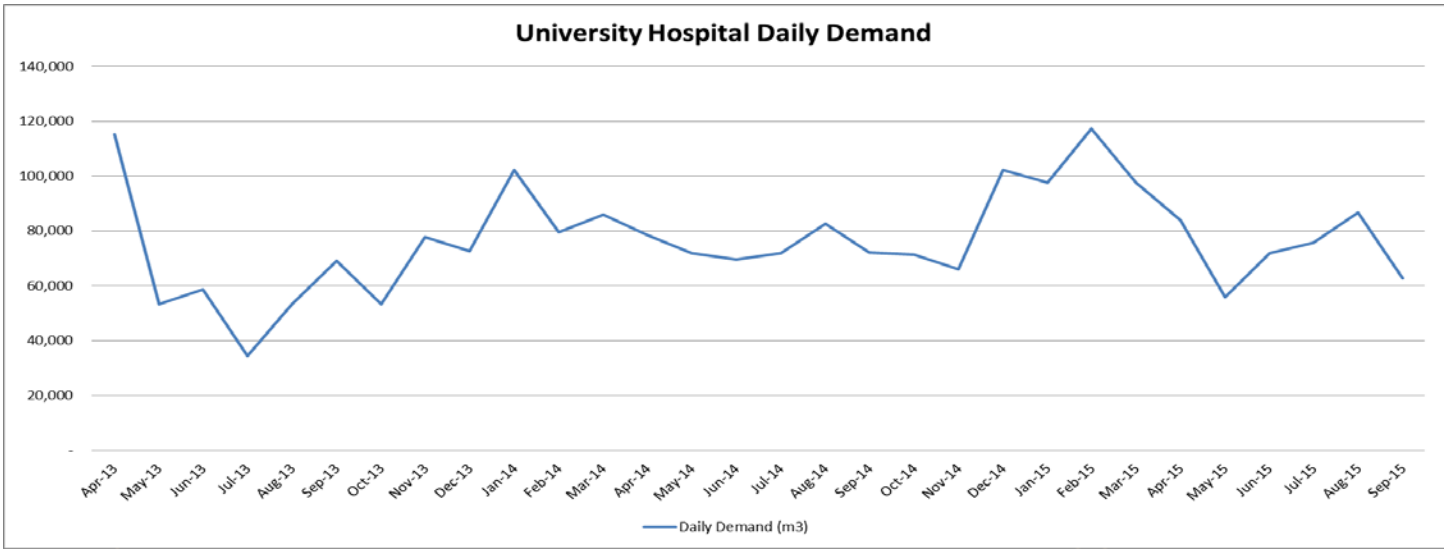
The overall consumption of natural gas has remained fairly consistent at Victoria Hospital over the last couple of years with the majority of the gas being used in the winter when the second gas turbine is running. The cost of natural gas however has been declining overall as a result of the decreasing gas rates shown below. LHSC is capitalizing on these decreasing rates by using a "risk management" approach to gas procurement as opposed to locking in ahead of time at a premium. The price spike seen on the graph was unforeseeable by anyone in the gas business because it was not a commodity price spike. The additional cost came from the basis, or cost to transport the gas from Alberta to Ontario. Victoria hospital's gas price went from $4.50/GJ to over $10.00/GJ however other facilities were paying $25.00/GJ and up to $75.00/GJ. LHSC now locks into the basis (transportation) component for winter months allowing protection from this kind of spike while still maintaining the ability to buy on the spot.

LHSC buys natural gas directly from the gas supplier (Direct Energy and/or BP Energy) and it is then distributed via Union Gas. The natural gas rates can be seen below. The average gas rate for this fiscal year is $3.62/GJ (about $0.14/m3) so far, much lower than our target price of $4.32/GJ and much lower than last fiscal year's price of $4.73/GJ. Our burner tip cost (point of use cost) for this fiscal year is approximately $4.83/GJ (about $0.186/m3) so far.



Last 12 Months Point of Use Cost of Natural Gas for Victoria Hospital - $0.1985/m3

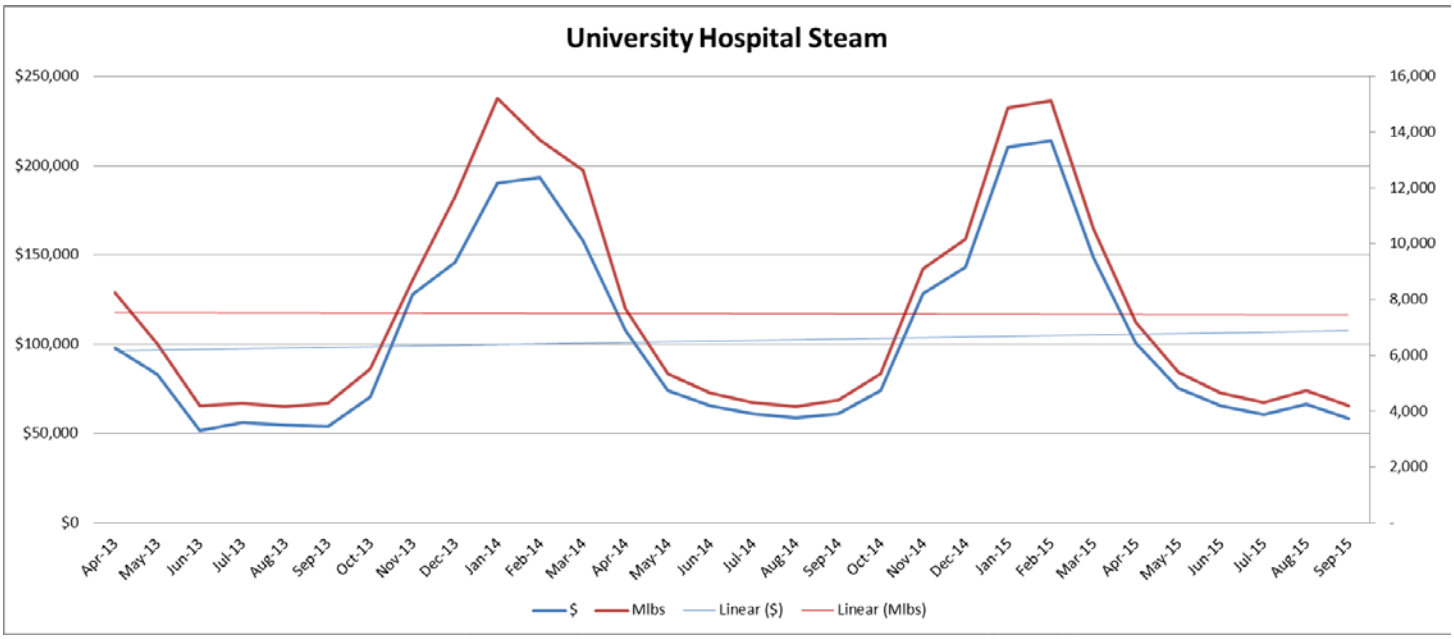
Victoria Hospital – Natural Gas Demand



Victoria Hospital is committed to a daily contracted quantity (DCQ) of natural gas. Incremental gas may be purchased on top of that volume and storage may also be used to inject or withdraw natural gas. The demand above represents the purchased amount (DCQ + Incremental) and does not include injections or withdrawals from storage.

University Hospital Steam

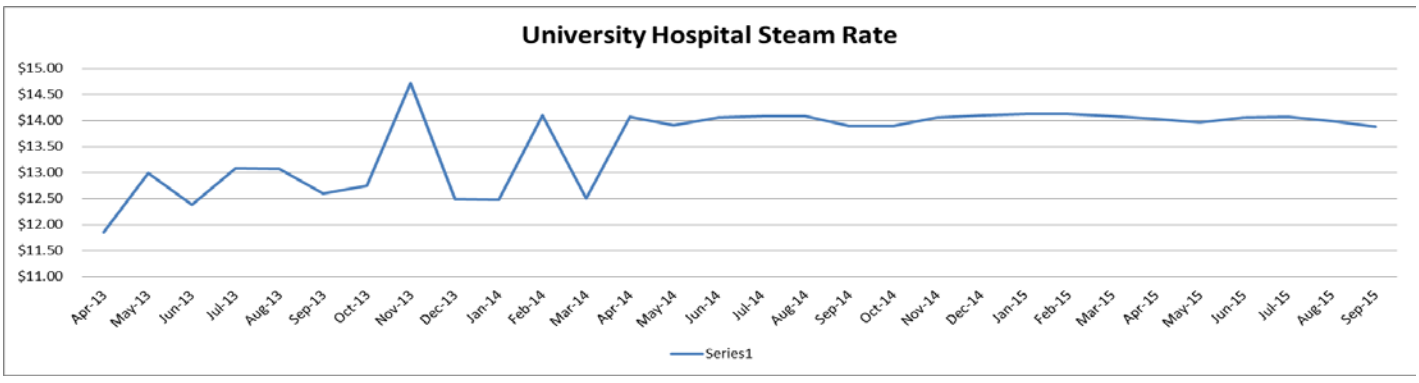
University Hospital – Steam Cost and Consumption



The Last Three Years Summary

	Cost ($)	Consumption (m3)
2013/2014	$1,283,151	99,037
2014/2015	$1,346,754	95,711
Last 12 months	$1,345,177	95,642

University Hospital has a fairly steady annual steam cost and consumption. The steam rate coming from UWO comes from two lines with two corresponding rates. Rate A and rate B are charged at $11.71/Mlb and $13.11/Mlb respectively. Rate A is calculated based on a condensate return meter and Rate B is calculated from a steam flow meter. The point of use cost to University Hospital, with both rates and tax included is as shown below at approximately $14.00/Mlb.



Last 12 Months Point of Use Cost of Steam for University Hospital - $14.06/1000lb

University Hospital – Steam Demand

University Hospital hourly steam demand data is currently not available. It has been requested from UWO and is expected to arrive Monday, November 23.

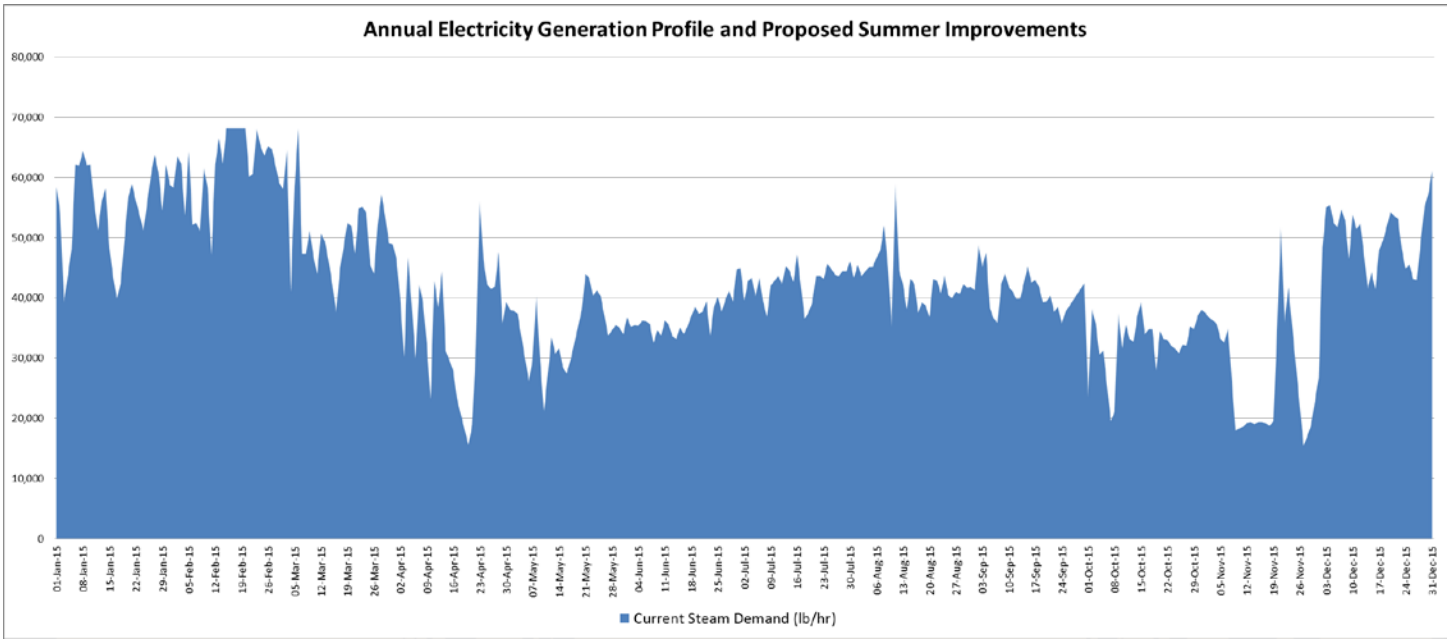
Victoria Hospital Steam

Victoria Hospital – Steam Cost and Consumption

Victoria Hospital steam consumption is tied to weather and the use of absorption chilling at the hospital. In the graph above we can see the difference in steam demand between the summer of 2015, when the hospital was more adamant about using absorption chilling, and the previous two summers. Since Victoria Hospital generates its own steam, the cost is included in the cost of natural gas above. A cost of steam production can be calculated however it will also be intrinsically tied to a cost of electricity production. One cannot be separate from the other. IE; from the calculation below we could say that the power plant could produce steam at a cost of $10.76/Mlb at an electricity production cost of $0.062/kWh. Note that this cost includes all costs associated with running the power plant.

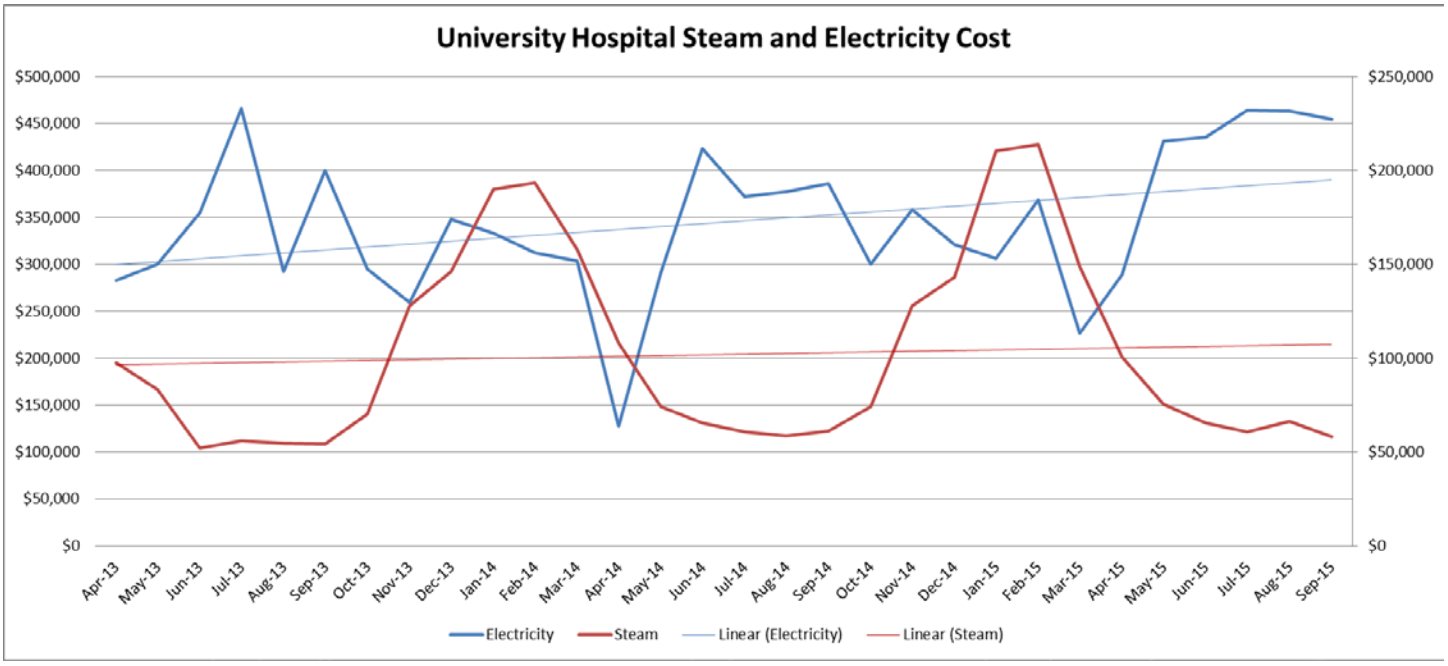
April 2014-March 2015								
Note	CHARGEABLE TO				STEAM		ELECTRICITY	
	Expense	$000's (No GST)	% of Total	Fixed or Variable	Capacity ($000's)	Energy ($000's)	Capacity ($000's)	Energy ($000's)
1	Salaries	**871**	10%	Fixed	697		174	
2	Natural Gas	**5,868**	61%	Variable	-	4,225	-	1,643
3	Purchased Electricity	**3,510**	0%	Variable	-	175	-	3,334
4	Water	**108**	1%	Variable	-	103	-	5
5	Water Treatment Chemicals	**48**	1%	Variable	-	45	-	2
6	Replacement Parts	**84**	1%	Fixed	67		17	
7	Equipment Maintenance - Service Contracts	**1,550**	17%	Fixed	233		1,318	
8	Equipment Maintenance - Other External	**286**	3%	Fixed	214		71	
9	Rental / Lease of Equipment	**605**	7%	Fixed	514		91	
10	Equipment Expense	**7**	0%	Fixed	6		1	
11	Pacific & Western Interest	**715**	0%	Fixed	0		715	
TOTALS		**9,147**	**100%**		**1,731**	**4,548**	**2,387**	**4,985**
Capacity Basis (Note 12)		-	-	-	158,700 pph		10,000 kW	
Energy Basis (Note 13)						423 10^6 lbs		81 GW.h
Proposed Unit Rates					**$.91/pph/mo**	**$10.76/1000 lbs**	**$20/kW/mo**	**$0.062/kW.h**
Add Debt Retirment Charge (DRC)								**$0.069/kW.h**

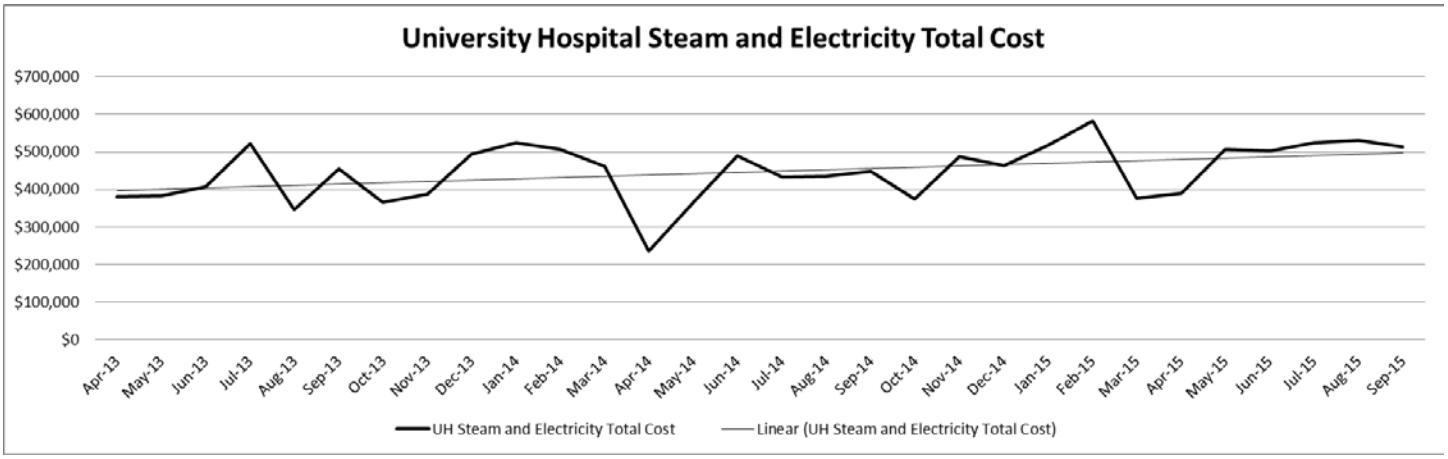
Victoria Hospital – Steam Demand

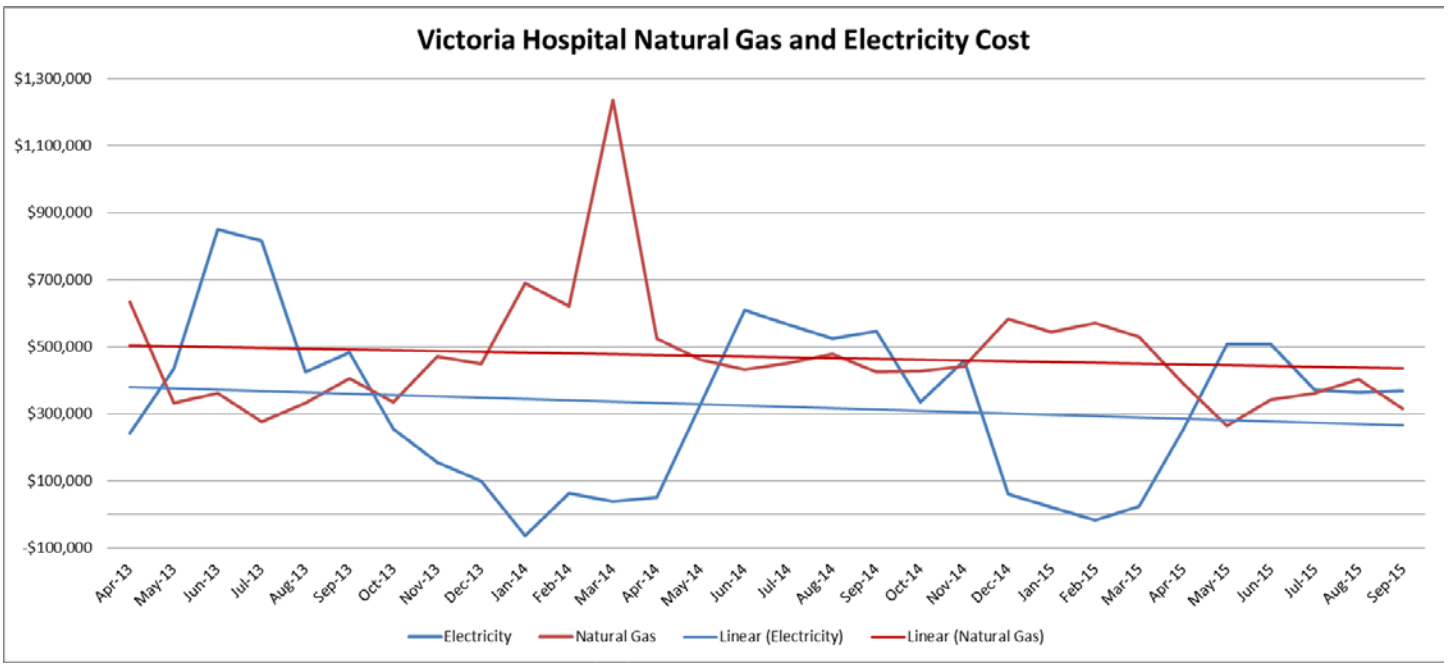


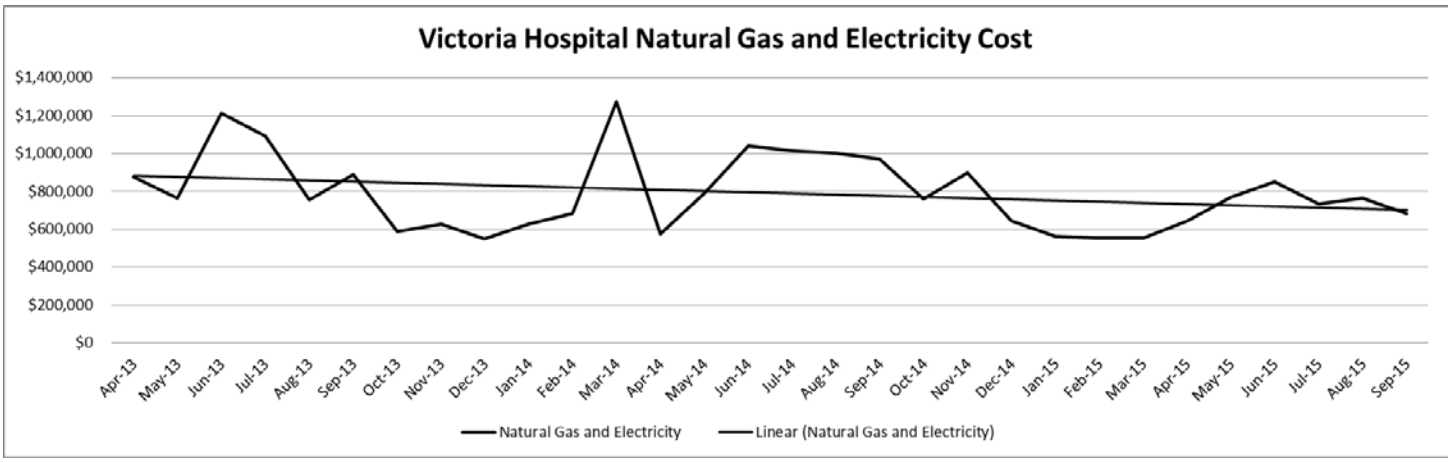
Victoria Hospital steam demand ranges from 20,000 lb/hr in the summer (when absorption chillers are not running) to over 60,000 lb/hr on a cold winter day. Steam demand is important to Victoria Hospital, especially now in the summer months, because it is tied to electricity generation during peak days and our Global Adjustment cost.

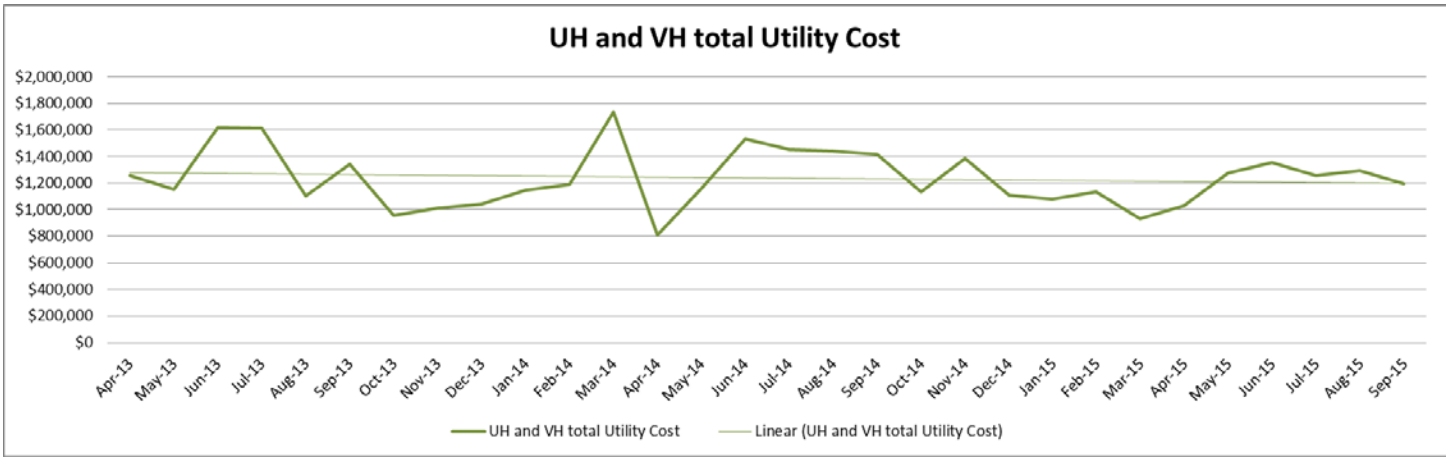
Summary


University Hospital Steam and Electricity Cost
$500,000
$450,000
$400,000
$350,000
$300,000
$250,000
$200,000
$150,000
$100,000
$50,000
$0
$250,000
$200,000
$150,000
$100,000
$50,000
$0
Apr-13 May-13 Jun-13 Jul-13 Aug-13 Sep-13 Oct-13 Nov-13 Dec-13 Jan-14 Feb-14 Mar-14 Apr-14 May-14 Jun-14 Jul-14 Aug-14 Sep-14 Oct-14 Nov-14 Dec-14 Jan-15 Feb-15 Mar-15 Apr-15 May-15 Jun-15 Jul-15 Aug-15 Sep-15
Electricity
Steam
Linear (Electricity)
Linear (Steam)


University Hospital Steam and Electricity Total Cost
$700,000
$600,000
$500,000
$400,000
$300,000
$200,000
$100,000
$0
Apr-13 May-13 Jun-13 Jul-13 Aug-13 Sep-13 Oct-13 Nov-13 Dec-13 Jan-14 Feb-14 Mar-14 Apr-14 May-14 Jun-14 Jul-14 Aug-14 Sep-14 Oct-14 Nov-14 Dec-14 Jan-15 Feb-15 Mar-15 Apr-15 May-15 Jun-15 Jul-15 Aug-15 Sep-15
UH Steam and Electricity Total Cost
Linear (UH Steam and Electricity Total Cost)


Victoria Hospital Natural Gas and Electricity Cost
$1,300,000
$1,100,000
$900,000
$700,000
$500,000
$300,000
$100,000
-$100,000
Apr-13 May-13 Jun-13 Jul-13 Aug-13 Sep-13 Oct-13 Nov-13 Dec-13 Jan-14 Feb-14 Mar-14 Apr-14 May-14 Jun-14 Jul-14 Aug-14 Sep-14 Oct-14 Nov-14 Dec-14 Jan-15 Feb-15 Mar-15 Apr-15 May-15 Jun-15 Jul-15 Aug-15 Sep-15
Electricity
Natural Gas
Linear (Electricity)
Linear (Natural Gas)





In the last three years the utility cost of University Hospital has increased, largely as a result of Ontario electricity rate increases. Some natural growth in utility cost is expected for University Hospital since it is a simple 'purchase to consume' system. Energy efficiency would be the normal path of utility cost reduction in this case.

At Victoria Hospital, we have seen a decrease in utility cost over the last three years and can expect this trend to continue. Declining natural gas prices have been coupled with a risk management procurement strategy that will allow Victoria Hospital to capitalize in a good market. Global adjustment costs are diminishing as a result of removing them from the electricity rate and managing them by peak demand. Victoria Hospital can now acquire electricity cheaper than the cost to generate throughout certain times of the year and will make use of its ability to switch between electricity and natural gas consumption as the market dictates.

Overall, the decreasing costs of Victoria Hospital utilities have covered off the increasing costs of University Hospital and we see an overall declining utility cost for LHSC. For the purpose of this report, water has not been included.